State of California

AIR RESOURCES BOARD

Ambient Air Monitoring for Captan in Tulare County During Spring 1993, After an Application to a Vineyard

Engineering Evaluation Branch

Monitoring and Laboratory Division

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Ambient Air Monitoring for Captan in Tulare County During Spring 1993, After an Application to a Vineyard

This report presents the results of ambient air monitoring for Captan and its primary breakdown product, tetrahydrophthalimide (THPI) after a ground application at a selected vineyard in Tulare County. Detected concentrations of Captan varied from 0.03 to 0.47 ug/m^3. No THPI above the limit of detection (0.5 ug/sample) was found. The results are based on samples collected by the Air Resources Board Engineering Evaluation Branch staff and analyzed by the Trace Analytical Laboratory, Department of Environmental Toxicology at U.C. Davis. The results have been reviewed by the ARB staff and are believed to be accurate within the limits of the methods.

Acknowledgments

LaJuan Taylor was the Instrument Technician. Frankie Martin of V.B. Zaninovich & Sons arranged for a suitable vineyard to monitor. Lynn Baker and Ruth Tomlin of the Air Resources Board Toxic Air Contaminant Identification Branch provided assistance as well as the Kern County Agricultural Commissioner's Office. Chemical analyses were performed by the Trace Analysis Laboratory, Department of Environmental Toxicology at U.C. Davis.

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I. INTRODUCTION

At the request of the California Department of Pesticide Regulation (DPR) and the Air Resources Board (ARB) Toxic Air Contaminant Identification Branch, the ARB Engineering Evaluation Branch (EEB) conducted a three-day source impacted ambient monitoring program for Captan in Tulare County during the Spring of 1993. As required by AB 1807, this monitoring was conducted to provide DPR with data for the evaluation of the persistence and exposure of airborne pesticides.

The Pesticide Use Report for 1991 indicates that Captan was used mainly on almonds, grapes and strawberries, with lesser amounts used on other crops. The greatest amount of Captan was applied in Kern County during July where it is applied primarily on grapes as a fungicide. Statewide, Captan is primarily applied on almonds.

II. DESCRIPTION

Captan is a protectant-eradicant fungicide used on various crops. It is a white solid with a melting point of 175^{0}C. It has very low solubility in organic solvents and is essentially insoluble in water. The vapor pressure of Captan is less than 8.00×10^{-8} mm Hg at 25^{0}C. The acute oral LD_{50} for rats is 10,000 mg/kg. Captan is regulated as a restricted use material under Section 6400, Title 3 of the California Code of Regulations.

III. SAMPLING LOCATIONS

A vineyard (Section 19, Township 24S, Range 27E) of about 18 acres was selected (FIGURE I) by Frankie Martin of V.B. Zaninovich & Sons and approved by ARB staff to use for application monitoring. Five samplers were set up: (1) two (collocated) approximately 20 yards south of the field, (2) one approximately 20 yards north of the field (3) one approximately 20 yards east of the field and (4) one approximately 20 yards west of the field. A meteorological station was set up near the eastern sampler (FIGURE II).

The application was by ground and took about forty-five minutes. The fungicide was applied using four tractors; two applying from the north and two applying from the south. The application rate was 3.89 pounds of Captan and 11 ounces of Latron 3-1956 spreader/sticker in 275 gallons of water per acre.

IV. SAMPLING METHODOLOGY

The sampling method used during this study required passing measured quantities of ambient air through XAD-4 resin (see APPENDIX I). The holders were made of Teflon and contained approximately 30 cc of resin. The resin was held in place by installing stainless steel screens on each side of the resin and between the Teflon support rings. Any Captan present in the sampled ambient air was captured by the XAD-4 adsorbent. Subsequent to sampling, the resin was transported on dry ice to the Trace Analytical Laboratory (TAL) of the Department of Environmental Toxicology (DET), U.C. Davis for analysis.

Sampling trains designed to operate continuously were set up at the sampling sites identified in FIGURE II. Duplicate samples were obtained from the site designated "S." Resin was changed, as closely as practical, according to the schedule outlined in the QA Plan for Pesticide Monitoring (APPENDIX II).

Each sample train consisted of an XAD-4 resin holder, Teflon fittings and tubing, control valve, train support, and a 12VDC battery-powered vacuum pump. A diagram of the sampling train is shown in FIGURE III. Aluminum foil was wrapped around the holder to protect the adsorbent from exposure to sunlight.

