Air Resources Board

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To: Pamela Wofford, Chief
Environmental Monitoring Branch
Department of Pesticide Regulation

From: Kenneth R. Stroud, Chief
Air Quality Surveillance Branch
Monitoring and Laboratory Division

Date: August 10, 2017

Subject: Final Report on Pesticide Application Site Monitoring for Chlorpyrifos and Chlorpyrifos-Oxon in San Joaquin County in July 2015

Attached is the pesticide report titled "Pesticide Application Air Monitoring for Chlorpyrifos and Chlorpyrifos-Oxon in San Joaquin County in July 2015." The draft of this report was previously forwarded to your staff for review in July 2017 and their comments have been incorporated. Please accept our apologies for the delay in the report as there was a program re-organization and personnel changes mid-way through the monitoring project.

Thank you for your cooperation during this project. If you or your staff have any questions or need further information, please contact me at (916)324-7630 or via email at Kenneth.Stroud@ARB.CA.Gov.

Attachment

cc: w/o attachment
Michael Benjamin, MLD

w/ attachment
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Kathy Gill, MLD
James Pham, MLD

Monitoring Report Approval

Report Title: Pesticide Application Air Monitoring For Chlorpyrifos and Chlorpyrifos-Oxon in San Joaquin County in July 2015

Project Lead: James Pham, Air Pollution Specialist

Approval: The following monitoring report has been reviewed and approved by the Air Quality Surveillance Branch.

Mac McDougall, Manager
Special Purpose Monitoring Section

8/21/17
Date

Kenneth R. Stroud, Chief
Air Quality Surveillance Branch

8-21-17
Date

California Environmental Protection Agency

Air Resources Board

State of California
California Environmental Protection Agency
Air Resources Board

Pesticide Application Air Monitoring for Chlorpyrifos and Chlorpyrifos-Oxon in San Joaquin County in July 2015

Prepared By:

James Pham, Air Pollution Specialist
Special Purpose Monitoring Section
Air Quality Surveillance Branch
Monitoring and Laboratory Division

April 25, 2017

Executive Summary

Ambient Pesticide Air Monitoring For Chlorpyrifos in San Joaquin County in July 2015

At the request of the Department of Pesticide Regulation (DPR), the Air Resources Board (ARB) conducted an air monitoring study for the insecticide chlorpyrifos (IUPAC name: O, O-diethyl O-3,5,6-trichloro-2-pyridyl-phosphorothioate) and its oxygen analog (chlorpyrifos-oxon) in Linden (San Joaquin County) from July 23rd through 26th, 2015. The monitoring was conducted near an application of chlorpyrifos on a 26 acre walnut orchard. Chlorpyrifos is used to control a variety of insects including beetles, fleas, and armyworms. Its Chemical Abstracts Service registry number is 2921-88-2.

A total of 73 samples which included 56 primary samples and 17 quality control samples (seven collocated samples, seven field spikes, one trip spike, one trip blank, and one field blank) were collected by Air Quality Surveillance Branch (AQSB) staff. Eight primary samplers were setup around the orchard. Two additional samplers for collocated and QC samples were set up at the expectant downwind location (south east corner). Samples were collected on XAD-2 resin sorbent tubes with an air sampling flow rate of 3.0 liters per minute (LPM). The resin sorbent tube air samples were analyzed by gas chromatography with a flame photometric detector (GC-FPD) by ARB's Northern Laboratory Branch (NLB) in Sacramento for both chlorpyrifos and chlorpyrifos-oxon.

One sample was invalidated due to pump failure. In addition, six samples were flagged due to early stoppage of the pumps due to battery theft. The batteries powering the pumps on the north east corner, east side, and south east corner of the orchard were stolen during the fourth and fifth post-application periods. The affected samples (#51, 52, 53, 54, 55, and 63) are not representative of the entire sunset to sunrise or sunrise to sunset sampling periods on July 25th and July 26th.

Chlorpyrifos resin sorbent tube results: The reported chlorpyrifos results from 56 resin sorbent tube samples indicated concentrations of chlorpyrifos ranging from less than 0.01 $\mu g/m^3$ (<EQL, estimated quantitation limit) at some locations during the background sampling period to a maximum of 31.38 $\mu g/m^3$ during the application sampling period at the south west corner. During the application sampling period, the wind was coming out of the south east. The three highest concentrations overall were detected during the application sampling period at the south west corner (31.38 $\mu g/m^3$), south side (23.19 $\mu g/m^3$), and south east corner (15.51 $\mu g/m^3$) sampling locations.

Chlorpyrifos-oxon resin sorbent tube results: The oxygen analog, chlorpyrifos-oxon, was not detected in many of the samples. In the samples that did contain the oxon, the highest values were seen during the first post-application samples at the south west corner (0.26 $\mu g/m^3$) and south east corner (0.23 $\mu g/m^3$) sampling locations.

