State of California

AIR RESOURCES BOARD

Ambient Air Monitoring in Monterey County for Telone II during DowElanco's Commercial Use Project, September and October, 1993

Engineering Evaluation Branch

Monitoring and Laboratory Division

Test Report No. C90-014C

Report Date: January 21, 1994

APPROVED:

_____, Project Engineer
Testing Section

_____, Manager
Testing Section

_____, Chief
Engineering Evaluation Branch

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Ambient Air Monitoring in Monterey County for Telone II
During DowElanco's Commercial Use Project
September and October, 1993

This report presents the results of ambient air monitoring for Telone II during DowElanco's "Commercial Use Project" in September and October of 1993. The Air Resources Board (ARB) collocated three samplers with DowElanco's. Two were adjacent (300 feet upwind and 300 feet downwind) to a field treated with Telone II. The third collocated sampler was in the town of Chualar. The "near site" upwind application values ranged from below the detection limit (0.074 ug/m^3 for a 24-hour sampling period) to 12. ug/m^3 with an average of 2.7 ug/m^3 (based on 24-hour samples). The "near site" downwind application values ranged from 0.49 ug/m^3 (24-hour sample) to 62.ug/m^3 (12-hour sample) with an average of 10. ug/m^3 (based on 24-hour samples). The values measured in Chualar ranged from non-detect to 2.9 ug/m^3 (average of duplicate samples) with an average of 1.5 ug/m^3 (based on 24-hour samples). The results are based on samples collected and analyzed by the ARB staff using ARB test methods. The results have been reviewed by the staff and are believed to be accurate within the limits of the methods.

Acknowledgments

The Instrument Technician was Jack LaBrue of the ARB. Assistance was provided by the Monterey County Agricultural Commissioner's Office and Lynn Baker and Ruth Tomlin of the ARB's Toxic Air Contaminant Identification Branch. Aaron Rotondaro of Paragon Research Services provided two of the three sample pumps and aided in the set up of the monitors.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

State of California
Air Resources Board

Ambient Air Monitoring in Monterey County for Telone II During Dow Elanco's Commercial Use Project September and October, 1993

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 five-week source impacted ambient monitoring program for Telone II in Monterey County during the months of September and October 1993. This is the third in a series of studies undertaken in California by DowElanco designed to mitigate the release of Telone II into the air. These monitoring studies were conducted after results from a study conducted in April 1990 indicated the presence of unacceptably high ambient concentrations of Telone II during the peak application period in Merced County. This resulted in a statewide suspension of the permits of all users of this soil fumigant.

For this project, limited commercial use of Telone II was allowed in a four township area of the Salinas Valley for a period of four weeks (see APPENDIX I, ATTACHMENT A and APPENDIX II). These applications were conducted under a stewardship program by the manufacturer of Telone II, DowElanco. This stewardship program included: training on the proper method of application, handling and limiting the overall volume of Telone II applied.

DowElanco's monitoring plan included five monitoring sites: (1) 300 feet northwest (upwind) of the designated application field, (2) 300 feet southeast (downwind) of the designated application field, (3) the fire station in the town of Chualar and (4) and (5) two "multiple source" sites located within the four township area. Applications began the week of September 13, 1993, and continued through the week ending October 9, 1993. Monitoring by DowElanco continued for an additional two weeks, through October 23, 1993.

DowElanco sampled continuously at all five sites identified in FIGURE I and FIGURE II for the whole six-week period. The role of ARB's monitoring was to independently verify the results of DowElanco. In the earlier studies, comparable results were obtained between ARB and DowElanco. For this reason, ARB's role was limited to forty-eight hours of sampling per week, at three (the two "near field" sites and Chualar) of the five sites and for five of the six weeks. Duplicate ARB samples were obtained from the Chualar site. Sampling tubes were changed approximately every twelve hours for the first week and every twenty-four hours for the remaining four weeks.

II. PESTICIDE DESCRIPTION

Telone II is a volatile, colorless to straw-colored liquid consisting of cis- and trans-isomers of the compound 1,3-dichloropropene. It has a molecular weight of 111.0, a boiling point of 103°C to 110°C and a solubility in water of approximately 2.3 gm/liter.

Telone II is a restricted use pesticide under Title 3, California Code of Regulations, Section 6400. The EPA has classified it as a Class B-2 carcinogen (probable human carcinogen).

