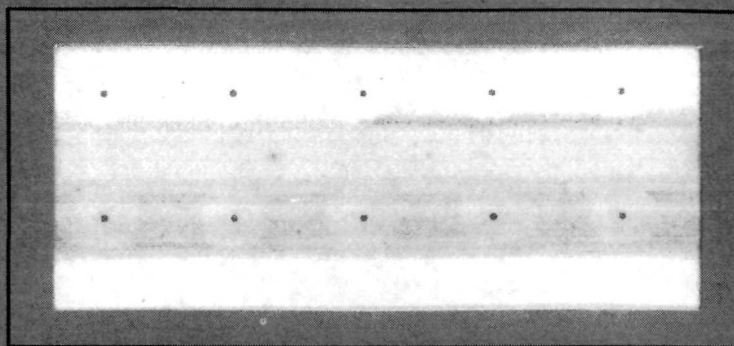
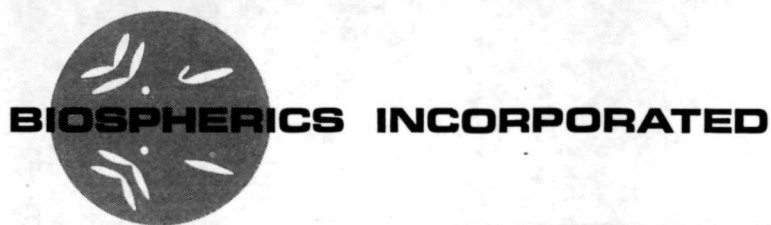


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Report

Final Report - Part II

"Airborne Microwave Radio-
metric Data Analysis"

Contract No. NAS5-21674

Prepared for:

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

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June 13, 1972

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I. INTRODUCTION

Between March 6 and March 13, 1972, NASA conducted a series of remote sensing experiments over the Imperial Valley, California and Phoenix, Arizona. NASA personnel employed the use of a Convair 990 fitted with microwave radiometers and photographic equipment in several overflights of the area. As partial fulfillment of Contract No. NAS5-21674, Biospherics directed ground based operations which included the coordination of sampling teams, placement of flight line markers, soil sample collection, soil moisture analysis, field observations, photography and data handling.

II. PROCEDURES

A. Selection of Test Fields

Several weeks before the scheduled March 1972 flights, meetings were held with personnel from the John D. Hess Testing Corp. of the Imperial Valley, California and the Salt River Project of Phoenix, Arizona. At that time a tentative flight line was selected and preliminary selection of test fields along that flight line were begun. The goal was 50 fields in the Imperial Valley, California and 100 fields in the Salt River Project, Arizona. Fields were to be 50-acre plots, lying within a one-half mile wide flight path which was planned to be paralleled to access roads. The majority of fields were to be free of vegetation.

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B. Placement of Airplane Marker

Prior to the scheduled flights, markers were placed along the flight path to assist with low altitude navigation of the plane over the planned route. The marker material was "day-glo" (international orange) perforated plastic sheeting. Strips 54 inches wide by 24 feet long were laid on the ground parallel to the line of flight at five - ten mile intervals. Ends of the flight path were marked with an "X" of the same material.

It was found during the March 7, 1972 flights that the markers lying flat on the ground were not visible at sufficient distance to provide much plane guidance but did act to verify location during the overpass. Prior to the March 11, 1972 flight, the markers in the Imperial Valley were hung from a scaffolding at ends of the flight paths. They were reportedly easy to observe.

C. Sample Collection

On the day of each flight, soil samples were collected from each of the designated test fields and personnel taking the sample filled out a data sheet as shown in Figure 1.

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FIGURE 1

Data Sheet Used by Field
Personnel During Sample Collection

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Soil Moisture Determinations

Field No. _____ Field Location _____

Date _____ Time _____ Soil Temperature _____ °F

Irrigation System☐ Furrowed, ☐ Bordered, ☐ LeveledVegetation Conditions☐ Bare☐ Fallow ☐ Plowed ☐ Disked ☐ Planted ☐ Non Cultivated☐ Vegetated, Percent Coverage _____ %

Type _____ Height _____

☐ Wilted ☐ TurgidSoil Texture ☐ Sandy Loam ☐ Sandy Clay Loam☐ Loam ☐ Clay Loam☐ Silty Clay
LoamPhysical Description ☐ Cloddy ☐ Smooth ☐ WeedyObserved Water Conditions☐ Flooded (if partial specify) _____☐ Wet☐ Moist Surface☐ Dry Surface, Moist Underneath☐ Dry☐ Trenches Wet, Furrows Dry

Days Since Last Irrigation _____

Can No.	Sample Depth	Net Wt. (gm)	Dry Wt. (gm)	Wt. of H ₂ O	% Moisture Dry Wt. Basis
	0 - $\frac{1}{4}$ "				
	0 - 1"				
	0 - 2"				
	0 - 4"				

Collector _____

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One composite sample for each of four depths, 0 - 1/4 inch, 0 - 1 inch, 0 - 2 inches and 0 - 4 inches, was collected in each field. The 0 - 1/4 inch sample was only taken from fields with little or no vegetation and having a fairly uniform surface texture. Each composite sample was composed of four individual, approximately 25 g, samples which were collected from four sample sites in that field. Individual samples were collected at least 100 yards from the border of the field and at least 30 yards apart and were composited in the field. The samples were to be representative of the field insofar as possible, i. e., furrowed fields should have one-half the sample collected from the top of the furrow and one-half collected from the bottom of the trench; samples of cloddy fields should include clods as well as loose soil in the composite sample.

1. Problems in Obtaining a Representative Sample

Several distinct difficulties were encountered during the sampling operation which make it difficult to obtain a representative sample. These are:

- o Many times irrigation is conducted a section at a time in an individual field. One-third of a field may have been previously irrigated and at the time of flight in a moist to wet condition. The second

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portion of the field may be receiving water and show standing water in trenches while the remainder, yet to be irrigated, is very dry. Slide No. 1A demonstrates this condition. Field personnel made notations of this condition but many times irrigation could have been initiated after the field was visited for sampling but prior to the overflight.

- o As shown in Slide No. 1A, a freshly irrigated field may have water flowing in the trenches but the soil at the tops of the furrows may remain very dry. Thus, representative sampling is nearly impossible. Results may need to be estimated on the basis of water area vs. soil area. A typical sized furrow is shown in Slide No. 1C.
- o After irrigation, the tops of the furrows dry more rapidly than the trenches (see Slide No. 1B). It was also noted that cultivation results in mixing moist clods from the trenches with dry clods from the tops of the furrows. This condition is demonstrated in Slide No. 1D where the moist clods appear much darker than the dry ones.

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- o Not all samples were collected at the same time. Especially at Imperial Valley, samples were collected from 7:00 a.m. until 6:45 p.m. on the day of the flight. Moisture conditions could occur during this period of time. It was observed in at least one case that a wet field, which was soggy to walk upon in the morning, was easily walked upon by late afternoon.
- o It was learned that most of the irrigated fields in the Imperial Valley are drained by a network of leach drains which are burried 30 to 300 feet apart. After irrigation, fields drain and dry out much more rapidly in the area above these drains. Although this drying pattern was not actually observed, it may have caused overall moisture concentrations to be different than those found by soil sampling. The location of these leach drains may be obtained from the Imperial Irrigation District, Imperial County, California.

2. Definition of Terms

A data sheet, as shown in Figure 1, was filled out by personnel for each test field on the day of each flight. The following is an explanation of terms found on this sheet:

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- o Field No. - is an arbitrary number assigned to each test field. The field number is also used to identify the location of test fields which are marked on irrigation maps. Imperial Valley numbers, 1 - 50, are used to identify the 50 test fields in that area. Salt River Project numbers range from 2 - 106 but are not complete and also include numbers with a letter subscript. This was because some fields which were selected earlier, were found to be unsuitable at the time of the overflights. Cards bearing the assigned field numbers and the letters P (for Phoenix) and IV (for Imperial Valley) were staked in each test field. These cards are included in slides taken of the fields and identify the field location.
- o Field Location - in the Salt River Project is as follows: The State of Arizona is divided into four quadrants, the center being the intersection of 115th Avenue and Baseline Road (see Phoenix Irrigation Map). The quadrants are identified by letters beginning in the upper right and going counter clockwise. Each section is identified in the same

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manner, with each succeeding letter or number referring to a quadrant within the previously identified larger quadrant. For example, D1205bc identifies a 40-acre field located in the S. W. 1/4, N. W. 1/4 Sec. 5 T.1S. R.2E. This field is number 50 which may be found one-quarter mile south of the intersection of 50th Avenue and Baseline Road.

The test fields in the Imperial Valley are located solely on the basis of field numbers on the included maps.

- o Date - month, day and year when sample was collected.
- o Time - is when the sample was collected. Local time is given, i. e., for the Phoenix area this is Mountain Standard Time (MST) and for the Imperial Valley it is Pacific Standard Time (PST).
- o Soil Temperature - was obtained at Phoenix only and was done by slanting a soil thermometer into the soil to a depth of 1 - 2 inches.
- o Irrigation System - describes the general topography of the surface. Three types were commonly encountered:

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- Furrowed (F) - field prepared for irrigation water to run in parallel ditches. Furrows vary in depth and width. Twelve inches by 36 inches, respectively, are typical (see Slide No. 1C).
- Bordered (B) - field prepared for irrigation water to flood entire field. Ridges approximately one foot high and 30 feet apart traverse the field.
- Leveled (L) - used to describe field which has been disked, plowed, dragged, etc., to remove borders or furrows. A non-cultivated or fallow field having a relatively flat surface is also described by this term.
- o Vegetation Conditions - or conditions of the field are categorized as bare or vegetated.
 - Bare (B) - no visible crops. Several stages of field preparation or planting were encountered. These were:
 - (a.) Fallow - field idle since last crop. No recent turning of soil. Stubble or weeds may remain.
 - (b.) Plowed - surface turned, generally produces large clods.
 - (c.) Disked - surface worked after or instead of plowing. Clods are generally smaller than plowed field.

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- (d.) Planted - field prepared and planted but without visible sprouting.
- (e.) Non-cultivated - not showing signs of cultivation. Surface is generally smooth.
- Vegetated (V) - crops visible. The type of crop, percent coverage estimated by field personnel, and height are indicated.
- o Soil Texture - has been classified by field personnel as (1) sandy loam, (2) loam, (3) silty clay loam, (4) sandy clay loam and (5) clay loam. This classification is strictly an estimate and, as shown in the data, varied somewhat on different days.
- o Physical Description - The gross texture of the soil has been described as being either cloddy (C) or smooth (S). Clods are hard clumps of soil which vary in size up to ten inches in diameter. Weeds (W), if present, are also indicated. Slide Nos. 1C, 1E and 1F demonstrate typical soil surface types. Slide No. 1E is a cloddy level field and 1F a smooth, fallow non-cultivated field with weeds. The field shown in Slide No. 1C is a freshly furrowed field which would probably be considered smooth by most field personnel.

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- o Observed Moisture - Conditions at the time of sampling were noted by field personnel. These conditions are:
 - (F) Flooded
 - (W) Wet
 - (DSMU) Dry Surface, Moist Underneath
 - (D) Dry
 - (TWFD) Trenches Wet, Furrows Dry
- o Analyzed Moisture (%) - determined by the following procedure:
 - Approximately 100 g of soil was taken to the laboratory and weighed.
 - The sample was placed in an oven and dried at approximately 105°C for 24 hours.
 - Samples were reweighed.
 - The percent moisture (dry weight basis) is calculated by the following:
$$\text{Moisture (\%)} = \frac{\text{wet wt.} - \text{dry wt.}}{\text{dry wt.}} \times 100$$

III. RESULTS

The results of soil moisture determinations and observed conditions of test fields are tabulated in Tables 1 to 7, Appendix I.

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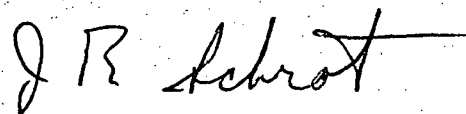
Maps used to locate the test fields are included in Appendix II.

The test fields are blocked off and are numbered to correspond with soil moisture data appearing in Tables 1 to 7.

