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Report on Air Monitoring of an Orchard Application of Diazinon In Glenn County during January 2010

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Monitoring Report Approval

Report Title: Report on Air Monitoring of an Orchard Application of Diazinon in Glenn County during January 2010

Project Lead: Steve Rider, Air Pollution Specialist

Approval: The following monitoring report has been reviewed and approved by the Monitoring and Laboratory Division.

Signatures:

Mac McDougall, Manager Special Purpose Monitoring Section	Date
Kenneth R. Stroud, Chief Air Quality Surveillance Branch	Date

Executive Summary

Report on Air Monitoring of an Orchard Application of Diazinon In Glenn County during January 2010

At the request of the Department of Pesticide Regulation (DPR), the Air Resources Board (ARB) conducted application air monitoring for the insecticide O,O-diethyl O-2-isopropyl-6-methylpyrimidin-4-yl phosphorothioate (Diazinon) and the Oxygen analog (Diazoxon) in Glenn County from January 4 through 7, 2010. This insecticide is generally used for controlling sucking and leaf eating insects and its CAS Registry Number is 333-41-5. Sampling was performed around a 19 acre orchard of dormant plum trees (prunes) during a Diazinon AG500 application at the rate of 2.1 pounds of active ingredient (a.i.) per acre mixed with spray oil and water.

A total of 41 air samples along with 10 quality control (QC) samples were collected by staff of the Air Quality Surveillance Branch. One (1) sampler, which had two (2) each independently plumbed rotameters and pumps, was located at each site. Samples were collected on XAD-2 resin sorbent tubes with an air sampling flow rate of three (3) liters per minute (LPM). The resin sorbent tube air samples were analyzed using gas chromatography/mass spectrometer (GC/MS) in the selected ion-monitoring mode (SIM) by ARB's Northern Laboratory Branch in Sacramento for both Diazinon and Diazoxon.

Diazinon resin sorbent tube results: The reported Diazinon results from resin sorbent tube samples indicated application concentrations ranging from less than the method detection limit (MDL) to a maximum of 4,261 ng/m^3 (4200 ng/sample) at the North Side (NS) site which ran for 5.3 hours during the application. Thirty five of the 41 samples exceeded the MDL of <6 ng/sample and 31 exceeded the estimated quantitative limit (EQL) of 30 ng/sample.

Diazoxon resin sorbent tube results: The reported Diazoxon results from resin sorbent tube samples indicated application concentrations ranging from less than the MDL to a maximum of 124 ng/m^3 (359 ng/sample) at the NS site which ran for 15.9 hours during the first night sampling period (period 2). Twenty four of the 41 samples exceeded the MDL of <20 ng/sample and seven (7) exceeded the EQL of 100 ng/sample.

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1.0 Introduction

At the request of the Department of Pesticide Regulation (DPR) (January 2009 Memorandum, Warmerdam to Goldstene), the Air Resources Board (ARB) conducted ambient air monitoring for the insecticide O,O-diethyl O-2-isopropyl-6-methylpyrimidin-4-yl phosphorothioate (Diazinon) and the Oxygen analog (Diazoxon). This insecticide is generally used for controlling sucking and leaf eating insects and its Chemical Abstract Service (CAS) Registry Number is 333-41-5.

A total of 41 air samples along with 10 quality control (QC) samples were collected at eight sites around a 19 acre Plum (Prunes) orchard in northeastern Glenn County. The south side (SS) site included two (2) additional samplers within one meter of the primary sampler for collocated and field spike samples. Monitoring was performed during the period of January 4 -7, 2010. This monitoring was performed under the requirements of the California Code of Regulation, Food and Agriculture Code, Section 14022(c) which requires the ARB, "…to document the level of airborne emissions…of pesticides that may be determined to pose a present or potential hazard...", when requested by the DPR. Monitoring was conducted to coincide with the use of Diazinon as an insecticide on an orchard's dormant trees. The "Sampling Protocol for Diazinon and its Oxygen Analog Diazoxon Application Study" dated November 30, is located in Appendix A. Application information is listed in Table 1 (Application Information) and application sampling periods are listed in Table 2 (Application Sampling Periods).

TABLE 1: APPLICATION INFORMATION

Parameter	Detail
Location	CA, Glenn County, Southeast of Artois, South of County Road 35
Section/Township/Range	S10/T20N/R3W Mt. Diablo
Field size	18.9 acres
Product applied	Diazinon AG500 Insecticide, 48% 0,0-diethyl 0-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate & 52% inert ingredients. Plus Superior 415 Spray oil.
Application Type	Ground air-blast (tractor pulled sprayer), 18.9 acres: Start = 1104, End = 1543
Commodity	Established Plum (Prune) Trees
Application rate	0.53 gallons per acre at a calculated 2.1 lbs of a.i./acre.

TABLE 2: APPLICATION SAMPLING PERIODS

Sampling Period	Sampling Period Duration (Hours)	January 2010 (Date)	Time (Start/Stop)
Background	21.1	4 – 5	1231 to 0947
1 (Application)	5.65	5	1048 to 1634
2 (Nighttime)	15.97	5 - 6	1607 to 0832
3 (Daytime)	7.68	6	0801 to 1613
4 (Nighttime)	16.53	6 - 7	1537 to 0830

Note: Start/Stop times indicate when the first sample for the corresponding sampling period was installed and the last sample for the same sampling period was removed. Exact duration for each sample is listed in Table 4.

2.0 Deviations From Protocol

No deviations from the sampling protocol were noted.