It is used on a wide variety of crops as a preplant soil treatment to control nematodes, fungi, insects, weeds and other soil pests. Prior to the suspension of its use, the DPR Pesticide Use Report for 1988 reported statewide use of 16,518,814 pounds. Telone II is injected into the soil. Historical application rates varied from five to thirty-six gallons per acre depending on the soil type and crop. During the Commercial Use Project application rates did not exceed twelve gallons per acre.

III. SAMPLING LOCATIONS

Two of the five sites chosen by DowElanco in Monterey County were referred to as "near site". These were also used by ARB for collocated samplers. They were located: (1) 300 feet northwest (upwind) and (2) 300 feet southeast (downwind) of a field treated with Telone II (FIGURE II). The application took place September 15, 1993 from 10:30 am to 1:45 pm. The sealing was completed by 2:30 pm. One hundred and twenty-nine gallons were used on the 11.1 acres resulting in 11.62 gallons per acre. The Telone II was injected at a depth of eighteen inches.

A third sampler set up by DowElanco and co-monitored by ARB was at the fire station in the town of Chualar. The two additional samplers, "multiple source" sites, were set up near Highway 101 (FIGURE I) and monitored only by DowElanco.

IV. SAMPLING METHODOLOGY

The sampling method used during this study required passing measured quantities of ambient air through charcoal tubes (see APPENDIX I). These tubes are 8 mm x 110 mm, coconut-base charcoal with 400 mg in the primary section with 200 mg in the secondary (SKC catalog #226-09). Any Telone II present in the sampled ambient air is captured by the charcoal adsorbent contained in the tubes. Subsequent to sampling, the tubes were stored and transported in an insulated container with dry ice to the ARB's Engineering Evaluation Branch in Sacramento for analysis.

Each sample train consisted of a charcoal tube with tube cover, Teflon fittings and tubing, rain shield, flow meter, train support, and a 6VDC vacuum pump. A diagram of the sampling train is shown in FIGURE III. Each tube was prepared for use by breaking off each sealed glass

end and then immediately inserting the tube into a Teflon fitting. The tubes were oriented in the sampling train according to a small arrow printed on the side of each tube indicating the direction of flow. Covers were placed around the tube to protect any collected Telone II from exposure to sunlight.

The sample pump was started and the flow through a rotometer adjusted with a metering valve to an indicated reading of 2.0 liters per minute (lpm). A leak check was performed by blocking off the sample inlet. The sampling train would be determined to be leak-free, if the indicated flow dropped to zero. Upon completion of a successful leak check, the indicated flow rate was again set at 2.0 lpm and was recorded (if different from the planned 2.0 lpm) along with date, time, and site location. Calibration on August 23 with a digital bubble meter prior to use in the field indicated that an average flow rate of 1.88 lpm was actually achieved when the rotometers were set to 2.0 lpm.

At the end of each sampling period the final indicated flow rate (if different than the set 2.0 lpm), the stop date and time were recorded. The charcoal tubes were then removed from the sample train, end caps installed on both ends, and identification labels affixed to each tube. Each tube was then placed in a culture tube with a screw cap and stored with dry ice in a covered chest until the tubes were delivered to the laboratory for analysis.

V. ANALYTICAL METHODOLOGY

The charcoal tubes recovered from each sampler were analyzed by the ARB Engineering Evaluation Branch staff. The charcoal in the primary section of each sample tube was extracted with carbon disulfide, followed by GC separation on a DB-624 capillary column and measurement by Electron Capture Detector (APPENDIX I, ATTACHMENT B). All samples were analyzed the week following collection. Based on the levels found in previous studies, no primary sections were deemed high enough to require the analysis of the secondary section.

VI. RESULTS

A summary of the meteorological data collected during ARB's sampling periods is shown in TABLE I. The concentration data for Telone II results are shown in TABLE II. A summary of the Telone II concentration and meteorological data is shown in TABLE III. A comparison of DowElanco's and ARB's results are in TABLE IV.

The "near site" upwind application values ranged from below the detection limit (0.074 ug/m^3 for a 24-hour sampling period) to 12. ug/m^3 with an average of 2.7 ug/m^3 (based on 24-hour samples). The "near site" downwind application values ranged from 0.49 ug/m^3 (24-hour sample) to 62. ug/m^3 (12-hour sample) with an average of 10. ug/m^3 (based on 24-hour samples). The values measured in Chualar ranged from non-detect to 2.9 ug/m^3 (average of duplicate samples) with an average of 1.5 ug/m^3 (based on 24-hour samples).