Slides were taken of the individual test fields. Eighty-acre fields which were designated as two test fields in the Imperial Valley, California were sometimes represented by a single slide showing two field numbers. The dates and order in which slides were taken are as follows:

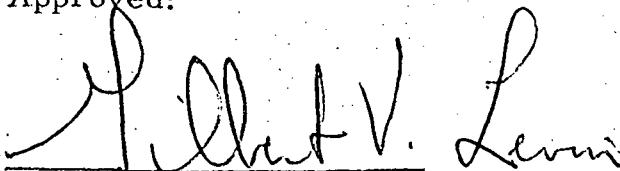
<u>Date</u>	<u>Location</u>	<u>Field Numbers</u>
3/07/72 Morning	Imperial Valley	38 → 50
3/07/72 Afternoon	Imperial Valley	30 → 1
3/08/72 Morning	Imperial Valley	37 → 37
3/10/72 Morning	Phoenix	59, 61, 63, 64, → 66
3/11/72 Morning	Phoenix	106 → 67, 62, 60, 58, 57
3/13/72 Morning	Phoenix	56 → 28
3/13/72 Afternoon	Phoenix	2 → 26

Respectfully submitted,



J. R. Schrot, Ph.D.
Project Director

Approved:



Gilbert V. Levin, Ph.D.
President

APPENDIX I

Soil Moisture Data

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TABLE 1

Fields Which Were Sampled During the 1972
NASA Overflights of Phoenix, Arizona

<u>Field Number</u>	<u>Location</u>	<u>Irrigation System</u>	<u>Field or Vegetation Conditions</u>	<u>Soil Texture</u>	<u>Physical Description</u>
2	D1604aa	F	B	2	
3	D1604bd	F	B	2	
4	D1604bc	F	B	2	
7	D1605bb	L	B,1	2	CS
8	D1605bc	L	B,3	2	C
9	D1606ad	B	V, 4 (alfalfa, 1/2")	2	S
10	D1606ab		B,3	2	C
11	D1606ac	L	B,3	2	S
11a	D1606ba	F	V, (lettuce, 30%, 3")	2	S
11b	D1606bd	F	V, (lettuce, 35%, 5")	2	S
13	D1503ba	F	B	2	C
14	D1503bd	F	B	2	C
14a	D1504bb	B	V, (barley, 100%, 14")	2	S
14b	D1504bc	B	V, (barley, 100%, 14")	2	S
14c	D1505aa	B	V, (barley, 100%, 12")	2	S
14d	D1505ad	B	V, (barley, 100%, 12")	2	S
14e	D1401aa	B	V, (grain, 100%, 12")	5	S
14f	D1401ad	B	V, (grain, 100%, 12")	5	S
14g	D1401ab	B	V, (alfalfa, 15%, 10")	5	S
14h	D1401ac	B	V, (alfalfa, 95%, 10")	5	S
15	D1504ba	F	B	2	C
16	D1504bd	F	B	2	C
19	D1401bb	B	B,3	5	C
20	D1401bc	L	B,3	5	C
25	D1404aa	F	V, (Safflower, 60%, 6")	1	S
26	D1404ad	F	V, (Safflower, 50%, 5")	1	S
28	D1306bb	L	B	1	S
29	D1306bc	F	B	1	S
30	D1201ab	F	B	1	C
31	D1201ba	F	B	1	S
32	D1201bd	F	B	1	S
33	D1201bb	F	F	1	S
34	D1201bc	F	B	1	S
36	D1202ad	L	B,3	1	S
38	D1202ac	L	B,3	2	S

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TABLE 1
(continued)

Fields Which Were Sampled During the 1972
NASA Overflights of Phoenix, Arizona

<u>Field Number</u>	<u>Location</u>	<u>Irrigation System</u>	<u>Field or Vegetation Conditions</u>	<u>Soil Texture</u>	<u>Physical Description</u>
39	D1202bd	F	V, (Safflower, 15%, 3")	2	S
40	D1202bc	F	V, (Safflower, 20%, 3")	4-2	S
41	D1203aa	F	B,1	4-2	S
42	D1203ad	F	B,1	4-3	S
43	D1203ab	F	B,1	4-2	S
44	D1203ac	F	B,1	4-2	S
45	D1203ba	F	B,1	5-2	S
46	D1203bd	F	B,1	2	S
47	D1203bb	L	B,1	2	S
48	D1203bc	L	B,1	2	S
50	D1205bc	F	B,1	2-3	S
51	D1206aa	F	B,1	3	S
53	D1101ba	F	B,1	2	S
54	D1101bd	F	B,1	2	S
55	D1101bb	L	B,3	2	W
56	D1101bc	L	B,3	2	S
57	A1133ab	L	B,1	4-3	S
58	A1128da	F	B,1	3	
59	A1121d(c&d)	B	V, (alfalfa, 100%)	1	
60	A1121ac	F	B,1	3	S
61	A1121ad	F	B,1	3	S
62	A1121ab	F	B,1	4	S
63	A1121aa	F	B,1	4-3	S
64	A1116dd	L	B,1	4-3	S
65	A1109d(c&d)	F	V, (grain, 100%, 30")	3	
66	A1109d(a&b)	F	V, (grain, 100%, 30")	3	
67	A1104ac	F	B,1	3-5	S
68	A1104ad	F	B,1	3-5	S
69	A1104ab	F	V, (safflower, 5%, 2")	3	S
70	A1104aa	F	V, (safflower, 5%, 2")	3	S
71	A2133dc	F	B	3	C
72	A2133dd	F	B	3	C
73	A2133ac	F	B	3	SC
74	A2133ad	F	B	3	SC
75	A2133ab	F	B	3	S

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TABLE 1
(continued)

Fields Which Were Sampled During the 1972
NASA Overflights of Phoenix, Arizona

<u>Field Number</u>	<u>Location</u>	<u>Irrigation System</u>	<u>Field or Vegetation Conditions</u>	<u>Soil Texture</u>	<u>Physical Description</u>
76	A2133aa	F	B,4	3	S
77	A2128d(c&d)	F	V, (wheat, 100%, 20")	3	
78	A2128d(a&b)	F	V, (beets, 5%, 8")	3	
79	A2121dc	B	V, (wheat, 80%, 6")	5	S
80	A2121dd	B	V, (wheat, 70%, 5")	5	S
81	A2121db	B	V, (wheat, 60%, 4")	5	S
82	A2116dc	B	V, (alfalfa, 100%, 10")	5	S
83	A2116db	F	B,1	5	C
84	A2116da	F	B,1	5	C
85	A2116ab	B	B,1	4-1	C
86	A2116aa	L	B,3	4-1	SC
87	A2104d(c&d)	B	V, (alfalfa, 100%, 18")	1	S
88	A2104d(a&b)	B	V, (alfalfa, 75%, 12")	1	
89	A2104ac	F	B,1	5-4	C
90	A2104ad	F	B	5	S
91	A3133db	F	B	4-5	S
92	A3133da	B	V, (alfalfa, 30%, 2")	4-5	S
93	A3133ad	F	B	1	S
94	A3133aa	F	B	1	S
95	A3128dc	F	B	1-5-4	C
96	A3128dd	F	B	1-2	C
97	A3128db	F	B	1	C
98	A3128da	B	B	1	S
99	A3128ac	F	B	4-1	C
100	A3128ad	F	B	1-4-5	C
101	A3128ab	F	B,2	1-4-5	S
102	A3121dc	B	V, (wheat, 50%, 6")	1	S
103	A3121db	F	V, (wheat, 80%, 8")	4	
104	A3121da	F	V, (wheat, 60%, 6")	3	S
105	A3121ac	B	V, (wheat, 40%, 6")	5	S
106	A3121ad	B	V, (wheat, 40%, 6")	3	S

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TABLE 2

Soil Moisture of Test Fields Which Were
Sampled at Phoenix, Arizona on 3/7/72

Field Number	Time MST	Soil Temp. (°F)	Observed Moisture Conditions	Soil Moisture (%)			
				0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
2	10:00 A	67	D		1.9	2.1	2.2
3	10:15 A	68	D		2.5	2.9	3.2
4	10:40 A	74	D		2.2	2.5	3.4
7	11:00 A	82	D	2.9	2.9	3.9	3.6
8	11:10 A	70	D	2.6	3.1	3.7	7.5
9	11:15 A	70	DSMU	2.9	9.6	15.5	16.6
10	11:30 A	68	D		2.9	3.5	6.0
11	11:20 A	76	D	2.2	2.8	4.4	6.1
11a	11:40 A	68	DSMU		11.4	14.1	15.0
11b	11:45 A	66	DSMU		14.8	15.1	15.3
13	2:20 P	88	D	1.7	3.1	3.8	4.2
14	2:30 P	94	D	2.9	3.2	3.5	4.1
14a	3:00 P	76	DSMU		15.6	16.5	15.8
14b	2:55 P	76	DSMU		13.8	15.3	15.6
14c	3:05 P	78	MS		27.8	25.6	25.5
14d	3:15 P	78	MS		29.3	27.5	26.2
14e	4:18 P	69	W		23.8	23.4	22.3
14f	4:25 P	60	W		22.1	21.8	21.3
14g	3:50 P	91	D		5.8	9.1	7.8
14h	3:45 P	91	D		7.9	8.8	8.8
15	2:40 P	84	D		2.5	3.0	3.4
16	2:50 P	88	D		2.1	3.4	3.2
19	10:00 A	61	D		4.6	5.1	4.3
20	10:10 A	61	D		2.9	3.2	5.2
25	10:20 A	69	TWFD	11.7	12.7	12.7	14.2
26	10:30 A	70	TWFD	7.9	10.6	9.8	13.8
28	11:00 A	76	D		1.6	1.6	1.4
29	11:15 A	76	D		1.6	2.0	1.9
39	11:20 A	80	D		2.2	2.1	2.4
31	11:30 A	77	W (20)		9.3	13.2	15.2
32	11:50 A	80	DSMU		4.2	6.6	8.0
33	1:30 P	96	D (17)		0.8	1.1	1.4
34	1:40 P	89	TWFD		9.6	11.2	13.1
36	12:00 N	93	D	0.8	1.0	2.4	1.3
38	2:15 P	94	D	1.2	1.9	1.9	2.1

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TABLE 2
(continued)

Soil Moisture of Test Fields Which Were
Sampled at Phoenix, Arizona on 3/7/72

Field Number	Time MST	Soil Temp. (°F)	Observed Moisture Conditions	Soil Moisture (%)			
				0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
39	2:20 P	93	DSMU	1.1	3.0	4.2	6.7
49	2:18 P	90	DSMU	0.8	2.7	3.0	7.5
41	1:45 P	97	D	0.7	0.9	1.0	1.4
42	2:00 P	97	D	0.8	1.0	1.2	1.4
43	1:35 P	97	D	0.7	0.9	1.0	6.2
44	1:54 P	98	D	0.8	1.1	1.3	1.8
45	11:30 A	90	D	1.6	1.6	1.8	2.8
46	11:20 A	78	D	1.8	2.0	2.2	2.8
47	11:08 A	79	D	1.1	1.2	1.2	1.3
48	11:15 A	78	D	1.1	0.8	1.5	1.6
50	10:51 A	79	D	1.5	1.8	2.0	1.9
51	10:44 A	82	D	2.1	2.4	2.4	4.7
53	10:20 A	80	D	2.4	2.4	3.1	4.7
54	10:10 A	80	D	2.1	2.3	3.5	3.5
55	10:32 A		D	2.7	3.4	2.8	5.6
56	10:25 A	75	D	4.8	4.9	3.1	5.0
57	10:00 A	70	D		2.2	3.3	4.4
58	10:00 A	62	DSMU		17.0	21.9	22.6
59	10:30 A	62	D (21)		8.5	6.2	9.3
60	10:40 A	64	DSMU		11.1	22.3	20.5
61	10:50 A	64	TWFD	18.0	20.7	22.9	24.1
62		68	DSMU		13.4	9.6	21.9
63	10:10 A	70	DSMU	7.4	13.0	18.0	18.5
64	11:25 A	82	D	2.4	3.1	5.3	6.8
65	11:40 A	60	W		29.1	27.1	25.4
66	11:45 A	60	W		31.6	29.6	29.3
67	1:10 P	80	DSMU	22.6	23.8	25.4	25.6
68	1:00 P	74	DSMU	9.9	17.6	21.6	23.6
69	1:40 P	70	DSMU		7.6	34.1	21.7
70	1:55 P	70	DSMU		9.4	17.7	18.8
71	10:15 A	67	TWFD	26.5	33.6	34.4	28.4
72	10:00 A	66	TWFD	26.7	31.9	28.0	29.8
73	10:30 A	68	TWFD	22.1	27.7	23.9	26.7
74	10:45 A	70	TWFD	15.2	18.8	19.0	20.8
75	11:15 A	72	DSMU	3.9	8.0	7.6	

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TABLE 2
(continued)

Soil Moisture of Test Fields Which Were
Sampled at Phoenix, Arizona on 3/7/72

Field Number	Time MST	Soil Temp. (°F)	Observed Moisture Conditions	Soil Moisture (%)			
				0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
76	11:00 A	60	DSMU	4.5	7.1	9.9	17.5
77	11:30 A	58	W		23.1	29.9	30.3
78	11:35 A	76	MS		17.9	22.1	21.7
79	11:40 A	72	W		40.2	37.6	36.6
80	11:45 A	71	W		32.9	30.7	28.1
81	12:45 P	69	W		37.4	35.2	32.6
82	1:00 P	68	MS		20.5	18.4	19.8
83	1:15 P	84	D (1)	2.3	2.4	2.8	3.6
84	1:30 P	86	D		2.3	2.6	3.1
85	1:45 P	86	DSMU	3.0	6.2	10.6	13.6
86	2:00 P	82	DSMU		5.7	6.3	10.8
87	2:15 P	62	MS		11.9	12.7	15.1
88	2:00 P	70	D		3.5	10.3	24.3
89	1:30 P	74	D	5.7	5.3	7.5	10.1
90	1:45 P	75	DSMU	10.5	14.3	14.4	14.8
91	1:15 P	71	DSMU	5.6	8.8	14.5	16.4
92	1:30 P	78	DSMU	11.0	18.0	18.7	21.3
93	12:45 P	68	DSMU	3.0	13.1	13.7	15.5
94	1:00 P	71	DSMU	3.4	11.8	12.2	13.4
95	11:15 A	58	TWFD (2)	12.1	24.1	25.0	29.9
96	11:30 A	61	D (4)	2.0	2.6	4.6	7.6
97	11:40 A	64	DSMU	21.7	21.5	25.7	25.3
98	11:30 A	62	D	2.8	3.8	5.2	5.4
99	11:00 A	60	W	15.7	18.8	18.2	16.8
100	11:10 A	60	TWFD	14.8	22.2	22.0	21.5
101	10:45 A	60	D	1.9	2.4	4.5	6.5
102	10:30 A	60	W		26.1	20.5	20.6
103	10:20 A	58	W		23.6	19.3	22.6
104	10:00 A	57	W		24.3	22.5	22.8
105	9:50 A	57	W		28.4	22.4	22.0
106	9:45 A	56	W		23.6	19.7	20.9