3.0 Sampling Sites

The site nomenclature for this study was generated by identifying each site with respect to its position around the field related to true north. A pesticide sampler was placed approximately midway on each side of the field located between 35 to 48 feet from the edge of the trees. Four pesticide sampler sites were placed diagonally from each corner at 44 to 55 feet from the edge of the trees. The placement of each sampler was dictated by variations in distances from the edge of the trees, access and available space. A collocated pesticide sampler and a field spike sampler were placed adjacent to the South Side (SS) site (the projected downwind site). All samplers were setup to sample at three liters per minute (lpm). Exact placement and details are given in Table 3 (Sampler Waypoints) and displayed in the topographical map, aerial photos and sketch (Figures 1-4). Also see Appendix B for site photographs and the pesticide label. The majority of surrounding crops were oil Olives or Almonds and no known additional Diazinon applications occurred during this four (4) day study.

TABLE 3: SAMPLER WAYPOINTS

Sampler ID	Sampler Position Related to Monitored Field	Waypoints
MET (Meteorology Station)	157' west southwest of NWC, Elevation = 153'	N 39^{O} 36' 20.30" W 122^{O} 11' 13.94"
NWC (Northwest Corner)	54' diagonally north northwest of the field's northwest corner, Elevation = 153'	N 39^{O} 36' 20.50" W 121^{O} 11' 12.00"
WS (West Side)	48' west of west side and approximately midway along west side of field (529' N by 560' S), Elevation = 152'	N 39^{O} 36' 14.80" W 122^{O} 11' 12.25"
SWC (Southwest Corner)	55' diagonally south southwest of southwest corner, Elevation = 151'	N 39^{O} 36' 08.75" W 122^{O} 11' 11.85"
SS (South Side), Collocated & Field Spike	46' diagonally southeast of mid-south side corner and approximately midway along south side of field (460' W by 353' E), Elevation = 151'	N 39^{O} 36' 08.80" W 122^{O} 11' 05.45"
SEC (Southeast Corner)	44' diagonally southeast of southeast corner, Elevation = 150'	N 39^{O} 36' 10.50" W 122^{O} 11' 00.50"
ES (East Side)	47' east of east side and approximately midway along east side of field (440' N by 462' S), Elevation = 151'	N 39^{O} 36' 15.10" W 122^{O} 11' 00.30"
NEC (Northeast Corner)	48' diagonally north northeast of northeast corner, Elevation = 151'	N 39^{O} 36' 20.10" W 122^{O} 11' 00.64"
NS (North Side)	35' north of north side and approximately midway along north side of field (427' W by 417' E), Elevation = 152'	N 39^{O} 36' 20.20" W 122^{O} 11' 06.20"

