



State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

**Report on Pesticide Air Monitoring
Around a Field Application of Sodium Tetrathiocarbonate
In Kern County during November 2006**

Prepared by

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Monitoring Report Approval

Report Title: Report on Pesticide Air Monitoring Around a Field Application of Sodium Tetrathiocarbonate In Kern County during November 2006

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

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Executive Summary

Report on Pesticide Air Monitoring Around a Field Application of Sodium Tetrathiocarbonate In Kern County during November 2006

At the request of the Department of Pesticide Regulation (DPR), the Air Resources Board (ARB) conducted air monitoring for the breakdown products hydrogen sulfide (H_2S) and carbon disulfide (CS_2) during the application of sodium tetrathiocarbonate. The common trade name is Enzone and its Environmental Protection Agency Registration number is 68891-2. The monitored drip irrigation application occurred in Kern County from November 13 through November 17, 2006. This fumigant is primarily used to control nematodes and oak root fungus in grape vines. Sampling was performed around a 39-acre field of established grape vines during an Enzone application at the rate of 6.79 gallons per acre over six hours at a calculated 986 PPM A.I. (active ingredient).

Seventy (70), 12-hour integrated air samples were collected by staff of the Air Quality Surveillance branch split between daytime and nighttime sampling periods for CS_2 . Four sampling sites were located 65' from each side of the field and four sampling sites were located 23' from each corner. All sites were to be 65' from the edge of the field, but due to the field being located next to a main road the corner sites were located between the field and the road. Staff used evacuated Silco canisters equipped with sample Siltek coated flow controllers to collect the samples. The collected air samples were analyzed by the Northern Laboratory Branch of ARB in Sacramento.

- Reported carbon disulfide (CS_2) results from 70 samples indicate that ambient air concentrations ranged from a low of 0.30 micrograms per cubic meter (ug/m^3) during the background to a maximum of approximately 200 ug/m^3 occurring at the West Side during the second sampling period.

At the end of each sampling period, when the canisters were changed out, a Jerome 631-X H_2S analyzer was used to make two consecutive H_2S measurements. In addition, measurements were made at the mid-point and end-point of the application period at the four side located sampling sites. There were a total of one hundred and thirty six (136) H_2S measurements made.

- Reported hydrogen sulfide (H_2S) results from 136 measurements indicated the majority of ambient measurements were zero. The two highest readings were 3 ppm.

Quality control field samples included 6 collocated pairs, 4 field spikes, 4 trip spikes and 4 trip blanks. The Relative Percent Difference ($RPD = ((Result B - Result A) / (Average of Result A and B)) \times 100$) of the collocated pairs for carbon disulfide ranged from +9.7 to -5.1% with an average of 0.8%. Field spike recoveries ranged from 107 to 112%. The trip spike recoveries ranged from 105 to 113%. All trip blank results were less than the Limit of Detection (LOD).

There was one sample failure and fourteen of the samples were flagged due to not meeting the final canister vacuum criteria of -10 to -5"Hg stated in the protocol. These samples ranged from -11.2 to -10.1"Hg, but had start and stop flows within $\pm 10\%$. These samples are reported, but flagged in this report.

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1.0 Introduction

At the request of the California Department of Pesticide Regulation (DPR) (October 4, 2005 Memorandum, Warmerdam to Witherspoon), the Air Resources Board (ARB) staff conducted air monitoring for carbon disulfide (CS₂) and hydrogen sulfide (H₂S) which are byproducts from the application of the fumigant sodium tetrathiocarbonate. Enzone is the common trade name for sodium tetrathiocarbonate and is primarily used on preplant or established grape vines for the control of nematodes, phylloxera insects and oak root fungus.

70 CS₂ canister samples were collected and 136 H₂S measurements were taken at eight sites around a 39-acre field of established grape vines in northern Kern County. The seventy CS₂ samples broke down into the following; fifty two primary samples, four field spikes, four trip spikes, four trip blanks and six collocated. Monitoring was performed during the period of November 13 -17, 2006. This monitoring was performed under the requirements of AB 1807/3219 (Food and Agricultural Code, Division 7, Chapter 3, Article 1.5) 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. Application information is located in Table 1: Application Information.

DPR originally requested sampling periods from one hour after sunrise till one hour before sunset followed by a sampling period from one hour before sunset until one hour after sunrise. This would create 9.5-hour daytime and 14.5-hour nighttime sampling periods, which the Restek flow controllers were not capable of. A compromise of two twelve-hour sampling periods per day was performed starting around 0600 in the morning and 1800 in the evening. Application sampling periods are shown in Table 2: Application Sampling Periods.

2.0 Sampling Sites

The original plan was to configure the placement of samplers at sixty five feet from the sides and corners of the field being monitored. However, due to the public roads possibly creating a traffic effect, a compromise was worked out. Four each samplers were placed at the midpoint of the field's sides at the normal 65 feet from the sides. This placed them with the public roads between the samplers and the edge of the field. The four corner sampler locations were moved to 23 feet from the corners of the field, which should have isolated the samplers from any traffic effects. A collocated sampler was located at the southeast corner, which would normally be the downwind site for this area at this time of year.

Exact placement and details are given in Table 3: Sampler Waypoints and can be seen located on the topographical maps, aerial photo and sketch, Figures 1-4. Further detail can be found in Appendix A: Site Photographs, Pesticide Label and Farm Work Order.