APPENDICES:

1.0 Introduction

At the request of the Department of Pesticide Regulation (DPR) (January 2013 Memorandum, Reardon to Corey), the Air Resources Board (ARB) conducted air monitoring for the pesticide chlorpyrifos (IUPAC name: O, O-diethyl O-3,5,6-trichloro-2-pyridyl-phosphorothioate) and its oxygen analog (chlorpyrifos-oxon). Chlorpyrifos is an organophosphate that is used on many crops throughout the state year-round. It is generally used for controlling a variety of insects including beetles, fleas, and armyworms. Its Chemical Abstract Service (CAS) registry number is 2921-88-2.

Data presented by DPR in 2013 showed that the overall use of chlorpyrifos in the state increased about 5% from 2009 to 2011. The report also showed that for those years, Kern County had the highest percentage of total statewide use at 19% compared to Fresno at 17%. San Joaquin County, where this study was performed, was number six for total usage for 2009 - 2011. Due to the difficulty of obtaining a monitoring site, finding a site in the higher use counties was attempted, but not accomplished. Thus, a secondary site was picked based on cooperation with the Agriculture Commissioner's Office and applicators. Statewide peak usage of chlorpyrifos generally occurs in July and August. Past usage indicates that the highest usage in San Joaquin County followed the statewide trend (Appendix A).

A total of 73 air samples including 56 primary and 17 quality control (QC) samples were collected at eight locations around the orchard in Linden. Monitoring for chlorpyrifos occurred over a period of four days from July 23 to 26, 2015. Monitoring was conducted to coincide with a night-time application of chlorpyrifos on walnut trees. The "Sampling Protocol for O, O-diethyl O-3,5,6-trichloro-2-pyridyl-phosphorothioate (Chlorpyrifos) Application Study" dated July 23, 2015 is located in Appendix B.

2.0 Deviations from Protocol

The background and application sampling periods proceeded without any issues.

During the first post-application sampling period, the pump located at the south side of the orchard failed part way through the sampling period. The sample was invalidated due to sampler malfunction (sample #26).

During the fourth and fifth post-application sampling periods, we experienced the theft of some batteries used to power our sampling pumps. Sometime after the samplers were started for the fourth post-application period, the batteries from five locations (north east corner, east side, south east corner, south east collocated, and south east field spike) were stolen. Air monitoring staff returned in the morning to find the samplers non-operational.

During the fifth post-application sampling, the batteries from the east side and south east corner were also stolen. On the east side sampler, only one of the three batteries was stolen (sample #62). The sampler continued to run through the sampling period with the two remaining batteries. This sample remained valid.

Due to the theft of the sampling equipment, 6 samples were flagged. The affected samples were #51, 52, 53, 54, 55, and 63.

No other significant deviations occurred during this Chlorpyrifos ambient study as stated in the "Sampling Protocol for [Chlorpyrifos] Application Study" (Appendix B).

3.0 Sampling Site

The orchard where this pesticide air monitoring study was performed was located by finding a cooperative applicator and farmer through a collaboration with the San Joaquin County Agriculture Commissioner's Office. A viable orchard was located in Linden with the planned application date of July 23, 2015. A night time application was planned as to not disturb any helpful insects such as honey bees. The application method was by air blast spray with an application rate of 1.88 lbs/acre.

The monitoring was conducted near an application of chlorpyrifos on a 26 acre orchard of walnuts. Samplers were setup to collect air samples from all sides and all corners of the square orchard totaling eight sampling locations. As sampler placement was dictated by the layout of the surrounding area and availability of space, the samplers were placed between six and 24 meters from the edge of the orchard. Two QC samplers for field spikes and collocated samples were placed at the expectant downwind location. With the prevailing winds coming out of the northwest, the expectant downwind location was at the south east corner of the orchard. Usually, the meteorological station is also set up at the downwind location, but due to the limited space at the south east/downwind location, it was set up at the south west corner of the orchard.

The global positioning satellite coordinates of each sampler is included in Table 1. The distance of the sampler from the edge of the orchard is also included in Table 1.

Figure 1 shows an aerial view of the application site with the sampler locations and meteorological tower marked. Figure 2 shows a photo of the meteorological tower at the south west corner of the orchard.

Photos of the samplers at each location can be seen in Appendix H.