FIGURE 1: ROAD MAP OVERVIEW OF MONITORED AREA

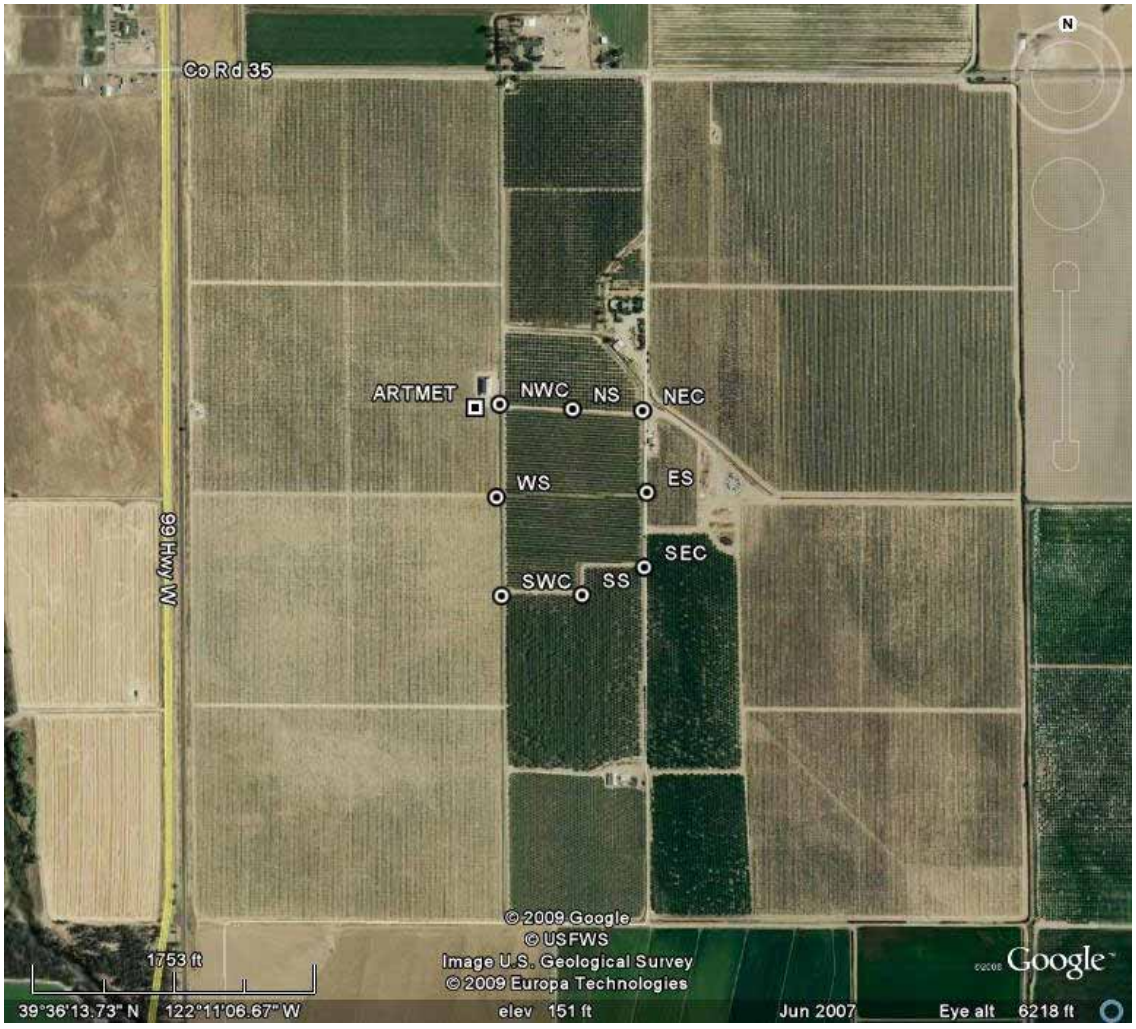

FIGURE 2: AERIAL PHOTO OVERVIEW OF MONITORED AREA

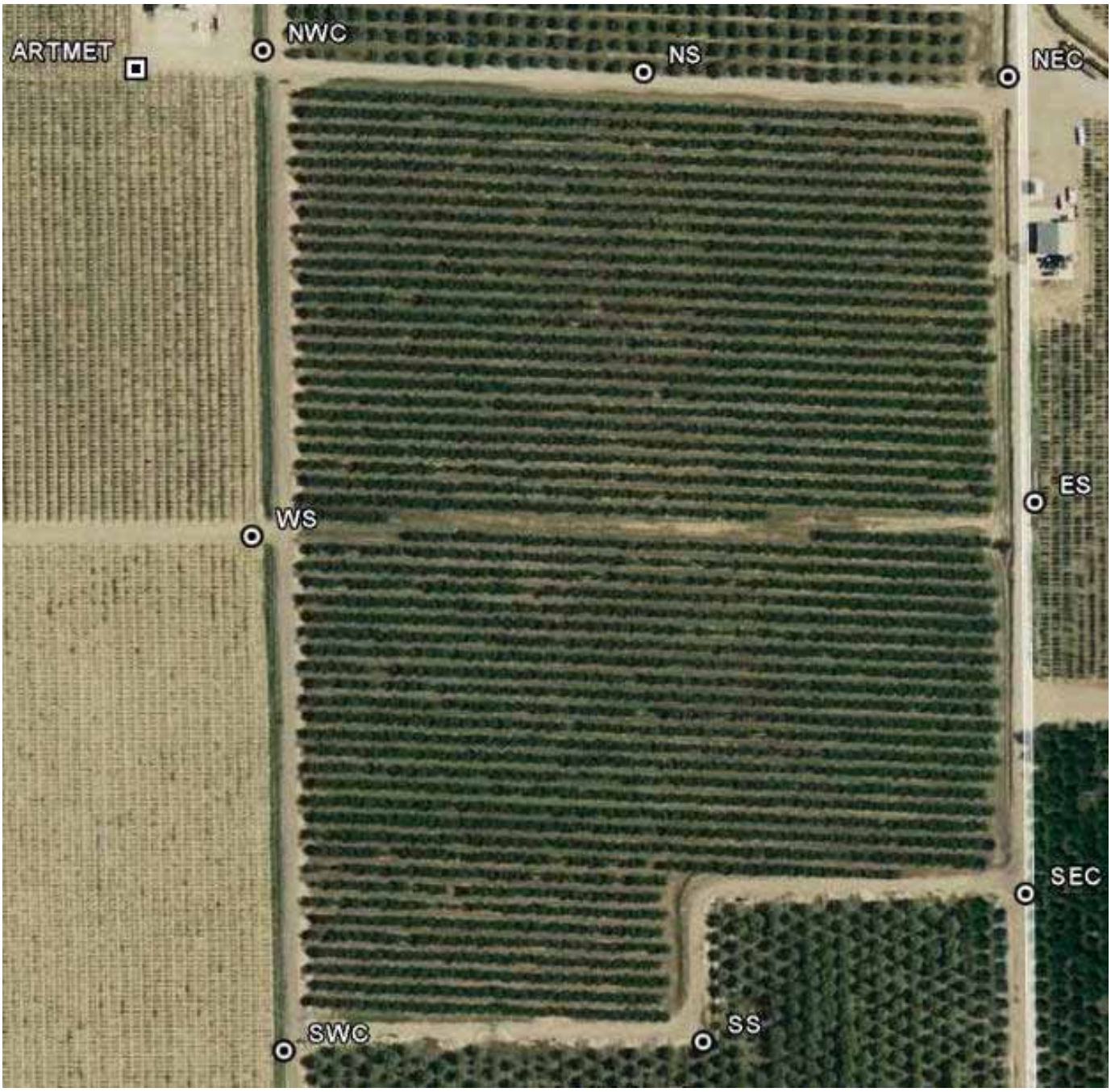

FIGURE 3: AERIAL PHOTO CLOSEUP OF MONITORED AREA

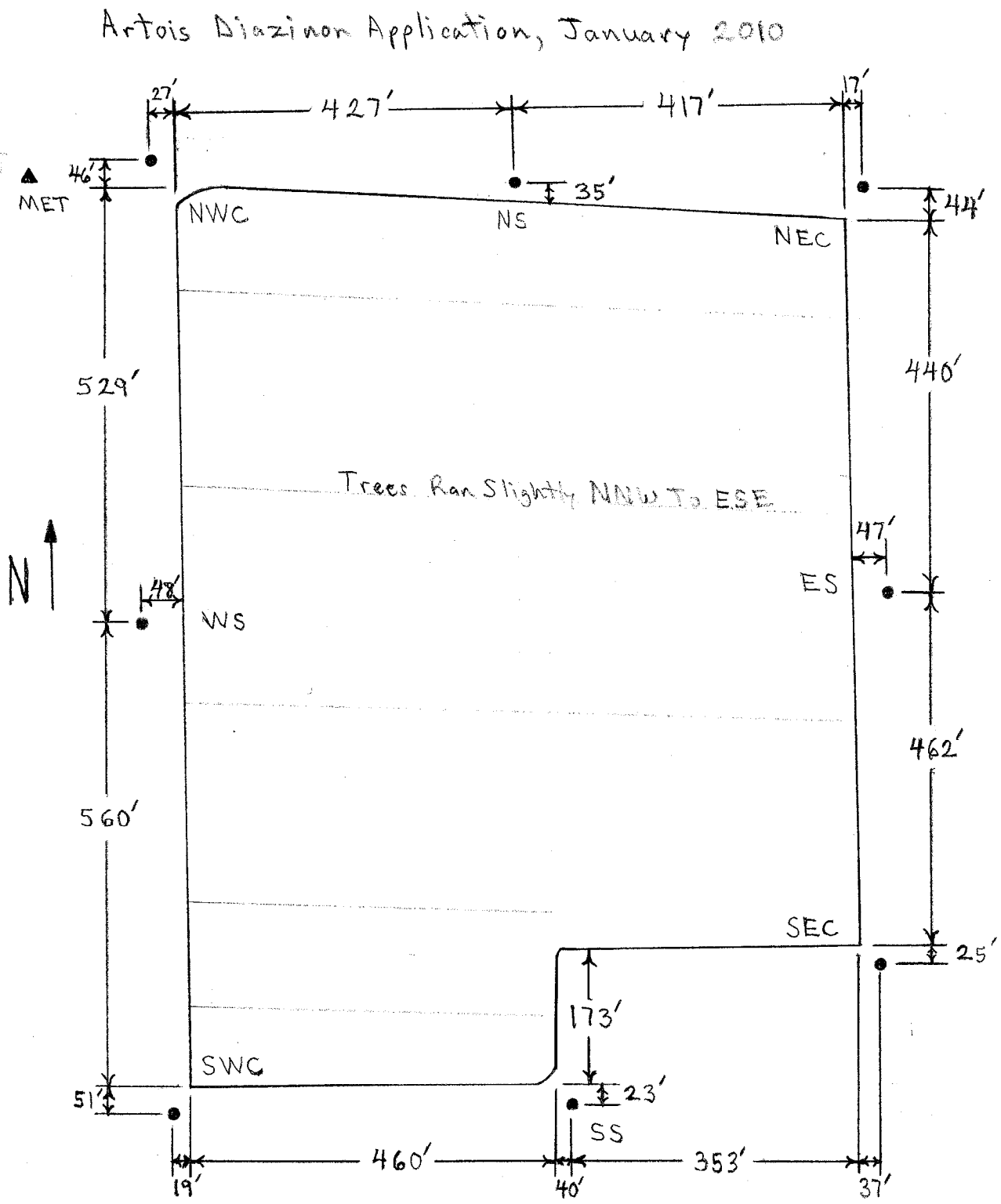

FIGURE 4: FIELD SKETCH

4.0 Methods

A total of 41 air samples along with 10 quality control (QC) samples were collected by staff of the Air Quality Surveillance Branch from January 4th through 7th. Actual sample resin sorbent tubes consisted of 36 samples and five (5) collocated samples. The 10 QC resin sorbent tube samples consisted of six (6) field spikes, three (3) trip spikes and one (1) trip blank. One (1) each field spike and collocated sample were sampled during each sampling period at the SS sampling site except the sixth field spike was sampled at the NS site.

Background sampling was performed from 1231 on January 4th through 0947 on January 5th for a 21.1 hour background period. Background samples included four (4) resin tubes placed near the center of each side of the field along with one (1) field spike and one (1) collocated resin sorbent tube located within one (1) meter of the SS sampler.

The total application sampling period occurred from 1104 through 1543 on January 5th. Due to the proximity to sunset no post application to one (1) hour prior to sunset sampling period was performed. After the application samples were removed ARB proceeded with two (2) nighttime and one (1) daytime sampling periods which were completed by 0830 on the 7th of January.