The sample pump was started and the flow through the resin holder adjusted with a metering valve to an indicated reading of 16.0 on a flow meter. This was accomplished by attaching a calibrated flow meter to the inlet of the resin holder. A leak check was performed by blocking off the flow meter inlet. Upon completion of a successful leak check, the indicated flow rate was again set at 16.0 and was recorded (if different from the planned 1pm) along with date, time and site location. Calibration prior to use in the field indicated that an average flow rate of 14.85 liters per minute (1pm) was actually achieved when the flow meter was set to 16.0.

At the end of each sampling period the final indicated flow rate (if different than the set 16.0), the stop date and the stop time were recorded. The XAD-4 resin was then removed from the holder and transferred to a pre-cleaned jar with a Teflon-lined lid. An identification label was affixed to each jar. Each jar was then placed in an ice chest containing dry ice until the jars were delivered to the laboratory for analysis.

V. ANALYTICAL METHODOLOGY

The XAD-4 resin recovered from each sampler was analyzed by the TAL, DET staff. The XAD-4 was extracted with 75 ml of ethyl acetate, concentrated, followed by gas chromatography (GC) separation on a DB-5 megabore column and measurement by a Thermionic Specific (nitrogen/phosphorous) Detector (TSD) (APPENDIX III). The minimum detection limit was a signal five times the baseline noise.

VI. RESULTS

Prior to sampling, it was noted that the vineyard was posted for a previous application of Thiodan (Endosulfan) which is used as an insecticide. The TAL at U.C. Davis did not report any interferences caused by this earlier application.

Results for Captan are shown in TABLE I and APPENDIX III. As can be seen from APPENDIX III, no THPI was found above the detection limit. Many of the flow rates decreased from the original set values. The reported values (TABLE I) were calculated using the average of the concentrations determined by using the beginning and ending flow rates independently. The $\pm$ values indicate the minimum and maximum concentrations possible using the minimum and maximum flow rates. TABLE II is a summary of the meteorological data collected on site. TABLE III is a pictographic summary of both the meteorological and sampling data. As TABLE I shows, very little Captan was detected. The values ranged from 0.03 to 0.47 ug/m^3 with three of the four values above the detection limit found during the application.

Because the anemometer of the weather station was not working during most of the sampling period, the meteorological data obtained from the nearest California Irrigation Management Information System (CIMIS) location, Visalia, is included as APPENDIX IV.

VII. QUALITY ASSURANCE

Reproducibility, linearity, collection and extraction efficiency, minimum detection limit and storage stability are described in the Laboratory Reports for Captan (APPENDIX III).

All of the procedures outlined in the Pesticide Quality Assurance Plan (APPENDIX II) were followed. The Quality Management and Operations Support Branch (QMOSB) of the ARB conducted a flow audit of the samplers as well as a laboratory audit of the DET at U.C. Davis. This report is included as APPENDIX V.

TABLE I. Captan Application Monitoring Data

Sample ID	Time (min.)	Volume (m^3)* min.	Volume (m^3)* max.	Detected (ug)	Concentration** (ug/m^3)	Collection Date (Approx.)
0S-1	275	3.49	4.08	<0.5	--	
0S-2	275	4.08	4.08	<0.5	--	
0E	275	4.08	4.08	<0.5	--	(Background)
0N	280	4.16	4.16	<0.5	--	5/24/93
0W	285	4.23	4.23	<0.5	--	1300-1800
1S-1	110	0.58	1.63	0.30	0.35±.17	
1S-2	110	0.82	1.63	<0.25	--	
1E	120	1.19	1.78	0.41	0.28±.06	(Application)
1N	130	0.96	1.93	<0.25	--	5/25/93
1W	135	2.00	2.00	0.94	0.47	0500-0730
2S-1	115	1.14	1.71	<0.25	--	
2S-2	115	1.56	1.71	<0.25	--	
2E	115	1.71	1.71	<0.25	--	
2N	110	1.63	1.63	<0.25	--	
2W	105	0.78	1.56	<0.25	--	5/25/93
2B	BLANK	--		<0.25	--	0730-0930
3S-1	235	2.81	3.49	<0.25	--	
3S-2	235	3.49	3.49	<0.25	--	
3E	240	3.56	3.56	>0.25	--	
3N	240	3.56	3.56	<0.25	--	5/25/93
3W	235	2.55	3.49	<0.25	--	0930-1330
4S-1	275	4.08	4.08	<0.25	--	
4S-2	275	4.08	4.08	<0.25	--	
4E	270	4.01	4.01	<0.25	--	
4N	270	4.01	4.01	<0.25	--	5/25/93
4W	270	4.01	4.01	<0.25	--	1330-1800
5S-1	755	8.20	11.2	<0.25	--	
5S-2	755	9.01	11.2	<0.25	--	
5E	755	5.59	11.2	<0.25	--	
5N	765	9.71	11.4	<0.25	--	5/25-26/93
5W	765	5.67	11.4	0.25	0.03+.01	1800-0630
6S-1	1435	15.1	21.3	<0.25	--	
6S-2	1435	12.7	21.3	<0.25	--	
6E	1435	15.1	21.3	<0.25	--	
6N	1425	18.9	21.2	<0.25	--	5/26-27/93
6W	1425	17.4	21.2	<0.25	--	0630-0630
7S-1	1455	21.60	21.60	<0.25	--	
7S-2	1455	19.94	21.60	<0.25	--	
7E	1455	20.12	21.61	<0.25	--	
7N	1455	17.88	21.61	<0.25	--	5/27-28/93
7W	1455	15.84	21.61	<0.25	--	0630-0630