TABLE IV indicates consistently higher levels were determined by EEB. The values are not proportionately greater, nor are they greater by a consistent amount. This indicates a random rather than systematic error on the part of one of the laboratories. However, the differences are not great enough to affect the risk assessment values derived from either set of data.

As can be seen from the data, the levels seem to follow the expected pattern. The field sites (NW and SE) increase after application until the maximum is reached on the night of the second day. The concentrations then decrease through the remainder of the monitoring. The collocated (C-1 and C-2) samplers in Chualar detect no Telone II during ARB's monitoring the first week (through series 4). Beginning the following week (5C-1 and 5C-2) measurable levels of Telone II are detected and continue to be detected throughout the monitoring period.

VII. QUALITY ASSURANCE

Reproducibility, linearity, collection and extraction efficiency, minimum detection limit and storage stability had been determined prior to the first monitoring program, and is outlined in the S.O.P. for Telone II (APPENDIX I, ATTACHMENT B).

Prior to this analysis, linearity, reproducibility and the minimum detection limit were checked to ensure reliable results. The values found were comparable to those presented in the S.O.P. for Telone II.

All of the procedures outlined in the Pesticide Quality Assurance Plan (APPENDIX I, ATTACHMENT C) were followed. The results of the audit by the Quality Management and Operations Support Branch (QMOSB) of the ARB is shown in APPENDIX III. In addition, audit spikes were provided by TRI to both the ARB staff conducting the analysis and DowElanco staff. ARB's EEB also provided spiked samples to DowElanco. A summary of all QA/QC results are found in TABLE V.

The results in TABLE V do not conclusively explain the consistently higher values determined by EEB for the field samples (TABLE IV). With spikes prepared by EEB, the values determined by EEB were consistently higher than DowElanco. For spikes prepared by ARB's QMOSB, the results are randomly higher and lower than the assigned masses as determined by EEB. Finally, the spikes prepared by TRI Environmental (an independent laboratory contracted by DowElanco) resulted in consistently lower values by both DowElanco and EEB (relative to TRI's own analysis). However, EEB's values were still consistently lower than DowElanco's for all of those same spikes. The only apparent common factor that might explain the variations is distance and/or time between preparation of the spikes and analysis. However, this trend has never been observed in previous studies.

