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MEMORANDUM

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SUBJECT: AIR MONITORING RESULTS OF METALAXYL AND METHOMYL APPLIED TO A POTATO FIELD IN SAN DIEGO COUNTY, 1996

BACKGROUND

The application of multiple pesticides to potato fields that are close to urban areas represents a potential for exposure. The San Diego County Agricultural Commissioner's office requested that the Department of Pesticide Regulation (DPR) monitor air concentrations during and after pesticide applications to a specific field. The Commissioner's office will use the data to assess compliance with permit conditions.

SAMPLING METHODS

DPR's Environmental Hazards Assessment Program (EHAP) monitored two aerial applications to determine offsite air concentrations of chlorothalonil, metalaxyl, and methomyl. Both applications were for the same 80-acre potato field near Oak Grove (San Diego County). For the first application on July 31, 1996, chlorothalonil and metalaxyl were applied in a tank mix at a rate of two pounds active ingredient per acre, each. For the second application on August 9, 1996,

methomyl, esfenvalerate, and mancozeb were applied in a tank mix at rates of 0.73, 0.5, and 1.8 pounds active ingredient per acre, respectively. Both applications occurred in the morning, using a helicopter equipped with a 32-foot boom, and lasted approximately one hour.

EHAP established eight sampling sites around the perimeter of the treatment site (Figure 1). Four of these (sites 1, 2, 3, and 4) were at the center of each side of the field, 10 meters from the edge. The remaining four sampling sites (5, 6, 7, and 8) were located 40 meters from the corners of the field. EHAP placed additional samplers on a hill above the field (site 10), at two residences (sites 9 and 11), and a campground adjacent to the ranch (site 12). These additional samplers were between 80 - 1,500 meters from the field.

EHAP collected air samples using high-volume air samplers calibrated to one cubic meter per minute. Each air sampler was positioned approximately 1.2 meters above ground level and was fitted with a glass jar containing 125 milliliters of XAD-2 resin. Samples were collected for approximately 36 hours before, during and after application: one 12-hour interval before application to measure any background levels, one sample during application, and two consecutive 10 - 11-hour samples following application. Once samples were collected, each jar was placed in a plastic bag, tightly closed, and stored on dry ice. Samples were kept frozen until analysis.

Meteorological data was collected near the field using a Met-One/Campbell Scientific weather station (Met One Instruments sensors, Campbell Scientific CR-21XL data logger). Wind direction, wind speed, air temperature, and relative humidity were recorded for 24 hours prior to application and the duration of the monitoring period. Values for these variables were recorded at one minute intervals.

CHEMICAL ANALYSIS/QUALITY CONTROL

The California Department of Food and Agriculture's Center for Analytical Chemistry performed the chemical analyses. Metalaxyl was analyzed by first extracting the XAD-2 resin with 50% hexane/acetone. The extract was concentrated with a rotary evaporator and then analyzed with a gas chromatograph equipped with a nitrogen-phosphorous detector. Methomyl was analyzed by extracting the XAD-2 resin with ethyl acetate. The extract was concentrated, filtered, and then analyzed with a high pressure liquid chromatograph equipped with a fluorescence detector and post-column derivatization system. Results are reported in micrograms per cubic meter of air, with a reporting limit of approximately 0.002 micrograms per cubic meter for metalaxyl and 0.001 micrograms per cubic meter for methomyl.

In addition to developing and validating analytical methods, EHAP completed a trapping efficiency study for each chemical of interest. The trapping efficiency tests for metalaxyl showed no problems, with recoveries averaging 96 percent. Trapping efficiency tests for methomyl indicate that it breaks down during sampling producing two degradates, probably methomyl sulfone and methomyl sulfoxide. However, reference material for methomyl sulfone and sulfoxide was not available and the breakdown products could not be positively identified or quantified. To account for chemical breakdown of the parent compound, EHAP adjusted the sampling results by using the data from field spikes. Trapping efficiency tests for chlorothalonil were highly variable and the method was considered unreliable.