*Min. and max. values based on minimum (end of sampling period) and maximum (beginning of sampling period) flow rates.

**± values indicate min. and max. values possible if flow rates were maintained for the whole sampling period.

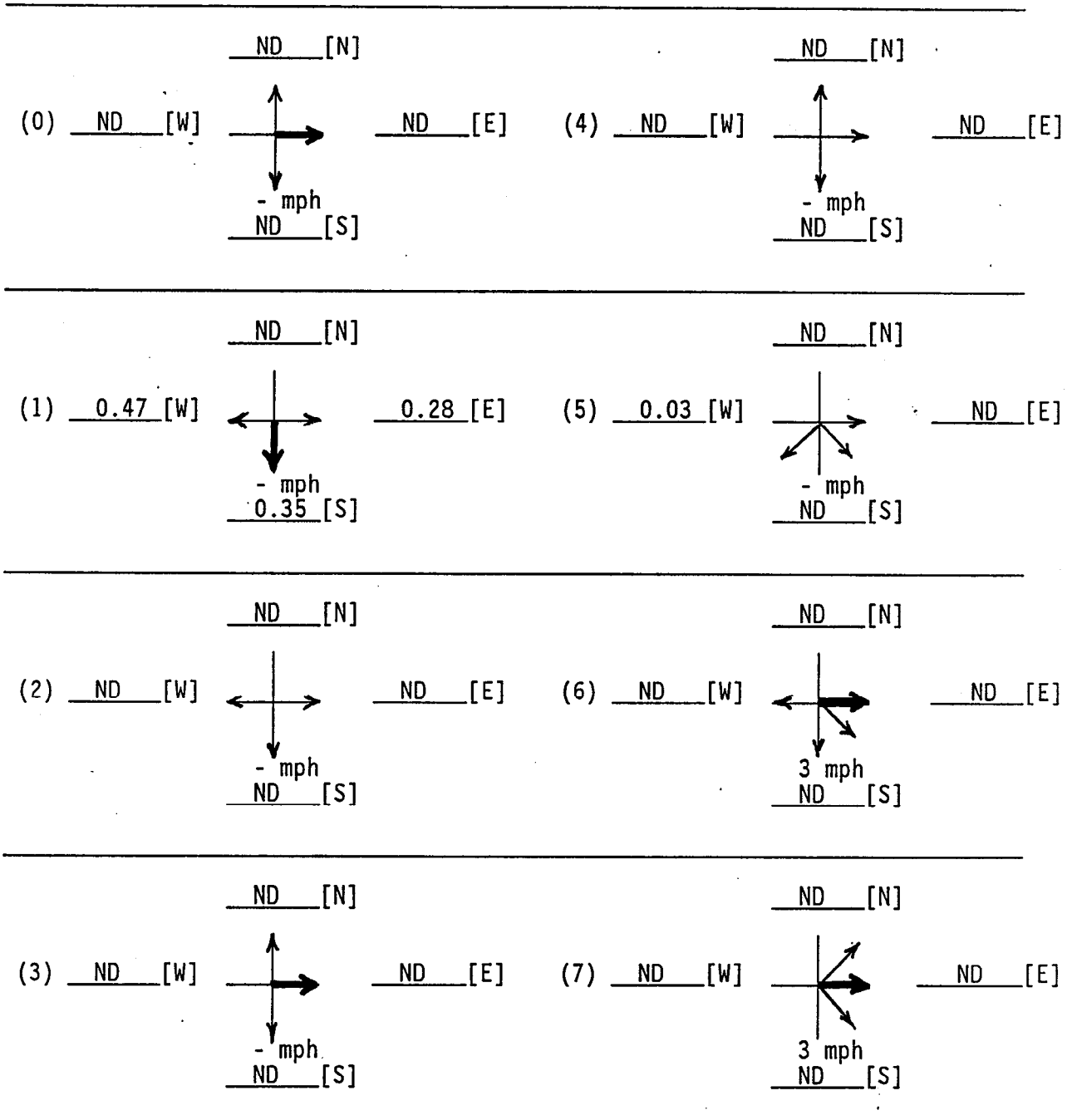
TABLE II. Captan Application Meteorological Data