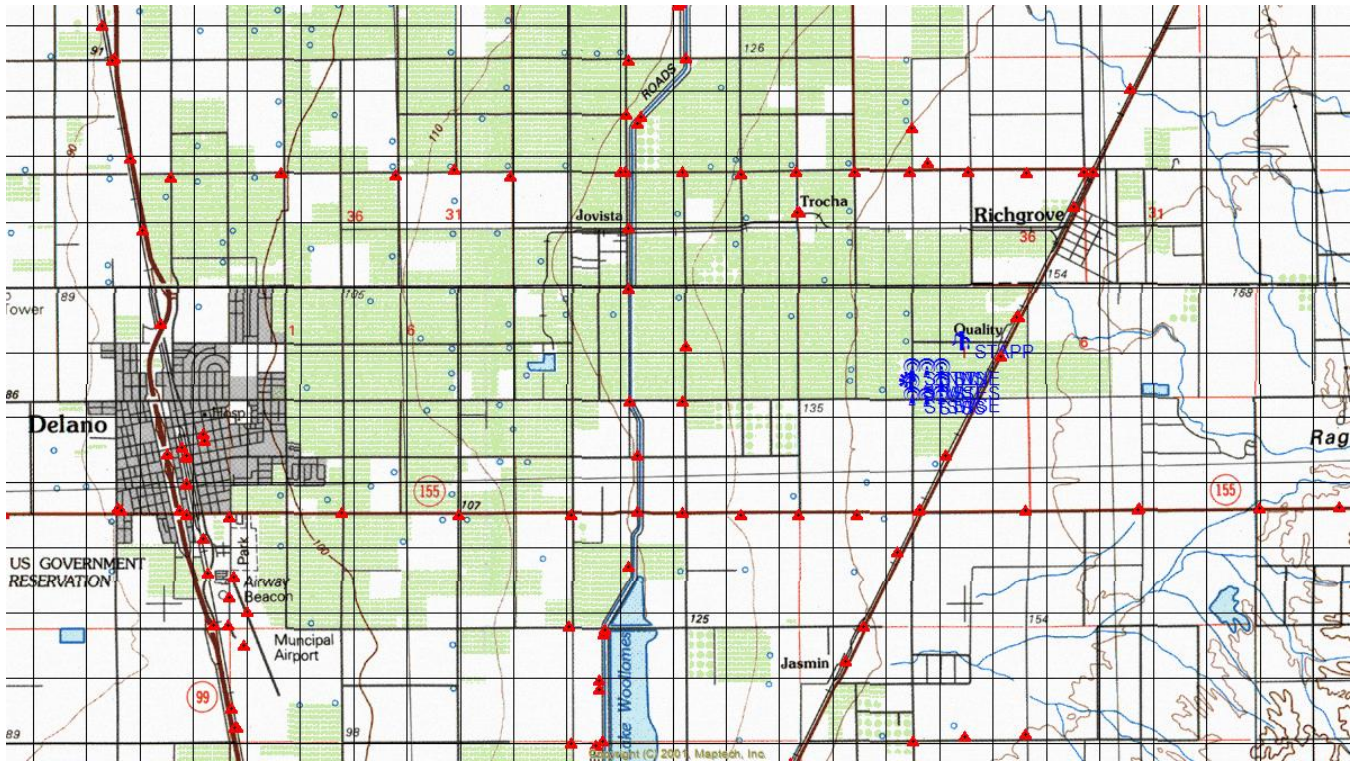


FIGURE 1: DELANO EAST TOPO OVERVIEW OF MONITORED AREA

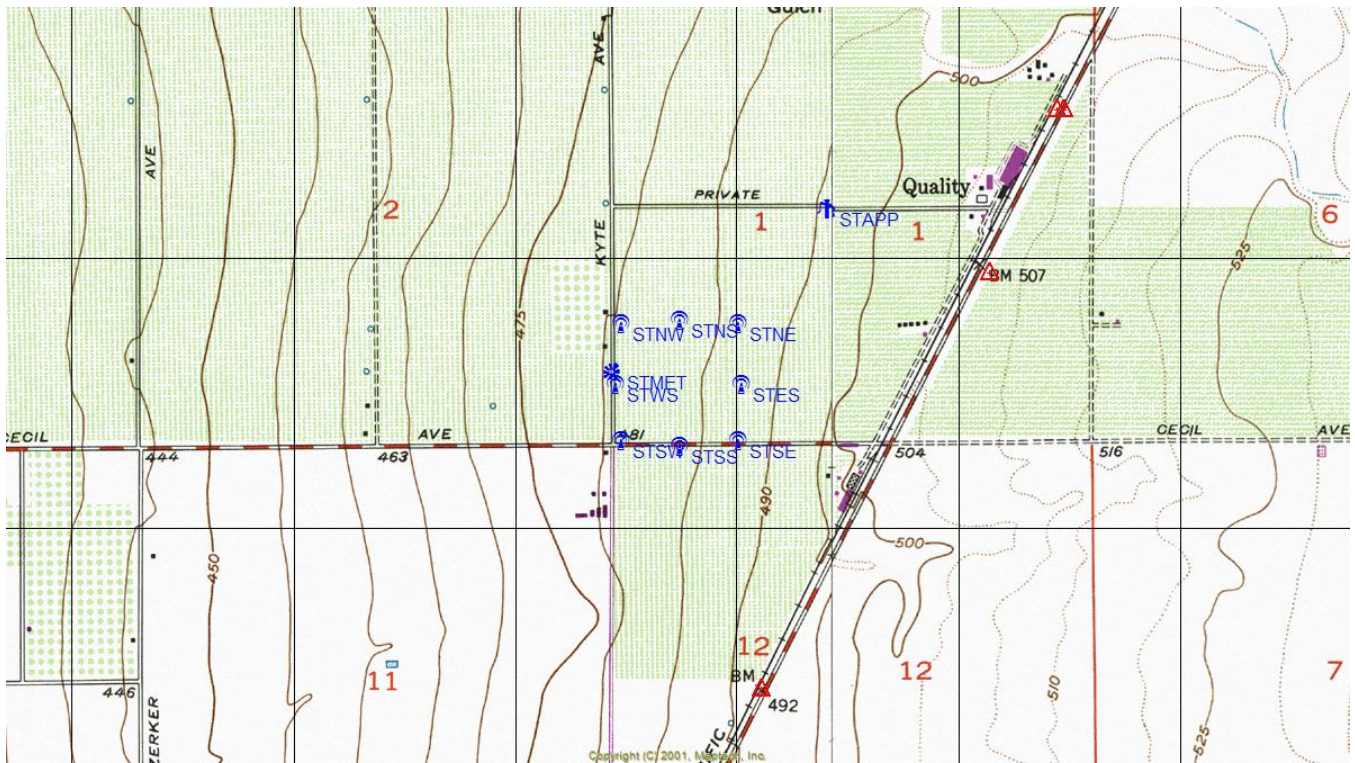


FIGURE 2: DELANO EAST TOPO CLOSEUP OF MONITORED AREA



FIGURE 3: AERIAL PHOTO OVERVIEW OF MONITORED AREA

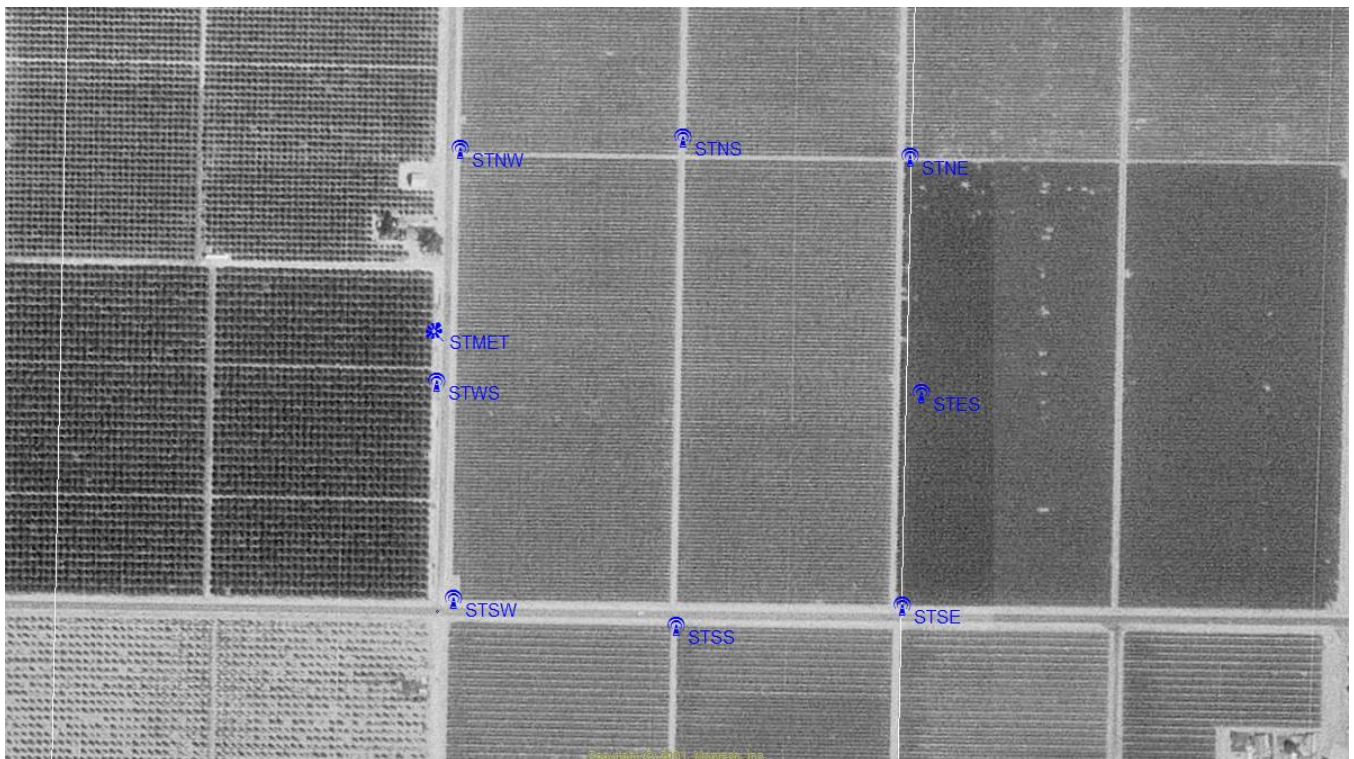


FIGURE 4: AERIAL PHOTO CLOSEUP OF MONITORED AREA

Sodium Tetrathiocarbonate Fumigation On 11/14/06 Near Delano

All Grape Rows Ran East/West

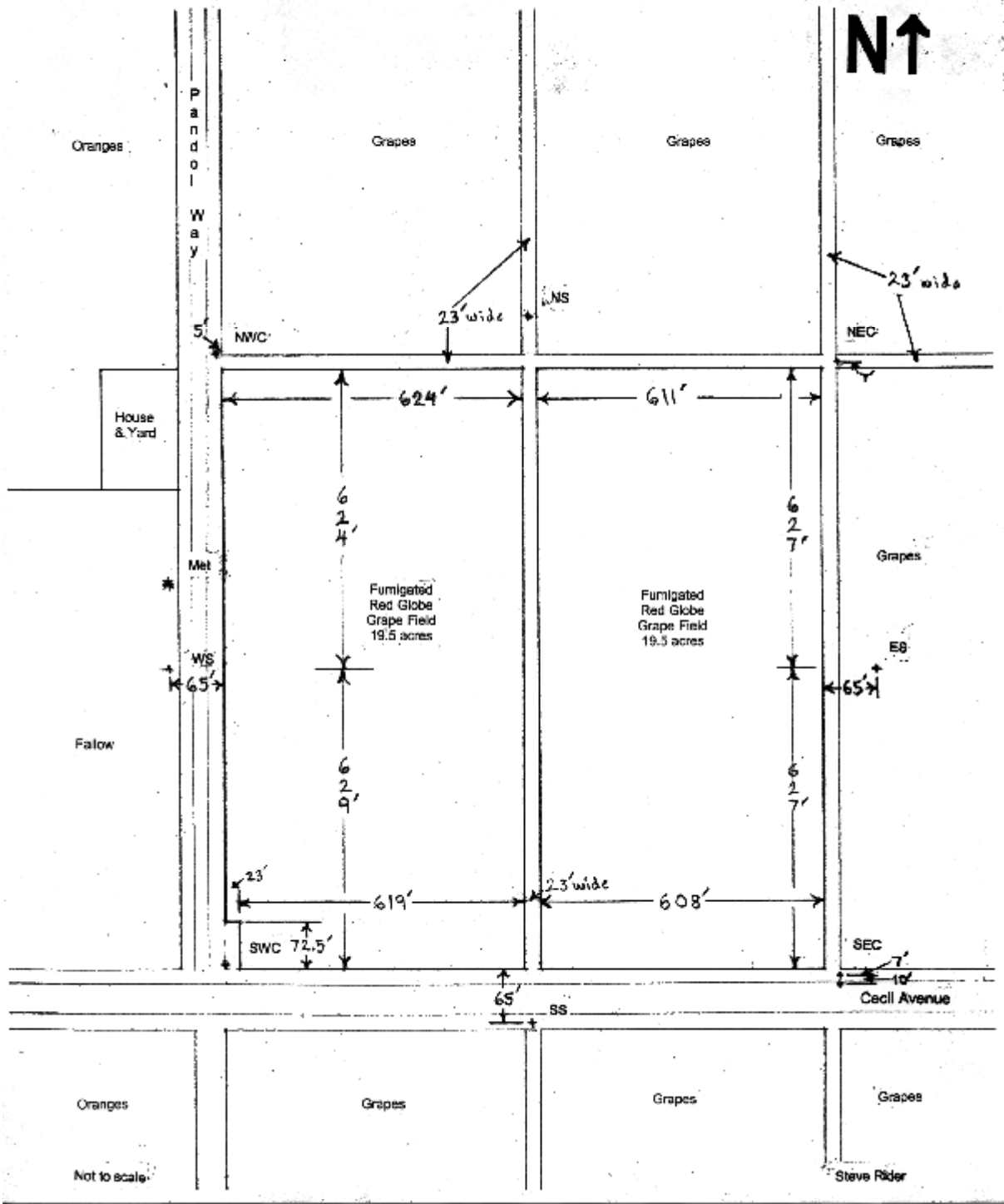


FIGURE 4: FIELD SKETCH

TABLE 1: APPLICATION INFORMATION

Parameter	Detail
Location	CA, Kern County, Delano, West of 33787 Cecil Avenue
R/T/S	26E/25S/1SW quadrant
Field size	39.00 acres
Product applied	Enzone Fumigant, 31.8% Sodium Tetrathiocarbonate & 68.2% inert ingredients
Type of application	Drip irrigation, Start = 07:30, End = 13:32 with an additional hour of plain water to rinse irrigation system
Commodity	Established Red Globe grapevines
Application rate	6.79 gallons per acre at a calculated PPM A.I. of 986
Grower/Applicator	M. Caratan, Inc., Paul Giboney

TABLE 2: APPLICATION SAMPLING PERIODS

Sampling Period	Sampling Period Duration (Hours)	Month & Year (November 2006)	Time (Start/Stop)
Background 1 (Nighttime)	12.88	13 - 14	1749 to 0642
1 (Application)	13.18	14	0535 to 1846
2 (Nighttime)	13.10	14 - 15	1733 to 0639
3 (Daytime)	12.83	15	0533 to 1823