Samples were collected by passing a measured volume of ambient air through one resin sorbent tube that is mounted on a pesticide sampling tree. All inlets were placed at 67" $\pm$3" above the ground. Sample flow is controlled by an inline rotameter at 3 LPM and the resin sorbent tubes were protected from direct sunlight or rain by a tubular shield. Flows were verified prior to sampling and prior to removing the sample with a certified mass flow meter (MFM). At the end of each sampling period the exposed XAD-2 resin sorbent tubes (SKC #226-30-06) with 400 and 200 mg of packing were placed in culture tubes with an identification label affixed and stored in an ice chest on dry ice. For details of the monitoring method, please refer to Appendix A, "Sampling Protocol for Diazinon and its Oxygen Analog Diazoxon Application Study" dated November 30, 2009.

Upon completion of sample collection, resin sorbent tube samples were transported to the MLD laboratory in Sacramento by ARB staff. Collected samples were analyzed using the following laboratory method. Sample tubes were extracted using pesticide grade ethyl acetate (EtAc). Sample analysis was performed using a gas chromatograph with a mass spectrometer (GC/MS) in the selected ion-monitoring mode (SIM). For more detail refer to, "Standard Operating Procedure Sampling and Analysis of O,O-diethyl O-2-isopropyl-6-methylpyrimidin-4-yl phosphorothioate (Diazinon) and the Oxygen Analog (Diazoxon)", located in Appendix A as part of, "Sampling Protocol for Diazinon and its Oxygen Analog Diazoxon Application Study" dated November 30. Appendix C contains the laboratory results report titled, "O,O-diethyl O-(2-isopropyl-6-methylpyrimidin-4-yl) phosphorothioate (Diazinon) and the Oxygen Analog (Diazoxon) Analytical Results for an Application Study".