FIGURE I. Telone Monitoring Area

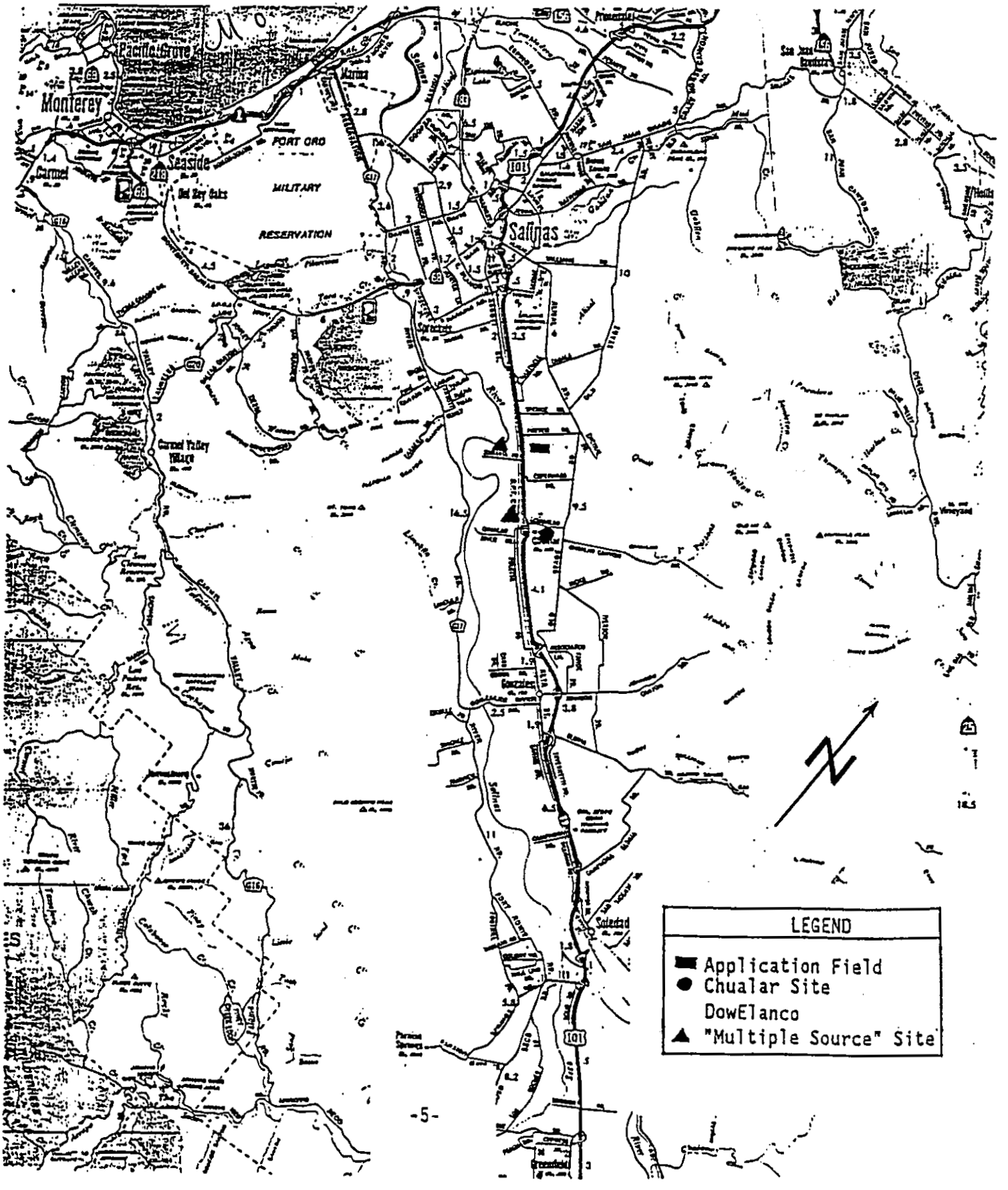


FIGURE II. Telone Application Monitoring Sites

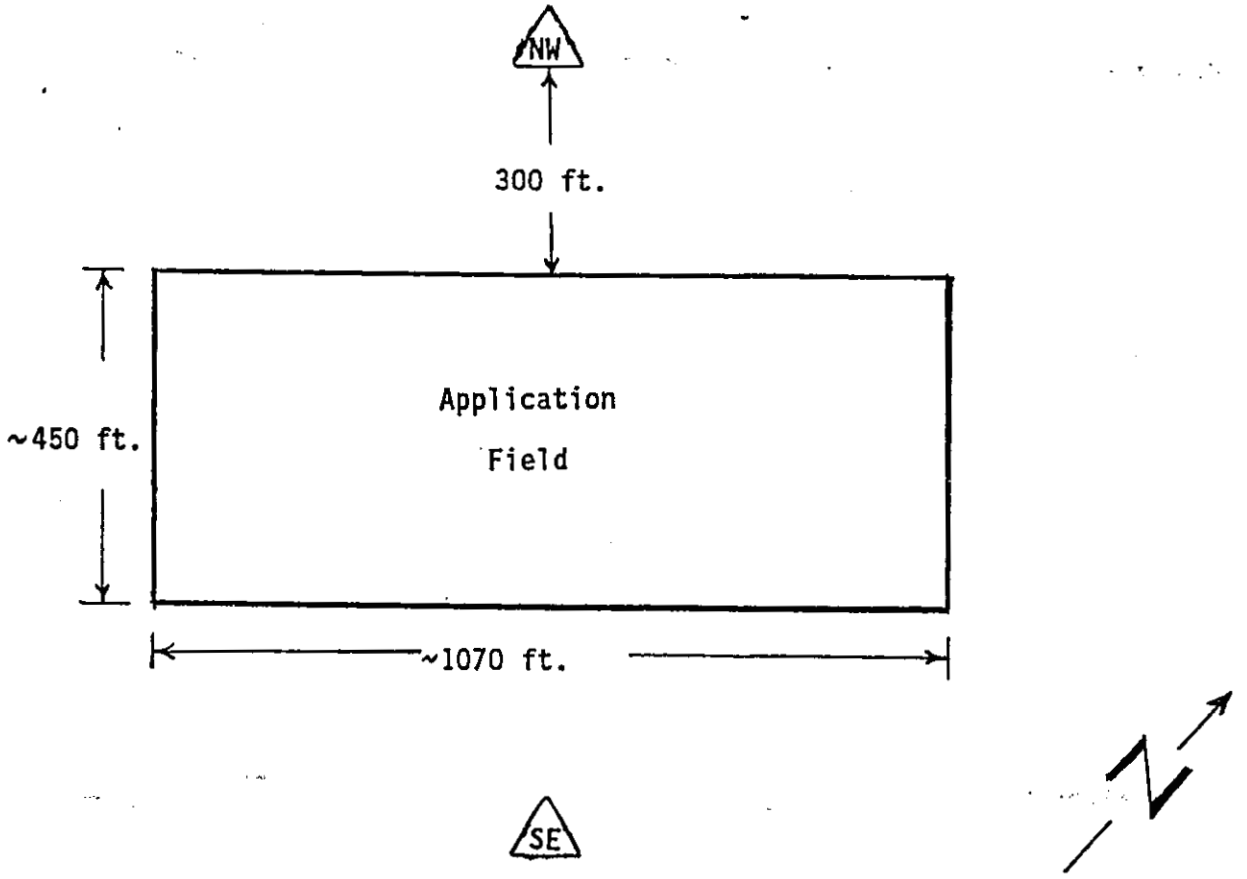


FIGURE III. Telone Monitoring Apparatus

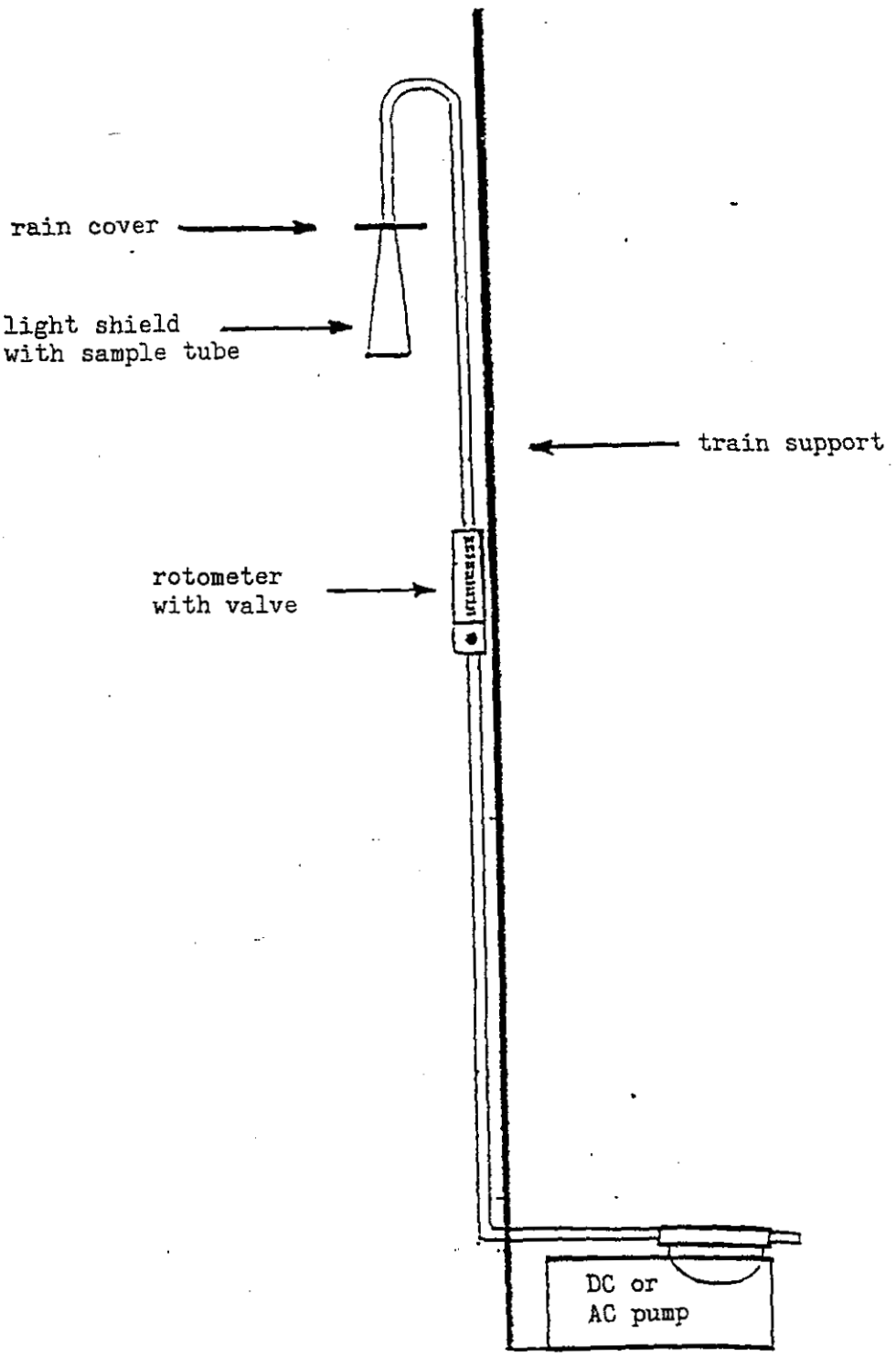


TABLE I. Telone II Meteorological Data

Sampling Period	Dates	Time	Wind Direction*	Wind Speed (mph)
1	9/15/93	0700-1900	W/SW/NW	6
2	9/15-16/93	1900-0700	WNW/SW/NW	4
3	9/16/93	0700-1900	W/NW/S/E/N	7
4	9/16-17/93	1900-0700	W/NW/SW	3
5	9/22-23/93	0700-0700	WNW/SW/SE	6
6	9/23-24/96	0700-0700	WNW/ESE/E	7
7	9/29-30/93	0700-0700	WNW/E/SE/S	5
8	9/30-10/1/93	0700-0700	WNW/SE/NW/E	6