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TABLE 3

Soil Moisture of Test Fields Which Were
Sampled at Phoenix, Arizona on 3/11/72

Field Number	Time MST	Soil Temp. (°F)	Observed Moisture Conditions	Soil Moisture (%)			
				0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
2	9:30 A	64	D		1.4	1.8	2.1
3	9:40 A	66	D		2.7	2.8	3.3
4	9:50 A	65	D		2.7	3.1	3.3
7	10:15 A	74	D	3.0	3.6	4.9	4.7
8	10:30 A	70	D	3.1	4.0	4.2	4.6
9	10:40 A	66	F				
10	11:10 A	76	D		3.5	4.1	5.3
11	10:45 A	72	D	2.8	3.4	4.3	5.0
11a	11:15 A	70	DSMU		3.3	7.7	9.8
11b	10:50 A	68	DSMU (22)		7.4	10.3	13.2
13	12:30 P	78	D	2.3	2.5	4.9	2.5
14	12:35 P	76	D	3.2	3.4	3.2	3.5
14a	1:05 P	66	DSMU (23)		14.4	12.6	12.8
14b	12:55 P	72	DSMU		9.8	13.3	14.3
14c	1:20 P	68	MS		22.1	21.4	20.8
14d	1:00 P	72	MS		22.8	21.2	20.6
14e	2:45 P	72	MS		17.5	17.6	18.0
14f	2:45 P	76	MS		10.7	16.1	16.4
14g	2:50 P	76	D		7.3	7.6	10.8
14h	2:55 P	76	D		5.3	7.3	9.0
15	2:42 P	88	D		2.4	2.6	2.5
16	12:50 P	88	D		2.1	3.1	3.3
19	10:00 A	66	D		2.4	2.6	3.3
20	10:15 A	67	D		6.0	2.3	3.2
25	10:30 A	68	TWFD	5.2	6.5	5.5	6.4
26	10:40 A	68	TWFD	4.5	6.0	7.0	9.4
28	11:10 A	72	D (18)		1.1	1.1	1.0
29	11:28 A	72	D		1.1	1.3	1.6
30	11:35 A	78	D		1.2	1.6	1.8
31	11:45 A	75	W (24)		12.0	15.1	12.8
32	11:50 A	74	DSMU		1.8	3.9	6.1
33	11:50 A	95	D (25)		1.2	1.0	1.6
34	1:32 P	90	TWFD		9.7	11.3	14.8
36	1:40 P	92	D	0.9	1.3	1.5	1.9
38	2:00 P	100	D	1.1	1.3	2.3	1.5

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TABLE 3
(continued)

Soil Moisture of Test Fields Which Were
Sampled at Phoenix, Arizona on 3/11/72

Field Number	Time MST	Soil Temp. (°F)	Observed Moisture Conditions	Soil Moisture (%)			
				0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
39	2:25 P	97	DSMU	1.7	2.0	3.9	4.1
40	2:40 P	101	DSMU	1.5	2.3	3.5	5.2
41	1:55 P	99	D	0.9	1.0	1.1	1.3
42	2:15 P	100	D (3)	0.7	0.9	1.0	1.3
43	2:00 P	98	D	0.9	0.9	1.0	1.2
44	2:25 P	101	D	0.9	0.9	1.0	1.3
45	1:31 P	102	D	1.4	1.6	2.4	2.1
46	1:35 P	102	D	1.4	1.7	1.8	2.5
47	1:40 P	97	D	0.7	0.9	1.0	1.2
48	1:45 P	98	D	0.9	1.0	1.2	1.7
50	11:22 A	72	W	26.1	26.4	25.5	26.7
51	11:07 A	74	D	1.5	2.5	1.7	1.9
53	10:34 A	78	D (5)	2.3	2.1	2.3	3.0
54	10:55 A	84	D (6)	2.6	2.9	2.9	3.4
55	10:17 A	70	D	2.5	2.7	3.0	6.2
56	10:22 A	70	D	2.5	2.6	2.6	4.3
57	1:15 P	93	D		2.1	2.6	3.4
58	10:30 A	67	DSMU		15.2	22.4	23.8
59	10:45 A	77	D		3.2	3.9	7.6
60	11:00 A	73	DSMU		7.7	9.2	15.1
61	11:15 A	76	DSMU	8.2	14.0	14.9	19.5
62	11:20 A	74	DSMU		13.2	18.7	20.0
63	11:05 A	70	DSMU	3.7	9.8	17.1	18.1
64	12:00 A	87	D	2.1	2.8	3.6	5.8
65	12:16 P	62	W		24.7	23.0	21.5
66	12:35 P	60	W		30.6	28.5	27.2
67	12:50 P	78	DSMU	3.2	3.6	4.9	14.7
68	1:10 P	78	DSMU	3.3	3.8	6.4	17.3
69	1:30 P	82	DSMU		9.7	14.6	17.6
70	1:45 P	81	DSMU		8.7	13.2	20.2
71	10:00 A	65	TWFD	19.9	21.4	24.8	24.6
72	9:45 A	66	TWFD	16.1	21.0	20.9	22.4
73	10:15 A	65	DSMU	14.2	19.1	18.9	21.4
74	10:30 A	66	DSMU	12.0	14.5	16.4	19.9
75	11:00 A	70	DSMU	4.2	4.9	6.3	16.0

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TABLE 3
(continued)

Soil Moisture of Test Fields Which Were
Sampled at Phoenix, Arizona on 3/11/72

Field Number	Time MST	Soil Temp. (°F)	Observed Moisture Conditions	Soil Moisture (%)			
				0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
76	10:45 A	60	DSMU	4.0	4.7	7.3	24.9
77	11:15 A	55	W		31.5	29.5	28.4
78	11:20 A	70	MS		21.4	21.7	22.2
79	11:30 A		MS		26.9	26.7	26.6
80	11:35 A	70	MS		19.0	18.9	23.8
81	12:45 P	71	MS		17.1	22.5	24.0
82	1:00 P	66	DSMU		13.1	14.7	16.8
83	1:15 P	90	D (1)	1.9	2.3	2.8	3.7
84	1:30 P	70	W	30.9	34.2	35.6	33.8
85	1:45 P	80	DSMU	2.7	3.8	7.2	12.7
86	2:00 P	88	DSMU	1.8	2.8	4.4	10.2
87	2:15 P	62	MS		8.8	8.5	10.2
88	2:30 P	70	W		24.9	24.2	20.0
89	1:45 P	78	D (7)	3.5	15.2	7.2	25.4
90	2:15 P	77	DSMU	6.7	15.7	15.9	16.2
91	1:30 P	78	DSMU	3.3	15.4	16.0	15.3
92	1:40 P	78	DSMU	7.4	17.1	15.7	18.2
93	1:15 P	71	DSMU	2.4	9.6	13.6	13.8
94	1:25 P	72	DSMU	2.2	10.6	11.2	12.9
95	11:10 A	62	W (8)	18.4	19.2	22.6	21.9
96	11:10 A	66	D	2.5	2.7	6.1	9.6
97	11:15 A		W (9)	11.1	18.8	21.1	19.3
98	1:00 P	72	D	2.1	4.1	14.5	9.3
99	10:50 A	62	TWFD	8.1	15.5	16.4	12.7
100	11:00 A	63	DSMU	6.2	19.6	21.1	21.4
101	10:45 A	64	TWFD	12.8	23.3	25.0	24.9
102	10:40 A	60	DSMU		11.7	13.9	14.4
103	10:10 A	59	DSMU		15.9	16.5	16.7
104	10:20 A	61	DSMU		16.1	17.9	18.9
105	10:25 A	60	DSMU		14.2	15.8	16.0
106	10:30 A	60	DSMU		10.5	13.4	13.7

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TABLE 4

Soil Moisture of Test Fields Which Were
Sampled at Phoenix, Arizona on 3/13/72

Field Number	Time MST	Soil Temp. (°F)	Observed Moisture Conditions	Soil Moisture (%)			
				0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
2	9:30 A	66	D (19)		1.6	1.6	1.8
3	9:35 A	62	D		2.7	3.0	3.6
4	9:45 A	68	D		2.5	2.7	3.1
7	10:25 A	74	D	2.8	3.3	4.5	5.7
8	10:30 A	76	D	2.8	3.5	3.9	4.6
9	10:35 A	68	MS	7.0	18.3	20.4	21.8
10	11:10 A	75	D		3.4	3.4	5.5
11	10:45 A	84	D	2.0	2.3	0.7	3.4
11a	11:15 A	72	DSMU		5.2	7.1	9.8
11b	10:55 A	68	DSMU		7.8	8.9	11.9
13	11:20 A	72	D	1.7	2.5	2.7	3.3
14	11:30 A	74	D	2.1	3.1	3.3	3.9
14a	11:45 A		F				
14b	11:45 A		F				
14c		66	MS		19.1	19.2	17.6
14d	11:50 A	66	MS		19.0	17.9	19.3
14e	12:05 P	66	MS		3.5	14.1	15.4
14f	12:10 P	67	MS		10.4	16.1	18.3
14g	12:20 P	80	D		4.6	5.7	10.9
14h	12:15 P	80	D		5.2	7.8	8.0
15	11:35 A	72	D		2.1	1.9	2.6
16	11:40 A	78	D		2.1	2.2	2.4
19	10:00 A	65	D		2.5	2.7	3.7
20	10:10 A	65	D		2.0	2.3	3.8
25	10:25 A	66	DSMU	4.1	6.0	5.9	7.0
26	10:35 A	68	DSMU	4.8	5.5	7.0	8.5
28	11:00 A	76	D		1.1	1.2	1.3
29	11:10 A	67	W		18.0	21.3	22.1
30	11:25 A	88	D		1.3	1.4	1.7
31	11:30 A	80	DSMU		6.0	7.8	8.6
32	11:40 A	80	DSMU		1.5	2.8	5.7
33	12:00 N	92	D		1.2	1.4	1.7
34	12:15 P	89	DSMU		8.4	11.3	13.3
36	1:15 P	103	D	1.0	1.1	1.2	1.6
38	2:00 P	101	D	1.3	1.6	1.6	1.7

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TABLE 4
(continued)

Soil Moisture of Test Fields Which Were
Sampled at Phoenix, Arizona on 3/13/72

Field Number	Time MST	Soil Temp. (°F)	Observed Moisture Conditions	Soil Moisture (%)			
				0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
39	2:15 P	95	DSMU	1.3	2.0	5.1	5.3
40	2:25 P	100	DSMU	1.7	2.8	4.5	5.7
41	2:45 P	105	D	0.9	1.1	1.2	1.3
42	3:15 P	104	D	0.6	0.7	0.9	1.2
43	2:55 P	103	D	1.0	1.1	1.0	1.3
44	3:05 P	105	D	0.6	0.8	1.0	1.1
45	2:36 P	107	D	1.4	1.5	1.4	2.1
46	2:41 P	107	D	1.4	1.2	1.4	2.0
47	2:51 P	103	D	0.9	1.2	1.6	1.8
48	2:46 P	99	DSMU	0.8	0.9	1.0	1.6
50	11:53 A	79	W	17.5	16.2	20.9	20.3
51	11:40 A	81	D	1.2	1.5	1.6	1.8
53	11:24 A	79	DSMU (10)	32.4	37.9	36.4	37.5
54	11:37 A	86	D	2.8	3.1	3.3	5.5
55	10:50 A	72	D (11)	3.6	3.7	4.2	5.1
56	10:57 A	72	D	3.5	4.3	5.2	6.4
57	11:45 A	65	D (12)	1.8 (12)	2.3	2.1	4.5
58	10:00 A	60	DSMU		10.2	10.6	14.7
59	10:15 A	64	DSMU		3.1	4.4	5.4
60	10:30 A	70	DSMU		6.0	7.7	13.1
61	10:40 A	65	DSMU	6.9	10.9	13.3	18.9
62	10:50 A	68	MS		6.7	8.0	14.7
63	11:05 A	65	DSMU	4.0	8.4	8.0	14.0
64	11:40 A	70	D	1.9	2.4	2.9	4.3
65	12:20 P	64	W		24.8	22.4	21.2
66	12:40 P	63	W		25.6	25.5	24.6
67	1:05 P	88	DSMU (13)	4.2	8.8	12.5	15.4
68	2:10 P	90	DSMU	64.3 (16)	5.3	11.5	13.8
69	1:20 P	100	DSMU		3.8	5.0	9.8
70	1:40 P	98	DSMU		4.2	6.0	14.1
71	10:00 A	63	TWFD	16.3	20.7	22.1	25.3
72	9:45 A	62	DSMU	16.7	16.3	17.5	23.4
73	10:15 A	63	DSMU	5.3	6.5	10.7	20.0
74	10:30 A	64	DSMU	4.3	7.3	9.5	18.4
75	11:00 A	65	DSMU	4.8	5.7	8.1	17.9

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TABLE 4
(continued)