5.0 Results

Diazinon and Diazoxon sample resin sorbent tube results are presented in Table 4 (Diazinon/Diazoxon Application Monitoring Results) by site name. These analytical results were obtained from the laboratory's raw data which include up to two (2) decimal places. Thus, Table 4's results differ slightly from the laboratory's data located in Appendix C due to rounding. Further reference data is located in Appendix D (Wind Rose and Meteorological Data by Sampling Period) and Appendix E (Application Field Log Sheets).

Site nomenclature for this study was based upon the location of each site and the run number. Additional letters were added, after inserting a dash, to identify the type of sample collected (background, collocated, blank, spike, back or duplicate).

Examples:

ES-B = East Side - Background
NWC-1 = Northwest Corner – Sampling Period 1 (Application)
SS-2C = South Side – Sampling Period 2 Collocated
SS-FS1 = South Side – Field Spike #1
TB-1 = Trip Blank - #1
NS-1 back = North Side – Sampling Period 1 – back section analyzed by lab for breakthrough
NS-2 (1) = North Side – Sampling Period 2 (Initial lab results outside cal range of GC. Sample diluted further and reanalyzed.)
NS-Bd = North Side – Background duplicate. Duplicate analysis is a lab QC check where they reanalyze samples choosing at random or taking every tenth sample.

All dilutions are at 3ml for the front section of each resin sorbent tube, but are at 2ml for the back section as noted in Table 4.

Table 4: Diazinon/Diazoxon Application Results By Site (1 of 2)

Log #	Sample Name	Elapsed Time (Hours)	Avg. Flow (LPM)	Total Volume (m^3)	Diazinon ng/sample	Diazinon ng/m^3	Dilution Factor	Diazoxon ng/sample	Diazoxon ng/m^3
02	ES-B	21.0	3.01	4.097	<6	<1	1 @ 3ml	<20	<5
09	**ES-1**	**5.4**	**2.97**	**0.963**	**720**	**748**	**1 @ 3ml**	<20	<21
19	**ES-2**	**15.9**	**3.05**	**2.907**	**770**	**265**	**1**	50	17
29	**ES-3**	**7.7**	**2.98**	**1.376**	**380**	**276**	**1**	20	15
40	**ES-4**	**16.4**	**3.02**	**2.969**	**800**	**269**	**1**	89	30
08	**NEC-1**	**5.3**	**2.99**	**0.952**	**880**	**925**	**1 @ 3ml**	<20	<21
18	**NEC-2**	**15.9**	**3.02**	**2.878**	**1400**	**486**	**1**	30	10
28	**NEC-3**	**7.7**	**2.91**	**1.346**	**940**	**699**	**1 @ 3ml**	<20	<15
39	**NEC-4**	**16.4**	**3.02**	**2.969**	**990**	**334**	**1**	76	26
01	NS-B	21.0	2.99	3.764	<6	<2	1 @ 3ml	<20	<5
01d	NS-Bd	21.0	2.99	3.767	<6	<2	1 @ 3ml	<20	<5
07	**NS-1**	**5.4**	**3.04**	**0.986**	**4200**	**4261**	**2**	50	51
07b	NS-1 back	5.4	3.04	0.985	<4	<4	1 @ 2ml	<10	<10
17d	**NS-2d**	**15.9**	**3.04**	**2.900**	**7519**	**2593**	**1**	**357**	**123**
17	**NS-2**	**15.9**	**3.04**	**2.900**	**10000**	**3448**	**5**	**360**	**124**
17b	NS-2 back	15.9	3.04	2.900	9	3	1 @ 2ml	<10	<3
27d	**NS-3d**	**7.6**	**2.98**	**1.359**	**2488**	**1831**	**1**	80	59
27	**NS-3**	**7.6**	**2.98**	**1.359**	**3300**	**2428**	**2**	80	59
27b	NS-3 back	7.6	2.98	1.359	<4	<3	1 @ 2ml	<10	<7
37d	**NS-4d**	**16.5**	**3.02**	**2.990**	**3301**	**1104**	**1**	**325**	**109**
37	**NS-4**	**16.5**	**3.02**	**2.990**	**4000**	**1338**	**2**	**310**	**104**
37b	NS-4 back	16.5	3.02	2.990	<4	<1	1 @ 2ml	<10	<3
38	NS-4FS	16.4	3.02	2.969	1810	610	1	267	90
16	**NWC-1**	**5.6**	**3.00**	**1.008**	**2800**	**2778**	**2**	50	50
16b	NWC-1 back	5.6	3.00	1.008	<4	<4	1 @ 2ml	<10	<10
26	**NWC-2**	**16.0**	**3.02**	**2.899**	**6000**	**2070**	**3**	**250**	**86**
26b	NWC-2 back	16.0	3.02	2.896	8	3	1 @ 2ml	<10	<3
36	**NWC-3**	**7.7**	**2.98**	**1.377**	**1500**	**1090**	**1**	60	44
47	**NWC-4**	**16.2**	**3.02**	**2.935**	**1100**	**375**	**1**	**140**	**48**
10	SEC-1	5.5	2.98	0.983	<6	<6	1 @ 3ml	<20	<20
20	**SEC-2**	**14.9**	**1.82**	**1.631**	**170**	**104**	**1 @ 3ml**	<20	<12
30	SEC-3	7.7	2.99	1.382	10	7	1 @ 3ml	<20	<14
41	**SEC-4**	**16.4**	**3.02**	**2.969**	**610**	**205**	**1**	70	24
03	SS-B	21.0	3.02	3.801	<6	<2	1 @ 3ml	<20	<5
04	SS-B-C	21.1	3.01	3.813	<6	<2	1 @ 3ml	<20	<5
05	SS-B-FS	21.1	3.02	3.820	63	17	1	154	40
11	**SS-1**	**5.5**	**3.00**	**0.991**	**56**	**56**	**1 @ 3ml**	<20	<20
11d	**SS-1d**	**5.5**	**3.00**	**0.990**	**60**	**61**	**1 @ 3ml**	<20	<20
12	SS-1C	5.5	2.99	0.987	29	29	1 @ 3ml	<20	<20
12d	**SS-1Cd**	**5.5**	**2.99**	**0.987**	**32**	**32**	**1 @ 3ml**	<20	<20
13	SS-1FS	5.5	2.97	0.981	95	97	1	148	151
13d	SS-1FSd	5.5	2.97	0.981	103	105	1	139	142
21	**SS-2**	**15.9**	**3.05**	**2.911**	**810**	**278**	**1**	70	24
22	**SS-2C**	**15.9**	**3.03**	**2.892**	**590**	**204**	**1**	50	17
23	SS-2FS	16.0	2.98	2.863	791	98	1	166	27
31	SS-3	7.7	2.96	1.366	20	15	1 @ 3ml	<20	<15
32	SS-3C	7.7	3.00	1.385	10	7	1	<20	<14
33	SS-3FS	7.6	3.00	1.369	97	71	1	145	106
42	**SS-4**	**16.3**	**3.02**	**2.951**	**650**	**220**	**1**	100	34