9	10/6-7/93	0700-0700	WNW/W/SE/SW	5
10	10/7-8/93	0700-0700	NW/W/E/SE/SW	5
11	10/13-14/93	0700-0700	NW/W/E/SE	6
12	10/14-15/93	0700-0700	NW/E/W	6

*Indicates direction wind is blowing from.

TABLE II. Telone II Monitoring Data

Sample ID	Time (min.)	Volume* (m^3)	Total (ug)	Concentration (ug/m^3)	Date (Approx. time)
1NW	680	1.3	ND	--	
1SE	715	1.3	20.0	15.	Application*
1C-1	705	1.3	ND	--	9/15/93
1C-2	705	1.3	ND	--	(0700-1900)
2NW	725	1.4	1.08	0.77	
2SE	710	1.3	65.5	50.	
2C-1	735	1.4	ND	--	
2C-2	735	1.4	ND	--	9/15-16/93
2B	BLANK	--	ND	--	(1900-0700)
3NW	720	1.4	5.62	4.0	
3SE	725	1.4	35.1	25.	
3C-1	705	1.3	ND	--	9/16/93
3C-2	705	1.3	ND	--	(0700-1900)
4NW	720	1.4	0.550	0.39	
4SE	715	1.3	80.6	62.	
4C-1	715	1.3	ND	--	9/16-17/93
4C-2	715	1.3	ND	--	(1900-0700)
5NW	1435	2.7	32.1	12.	
5SE	1430	2.7	32.6	12.	
5C-1	1425	2.7	3.99	1.5	9/22-23/93
5C-2	1425	2.7	4.22	1.6	(0700-0700)
6NW	1430	2.7	7.98	3.0	
6SE	1445	2.7	11.9	4.4	
6C-1	1440	2.7	1.50	0.56	
6C-2	1440	2.7	1.41	0.52	9/23-24/93
6B	BLANK	--	ND	--	(0700-0700)

ND = not detected, <0.2 ug/sample (0.074 ug/m^3 for a 24-hour sample).

*Application occurred at the near field site from 10:30 am to 1:45 pm.

TABLE II. Telone II Monitoring Data (cont.)