4 (Nighttime)	12.90	15 - 16	1731 to 0625
5 (Daytime)	12.80	16	0532 to 1820
6 (Nighttime)	12.65	16 - 17	1731 to 0610

Note: Time (Start/Stop) overlaps are due to time getting around field of 22 to 60 minutes and each sample's sampling time will be less than this tables Sampling Period Duration due to different start and stop times.

TABLE 3: SAMPLER WAYPOINTS

Sampler ID	Sampler Position Related to Monitored Field	Waypoints
STMET (Meteorology Station)	65' west of west side and a little north of the midpoint of west side of field, Elevation = 480'	N 35 ^o 46.702' W 119 ^o 07.992'
STAPP (Application Injection Point)	Approximately 1 mile east northeast of the NEC site, Elevation = 490'	N 35 ^o 47.003' W 119 ^o 07.513'
STNWC (Northwest Corner)	23' north of the northwest corner and 5' west of west side of field, Elevation = 480'	N 35 ^o 46.790' W 119 ^o 07.981'
STWS (West Side)	65' west of west side and approximately midway along west side of field (624' N by 629' S), Elevation = 480'	N 35 ^o 46.678' W 119 ^o 07.993'
STSWC (Southwest Corner)	23' west of southwest corner notch and even with the south side of field, 73' south of corner notch, Elevation = 480'	N 35 ^o 46.574' W 119 ^o 07.980'
STSS (South Side)	65' south of south side approximately midway along south side of field (619' W by 608' E), Elevation = 485'	N 35 ^o 46.562' W 119 ^o 07.848'
STSEC (Southeast Corner), Collocated	23' east of southeast corner with one sampler 7' south and one sampler 10' south of south side of field, Elevation = 485'	N 35 ^o 46.575' W 119 ^o 07.714'
STES (East Side)	65' east of east side and midway along east side of field (627'), Elevation = 485'	N 35 ^o 46.677' W 119 ^o 07.706'
STNEC (Northeast Corner)	23' east of northeast corner and 7' north of north side of field, Elevation = 485'	N 35 ^o 46.791' W 119 ^o 07.716'
STNS (North Side)	65' north of north side and approximately midway along north side of field (624' W by 611' E), Elevation = 480'	N 35 ^o 46.798' W 119 ^o 07.850'

3.0 Methods

CS₂:

Fifty-two twelve hour integrated air samples were collected from November 13th through November 17th. The air samples were collected by an air sampling assembly consisting of a 0.23 meter long by ¼" diameter Siltek treated stainless steel sample probe, passive Siltek treated stainless steel flow controller, and an evacuated Silco canister. The inlets were placed at 76" ± 2" above ground level to get above the grape leaves. The target sample flow rate of six standard cubic centimeters per minute was measured using a certified transfer standard mass flow meter (MFM) at the beginning and again at the end of each sample collection period.