Soil Moisture of Test Fields Which Were
Sampled at Phoenix, Arizona on 3/13/72

Field Number	Time MST	Soil Temp. (°F)	Observed Moisture Conditions	Soil Moisture (%)			
				0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
76	10:45 A	66	DSMU	4.6	6.8	5.7	12.7
77	11:15 A	52	MS		25.1	27.1	26.0
78	11:20 A	56	MS		14.9	16.1	19.4
79	11:30 A	62	MS		22.8	24.6	26.7
80	11:35 A	64	DSMU		16.2	19.2	19.1
81	11:40 A	65	DSMU		22.0	22.3	24.4
82	11:45 A	58	DSMU		13.9	14.6	16.6
83	1:00 P	70	W	30.1	31.9	29.5	30.6
84	1:15 P	78	W	31.6	29.4	26.8	28.5
85	1:30 P	87	DSMU	2.7	3.4	5.6	27.8
86	1:45 P	86	DSMU (14)	3.3	5.9	7.1	9.8
87	2:15 P	62	DSMU		9.9	10.1	10.5
88	2:30 P		W		18.9	17.7	17.3
89	1:30 P	70	TWFD		24.7	22.0	21.0
90	1:40 P	71	DSMU	8.2	15.0	14.0	17.9
91	1:10 P	72	DSMU	2.8	14.7	15.3	16.1
92	1:20 P	71	DSMU		14.6	18.2	18.5
93	11:20 A	70	DSMU	2.8	13.7		16.6
94	11:25 A	70	DSMU	1.9	9.0		12.0
95	10:50 A		W	10.2	16.5	18.0	20.0
96	11:00 A	60	F				
97	11:05 A	61	DSMU (15)	12.8	16.5	19.0	18.1
98	11:10 A		D	2.2	3.1	4.1	4.3
99	10:40 A	62	DSMU	5.6	13.8	13.6	15.1
100	10:45 A	60	DSMU	5.3	16.2	19.4	19.7
101	10:30 A	60		11.2	18.0	19.8	19.2
102							
103	9:50 A	56	DSMU		14.4	14.2	14.8
104	10:00 A	58	DSMU		13.7	15.9	15.2
105	10:10 A	58	DSMU		12.5	13.3	16.5
106	10:15 A	60	DSMU		10.4	10.5	10.4

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LIST OF NOTES INCLUDED WITH DATA IN TABLES 2-4

- (1) Field No. 84 (A2116da) being irrigated and this field getting water across bottom.
- (2) Partially irrigated, North wet, South dry.
- (3) Water in East 50 rows and 20 ft. wide tail water in North side.
- (4) South half furrowed, wet; North level, dry.
- (5) Water in south 2/3 of field, tail water 20 ft. wide in West edge.
- (6) Tail water from 53 (D1101ba) 2 ft. wide across West side of field.
- (7) West dry, East TWFD irrigating.
- (8) South dry, North wet.
- (9) South furrowed and wet, North leveled and dry.
- (10) South 1/4 dry, middle 1/2 DSMU, North 1/4 wet.
- (11) Replicates of single collections:

	$0-\frac{1}{4}''$	$0-1''$	$0-2''$	$0-4''$
Top of Furrow	3.2	2.8	2.7	2.9
	2.5	3.1	3.4	4.0
Trench	7.0	5.3	13.2	16.2
	4.5	5.7	10.6	18.1

- (12) Replicates of single collections:

	$0-\frac{1}{4}''$	$0-1''$	$0-2''$	$0-4''$
	1.9	2.3	3.8	6.2
	1.9	1.9	2.6	3.8
	1.8	2.3	3.3	4.4
	1.5	2.0	3.1	4.2

- (13) Replicates of single collections:

	$0-\frac{1}{4}''$	$0-1''$	$0-2''$	$0-4''$
Top of Furrow	8.6	10.6	20.2	21.3
	6.9	11.6	18.1	20.8
Trench	11.9	12.4	21.2	21.8
	8.3	11.5	20.1	21.8

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(14) Replicates of single collections:

<u>0-$\frac{1}{4}$"</u>	<u>0-1"</u>	<u>0-2"</u>	<u>0-4"</u>
2.1	5.0	11.3	---
2.9	---	9.4	10.4
2.8	4.4	10.4	11.0
2.0	4.6	10.5	12.2

- (15) North half level and dry, South furrowed and wet.
- (16) Soil being turned
- (17) West 1/6th of field being irrigated.
- (18) West 1/6th of field being irrigated.
- (19) East 1/3rd being irrigated.
- (20) West 1/2 dry, water running on South 1/2.
- (21) East 1/2 cut 2 in., west uncut 2 ft.
- (22) South 1/2 being irrigated. Sampled in North 1/2.
- (23) North 1/2 being irrigated.
- (24) West 1/2 being irrigated.
- (25) Water running into East, West section wet.

BIOSPHERICS INCORPORATED

TABLE 5

Fields Which Were Sampled During the 1972
NASA Overflights of the Imperial Valley, California

<u>Field Number</u>	<u>Irrigation System</u>	<u>Field or Vegetation Conditions</u>	<u>Soil Texture</u>	<u>Physical Description</u>
1	F	B,4	3	C
2	F	V, (melons, 1%, 1")	3	C
3	F	V, (melons, 1%, 1")	5	C
4	F	V, (melons, 1%, 1")	5	C
5	F	V, (unknown, 12%, 4")	5	C
6	F	V, (unknown, 12%, 4")	5	C
7	F	V, (melons, 1%, 1")	3	C
8	F	V, (melons, 1%, 1")	3	C
9	L	B,3	3	C
10	L	B,3	3	C
11	F	B,4	3	C
12	F	B,4	3	C
13	F	V, (tomatoes, 2%, 3")	5	C
14	F	V, (tomatoes, 2%, 3")	5	C
15	F	B,4	3	C
16	F	B	3	C
17	L	B,2	3	C
18	L	B,5	3	S
19	L	B,5	3	S
20	L	B,3	3	C
21	L	B,3	3	C
22	F	V, (safflower, 55%, 3")	4	S
23	B	V, (safflower, 10%, 4")	4	S
24	B	V, (alfalfa, 100%, 8")	3	S
25	B	V, (alfalfa, 100%, 14")	1	S
26	F	V, (tomatoes, 2%, 3")	4	C
27	B	V, (alfalfa, 100%, 5")	1	S
28	B	V, (alfalfa, 100%, 5")	1	S
29	F	V, (beets, 100%, 15")	1	S
30	L	B,5	1	SW
31	F	B,3	5	C
32	F	B,3	5	C
33	L	B,3	5	C
34	L	B,3	5	C
35	B	V, (barley, 100%, 12")	3	S
36	F	B,3	3	C
37	F	B,3	3	C
38	F	V, (barley, 100%, 14")	1	S
39	L	B,5	1	SW
40	B	V, (alfalfa, 100%, 15")	3	S

BIOSPHERICS INCORPORATED

TABLE 5
(continued)

Fields Which Were Sampled During the 1972
NASA Overflights of the Imperial Valley, California

<u>Field Number</u>	<u>Irrigation System</u>	<u>Field or Vegetation Conditions</u>	<u>Soil Texture</u>	<u>Physical Description</u>
41	B	B,3	2	S
42	L	B,3	2	C
43	B	V, (barley, 75%, 2")	1	S
44	F	V, (beets, 100%, 24")	3	S
45	F	B,4	3	C
46	B	V, (wheat, 20%, 3")	1	S
47	B	V, (wheat, 100%, 10")	1	S
48	B	B,3	1	S
49	F	V, (melons, 2%, 1")	1	C
50	F	V, (melons, 2%, 1")	1	C

- (1) South and East sections - water in furrows.
- (2) Running water in furrows.
- (3) Flooded at East end.

BIOSPHERICS INCORPORATED

TABLE 6

Soil Moisture of Test Fields Which Were
Sampled in the Imperial Valley, California on 3/7/72

Field Number	Time PST	Observed Moisture Conditions	Soil Moisture (%)			
			0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
1	9:00 A	DSMU	6.5	12.9	21.1	24.7
2	9:10 A	DSMU	6.0	13.0	14.5	20.8
3	9:25 A	DSMU	8.3	19.3	22.0	23.8
4	9:30 A	DSMU	9.5	17.9	22.2	26.6
5	9:40 A	DSMU		7.4	11.2	16.0
6	9:50 A	DSMU		7.8	8.0	12.9
7	10:10 A	MS	18.5	23.6	24.2	25.0
8	10:20 A	MS	14.4	20.0	25.3	26.0
9	10:30 A	DSMU		4.4	7.1	11.9
10	10:40 A	D		8.5	7.7	7.2
11	10:30 A	P	3.6	4.2	6.8	7.8
12	11:00 A	D	3.0	4.1	5.2	6.4
13	11:10 A	DSMU	5.3	8.1	13.9	17.2
14	11:20 A	DSMU	1.9	7.3	12.1	14.0
15	11:30 A	DSMU	2.2	5.6	9.5	8.5
16	11:40 A	DSMU	1.7	7.1	8.7	8.3
17	12:00 P	D	1.7	2.4	2.9	4.6
18	12:15 P	D	1.4	1.9	2.2	2.0
19	12:25 P	D	1.4	2.5	2.9	3.3
20	12:45 P	DSMU		13.0	13.4	13.5
21	12:55 P	DSMU		11.7	13.4	14.8
22	1:10 P	W		26.6	28.5	27.9
23	1:25 P	W	15.6	19.0	23.3	27.6
24	1:35 P	W		30.4	30.9	29.4
25	1:50 P	DSMU		10.1	8.9	8.1
26	2:00 P	DSMU	2.9	9.9	17.4	23.3
27	2:10 P	MS		13.8	12.6	12.9
28	2:20 P	MS		12.6	11.7	12.2
29	2:30 P	DSMU		6.2	9.9	10.7
30	2:40 P	D	0.5	0.6	0.8	0.9
31	3:20 P	DSMU		6.3	17.8	22.4
32	3:30 P	DSMU		8.3	17.4	21.4
33	3:45 P	D	2.8	4.5	8.3	7.1
34	4:00 P	D	2.8	5.6	8.7	18.6
35	4:15 P	MS		14.9	16.1	17.0
36	4:25 P	DSMU		9.1	14.9	16.0
37	4:35 P	DSMU		9.9	17.8	21.2
38	4:55 P	W		23.5	19.3	19.9
39	5:00 P	D	2.5	3.6	3.6	11.1
40	5:20 P	MS		12.2	15.3	15.2

BIOSPHERICS INCORPORATED

TABLE 6
(continued)

Soil Moisture of Test Fields Which Were
Sampled in the Imperial Valley, California on 3/7/72

Field Number	Time PST	Observed Moisture Conditions	Soil Moisture (%)			
			0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
41	5:30 P	MS	11.3	19.8	21.7	20.6
42	5:40 P	D	1.7	3.6	4.1	3.7
43	5:55 P	DSMU		5.9	12.6	15.2
44	6:10 P	DSMU		23.2	23.8	24.2
45	6:15 P	DSMU	2.6	8.7	15.5	15.9
46	6:20 P	F	30.4	32.4	31.2	29.2
47	6:25 P	MS (3)		8.5	15.7	19.6
48	6:35 P	F		27.4	24.7	22.7
49	6:40 P	DSMU	3.8	16.8	20.6	20.9
50	6:45 P	DSMU	4.5	15.3	17.6	21.2

BIOSPHERICS INCORPORATED

TABLE 7

Soil Moisture of Test Fields Which Were
Sampled in the Imperial Valley, California on 3/11/72

Field Number	Time PST	Observed Moisture Conditions	Soil Moisture (%)			
			0-1/4 in.	0-1 in.	0-2 in.	0-4 in.
1	7:00 A	DSMU	8.5	10.4	15.1	21.2
2	7:20 A	DSMU	3.7	6.7	9.4	15.6
3	7:45 A	DSMU	6.0	8.8	15.6	18.6
4	8:00 A	DSMU	5.6	6.8	9.1	18.9
5	8:25 A	DSMU		6.0	9.9	12.0
6	8:50 A	DSMU		4.8	8.1	9.6
7	9:05 A	MS	13.0	21.2	25.2	24.8
8	9:15 A	MS	11.0	22.9	23.6	24.1
9	9:20 A	DSMU		5.0	5.8	7.5
10	9:30 A	DSMU		4.6	6.4	6.4
11	9:40 A	F	22.7	25.8	26.7	30.7
12	9:55 A	F	26.3	28.7	31.2	29.9
13	10:05 A	DSMU	3.1	9.8	14.8	24.2
14	10:20 A	DSMU	2.9	7.8	17.2	19.2
15	10:30 A	DSMU (1)	2.2	20.8	23.0	23.3
16	10:40 A	F	30.2	32.8	33.7	31.9
17	11:00 A	D	1.6	2.9	4.1	4.1
18	11:20 A	D	0.9	1.9	1.5	2.4
19	11:30 A	D	1.2	0.7	1.3	1.8
20	11:50 A	DSMU		13.0	14.9	17.8
21	12:00 P	DSMU		7.9	10.9	9.4
22	12:20 P	W		24.2	21.4	23.3
23	12:40 P	W	17.9	25.0	26.4	29.4
24	12:50 P	W		32.3	30.2	28.4
25	1:10 P	DSMU		8.1	8.6	8.9
26	1:25 P	F	5.7	16.7	17.5	19.3
27	1:35 P	MS		12.4	12.0	13.3
28	1:45 P	MS		8.3	10.6	12.6
29	1:55 P	DSMU		5.3	9.8	9.9
30	2:05 P	D	0.1	0.4	0.4	0.5
31	2:45 P	DSMU		3.6	10.1	17.6
32	3:00 P	DSMU		5.9	9.2	19.3
33	3:15 P	D	2.2	2.7	4.1	8.0
34	3:30 P	D	3.7	8.2	14.5	18.9
35	3:45 P	MS		13.4	18.6	20.0
36	3:55 P	DSMU		10.5	17.0	17.5
37	4:05 P	DSMU		6.4	9.9	16.6
38	4:25 P	W		19.3	21.5	21.2
39	4:30 P	D	4.1	4.3	8.5	10.4
40	4:50 P	MS		10.4	10.0	12.2