BOLDED = Analytical results > EQL

= Quality Control Sample

= Invalid Sample

Table 4: Diazinon/Diazoxon Application Results By Site Continued (2 of 2)

Log #	Sample Name	Elapsed Time (Hours)	Avg. Flow (LPM)	Total Volume (m^3)	Diazinon ng/sample	Diazinon ng/m^3	Dilution Factor	Diazoxon ng/sample	Diazoxon ng/m^3
43	**SS-4C**	**16.3**	**3.02**	**2.951**	**650**	**220**	**1**	92	31
44	**SS-4FS**	**16.3**	**3.02**	**2.951**	**472**	**160**	**1**	**218**	**74**
14	**SWC-1**	**5.6**	**2.99**	**1.005**	**710**	**706**	**1**	<20	<20
14b	SWC-1 back	5.6	2.99	1.005	<4	<4	1	<10	<10
24	**SWC-2**	**15.9**	**3.01**	**2.869**	**1100**	**383**	**1**	70	24
34	**SWC-3**	**7.7**	**3.10**	**1.433**	**39**	**27**	**1**	<20	<14
45	**SWC-4**	**16.3**	**3.00**	**2.934**	**1000**	**341**	**1**	**120**	**41**
06	WS-B	21.1	3.00	3.801	<6	<2	1	<20	<5
15	**WS-1**	**5.6**	**3.01**	**1.012**	**3100**	**3063**	**2**	70	69
15b	WS-1 back	5.6	3.01	1.011	<4	<4	1	<10	<10
25	**WS-2**	**16.0**	**3.02**	**2.896**	**9400**	**3245**	**6**	**340**	**117**
25b	WS-2 back	16.0	3.02	2.899	10	3	1	<10	<3
35	**WS-3**	**7.6**	**2.97**	**1.355**	**1200**	**885**	**1**	50	37
35b	WS-3 back	7.6	2.97	1.354	<4	<3	1	<10	<7
46	**WS-4**	**16.3**	**3.16**	**3.090**	**3300**	**1068**	**2**	**330**	**107**
46b	WS-4 back	16.3	3.16	3.090	<4	<1	1	<10	<3
48	TB-1	N.A.	N.A.	N.A.	<6	N.A.	1	<20	N.A.
49	TS-1	N.A.	N.A.	N.A.	67	N.A.	1	157	N.A.
50	TS-2	N.A.	N.A.	N.A.	67	N.A.	1	159	N.A.
51	TS-3	N.A.	N.A.	N.A.	58	N.A.	1	140	N.A.
N.A.	LS-1	N.A.	N.A.	N.A.	58	N.A.	1	134	N.A.
N.A.	LS-2	N.A.	N.A.	N.A.	72	N.A.	1	162	N.A.
N.A.	LS-3	N.A.	N.A.	N.A.	63	N.A.	1	147	N.A.

BOLDED = Analytical results > EQL = Quality Control Sample

Data completeness for this study was 98% for the 41 samples collected. There was one (1) invalid sample. Log #020 is invalid due to the battery failing approximately one (1) hour prior to recovery. Water condensate was noted in approximately 50% of the samples.

Diazinon Results:
All background samples were less than the MDL. Of the samples collected, 35 exceeded the MDL of <6 ng/sample and 31 of those exceeded the EQL of 30 ng/sample. Of those samples that exceeded the EQL, seven (7) occurred during sampling period 1 (application), nine (9) occurred during sampling period 2 (first night time period), six (6) occurred during sampling period 3 (first day time post application period) and nine (9) occurred during the final night time sampling period. Note that no period was completely free of fog, but the application period had the least amount of fog.