At the end of the study, canister samples were transported to the MLD laboratory in Sacramento by ARB staff. In addition to ambient air samples, eighteen quality control samples consisting of collocated, field spikes, trip spikes, and trip blanks were also collected.

For details of the monitoring method, please refer to Appendix B, "Protocol for Air Monitoring Around a Field Application of Sodium Tetrathiocarbonate" dated November 9, 2006. The canister sample flows were increased from a range of 5.6 to 5.9 sccpm, as stated in the protocol, to approximately 6.3 sccpm. This correction was due to changes in the setup conditions versus field conditions with respect to temperature and humidity. When sampling around the field, sample flows dropped as much as 19% during the warm, dry times of the day versus the typical cold and damp start and stop times.

Collected samples were analyzed using the laboratory method, "Standard Operating Procedure Sampling and Analysis of Carbon Disulfide in Silco™ Canisters Using a Varian Stand Alone Cryogenic Sampler", located in Appendix B as part of, "Protocol for Air Monitoring Around a Field Application of Sodium Tetrathiocarbonate". The estimated quantitative limit (EQL) for CS₂ was 0.6 ug/m³. Samples with concentrations above the calibration range, after initial analysis, were diluted and re-analyzed. Appendix C contains the laboratory results report entitled, "Carbon Disulfide Method Development and Analytical Results for Kern County Air Monitoring Samples Collected in Six-Liter Silco™ Canisters after Application of Sodium Tetrathiocarbonate" (December 2006).

H₂S:

H₂S Measurements were collected using a portable Jerome 631-X Hydrogen Sulfide Analyzer at each of the eight CS₂ sampler locations. A minimum of two H₂S measurements were performed each time the canisters were changed. Measurements were also taken at the mid-point and end-point of the application at the four side sampler locations.

For details of the monitoring method, please refer to Appendix B, "Protocol for Air Monitoring Around a Field Application of Sodium Tetrathiocarbonate" dated November 9, 2006. The configured range for the Jerome 631-X was 3 to 100 ppb (specified accuracy of 1 ppb). A deviation from this protocol occurred when it was decided to place the corner samplers between the field and the roads. This placed the sampling areas within 25 feet of the application. Thus, for safety reasons it was determined that H₂S samples would not be taken at the corner sites during the mid-point and the end-point of the six-hour application.

4.0 Results

All collected samples and their respective analytical results (if available) are presented in Table 4 (Carbon Disulfide Application Monitoring Results), Table 5 (Hydrogen Sulfide Monitoring Results, PPM) and Table 6 (Carbon Disulfide Application Quality Control Results which is located in Section 5.0 Quality Control Results). These analytical results were obtained from Appendix C (Laboratory Results Report) and Appendix H (Invalidated Carbon Disulfide Data). For additional information on the analytical results, please refer to Appendices C and H.

The naming format for this study consisted of one of the eight cardinal directions (N, NE, E, SE, S, SW, W, NW) followed immediately by whether it is a side or corner location (S or C). After inserting a dash the letters for Carbon Disulfide or Hydrogen Sulfide (CD or HS) were entered and after another dash came the run number. Additional letters were added for QC canisters and background runs as listed below in the examples.

Examples:

SEC-CD-B = Southeast Corner – Carbon Disulfide – Background
 SEC-CD-B-FS = SE Corner – Carbon Disulfide – Background – Field Spike
 CD-TS1 = Carbon Disulfide – Trip Spike 1, There are 4 ea. Trip Spikes
 CD-TB1 = Carbon Disulfide – Trip Blank 1, There are 2 ea. Trip Blanks
 SS-CD1 = South Side – Carbon Disulfide – Run One, The application
 SS-HS1 = South Side – Hydrogen Sulfide – Run One

Table 4: Carbon Disulfide Application Monitoring Results

Site	Log Number	Sample Identification	Canister Number	Date Received	Date Analyzed	Results (µg/m3)		Lab Certified		Period
						Carbon Disulfide	Dilution Ratio	Arrival Vacuum	Dilution Pressure	
NWC	1	NWC-CD-B	1165	11/20/2006	11/28/2006	3.6E-01	2.08	-10.5	5.1	Night
	9	NWC-CD1	1069	11/20/2006	11/28/2006	5.4E+00	2.06	-10.3	5.2	Day
	26	NWC-CD2	1064	11/20/2006	12/1/2006	1.4E+02	39.67	-9.5	5.7	Night
	35	NWC-CD3	1136	11/20/2006	12/6/2006	1.1E+01	7.67	-9.0	5.0	Day
	44	NWC-CD4	1097	11/20/2006	12/8/2006	1.9E+01	16.94	-10.5	5.5	Night
	53	NWC-CD5	1092	11/20/2006	12/8/2006	5.1E+00	1.96	-9.2	5.3	Day
	62	NWC-CD6	1083	11/20/2006	12/12/2006	1.2E+01	3.97	-9.5	5.2	Night
WS	10	WS-CD1	1074	11/20/2006	11/29/2006	2.6E+01	17.01	-10.3	5.8	Day
	27	WS-CD2	1066	11/20/2006	12/1/2006	2.0E+02	58.89	-8.7	5.7	Night
	36	WS-CD3	1091	11/20/2006	12/6/2006	2.3E+01	16.19	-9.8	5.3	Day
	45	WS-CD4	1176	11/20/2006	12/8/2006	2.1E+01	7.79	-8.8	5.5	Night
	54	WS-CD5	1101	11/20/2006	12/8/2006	2.9E+00	1.97	-9.1	5.5	Day
	63	WS-CD6	1105	11/20/2006	12/11/2006	5.3E+00	1.95	-9.2	5.2	Night
SWC	3	SWC-CD-B	1171	11/20/2006	11/28/2006	3.6E-01	2.16	-10.4	6.0	Night
	11	SWC-CD1	1141	11/20/2006	11/29/2006	3.0E+01	16.84	-10.0	5.9	Day
	28	SWC-CD2	1082	11/20/2006	12/1/2006	5.7E+01	15.28	-8.5	5.4	Night
	37	SWC-CD3	1142	11/20/2006	12/6/2006	9.6E+00	3.85	-8.8	5.3	Day
	46	SWC-CD4	1112	11/20/2006	12/7/2006	3.2E+00	1.92	-8.2	5.8	Night
	55	SWC-CD5	1056	11/20/2006	12/8/2006	8.1E-01	1.98	-8.9	5.7	Day
	64	SWC-CD6	1093	11/20/2006	12/11/2006	7.8E-01	1.8	-7.3	5.3	Night