Table 1: Sampler Waypoints

Sampler Location	Waypoints	Distance From Orchard (meters)
South	37°59'26.50"N 121° 5'48.10"W	10
South west corner	37°59'28.90"N 121° 5'53.50"W	7
West	37°59'32.00"N 121° 5'55.20"W	24
North west corner	37°59'38.00"N 121° 5'54.60"W	6
North	37°59'38.20"N 121° 5'48.30"W	6
North east corner	37°59'38.30"N 121° 5'42.60"W	10
East	37°59'32.90"N 121° 5'42.50"W	6
South east corner	37°59'26.60"N 121° 5'42.40"W	13
Met Tower	37°59'30.40"N 121° 5'54.00"W	Within Orchard

Figure 1: Aerial Overview of Monitored Area

Figure 2 – Meteorological Tower – Facing West

4.0 Methods

The sampling process was designed to collect both chlorpyrifos and chlorpyrifos-oxon on a single XAD-2 resin sorbent tube (SKC item #226-30-06). Samples were collected by passing a measured volume of ambient air through XAD-2 resin sorbent tubes mounted on sampling trees. The inlet portion of each sampling tree was approximately 1.7 meters above the ground. Prior to each sampling period, the sampler was leak checked. After the sample resin sorbent tube was installed, the flow rate was set to 3.0 LPM using inline rotameter (flow range of 0-5 LPM). A sampling flow rate of 3.0 liters per minute (LPM) was accurately measured using an Aalborg digital mass flow meter with a range of 0-5 LPM. The flow rate was re-checked at the end of each sampling period just prior to removal of the sorbent tube. For the samples to be considered valid, the average flow rate must have been within 20% of 3.0 LPM (between 2.4 and 3.6 LPM).

The background samples were collected starting on July 23rd at 1158 PST and removed later in the day at 1950. The application of chlorpyrifos commenced at 2219 on July 23rd and finished at 0410 on July 24th. The collection of application period samples occurred approximately half an hour prior to the beginning of the application through until approximately 1.5 hours after the application. Due to the time it takes to remove samples from all of the sampler locations, the one hour difference was split. Therefore, some samples were removed prior to the completion of the one hour post-application mark, and some were removed after one hour. The first post-application samples were collected from approximately an hour after the application to the next sunset. The subsequent post-application samples were taken on a sunrise to sunset and sunset to sunrise schedule for a total of five post-application sampling periods.

A total of 73 samples were collected during the study consisting of 56 primary samples and 17 QC samples. The 17 QC samples consisted of seven collocated samples, seven field spikes, one trip spike, one trip blank, and one field blank. Collocated and field spike samples were collected for each sampling period at the south east corner sampling location. Spiked XAD resin sorbent tubes were prepared at the laboratory and placed in the freezer the Tuesday preceding the start of sampling (July 22, 2015).

At the end of each sampling period, the sampled sorbent tubes were placed in culture tubes with an identification label affixed to each sample. Each culture tube was then placed in a dry ice cooler for the remainder of the study. The operating interval of each sample was recorded on the log sheet. At the end of the study, the collected samples were transported to ARB MLD's Northern Laboratory Branch (NLB) and stored in a freezer until analysis.

Appendix E contains the chlorpyrifos field log and presents the sample start and end times, start and end flow rates, and weather conditions for each sampling period. Site nomenclature for this study was based upon the location of each sampler and the sample period number. Additional abbreviations were added to identify the type of sample collected (background, collocated, blank or spike). Please note that the "Corrected Average Flow" indicates the actual flow factoring in a certified correction for a slope of 0.996 and intercept of 0.071.

Sampler Locations:
S - South
SWC - South West Corner
W - West
NWC - North West Corner
N - North
NEC - North East Corner
E - East
SEC - South East Corner

Sampling Periods:
BKG - Background
1 - Application
2 - First Post-Application
3 - Second Post-Application
4 - Third Post-Application
5 - Fourth Post-Application
6 - Fifth Post-Application

Quality Control:
C – Collocated
Trip Spike
FS - Field Spike
Trip Blank
Field Blank

Examples:
BKG - S = Background, south side sampling location
NEC - 1 = North east corner sampling location, sample 1 (Application)
NEC - 2FS = North east corner sampling location, sample 2 (First Post-Application), Field Spike
NEC - 2C = North east corner sampling location, sample 2, Collocated sample

For more details of the monitoring method, please refer to Appendix B, "Sampling Protocol for O, O-diethyl O-3,5,6-trichloro-2-pyridyl-phosphorothioate (chlorpyrifos) Application Study" dated July 23, 2015.

The chlorpyrifos was applied via an air blast sprayer towed by a tractor. A photo of the tractor and air blast sprayer can be seen in Figure 3. The applicator mixed the solution on site. Field staff observed the application from a safe distance just east of monitoring site.

The calculated application rate of chlorpyrifos was 1.88 lbs/acre. The product use recommendation and product labels of the applied products can be seen in Appendix G.

Meteorological data was collected using a Met-One weather station. Data was logged at five minute intervals for resultant wind speed, resultant wind direction, ambient temperature, and relative humidity. The calibration/certification reports for the meteorological instrumentation are presented in Appendix F.