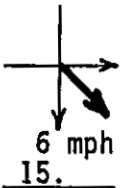
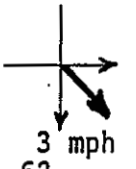
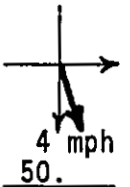
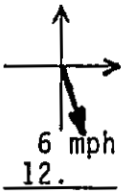
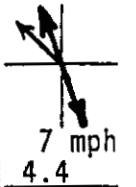
Sample ID	Time (min.)	Volume (m^3)	Total (ug)	Concentration (ug/m^3)	Date (Approx. time)
7NW	1440	2.7	1.88	0.70	
7SE	1440	2.7	3.22	1.2	
7C-1	1435	2.7	7.47	2.8	9/29-30/93
7C-2	1435	2.7	8.04	3.0	(0700-0700)
8NW	1440	2.7	9.44	3.5	
8SE	1445	2.7	11.9	4.4	
8C-1	1440	2.7	7.05	2.6	
8C-2	1440	2.7	6.42	2.4	9/30-10/1/93
8B	BLANK	--	ND	--	(0700-0700)
9NW	1440	2.7	2.17	0.80	
9SE	1440	2.7	2.44	0.90	
9C-1	1435	2.7	3.48	1.3	10/6-7/93
9C-2	1435	2.7	4.26	1.6	(0700-0700)
10NW	1445	2.7	2.46	0.91	
10SE	1440	2.7	2.46	0.91	
10C-1	1445	2.7	3.15	1.2	
10C-2	1445	2.7	3.12	1.2	10/7-8/93
10B	BLANK	--	ND	--	(0700-0700)
11NW	1440	2.7	1.21	0.45	
11SE	1440	2.7	1.31	0.49	
11C-1	1445	2.7	1.70	0.63	10/13-14/93
11C-2	1445	2.7	1.79	0.66	(0700-0700)
12NW	35	0.06	ND	-- *	
12SE	1445	2.7	3.14	1.2	
12C-1	1450	2.7	3.72	1.4	
12C-2	1450	2.7	3.75	1.4	10/14-15/93
12B	BLANK	--	ND	--	(0700-0700)

ND = not detected, <0.2 ug/sample (0.074 ug/m^3 for a 24-hour sample).

*The pump had stopped after 35 minutes.

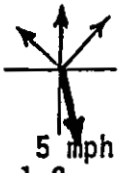
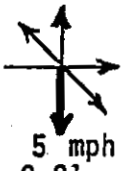
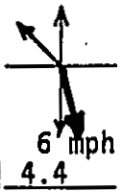
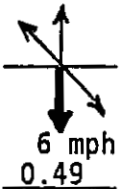
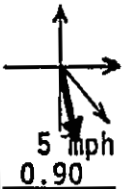
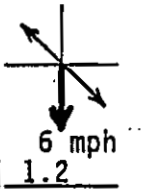
The final application in the area occurred on October 11.

TABLE III. Summary of Telone II Application Data, ug/m^3

(1)	[NW] ND  [SE] 15. [C] ND	(4) [NW] 0.39  [SE] 62. [C] ND
(2)	[NW] 0.77  [SE] 50. [C] ND	(5) [NW] 12.  [SE] 12. [C] 1.6
(3)	[NW] 4.0  [SE] 25. [C] ND	(6) [NW] 3.0  [SE] 4.4 [C] 0.54

[ ] indicates sampling site identification.
( ) indicates sampling period.
Arrow indicates direction wind is blowing toward, **BOLD** indicates primary direction, if any.

TABLE III. Summary of Telone II Application Data, ug/m^3 (cont.)

(7)	[NW] 0.70  [SE] 1.2 [C] 2.9	(10) [NW] 0.91  [SE] 0.91 [C] 1.2
(8)	[NW] 3.5  [SE] 4.4 [C] 2.5	(11) [NW] 0.45  [SE] 0.49 [C] 0.64
(9)	[NW] 0.80  [SE] 0.90 [C] 1.4	(12) [NW] ND*  [SE] 1.2 [C] 1.4

[ ] indicates sampling site identification.
( ) indicates sampling period.
Arrow indicates direction wind is blowing toward, BOLD indicates primary direction, if any.