Table 4: Carbon Disulfide Application Monitoring Results Continued

Site	Log Number	Sample Identification	Canister Number	Date Received	Date Analyzed	Results (µg/m3)		Lab Certified		Period
						Carbon Disulfide	Dilution Ratio	Arrival Vacuum	Dilution Pressure	
SS	12	SS-CD1	1065	11/20/2006	11/29/2006	6.1E+01	27.52	-10.1	5.4	Day
	29	SS-CD2	1058	11/20/2006	12/1/2006	6.1E+01	15.88	-9.1	5.6	Night
	38	SS-CD3	1070	11/20/2006	12/5/2006	5.0E+00	1.94	-9.0	5.2	Day
	47	SS-CD4	1160	11/20/2006	12/7/2006	8.8E-01	2.04	-10.0	5.3	Night
	56	SS-CD5	1144	11/20/2006	12/8/2006	1.0E+00	2	-9.0	5.9	Day
	65	SS-CD6	1180	11/20/2006	12/11/2006	6.8E-01	2	-9.7	5.2	Night
SEC	5	SEC-CD-B	1057	11/20/2006	11/28/2006	3.0E-01	2.04	-9.9	5.4	Night
	13	SEC-CD1	1161	11/20/2006	11/29/2006	5.4E+01	28.36	-10.4	5.7	Day
	14	SEC-CD1-C	1158	11/20/2006	12/1/2006	4.9E+01	29.86	-11.2	5.9	Day
	30	SEC-CD2	1098	11/20/2006	12/1/2006	5.1E+01	15.8	-9.2	5.4	Night
	31	SEC-CD2-C	1179	11/20/2006	12/6/2006	5.3E+01	28.06	-9.9	6.0	Night
	39	SEC-CD3	1134	11/20/2006	12/5/2006	3.6E+00	1.95	-9.0	5.3	Day
	40	SEC-CD3-C	1099	11/20/2006	12/7/2006	3.7E+00	2.04	-9.7	5.6	Day
	48	SEC-CD4	1196	11/20/2006	12/7/2006	4.0E-01	1.88	-8.3	5.3	Night
	49	SEC-CD4-C	1073	11/20/2006	12/7/2006	4.0E-01	1.99	-9.6	5.2	Night
	57	SEC-CD5	1053	11/20/2006	12/8/2006	1.5E+00	1.91	-8.9	5.0	Day
	58	SEC-CD5-C	1071	11/20/2006	12/8/2006	1.4E+00	1.95	-8.8	5.5	Day
66	SEC-CD6	1137	11/20/2006	12/11/2006	5.7E-01	1.87	-7.9	5.5	Night	
67	SEC-CD6-C	1138	11/20/2006	12/11/2006	6.0E-01	1.92	-8.8	5.2	Night	
ES	15	ES-CD1	1177	11/20/2006	12/1/2006	7.7E+01	28.63	-10.3	6.0	Day
	32	ES-CD2	1089	11/20/2006	12/6/2006	4.0E+01	28.06	-10.0	5.9	Night
	41	ES-CD3	1175	11/20/2006	12/7/2006	6.9E+00	2	-9.5	5.4	Day
	50	ES-CD4	1107	11/20/2006	12/7/2006	9.6E-01	1.89	-8.3	5.4	Night
	59	ES-CD5	1170	11/20/2006	N.A.	INVALID	N.A.	0.0	N.A.	Day
	68	ES-CD6	1186	11/20/2006	Not Anal.	INVALID	N.A.	-29.3	Removed	N.A.
	71	ES-CD6-a	1182	11/20/2006	12/11/2006	6.0E-01	2	-9.6	5.3	Night
NEC	7	NEC-CD-B	1173	11/20/2006	11/28/2006	3.0E-01	2.06	-10.0	5.5	Night
	16	NEC-CD1	1060	11/20/2006	11/30/2006	6.6E+00	2.23	-11.1	5.9	Day
	33	NEC-CD2	1139	11/20/2006	12/6/2006	3.1E+01	16.93	-10.2	5.8	Night
	42	NEC-CD3	1152	11/20/2006	12/7/2006	7.2E+00	2.07	-10.3	5.3	Day
	51	NEC-CD4	1167	11/20/2006	12/7/2006	1.2E+00	2.05	-10.1	5.3	Night
	60	NEC-CD5	1063	11/20/2006	12/8/2006	9.5E-01	1.9	-8.5	5.3	Day
	69	NEC-CD6	1178	11/20/2006	12/11/2006	7.2E-01	1.98	-9.7	5.0	Night
NS	17	NS-CD1	1062	11/20/2006	12/1/2006	1.2E+01	4.26	-10.7	5.4	Day
	34	NS-CD2	1122	11/20/2006	12/6/2006	1.2E+02	62.54	-9.4	5.2	Night
	43	NS-CD3	1162	11/20/2006	12/8/2006	1.5E+01	7.97	-9.7	5.1	Day
	52	NS-CD4	1061	11/20/2006	12/8/2006	1.3E+01	7.79	-8.9	5.4	Night
	61	NS-CD5	1125	11/20/2006	12/8/2006	5.0E+00	1.89	-8.5	5.2	Day
	70	NS-CD6	1132	11/20/2006	12/11/2006	2.8E+00	1.98	-9.3	5.4	Night

Note: BOLDED = Analytical results \geq LOD and \leq EQL.

SHADED = Analytical results are flagged for reasons explained below.

Of the data collected from the 70 sample canisters, 55 of the analytical results (79% of the data) are considered valid. A 71st sample (Log #68) was started, but was removed after 28 minutes when it was determined that the flow controller had an internal leak. A new controller and canister were installed (Log #71) and operated for 11 hours and 23 minutes.