The NLB extracted and analyzed all of the samples from this pesticide application study. The collected resin sorbent tube samples were analyzed following the laboratory method titled, "Method Development for the Sampling and Analysis of O, O-diethyl O-3,5,6-trichloro-2-pyridyl-phosphorothioate (chlorpyrifos) and its Oxygen Analog (chlorpyrifos-Oxon) in Application Air using Gas Chromatography/Flame Photometric Detector" (Appendix C). Using this method, the resin tubes were extracted with three milliliters of dichloromethane and desorbed in an ultrasonic bath for 60 minutes. The sample extracts were analyzed using a gas chromatograph with a flame photometric detector (GC-FPD). Appendix D contains the laboratory results report titled, "Analytical Results for Application Air Monitoring Samples in San Joaquin County for O, O-Diethyl O-3,5,6-trichloro-2-pyridyl-phosphorothioate (Chlorpyrifos) and its Oxygen Analog (Chlorpyrifos-Oxon)" dated October 2015. Please note that the spiked samples were spiked with 0.15 µg of chlorpyrifos per sample. The resultant values for the spikes are represented in µg per sample.

Figure 3 –Tractor and Air Blast Sprayer

5.0 Results

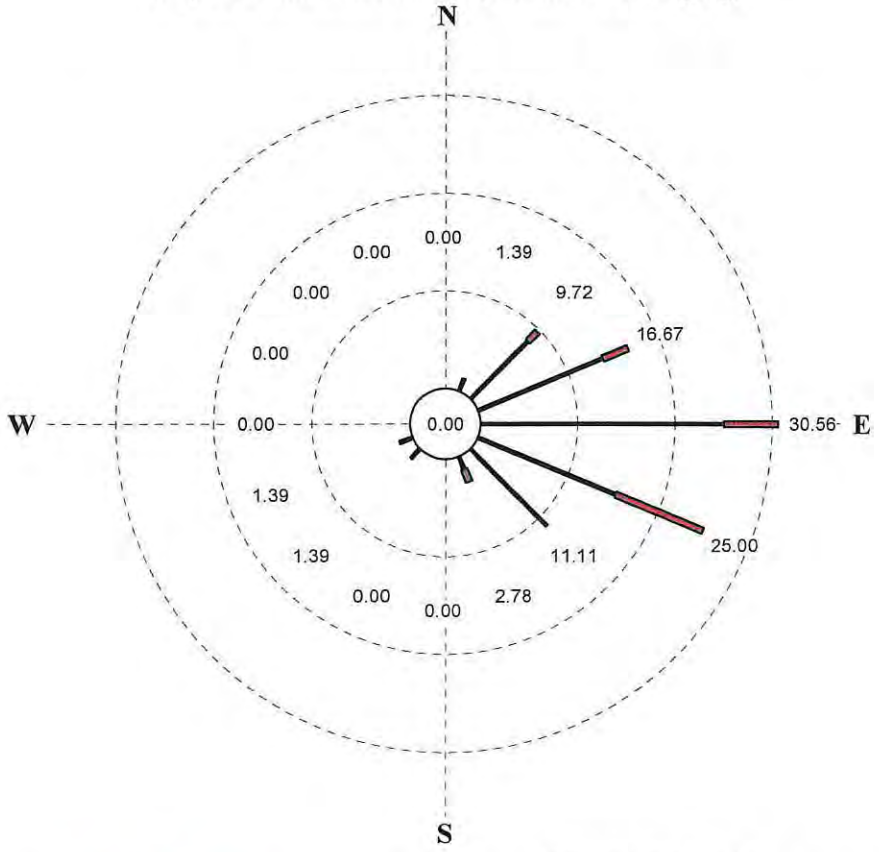
The wind rose plots can be seen in Figures 4 through 10. Each figure presents data from each sampling period. The wind roses were plotted using the meteorological data captured by the meteorological tower at 5 minute averaged intervals.

Due to the stolen batteries, the end flow reading was not available for some samples. Therefore, the affected 6 samples were flagged. At the start of each sampling period, the target flow rate of each sampler was set to match the flow rate criteria. The standard deviation of the flow rates for all of the valid and unflagged samples is 0.07 LPM. Under these conditions, AQSB staff has confidence that the ending flow rate would have had little to no variation from the starting flow rate in the time the samples were collected. Therefore, the ending flow rate was assumed to be the same as the starting flow rate in the calculations.

Chlorpyrifos and chlorpyrifos-oxon sample resin sorbent tube results are presented in Table 2 and are sorted by site location. The 3 highest concentrations overall were all detected during the application sampling period at the south west corner (31.38 $\mu g/m^3$), south side (23.19 $\mu g/m^3$), and south east corner (15.51 $\mu g/m^3$) sampling locations.

Many of the chlorpyrifos-oxon values were below the method detection limit. The highest values were collected during the first post-application period at the south west corner (0.26 $\mu g/m^3$) and south east corner (0.23 $\mu g/m^3$) sampling locations.

Wind Rose
San Joaquin County Chlorpyrifos Application
Background Sample
July 23 From 1158 to 1950 (5 Minute Averaging)



Calms included at center.
Rings drawn at 10% intervals.
Wind flow is FROM the directions shown.
No observations were missing.

PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	1.39	0.00	0.00	0.00	0.00	0.00
NE	8.33	1.39	0.00	0.00	0.00	0.00
ENE	13.89	2.78	0.00	0.00	0.00	0.00
E	25.00	5.56	0.00	0.00	0.00	0.00
ESE	15.28	9.72	0.00	0.00	0.00	0.00
SE	11.11	0.00	0.00	0.00	0.00	0.00
SSE	1.39	1.39	0.00	0.00	0.00	0.00

TOTAL OBS = 72 MISSING OBS = 0

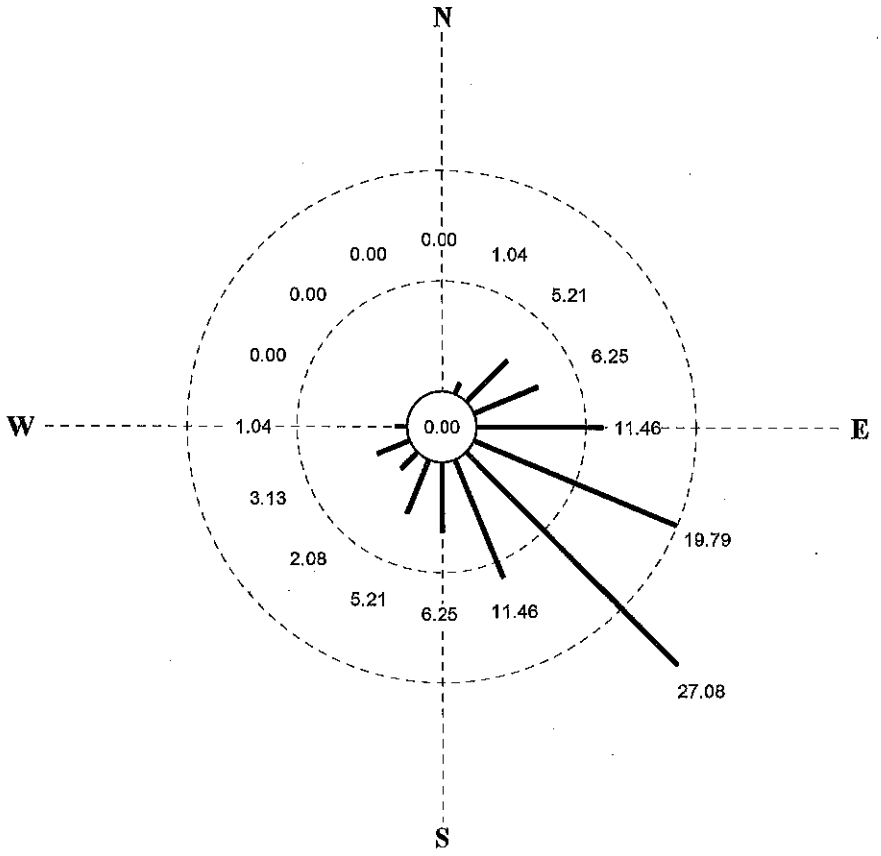
PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	1.39	0.00	0.00	0.00	0.00	0.00
WSW	1.39	0.00	0.00	0.00	0.00	0.00
W	0.00	0.00	0.00	0.00	0.00	0.00
WNW	0.00	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

CALM OBS = 0 PERCENT CALM = 0.00

Figure 4 – Wind Rose for Background Sampling Period

Wind Rose
San Joaquin County Chlorpyrifos Application
Application Sample
From July 23 2152 to July 24 0545 (5 Minute Averaging)



Calms included at center.
Rings drawn at 10% intervals.
Wind flow is FROM the directions shown.
No observations were missing.

PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	1.04	0.00	0.00	0.00	0.00	0.00
NE	5.21	0.00	0.00	0.00	0.00	0.00
ENE	6.25	0.00	0.00	0.00	0.00	0.00
E	11.46	0.00	0.00	0.00	0.00	0.00
ESE	19.79	0.00	0.00	0.00	0.00	0.00
SE	27.08	0.00	0.00	0.00	0.00	0.00
SSE	11.46	0.00	0.00	0.00	0.00	0.00