TABLE IV. Comparison of ARB and DowElanco Results

ID		m^3		Total ug		ug/m^3		
Dow	ARB	Dow	ARB	Dow	ARB	Dow	ARB	
404	1NW	1.06	1.3	ND	ND	--	--	*
405	1SE	1.08	1.3	12.75	20.0	11.85	15.	
203	1C	1.07	1.3	0.12	ND	0.11	--	
406	2NW	1.10	1.4	0.17	1.08	0.15	0.77	*
407	2SE	1.09	1.3	38.60	65.5	35.35	50.	
204	2C	1.07	1.3	ND	ND	--	--	
408	3NW	1.09	1.4	2.69	5.62	2.48	4.0	*
409	3SE	1.09	1.4	23.87	35.1	22.00	25.	
205	3C	1.03	1.3	ND	ND	--	--	
410	4NW	1.06	1.4	0.198	0.550	0.19	0.39	*
411	4SE	1.07	1.3	52.1	80.6	48.47	62.	
206	4C	1.10	1.3	0.1	ND	0.09	--	
432	5NW	2.15	2.7	22.1	32.1	10.27	12.	
433	5SE	2.18	2.7	22.5	32.6	10.34	12.	
216	5C	2.18	2.7	1.546	4.10	0.71	1.6	
434	6NW	2.19	2.7	4.88	7.98	2.23	3.0	
435	6SE	2.28	2.7	7.45	11.9	3.27	4.4	
217	6C	2.20	2.7	0.358	1.46	0.16	0.54	
446	7NW	2.18	2.7	0.917	1.88	0.42	0.70	
447	7SE	2.22	2.7	1.607	3.22	0.72	1.2	
223	7C	2.14	2.7	4.33	7.76	2.03	2.9	
448	8NW	2.19	2.7	5.78	9.44	2.64	3.5	
449	8SE	2.25	2.7	7.84	11.9	3.49	4.4	
224	8C	2.17	2.7	3.73	6.74	1.72	2.5	
460	9NW	2.08	2.7	0.927	2.17	0.45	0.80	
461	9SE	2.21	2.7	1.055	2.44	0.48	0.90	
230	9C	2.20	2.7	1.841	3.87	0.84	1.4	
462	10NW	2.12	2.7	1.121	2.46	0.53	0.91	
463	10SE	2.14	2.7	1.152	2.46	0.54	0.91	
231	10C	2.14	2.7	1.343	3.14	0.63	1.2	
474	11NW	2.12	2.7	0.366	1.21	0.17	0.45	
475	11SE	2.13	2.7	0.347	1.31	0.16	0.49	
237	11C	2.16	2.7	0.593	1.75	0.27	0.64	
476	12NW	2.15	.06	1.144	ND	0.53	--**	
477	12SE	2.14	2.7	1.501	3.14	0.70	1.2	
238	12C	2.17	2.7	1.828	3.74	0.84	1.4	

*These series of samples (both DowElanco and ARB) were collected for 12 hours. All others were 24-hour samples.

**Pump ran only 35 minutes.

TABLE V. Telone QA/QC Data

EEB's Telone Spikes Prepared for DowElanco

Sample ID	Planned (ug)	Measured by EEB (ug)	Measured by Dow (ug)
Sp-			
1,2,6,7	1.3	1.19	0.54
3,4,8,9	13.0	4.62	0.48
5,10,11	65.0	53.2	29.0

EEB's spiking solution was calculated to be 130 ug/ml by EEB staff. Analysis by DowElanco of this solution resulted in 93.8 ug/ml based on its standards.

QMOSB Spikes Prepared for EEB

Sample ID	Assigned Mass (ug)	Reported Mass(ug)	Percent Difference
TEL-1	8.40	7.47	-11.1
TEL-2	1.05	1.40	33.3
TEL-3	4.20	4.56	8.6
TEL-4	8.40	7.08	-15.7
TEL-5	0	ND	N/A
TEL-6	4.20	3.24	-22.9
TEL-7	1.05	1.28	21.9

QMOSB stock spiking solution was calculated to be 210 ug/ml by QMOSB staff. Analysis by EEB of this solution resulted in 242 ug/ml based on its standards.

TRI Environmental, Inc. Prepared Spikes

Sample ID	Assigned Mass (ug)	Measured by TRI	Measured by Dow	Measured by EEB
18852	288.	205.	164.6	130.
18853	288.	186.3	170.8	121.
18856	288.	184.1	166.	141.
18855	26.2	9.48	9.89	3.62
18858	26.2	9.18	10.39	4.17
18859	26.2	10.52	10.18	5.55
18854	3.6	0.374	0.22	0.25
18857	3.6	0.133	0.468	ND
18860	3.6	0.477	0.224	0.940