14 of the 15 flagged samples are due to the deviation noted in paragraph two of the 3.0 Methods section. These samples final pressures ranged from -11.2 to -10.1”Hg which are outside the protocol’s range of -10 to -5”Hg, but had start and stop flows that were within $\pm 10\%$. In this report these samples (Log #'s; 1, 3, 9, 10, 12, 13, 14, 15, 16, 17, 33, 42, 44 & 51) are listed as flagged (shaded) in Table 4 above. The one failure (Log #59) was due to an internal leak in the flow controller.

The significance of the canister’s final vacuums being between -10 to -5”Hg in the protocol were based on the following. Restek’s, the manufacturer of the flow controllers, literature states that when the vacuum in the canister goes above -5”Hg the controllers can no longer control the flows accurately. ARB staff chose to achieve final vacuums between -10 and -5”Hg with the goal of reaching -8 or -7”Hg. The closer the final vacuum is to -5”Hg, the lower the level of dilution required. Canisters with final vacuum readings below -10”Hg will require more dilution air. If the stop vacuum reading is lower than expected, (i.e. less than -10”Hg), it is usually an indication that the sample was not collected evenly over the sampling period. However, flow tolerances are $\pm 20\%$ and during this study start and stop flows were all within $\pm 10\%$. This indicates that although there was some deviation in the flows, due to temperature and humidity changes, the samples were generally collected evenly over the sampling period.

The background samples averaged 0.33 ug/m^3 . By the sixth and last sampling period the results had not dropped to the original background levels and averaged 2.9 ug/m^3 . Sampling period five, a daytime sampling period, averaged slightly lower at 2.5 ug/m^3 where the winds were more variable. Generally, the higher results recorded during these sampling periods correlated with the wind directions recorded. Two exceptions were the 77 ug/m^3 sample collected at ES during sampling period one and the results for NS, NWC and WS during sampling period five. The highest result of 200 ug/m^3 was recorded at WS during sampling period two. The prevailing wind directions for most sampling periods varied from each other and the maximum wind speed recorded was 8.1 mph during sampling period 3. For further details on the meteorological data collected refer to Appendix D: Wind Rose and Data by Sampling Period.

Table 5: Hydrogen Sulfide Monitoring Results, PPM

Log #	Site Name	Date & Time Of Site's First Sample	Jerome 631-X H ₂ S Sample		Average Reading	Comment Number	Weather K,P,C,F&R	Operator's Initials
			First	Second				
001	NWS-HS-B	11/13/06 17:44	0	0	0.0		P	SRR
002	SWC-HS-B	11/13/06 17:59	1	0	0.5		P	SRR
003	SEC-HS-B	11/13/06 18:11	0	0	0.0		P	SRR
004	NEC-HS-B	11/13/06 18:22	0	0	0.0		P	SRR
005	NWC-HS1	11/14/06 5:28	0	0	0.0		C	SRR
006	WS-HS1	11/14/06 5:40	0	0	0.0		C	SRR
007	SWC-HS1	11/14/06 5:47	0	0	0.0		C	SRR
008	SS-HS1	11/14/06 6:04	0	0	0.0		C	SRR
009	SEC-HS1	11/14/06 6:10	1	0	0.5		C	SRR
010	ES-HS1	11/14/06 6:32	1	1	1.0		C	SRR
011	NEC-HS1	11/14/06 6:39	0	0	0.0		C	SRR
012	NS-HS1	11/14/06 6:51	0	0	0.0		C	SRR
013	WS-HS1-Mid	11/14/06 10:59	2	3	2.5		C	SRR
014	SS-HS1-Mid	11/14/06 11:03	2	2	2.0		C	SRR
015	ES-HS1-Mid	11/14/06 11:06	2	2	2.0		C	SRR
016	NS-HS1-Mid	11/14/06 11:11	2	1	1.5		C	SRR
017	WS-HS1-End	11/14/06 13:31	2	2	2.0		P	SRR
018	SS-HS1-End	11/14/06 13:35	2	2	2.0		P	SRR
019	ES-HS1-End	11/14/06 13:38	2	2	2.0		P	SRR
020	NS-HS1-End	11/14/06 13:41	2	2	2.0	1	P	SRR
021	NWC-HS2	11/14/06 17:30	0	0	0.0		K	SRR
022	WS-HS2	11/14/06 17:39	0	0	0.0		K	SRR
023	SWC-HS2	11/14/06 17:52	0	0	0.0		K	SRR
024	SS-HS2	11/14/06 18:01	2	1	1.5		K	SRR
025	SEC-HS2	11/14/06 18:13	0	0	0.0		K	SRR
026	ES-HS2	11/14/06 18:25	0	0	0.0		K	SRR
027	NEC-HS2	11/14/06 18:35	2	2	2.0		K	SRR
028	NS-HS2	11/14/06 18:45	2	2	2.0		K	SRR
029	NWC-HS3	11/15/06 5:29	0	0	0.0		K	SRR
030	WS-HS3	11/15/06 5:41	0	0	0.0		K	SRR
031	SWC-HS3	11/15/06 5:48	0	0	0.0		K	SRR
032	SS-HS3	11/15/06 5:55	0	0	0.0		K	SRR
033	SEC-HS3	11/15/06 6:01	0	0	0.0		K	SRR
034	ES-HS3	11/15/06 6:15	0	0	0.0		K	SRR
035	NEC-HS3	11/15/06 6:26	0	0	0.0		K	SRR
036	NS-HS3	11/15/06 6:38	0	0	0.0		K	SRR
037	NWC-HS4	11/15/06 17:30	1	0	0.5		K	SRR
038	WS-HS4	11/15/06 17:35	0	0	0.0		K	SRR
039	SWC-HS4	11/15/06 17:42	2	0	1.0		K	SRR
040	SS-HS4	11/15/06 17:49	1	0	0.5		K	SRR
041	SEC-HS4	11/15/06 17:58	1	0	0.5		K	SRR
042	ES-HS4	11/15/06 18:09	1	1	1.0		K	SRR