TOTAL OBS = 96 MISSING OBS = 0

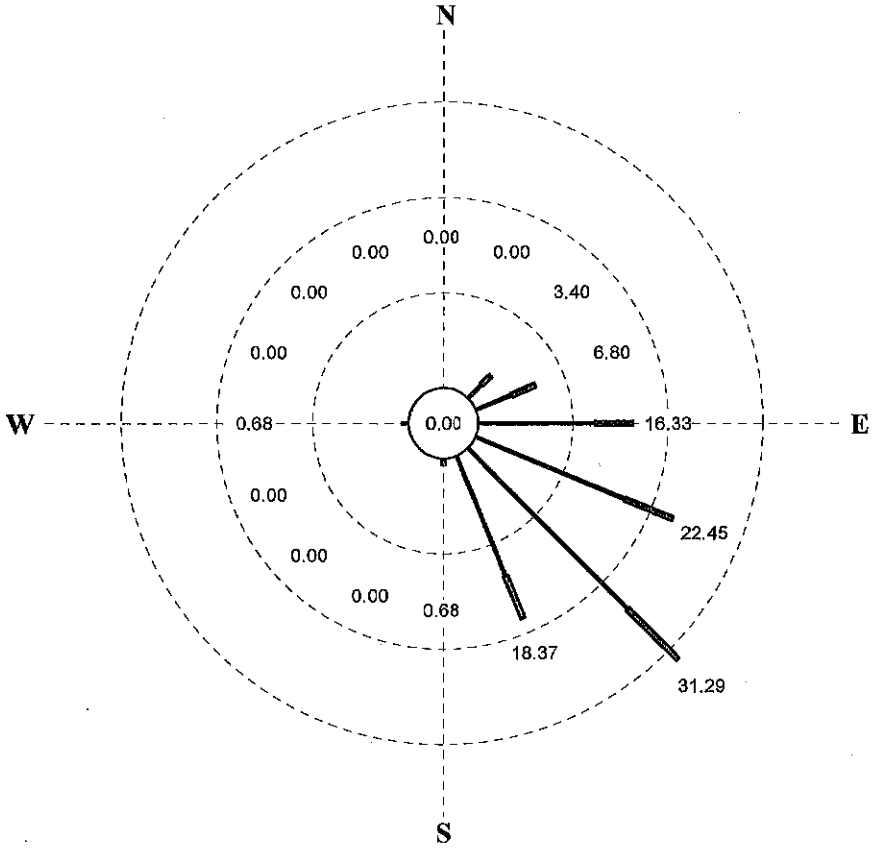
PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

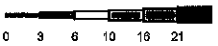
DIR	0	3	6	10	16	21
S	6.25	0.00	0.00	0.00	0.00	0.00
SSW	5.21	0.00	0.00	0.00	0.00	0.00
SW	2.08	0.00	0.00	0.00	0.00	0.00
WSW	3.13	0.00	0.00	0.00	0.00	0.00
W	1.04	0.00	0.00	0.00	0.00	0.00
WNW	0.00	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

CALM OBS = 0 PERCENT CALM = 0.00

Figure 5 – Wind Rose for Application Sampling Period

Wind Rose
San Joaquin County Chlorpyrifos Application
First Post Application Sample
July 24 From 0547 To 1801 (5 Minute Averaging)





Wind Speed (Knots)

Calms included at center.
Rings drawn at 10% intervals.
Wind flow is FROM the directions shown.
No observations were missing.

PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	2.04	1.36	0.00	0.00	0.00	0.00
ENE	4.08	2.72	0.00	0.00	0.00	0.00
E	12.24	4.08	0.00	0.00	0.00	0.00
ESE	17.01	5.44	0.00	0.00	0.00	0.00
SE	23.81	7.48	0.00	0.00	0.00	0.00
SSE	13.61	4.76	0.00	0.00	0.00	0.00

TOTAL OBS = 147 MISSING OBS = 0

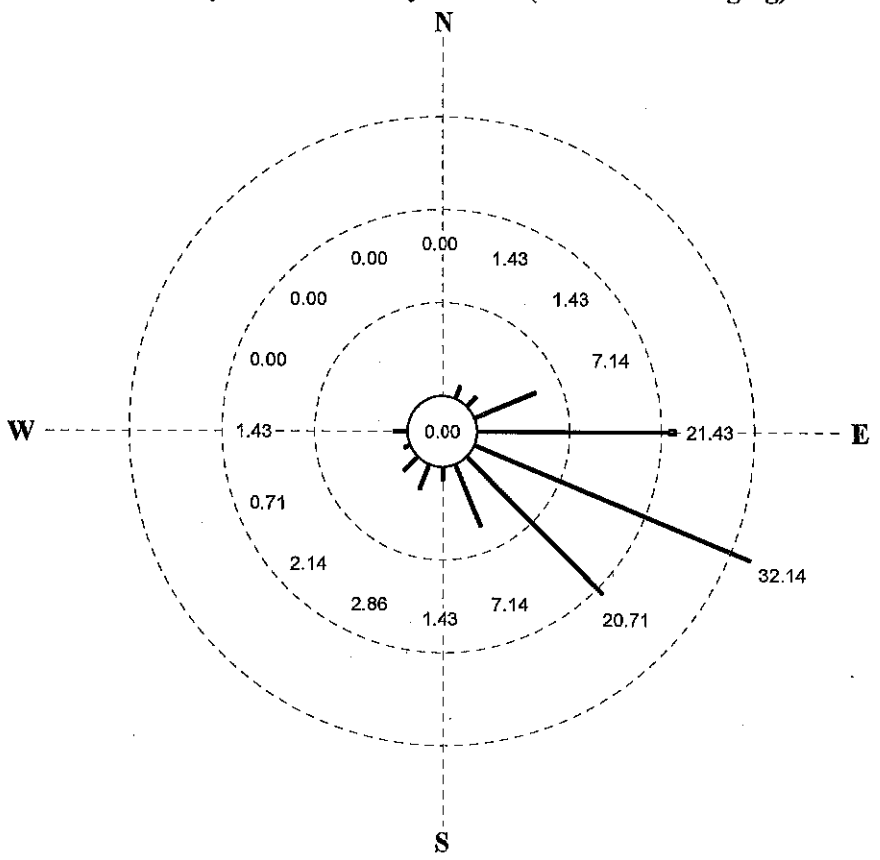
PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
S	0.00	0.68	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	0.00	0.00	0.00	0.00	0.00	0.00
W	0.68	0.00	0.00	0.00	0.00	0.00
WNW	0.00	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