Sampling Period	Wind* Direction	Wind Speed** (mph)
0	W/S/N	-
1	N/E/W	-
2	N/E/W	-
3	W/S/N	-
4	W/S/N	-
5	W/NW/NE	-
6	W/NW/N/E	3
7	W/NW/SW	3

*Indicates direction wind is blowing from.

** - indicates anemometer on weather station not working.

Table III. Summary of Captan Application Data (ug/m^3)



( ) indicates sampling period. [ ] indicates sampling site represented.
ND = not detected, less than 0.3 ug/sample
Arrow indicates direction wind is blowing toward.
Bold arrow indicates predominant wind direction.
- indicates anemometer on weather station not working.

FIGURE I. Captan Monitoring Area

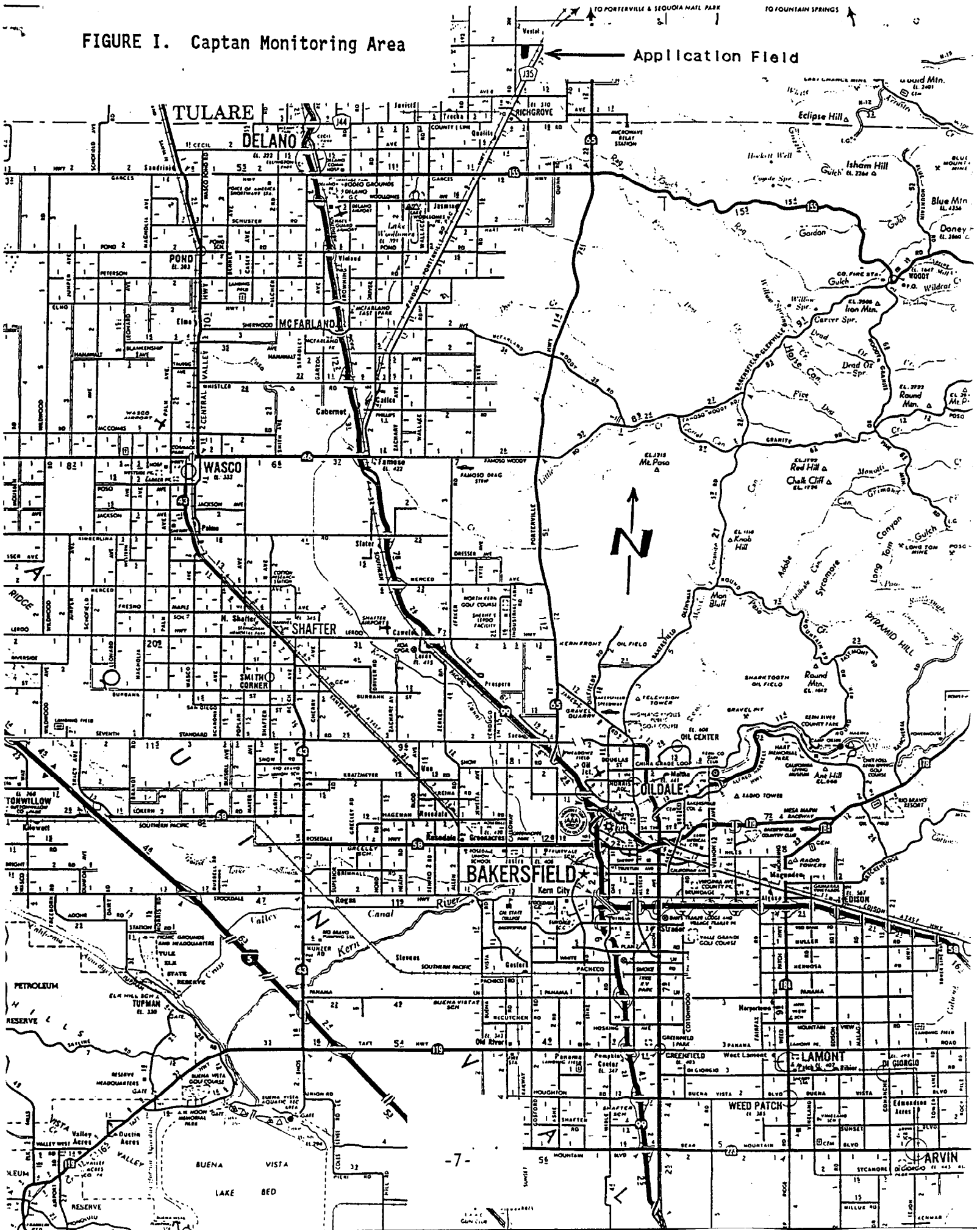


FIGURE II. Captan Monitoring Sites

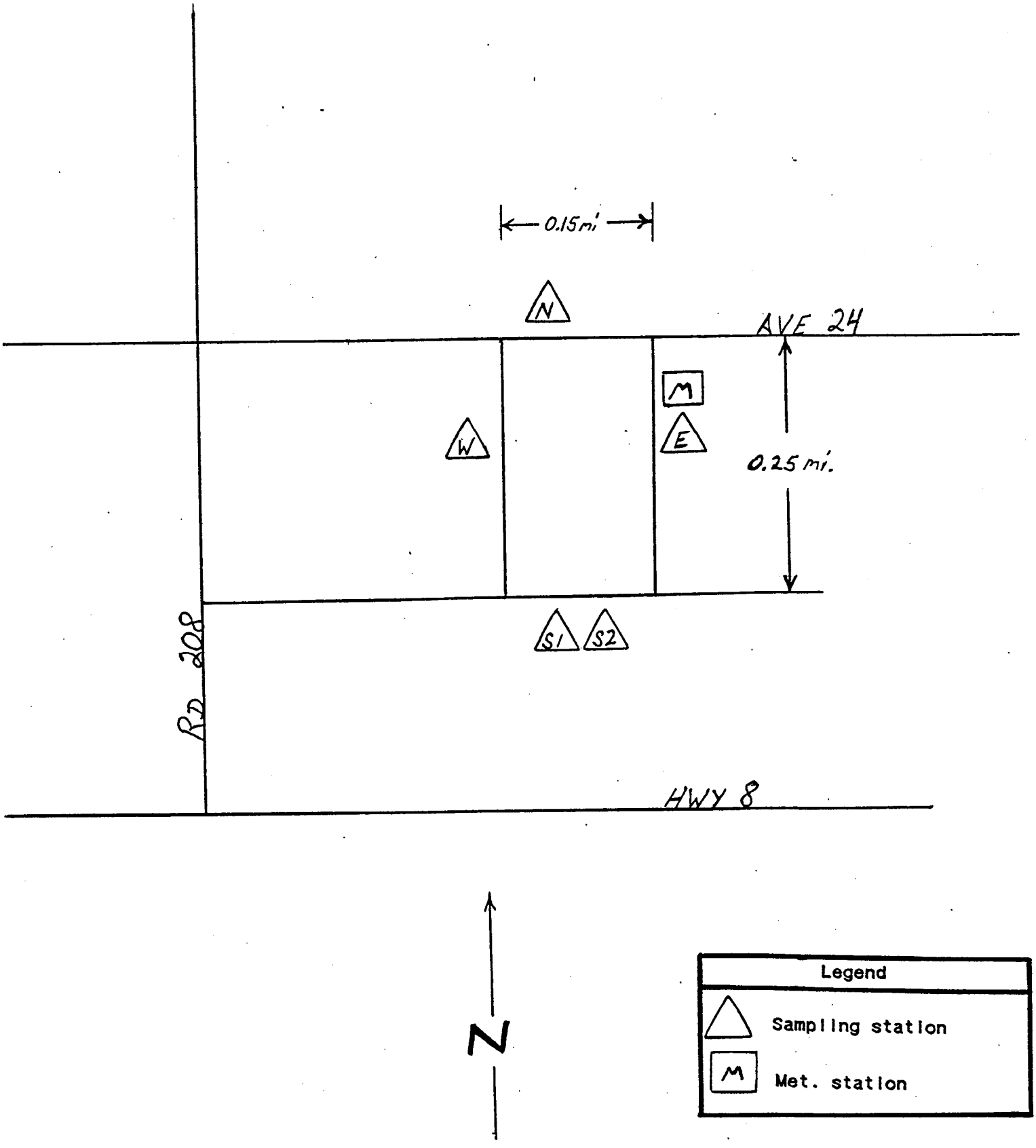


FIGURE III. Captan Monitoring Apparatus