The back portions of most of the resin sorbent tubes (breakthrough) were analyzed when corresponding front portions were greater than 710 ng/sample. Of the 11 back sections analyzed, eight (8) were below the MDL of <4 ng/sample. Note that the MDL for the back sections was lower due to less diluent required for the smaller size of the back section. Three (3) back section analyses were above the MDL at 10.1 ng/sample (WS-2 back), 9.3 ng/sample (NS-2 back) and 7.6 ng/sample (NWC-2 back). These three (3) indicated minimal break through during very high collection periods. There was generally good correlation with the wind direction and the highest results. See Appendix D for wind roses and meteorological data.

Diazoxon Results:
All background samples were less than the MDL. Of the samples collected, 24 exceeded the MDL of <20 ng/sample and seven (7) of those exceeded the EQL of 100 ng/sample. Of those samples that exceeded the EQL, three (3) occurred during sampling period 2 (first night time period) and four (4) occurred during sampling period four (4) (final night time period). There was very good correlation with the wind direction and the highest results.

Further reference material can be found in Appendix E which presents the field log sheets and Appendix F which presents the calibration/certification reports.

6.0 Quality Control Results

Quality control resin sorbent tube samples were collected from the field consisted of five (5) collocated, six (6) field spike, three (3) trip spikes and one (1) trip blank. In addition, the laboratory produced three (3) lab spikes and six (6) duplicate analyses. The quality control results are summarized on the following pages in Table 5 (Diazinon/Diazoxon Application Quality Control Results), Table 6 (Diazinon Application QC Field Spike Results) and Table 7 (Diazoxon Application QC Field Spike Results).

Diazinon:
The five (5) collocated sample results average Relative Percent Difference (RPD) was 36% as reported in Appendix C (Laboratory Results). As shown in Table 6, field spike recoveries were 92%, 69%, 65%, 111%, -3133% and -258% for an average of -509%. The average trip spike recovery was 93%, the trip blank result was below the MDL and the average RPD for the duplicate lab results was 4%.

Poor field spike recovery may be due to high humidity conditions during the study and/or the primary sample value being as much as 60x's greater than the spike value of 69 ng/sample.

Diazoxon:
The five (5) collocated sample results average RPD was 18% as reported in Appendix C (Laboratory Results). The average field spike recovery was 76%, the average trip spike recovery was 101%, the trip blank result was below the MDL and the average RPD for the duplicate lab results was 2%.

The formula for calculating the RPD for Table five (5) is as follows:

$$RPD = \frac{\left| \ (Collocated(ng/m^3) - Sample(ng/m^3) \ \right|}{\left((Collocated(ng/m^3) + Sample(ng/m^3)\right) \div 2}$$

Table 5: Diazinon/Diazoxon Application Quality Control Results

Trip & Laboratory Spike Results

				Diazinon & Diazoxon			Diazinon			Diazoxon		
Log #	Sample Name	Date Collected	Date Analyzed	Expected (ng/sample)	Measured (ng/sample)	Recovery Percent	Expected (ng/sample)	Measured (ng/sample)	Recovery Percent
49	TS-1	1/7/2010	1/11/2010	69	67	97.3%	150	157	104.6%
50	TS-2	1/7/2010	1/11/2010	69	67	97.1%	150	159	106.1%
51	TS-3	1/7/2010	1/11/2010	69	58	84.1%	150	140	93.2%
N.A.	LS-1	12/30/2009	1/11/2010	69	58	83.8%	150	134	89.3%
N.A.	LS-2	12/30/2009	1/12/2010	69	72	104.4%	150	162	107.7%
N.A.	LS-3	12/30/2009	1/19/2010	69	63	91.7%	150	147	98.3%

Trip Blank Result

				Diazinon & Diazoxon			Diazinon			Diazoxon		
Log #	Sample Name	Date Collected	Date Analyzed	MDL (ng/sample)	Blank (ng/sample)	Recovery Percent	MDL (ng/sample)	Blank (ng/sample)	Recovery Percent
048	TB-1	1/7/2010	1/11/2010	6	<6	N.A.	20	<20	N.A.

Collocated Sample Results

				Diazinon & Diazoxon			Diazinon			Diazoxon		
Log #	Sample Name	Date Collected	Date Analyzed	Collocated (ng/m3)	Sample (ng/m3)	Relative Difference	Collocated (ng/m3)	Sample (ng/m3)	Relative Difference
04	SS-B-C	1/4/2010	1/11/2010	<2	<2	N.A.	<5	<5	N.A.
12	SS-1C	1/5/2010	1/12/2010	29.0	56.4	64.2%	<20	<20	N.A.
22	SS-2C	1/5/2010	1/13/2010	204.4	276.9	30.1%	18	24	28.0%
32	SS-3C	1/6/2010	1/14/2010	8.3	13.7	49.1%	<14	<15	N.A.
43	SS-4C	1/6/2010	1/19/2010	220.7	221.0	0.1%	31	34	8.0%

Duplicate Sample Results

				Diazinon & Diazoxon			Diazinon			Diazoxon		
Log #	Sample Name	Date Collected	Date Analyzed	Sample (ng/m3)	Duplicate (ng/m3)	Relative Difference	Sample (ng/m3)	Duplicate (ng/m3)	Relative Difference
01d	NS-Bd	1/5/2010	1/13/2010	<2	<2	N.A.	<5	<5	N.A.
11d	SS-1d	1/5/2010	1/13/2010	56.4	60.9	7.7%	<20	<20	N.A.
12d	SS-1Cd	1/5/2010	1/13/2010	29.0	32.1	10.1%	<20	<20	N.A.
13d	SS-1FSd	1/5/2010	1/13/2010	97.0	104.8	7.7%	150.7	141.6	6.2%
17d	NS-2d	1/6/2010	1/13/2010	2611.2	2592.7	0.7%	123.9	123.3	0.5%
27d	NS-3d	1/6/2010	1/14/2010	1866.6	1830.9	1.9%	55.8	58.9	5.4%
37d	NS-4d	1/7/2010	1/19/2010	1105.7	1104.2	0.1%	104.0	108.8	4.5%