RESULTS

EHAP monitored metalaxyl for the first application. Background samples collected the day before application contained no detectable metalaxyl. Table 1 shows the metalaxyl monitoring results during and following application. Air concentrations ranged from no detectable amount (detection limit approximately 0.002 micrograms per cubic meter) to 3.4 micrograms per cubic meter. The

highest concentration and greatest number of positives were detected during the application (7:30 am - 9:30 am). These results are consistent with the weather patterns recorded during the monitoring. The wind direction shifted approximately 180 degrees during the application. Wind was from the east-northeast during the first part of application and was from the west during the last part of the application. Air concentrations decreased over time. The highest concentration detected during the first sampling period was 3.4 micrograms per cubic meter. The highest concentration detected 12 - 24 hours later during the third sampling period was 0.32 micrograms per cubic meter. Air concentrations at the remote sites (sites 9, 10, 11, 12) were lower than concentrations detected next to the field. The highest concentration detected at a remote site was 0.21 micrograms per cubic meter.

EHAP monitored methomyl for the second application. Background samples collected the day before application contained no detectable methomyl. Table 2 shows the methomyl monitoring results during and following application. Air concentrations ranged from no detectable amount (detection limit approximately 0.001 micrograms per cubic meter) to 2.4 micrograms per cubic meter. The highest concentrations were detected during application, but only three of the 12 sampling sites were positive. Air concentrations following application were lower, but a greater number of sampling sites were positive, 11 of 12. These results are also consistent with the weather patterns recorded during the monitoring period. During application the wind was from the southeast and the positive sites were located to the northwest. Following application winds shifted direction several times. With no predominant wind direction methomyl was detected all around the field. Air concentrations decreased over time, but not as much as metalaxyl concentrations decreased. The highest concentration detected during the first sampling period was 2.4 micrograms per cubic meter. The highest concentration detected 12 - 24 hours later during the third sampling period was 1.1 micrograms per cubic meter. Air concentrations at the remote sites (sites 9, 10, 11, 12) were lower than concentrations detected next to the field. The highest concentration detected at a remote site was 0.04 micrograms per cubic meter.

Figure 1. Locations of sampling sites for the potato field air monitoring near Oak Grove, July - August, 1996.