BIOSPHERICS INCORPORATED

TABLE 7
(continued)

Soil Moisture of Test Fields Which Were
Sampled in the Imperial Valley, California on 3/11/72

<u>Field Number</u>	<u>Time PST</u>	<u>Observed Moisture Conditions</u>	<u>Soil Moisture (%)</u>			
			<u>0-1/4 in.</u>	<u>0-1 in.</u>	<u>0-2 in.</u>	<u>0-4 in.</u>
41	5:00 P	MS	12.4	21.1	22.4	24.5
42	5:10 P	DSMU	2.4	3.4	3.3	4.1
43	5:25 P	DSMU		5.4	16.1	17.2
44	5:40 P	DSMU		19.9	20.5	20.3
45	5:45 P	DSMU	2.6	10.0	18.2	19.9
46	5:50 P	W	16.0	18.1	22.0	22.9
47	5:55 P	W		26.9	22.9	23.8
48	6:05 P	W		24.8	21.8	20.5
49	6:10 P	DSMU	2.8	13.8	16.2	17.0
50	6:25 P	DSMU	3.8	11.1	16.7	20.8

APPENDIX II

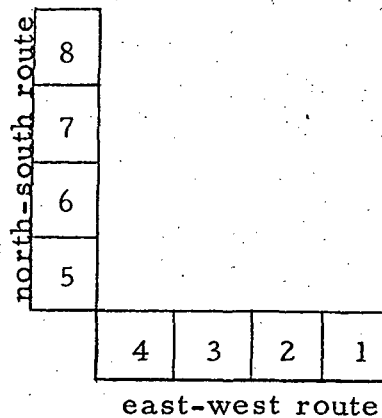
Maps of Sampled Areas

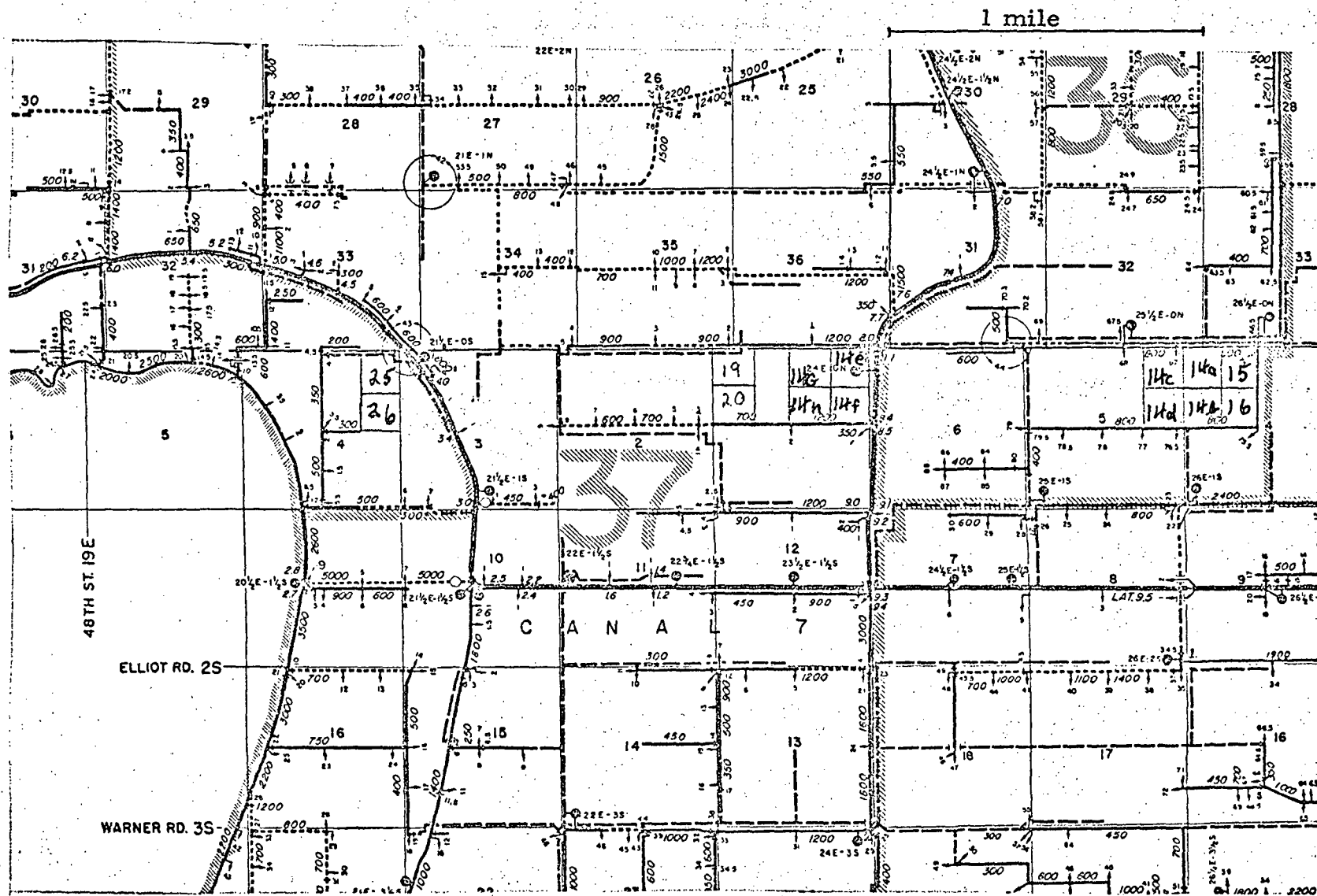
BIOSPHERICS INCORPORATED

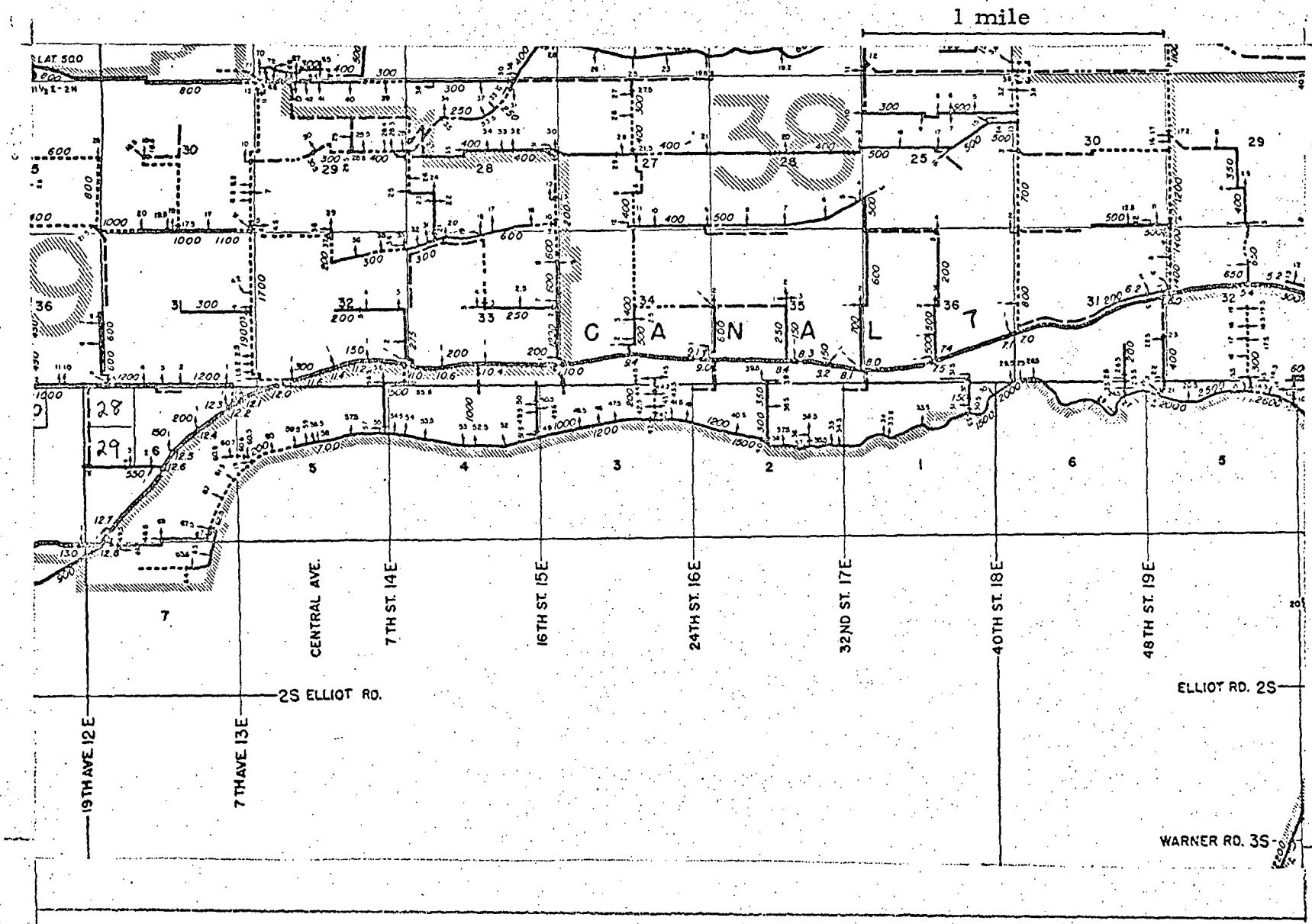
PHOENIX, ARIZONA

Test fields in the Salt River Irrigation Systems were located along an east-west route which was adjacent to and south of Baseline Road, and a north-south route which was adjacent to and west of 91st Avenue. Sample fields all fell within a one-half mile wide path south and west of the Baseline Road and 91st Avenue, respectively.

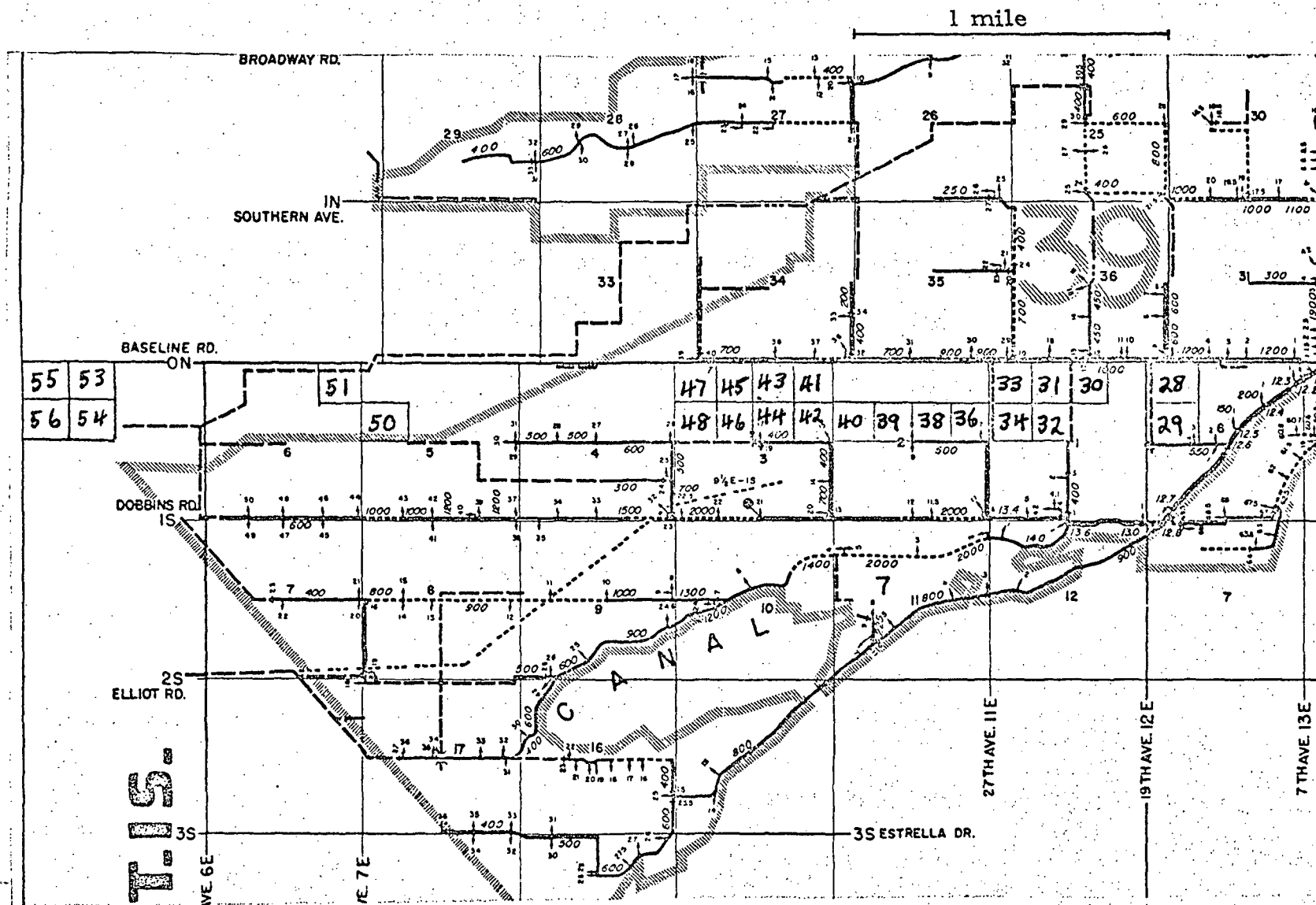
Sample fields are outlined and numbered on the following maps, which are identified by section according to the following scheme:



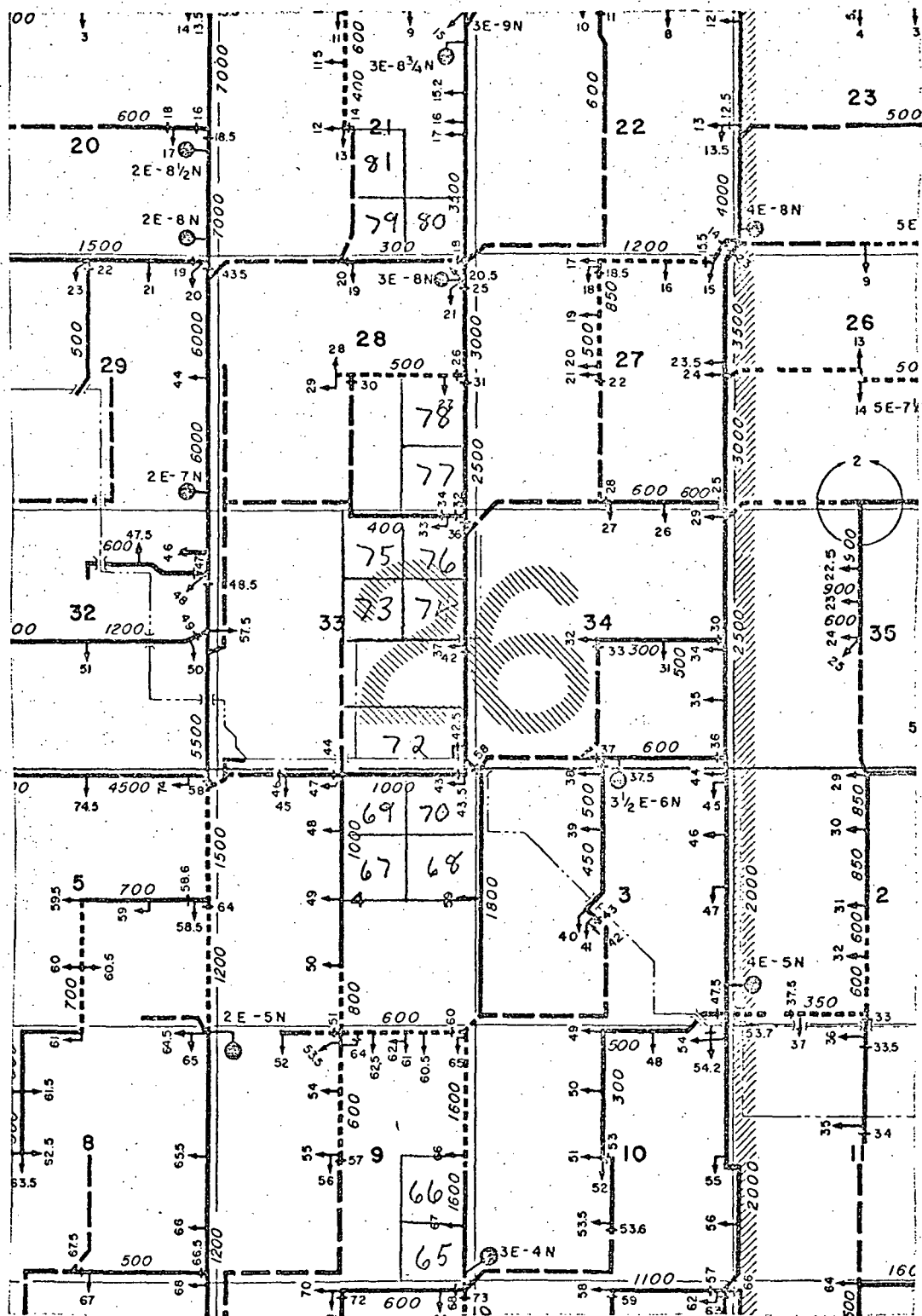




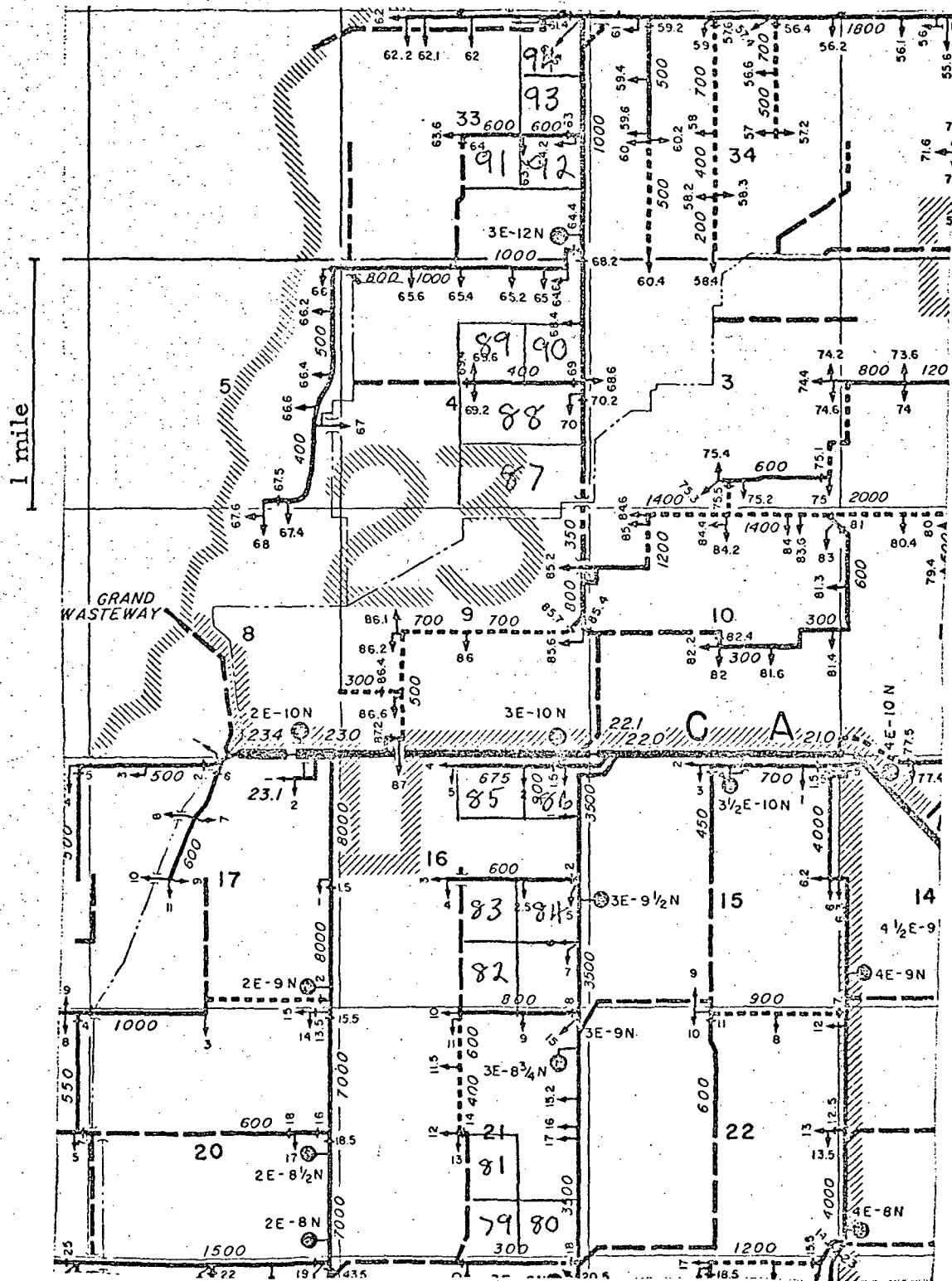
Salt River Project
East-West Route
Section 3



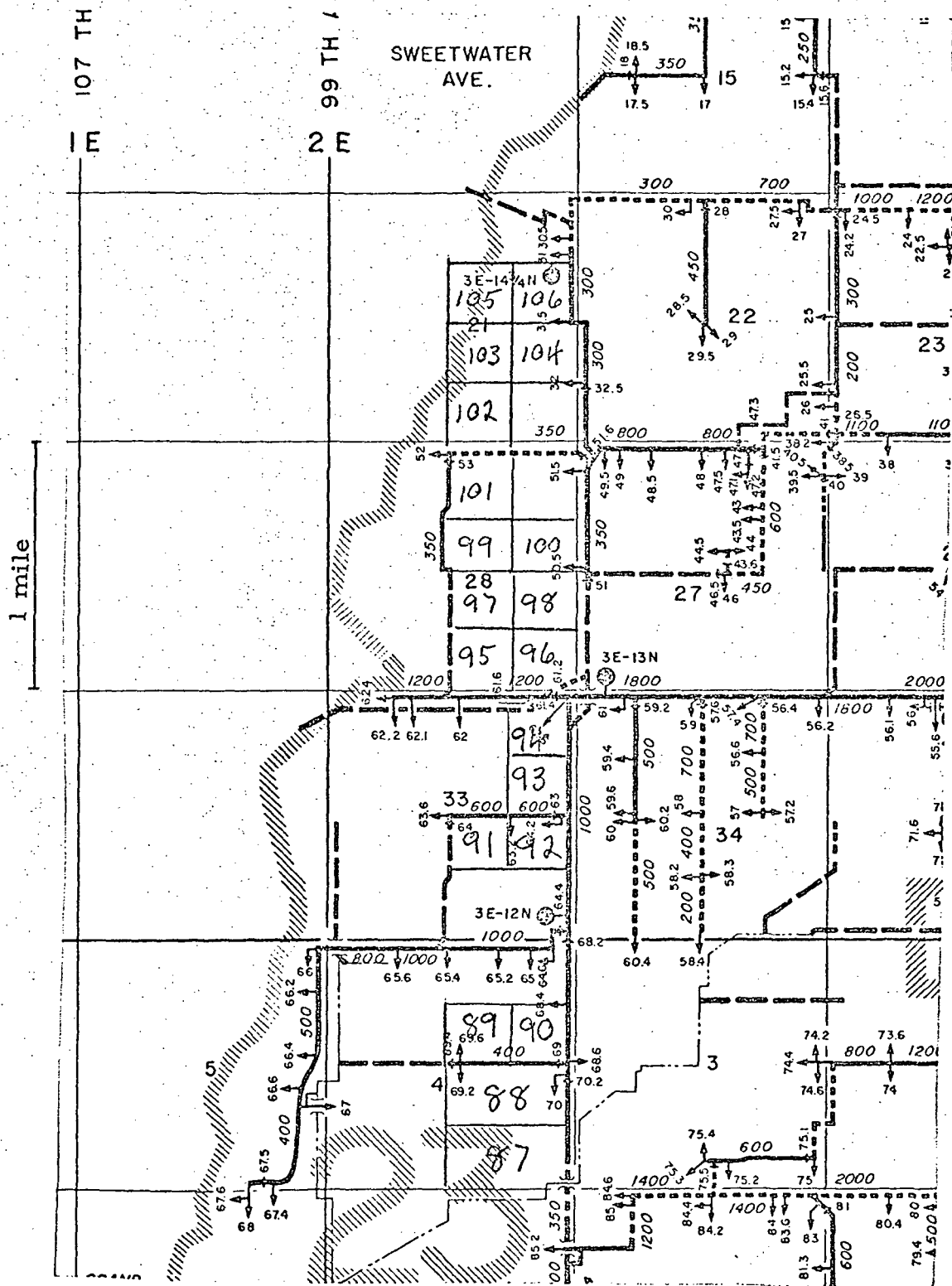
1 mile



Salt River Project
North-South Route
Section 6



Salt River Project
North-South Route
Section 7



Salt River Project
North-South Route
Section 8

BIOSPHERICS INCORPORATED

IMPERIAL VALLEY, CALIFORNIA

Test fields in the Imperial Valley Irrigation System were located along two east-west routes. The northern route was adjacent to and north of Eddins and Wirt Roads which pass through Calipatria. The southern route was adjacent to and north of Worthington Road which passes through Imperial.