Field spike percent recoveries are shown in Table 6 for Diazinon and Table 7 for Diazoxon on the following page. Spiked XAD resin sorbent tubes were prepared at the laboratory and immediately placed in the freezer and then placed in a dry ice cooler before leaving for the study. The laboratory spike values were 69 ng/sample for Diazinon and 150 ng/sample for Diazoxon. While viewing Field Spike Tables 6 and 7 reference the below equations describing the calculations necessary to determine the percent recovery of each field spike.

$$Field\ Spike\ Sample\ Conc.\frac{ng}{m^3} = Field\ Recovery\left(\frac{ng}{sample}\right) \times Total\ Volume\left(\frac{sample}{m^3}\right)$$

$$Net\ Spike\frac{ng}{m^3} = Field\ Spike\ Sample\ Conc.\left(\frac{ng}{m^3}\right) - Primary\ Sample\left(\frac{ng}{m^3}\right)$$

$$Net\ Spike\frac{ng}{sample} = Net\ Spike\left(\frac{ng}{m^3}\right) \times Total\ Volume\left(\frac{m^3}{sample}\right)$$

$$Spike\ Percent\ Recovery \frac{ng}{sample} = Net\ Spike\left(\frac{ng}{sample}\right) \div Lab\ Spike\ Value\left(\frac{ng}{sample}\right) \times 100$$

Table 6: Diazinon Application QC Field Spike Results

Log #	Sample ID	Field Recovery (ng/sample)	Total Volume (m^3)	Field Spike Sample Conc. (ng/m^3)	Primary Sample (ng/m^3)	Net Spike (ng/m^3)	Net Spike (ng/sample)	Lab Spike Value (ng/sample)	Spike Recovery
03	SS-B	<6	3.801	N.A.	<2	N.A.	N.A.	N.A.	N.A.
05	SS-B-FS	63	3.820	17	N.A.	17	63	69	92%
11	SS-1	56	0.991	N.A.	56	N.A.	N.A.	N.A.	N.A.
13	SS-1FS	103	0.981	105	N.A.	48	47	69	69%
21	SS-2	810	2.911	N.A.	278	N.A.	N.A.	N.A.	N.A.
23	SS-2FS	841	2.863	294	N.A.	16	45	69	65%
31	SS-3	20	1.366	N.A.	15	N.A.	N.A.	N.A.	N.A.
33	SS-3FS	97	1.369	71	N.A.	56	77	69	111%
37	NS-4	4000	2.990	N.A.	1338	N.A.	N.A.	N.A.	N.A.
38	NS-4FS	1810	2.969	610	N.A.	-728	-2162	69	-3133%
42	SS-4	650	2.951	N.A.	220	N.A.	N.A.	N.A.	N.A.
44	SS-4FS	472	2.951	160	N.A.	-60	-178	69	-258%

Table 7: Diazoxon Application QC Field Spike Results

Log #	Sample ID	Field Recovery (ng/sample)	Total Volume (m^3)	Field Spike Sample Conc. (ng/m^3)	Primary Sample (ng/m^3)	Net Spike (ng/m^3)	Net Spike (ng/sample)	Lab Spike Value (ng/sample)	Spike Recovery
03	SS-B	<20	3.801	N.A.	<5	N.A.	N.A.	N.A.	N.A.
05	SS-B-FS	154	3.820	40	N.A.	40	154	150	103%
11	SS-1	<20	0.991	N.A.	<20	N.A.	N.A.	N.A.	N.A.
13	SS-1FS	139	0.981	142	N.A.	142	139	150	93%
21	SS-2	70	2.911	N.A.	24	N.A.	N.A.	N.A.	N.A.
23	SS-2FS	231	2.863	81	N.A.	57	162	150	108%
31	SS-3	<20	1.366	N.A.	<15	N.A.	N.A.	N.A.	N.A.
33	SS-3FS	145	1.369	106	N.A.	106	145	150	97%
37	NS-4	310	2.990	N.A.	104	N.A.	N.A.	N.A.	N.A.
38	NS-4FS	267	2.969	87	N.A.	-14	-41	150	-27%
42	SS-4	100	2.951	N.A.	34	N.A.	N.A.	N.A.	N.A.
44	SS-4FS	218	2.951	74	N.A.	40	118	150	79%

Calculated values in the above tables were produced using raw laboratory data using up to two (2) decimal places.

7.0 Summary

The ambient conditions were very humid during most of this study. Prior to the start of the application, the farmer was concerned that the fog would not lift in time to apply. Conditions improved to where the sun was visible and the farmer decided it was okay to apply. As the application neared completion and evening was approaching, the fog rolled back in and the sun was barely visible for the rest of the study. Water condensate was noted in approximately 50% of the samples. The two (2) sampling periods with the largest number of results exceeding the EQL were during the evening sampling periods which also had the densest fog conditions. The second evening sampling period had the densest fog of any sampling period.

Poor field spike recovery may be due to high humidity conditions during the study and/or the primary sample value being as much as 60x's greater than the spike value of 69 ng/sample. Field spike recoveries are most indicative of theoretical recoveries when spike values approximate ambient concentrations. The trip and lab spike percent recoveries were well within tolerances.