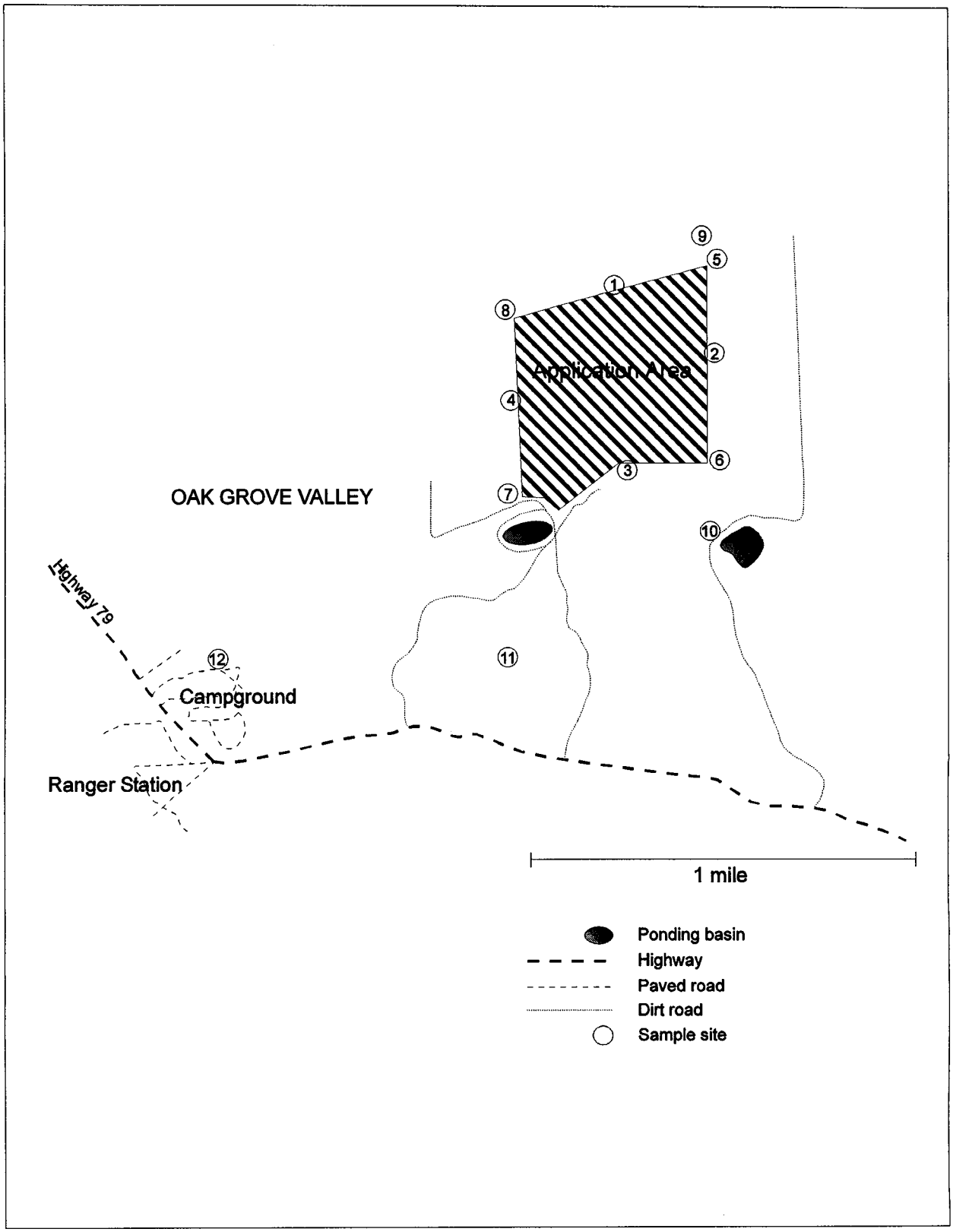

Table 1. Metalaxyl air concentrations during three sampling periods beginning with the start of the first application, July 31, 1996.

Sampler Location[a]			Metalaxyl (micrograms per cubic meter)		
			7:30 - 09:30	09:30 - 19:30	19:30 - 06:30
Site	Direction	Distance (m)	(2 hrs)[b]	(10 hrs)	(11 hrs)
1	north	10	1.40	ND[c]	0.03
2	east	10	2.35	0.36	0.05
3	south	10	3.44	0.74	0.16
4	west	10	1.64	0.01	0.40
5	northeast	40	0.27	ND	0.002
6	southeast	40	2.02	0.69	0.03
7	southwest	40	1.60	0.003	0.32
8	northwest	40	0.33	ND	0.04
9	northeast	80	ND	ND	ND
10	southeast	270	0.10	0.06	0.003
11	southwest	650	0.21	ND	ND
12	southwest	1460	0.02	ND	ND

[a] direction and distance relative to the edge of the field, see Figure 1 for exact locations.

[b] duration of sampling period shown in parentheses

[c] None Detected, detection limit approximately 0.002 micrograms per cubic meter

Table 2. Methomyl air concentrations during three sampling periods beginning with the start of the second application, August 9, 1996.

Sampler Location[a]			Methomyl (micrograms per cubic meter)		
			06:45 - 09:30	09:30 - 20:30	20:30 - 07:00
Site	Direction	Distance (m)	(2.75 hrs)[b]	(11 hrs)	(10.5 hrs)
1	north	10	0.42	0.37	0.09
2	east	10	ND[c]	0.38	0.002
3	south	10	ND	0.96	0.30
4	west	10	1.99	1.64	1.11
5	northeast	40	ND	0.04	ND
6	southeast	40	ND	0.40	0.01
7	southwest	40	ND	1.11	0.52
8	northwest	40	2.44	0.42	0.44
9	northeast	80	ND	ND	ND
10	southeast	270	ND	0.03	0.002
11	southwest	650	ND	0.04	0.002
12	southwest	1460	ND	0.002	ND

[a] direction and distance relative to the edge of the field, see Figure 1 for exact locations.

[b] duration of sampling period shown in parentheses

[c] None Detected, detection limit approximately 0.002 micrograms per cubic meter

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