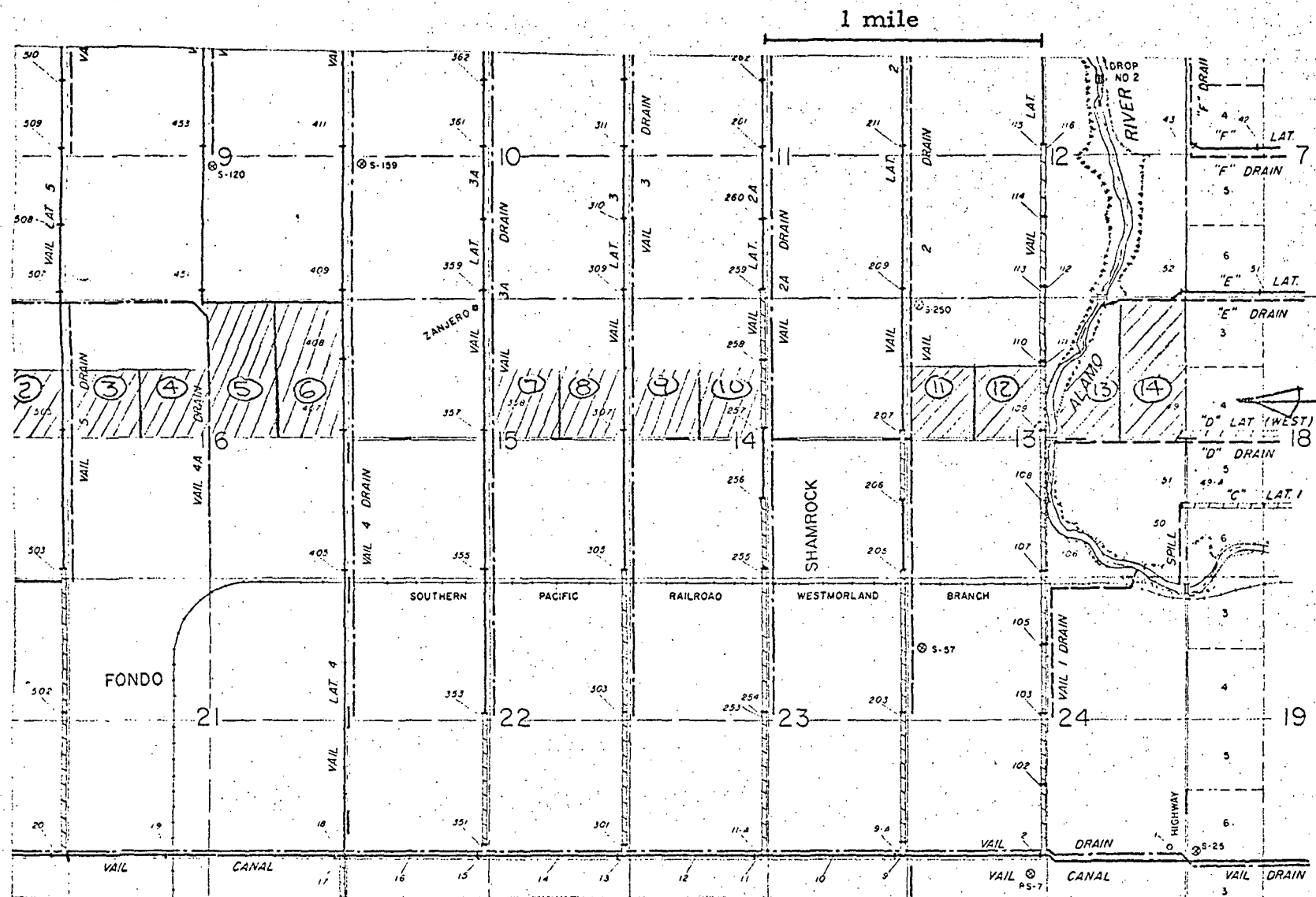
Sample fields all fell within a one-quarter mile wide path north of the two east-west highways. In some cases, the 40-acre test field was actually one-half of an 80-acre field, which extended one-half mile in depth. Although sampling was done in the 40-acre portion adjacent to the access roads mentioned, the entire field is outlined on the map since the moisture values obtained are probably representative of the entire field. The fields are outlined and numbered on the following maps which are identified by section according to the following scheme:

North Route

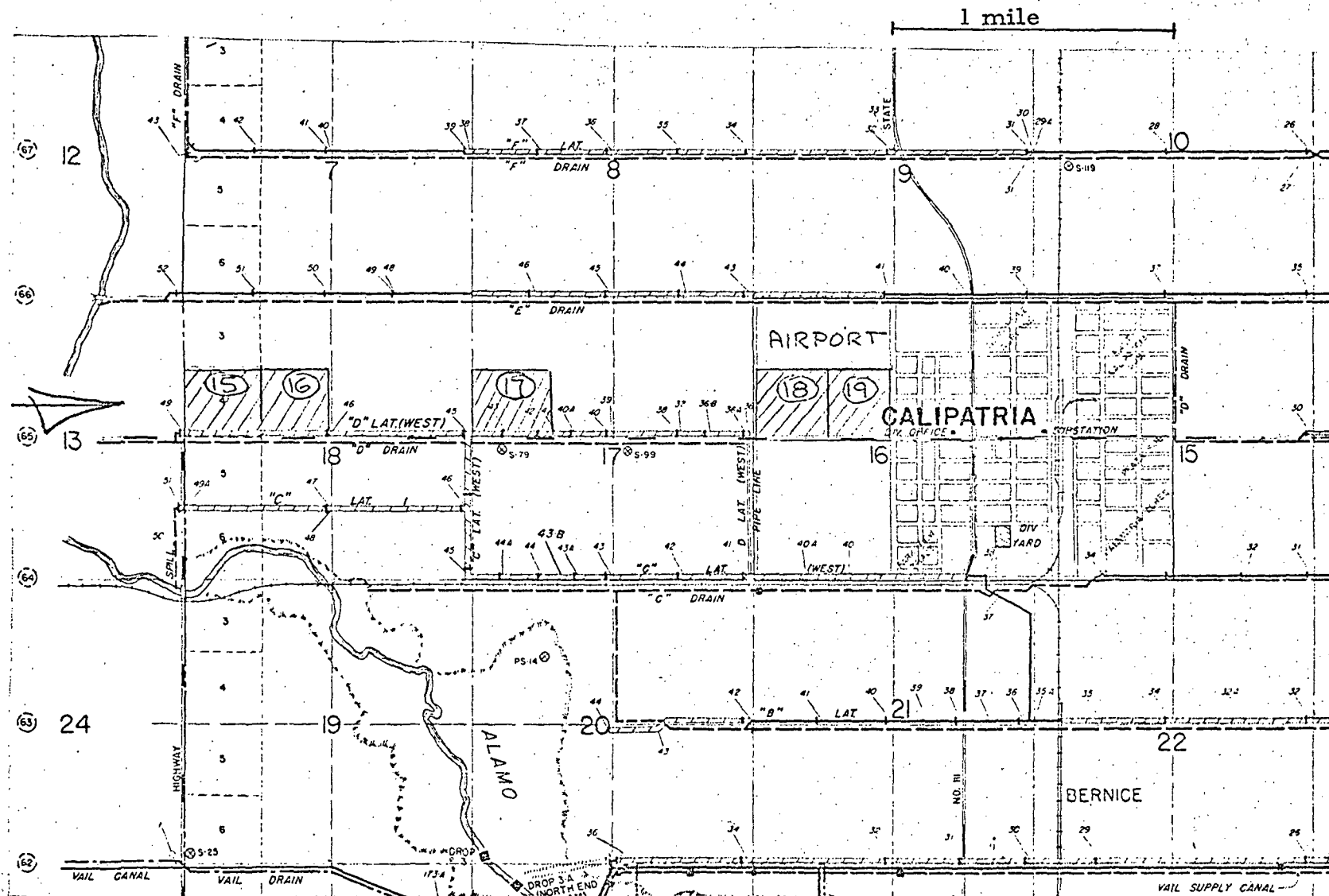
1	2	3	4	5	6
---	---	---	---	---	---

South Route

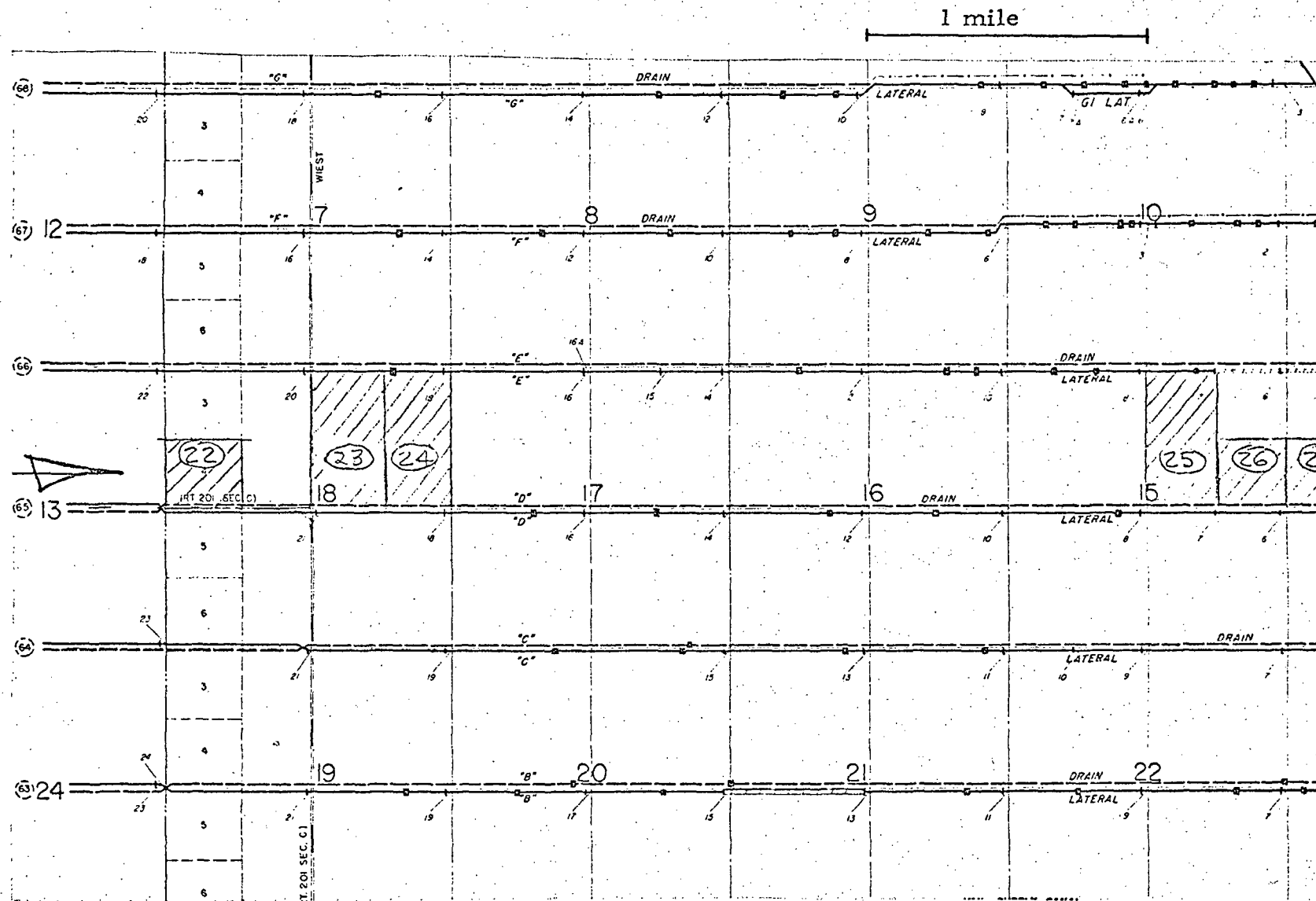
7	8	9	10	11	12	13	14	15
---	---	---	----	----	----	----	----	----