H₂S Monitoring Results Continued

Log #	Site Name	Date & Time Of Site's First Sample	Jerome 631-X H ₂ S Sample		Average Reading	Comment Number	Weather K,P,C,F&R	Operator's Initials
			First	Second				
043	NEC-HS4	11/15/06 18:19	0	0	0.0		K	SRR
044	NS-HS4	11/15/06 18:24	0	0	0.0		K	SRR
045	NWC-HS5	11/16/06 5:28	0	0	0.0		K	SRS
046	WS-HS5	11/16/06 5:41	0	0	0.0		K	SRS
047	SWC-HS5	11/16/06 5:47	0	0	0.0		K	SRS
048	SS-HS5	11/16/06 5:56	0	0	0.0		K	SRS
049	SEC-HS5	11/16/06 6:05	0	0	0.0		K	SRS
050	ES-HS5	11/16/06 6:13	0	0	0.0		K	SRS
051	NEC-HS5	11/16/06 6:18	0	0	0.0		K	SRS
052	NS-HS5	11/16/06 6:24	0	0	0.0		K	SRS
053	NWC-HS6	11/16/06 17:31	0	0	0.0		K	SRS
054	WS-HS6	11/16/06 17:36	0	0	0.0		K	SRS
055	SWC-HS6	11/16/06 17:41	0	0	0.0		K	SRS
056	SS-HS6	11/16/06 17:47	1	0	0.5		K	SRS
057	SEC-HS6	11/16/06 17:52	3	2	2.5		K	SRS
058	ES-HS6	11/16/06 17:55	1	0	0.5		K	SRS
059	NEC-HS6	11/16/06 18:11	0	0	0.0		K	SRS
060	NS-HS6	11/16/06 18:19	0	0	0.0		K	SRS
061	NWC-HS7	11/17/06 5:27	0	0	0.0		K	SRS
062	WS-HS7	11/17/06 5:36	0	0	0.0		K	SRS
063	SWC-HS7	11/17/06 5:43	0	0	0.0		K	SRS
064	SS-HS7	11/17/06 5:47	0	0	0.0		K	SRS
065	SEC-HS7	11/17/06 5:54	0	0	0.0		K	SRS
066	ES-HS7	11/17/06 6:00	0	0	0.0		K	SRS
067	NEC-HS7	11/17/06 6:04	0	0	0.0		K	SRS
068	NS-HS7	11/17/06 6:10	0	0	0.0		K	SRS
Comments By Number								
1	Ran zero filter at hotel. 2 ea. 000's.							
Weather codes: K = Clear, P = Partly Cloudy and C = >67% Cloudy.								

No readings above 3 PPM were observed. The Jerome 631-X was operated per the manufacturer's manual and no problems were noted.

5.0 Quality Control Results

Quality Control samples collected from the field consisted of six collocated canister pairs, four Field Spikes, four Trip Spikes and four Trip Blanks. The quality control results are summarized below. For more detailed information see Table 6: Carbon Disulfide Application Quality Control Results on page 13 and Appendix D of this report.

Collocated sample results and Relative Percent Differences (RPD), $a-b \div [(a+b) \div 2] \times 100 =$ RPD, for primary and collocated sample pairs ranged from +9.7 to -5.1% with an average of 0.8%.

Field Spike recovery ranged from 107 to 112% with an average of 109%. The generally accepted stability period for prepared CS₂ spike standards is 30 days under the TO-15 test method.

Trip Spike recovery ranged from 105 to 113% with an average of 109%.

All Trip Blank results were less than the Limit of Detection (LOD) of 0.120 ug/m³.

Table 6: Carbon Disulfide Application Quality Control Results

Log Number	Sample Identification	Canister Number	Date Received	Date Analyzed	Field Spike Results			Lab Certified	
					Expected (ug/m ³)	Actual (ug/m ³)	Recovery (%)	Arrival Vacuum	Dilution Pressure
2	NWC-CD-B-FS	1129	11/20/2006	11/28/2006	4.62	5.17	111.9	-9.5	5.4
4	SWC-CD-B-FS	1086	11/20/2006	11/30/2006	4.55	4.89	107.3	-9.5	5.7
6	SEC-CD-B-FS	1135	11/20/2006	12/5/2006	4.67	5.15	110.3	-9.5	5.2
8	NEC-CD-B-FS	1140	11/20/2006	12/6/2006	4.58	4.88	106.7	-9.1	5.6
Log Number	Sample Identification	Canister Number	Date Received	Date Analyzed	Trip Spike Results			Lab Certified	
					Expected (ug/m ³)	Actual (ug/m ³)	Recovery (%)	Arrival Vacuum	Dilution Pressure
18	CD-TS1	1126	11/20/2006	11/28/2006	4.51	5.10	113.2	-29.4	5.9
19	CD-TS2	1172	11/20/2006	11/30/2006	4.55	4.80	105.3	-29.5	5.7
20	CD-TS3	1128	11/20/2006	12/5/2006	4.74	5.19	109.5	-29.5	4.9
21	CD-TS4	1087	11/20/2006	12/8/2006	4.67	5.13	109.8	-29.5	5.2
Log Number	Sample Identification	Canister Number	Date Received	Date Analyzed	Trip Blank Results			Lab Certified	
					LOD (ug/m ³)	Actual (ug/m ³)	Dilution Ratio	Arrival Vacuum	Dilution Pressure
22	CD-TB1	1066	11/20/2006	11/28/2006	0.12	<LOD	1.82	-30.0	5.8
23	CD-TB2	1153	11/20/2006	11/30/2006	0.12	<LOD	1.83	-30.0	5.9
24	CD-TB3	1052	11/20/2006	12/5/2006	0.12	<LOD	1.78	-29.6	5.3
25	CD-TB4	1085	11/20/2006	12/6/2007	0.12	<LOD	1.78	-30.0	5.3

Note: LOD = Limit of Detection.