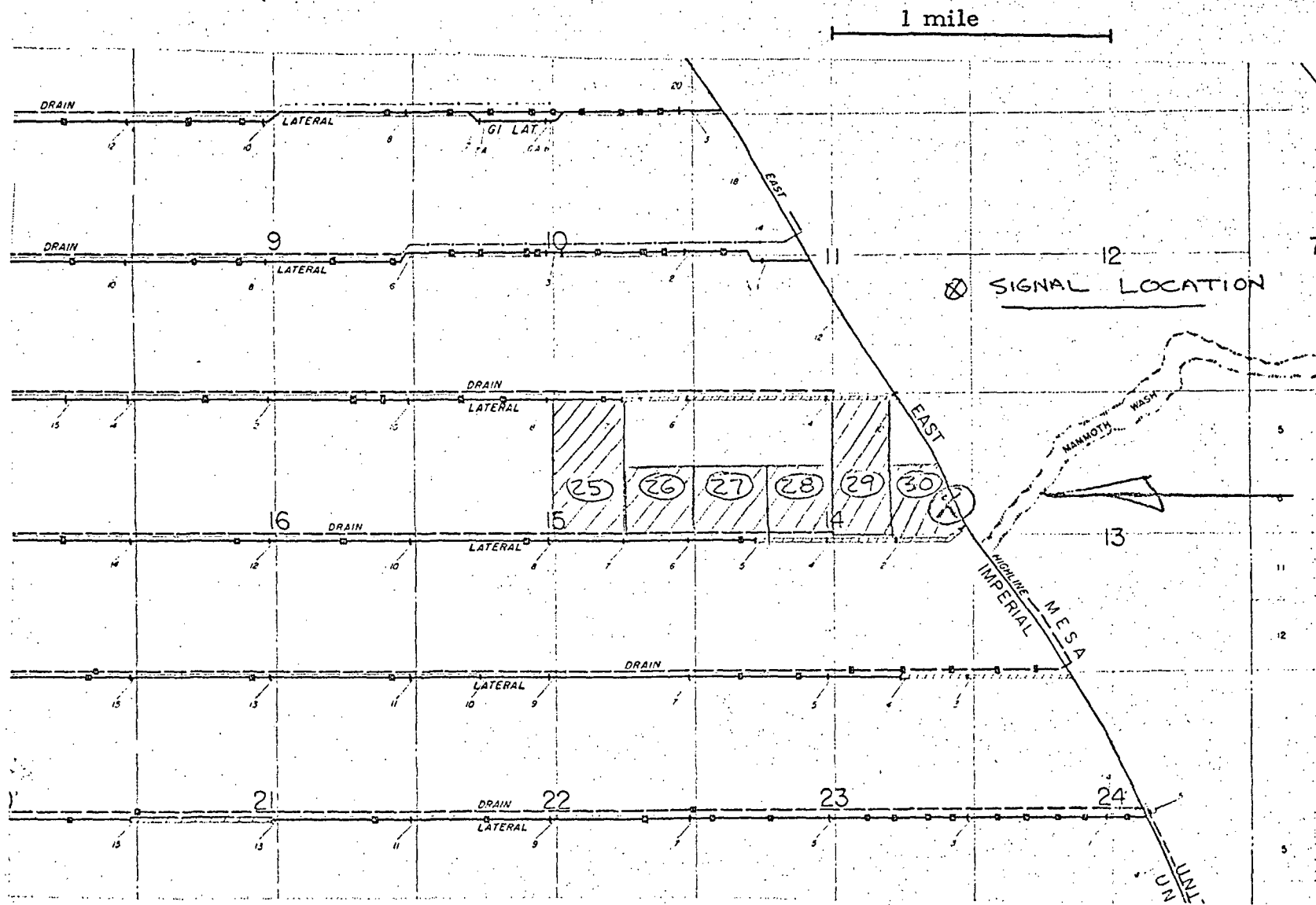
Imperial Valley
North Route
Section 2



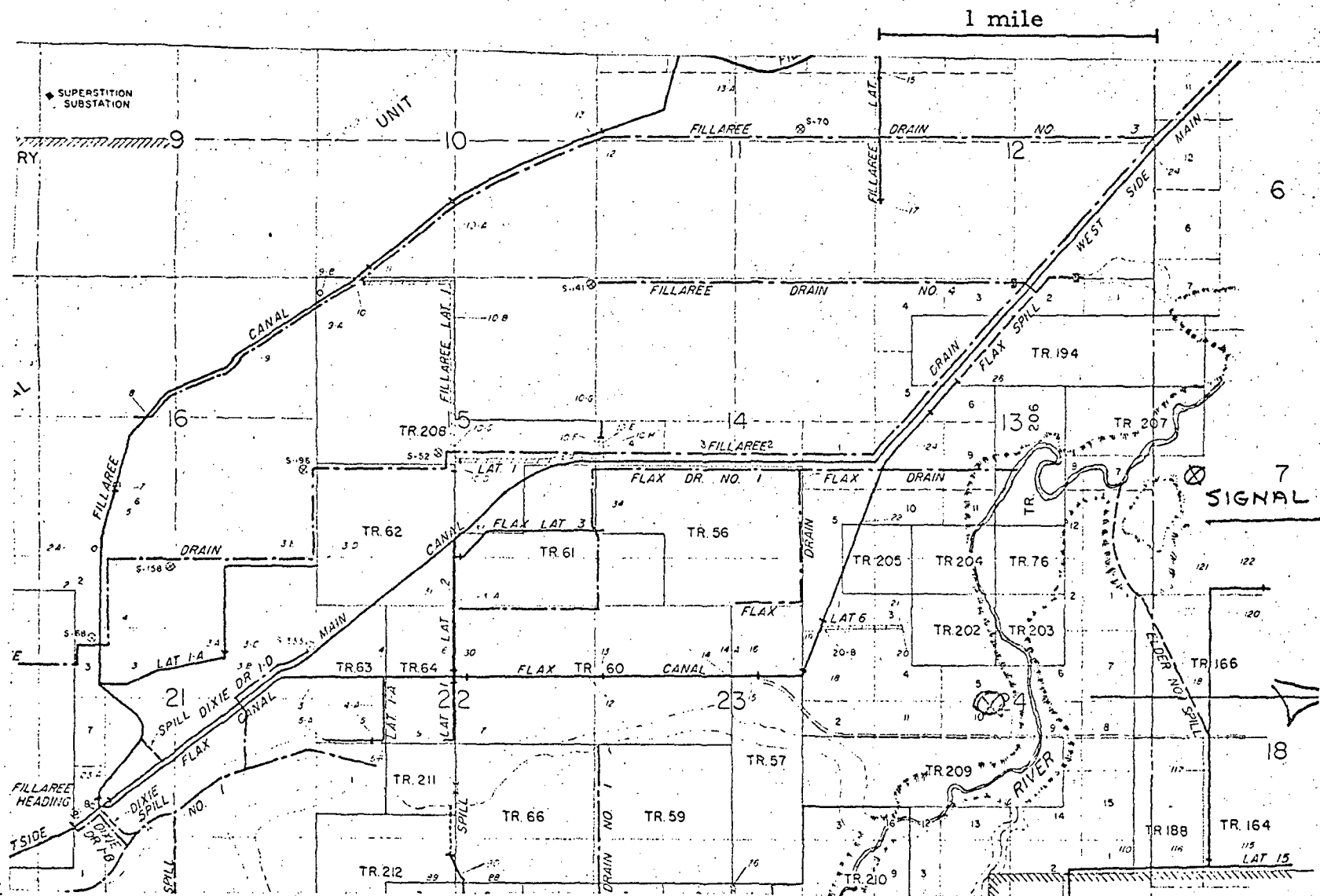
Imperial Valley
North Route
Section 3



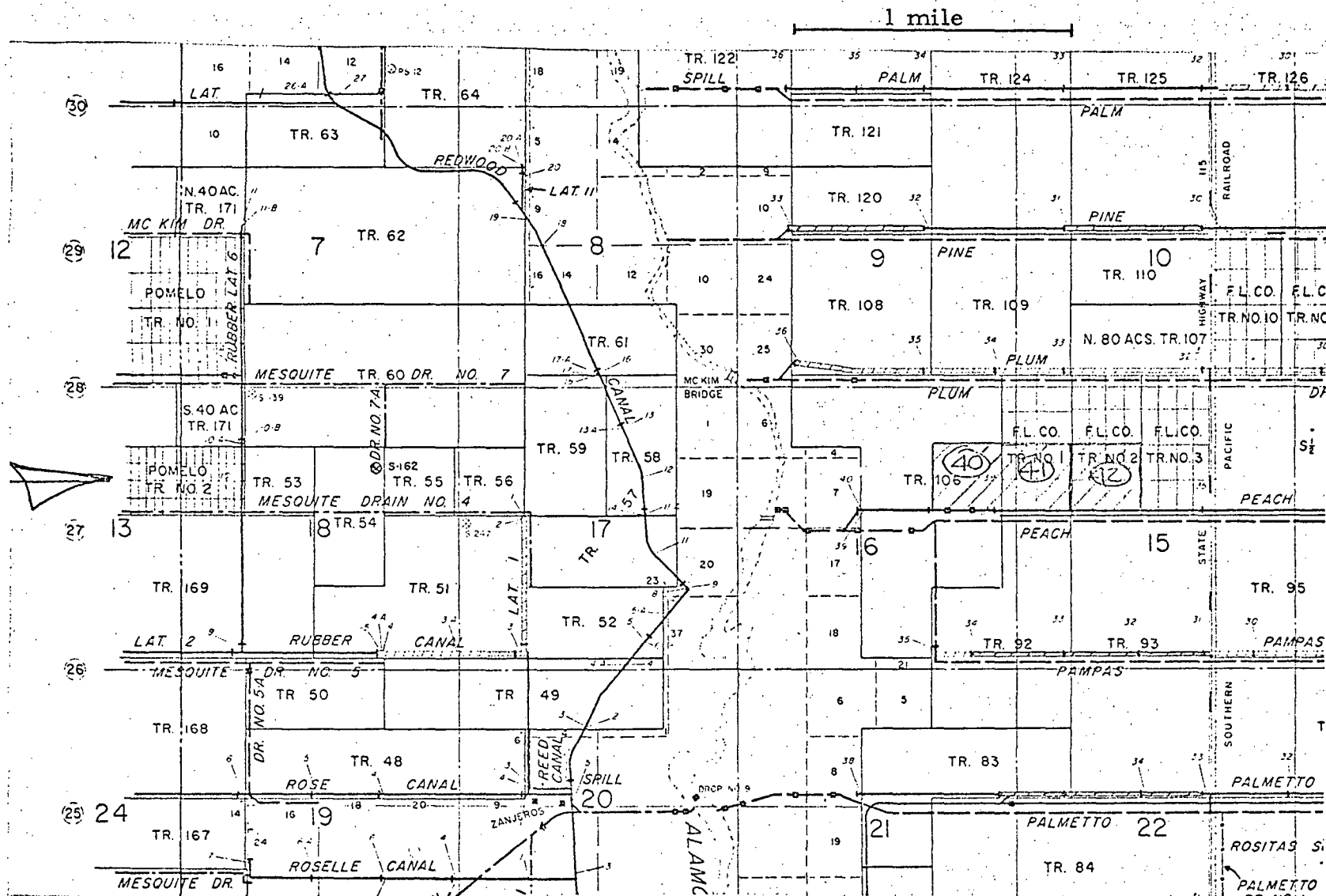
Imperial Valley
North Route
Section 5



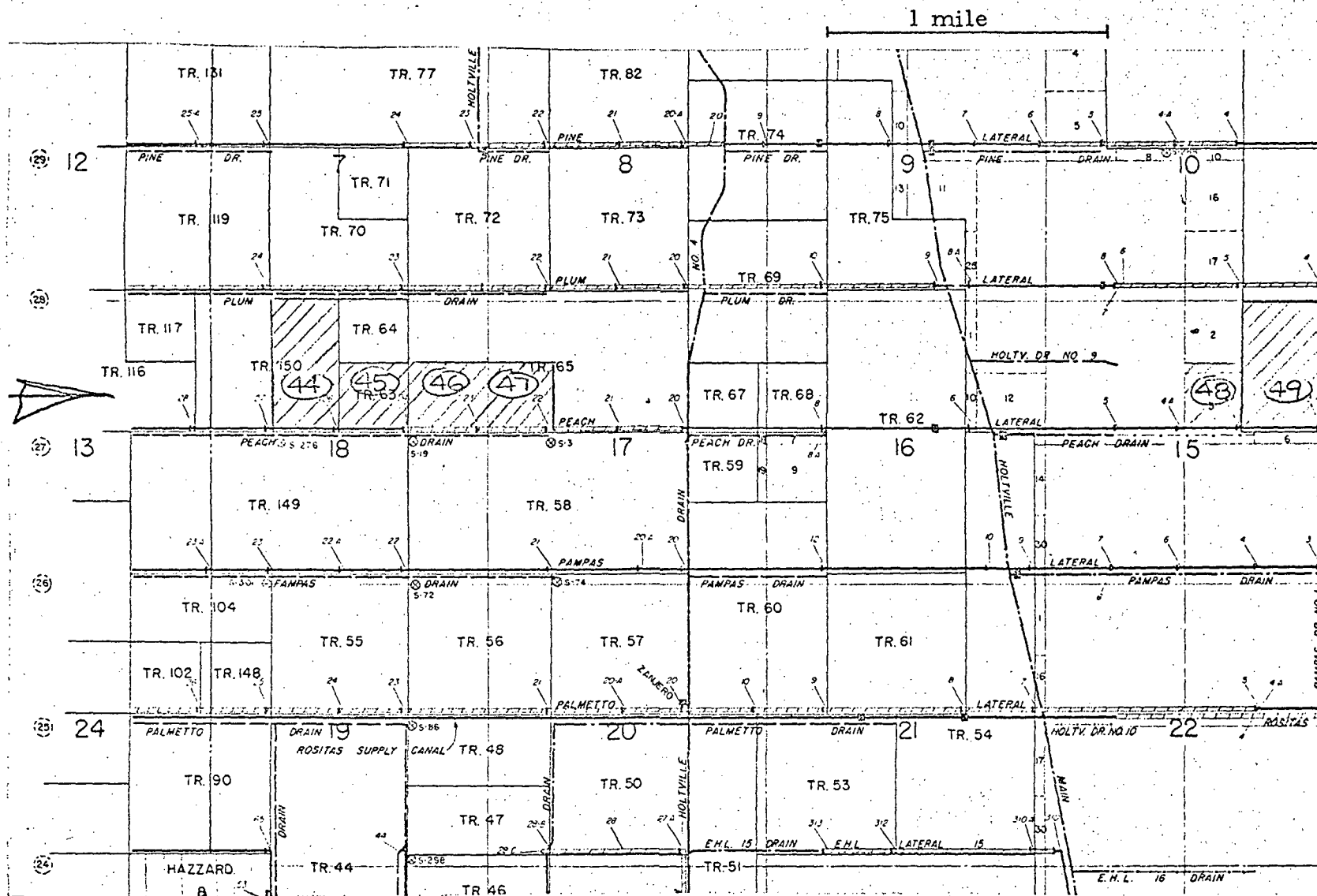
Imperial Valley
North Route
Section 6



Imperial Valley
South Route
Section 7



Imperial Valley
South Route
Section 12



Imperial Valley
South Route
Section 14