CALM OBS = 0 PERCENT CALM = 0.00

Figure 6 – Wind Rose for First Post-Application Sampling Period

Wind Rose
San Joaquin County Chlorpyrifos Application
Second Post Application Sample
From July 24 1803 To July 25 0539 (5 Minute Averaging)



Calms included at center.
Rings drawn at 10% intervals.
Wind flow is FROM the directions shown.
No observations were missing.

PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	1.43	0.00	0.00	0.00	0.00	0.00
NE	1.43	0.00	0.00	0.00	0.00	0.00
ENE	7.14	0.00	0.00	0.00	0.00	0.00
E	20.71	0.71	0.00	0.00	0.00	0.00
ESE	32.14	0.00	0.00	0.00	0.00	0.00
SE	20.71	0.00	0.00	0.00	0.00	0.00
SSE	7.14	0.00	0.00	0.00	0.00	0.00

TOTAL OBS = 140 MISSING OBS = 0

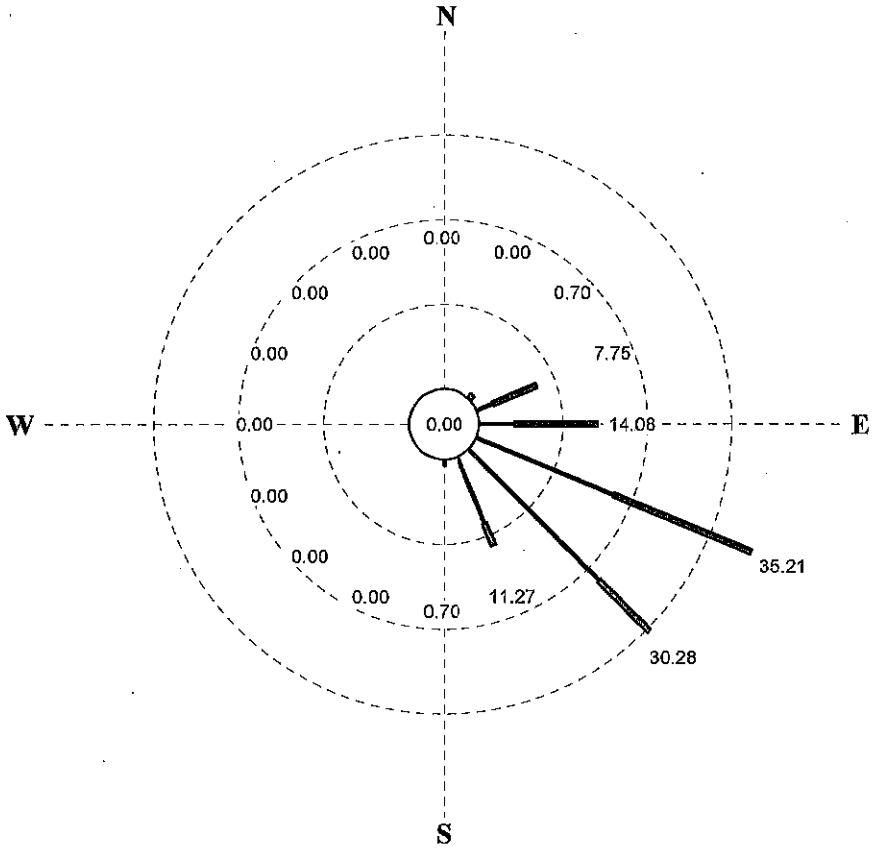
PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
S	1.43	0.00	0.00	0.00	0.00	0.00
SSW	2.86	0.00	0.00	0.00	0.00	0.00
SW	2.14	0.00	0.00	0.00	0.00	0.00
WSW	0.71	0.00	0.00	0.00	0.00	0.00
W	1.43	0.00	0.00	0.00	0.00	0.00
WNW	0.00	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

CALM OBS = 0 PERCENT CALM = 0.00

Figure 7 – Wind Rose for Second Post-Application Sampling Period

Wind Rose
San Joaquin County Chlorpyrifos Application
Third Post Application Sample
July 25 From 0540 To 1730 (5 Minute Averaging)



0 3 6 10 16 21

Wind Speed (Knots)

Calms included at center.
Rings drawn at 10% intervals.
Wind flow is FROM the directions shown.
No observations were missing.

PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.70	0.00	0.00	0.00	0.00
ENE	2.11	5.63	0.00	0.00	0.00	0.00
E	4.23	9.86	0.00	0.00	0.00	0.00
ESE	17.61	17.61	0.00	0.00	0.00	0.00
SE	21.83	8.45	0.00	0.00	0.00	0.00
SSE	8.45	2.82	0.00	0.00	0.00	0.00

TOTAL OBS = 142 MISSING OBS = 0

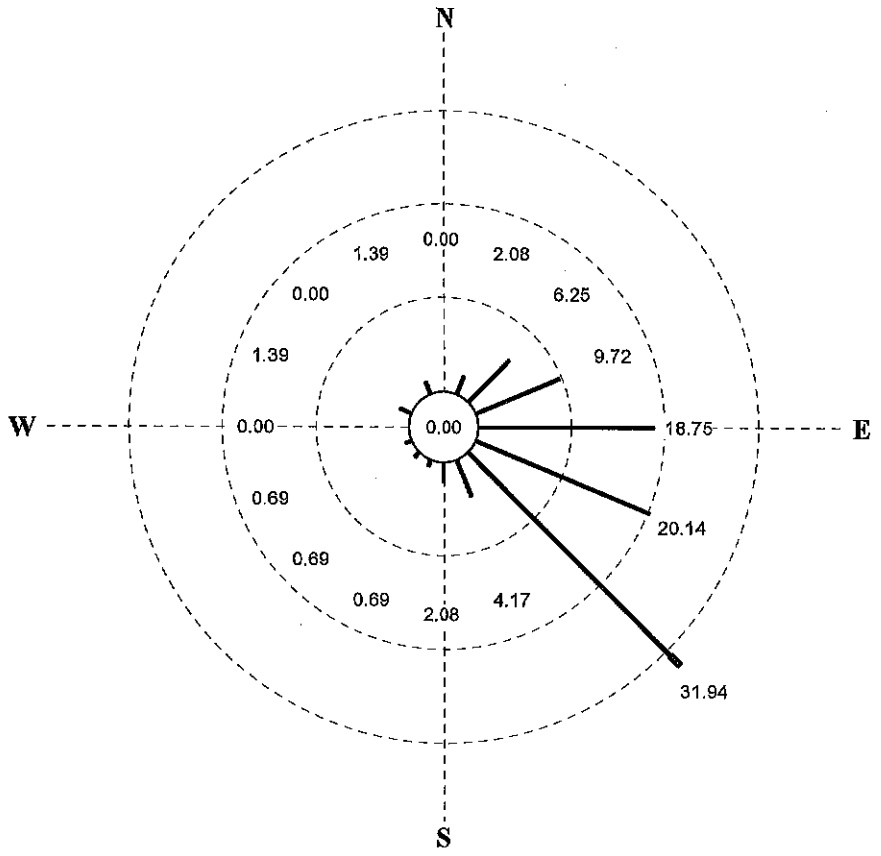
PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
S	0.70	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	0.00	0.00	0.00	0.00	0.00	0.00
W	0.00	0.00	0.00	0.00	0.00	0.00
WNW	0.00	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

CALM OBS = 0 PERCENT CALM = 0.00

Figure 8 – Wind Rose for Third Post-Application Sampling Period

Wind Rose
San Joaquin County Chlorpyrifos Application
Fourth Post Application Sample
From July 25 From 1741 To 0531 (5 Minute Averaging)



Calms included at center.
Rings drawn at 10% intervals.
Wind flow is FROM the directions shown.
No observations were missing.

PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	2.08	0.00	0.00	0.00	0.00	0.00
NE	6.25	0.00	0.00	0.00	0.00	0.00
ENE	9.72	0.00	0.00	0.00	0.00	0.00
E	18.75	0.00	0.00	0.00	0.00	0.00
ESE	20.14	0.00	0.00	0.00	0.00	0.00
SE	30.56	1.39	0.00	0.00	0.00	0.00
SSE	4.17	0.00	0.00	0.00	0.00	0.00

TOTAL OBS = 144 MISSING OBS = 0

PERCENT OCCURRENCE: Wind Speed (Knots)
LOWER BOUND OF CATEGORY

DIR	0	3	6	10	16	21
S	2.08	0.00	0.00	0.00	0.00	0.00
SSW	0.69	0.00	0.00	0.00	0.00	0.00
SW	0.69	0.00	0.00	0.00	0.00	0.00
WSW	0.69	0.00	0.00	0.00	0.00	0.00
W	0.00	0.00	0.00	0.00	0.00	0.00
WNW	1.39	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	1.39	0.00	0.00	0.00	0.00	0.00

CALM OBS = 0 PERCENT CALM = 0.00

Figure 9 – Wind Rose for Fourth Post-Application Sampling Period

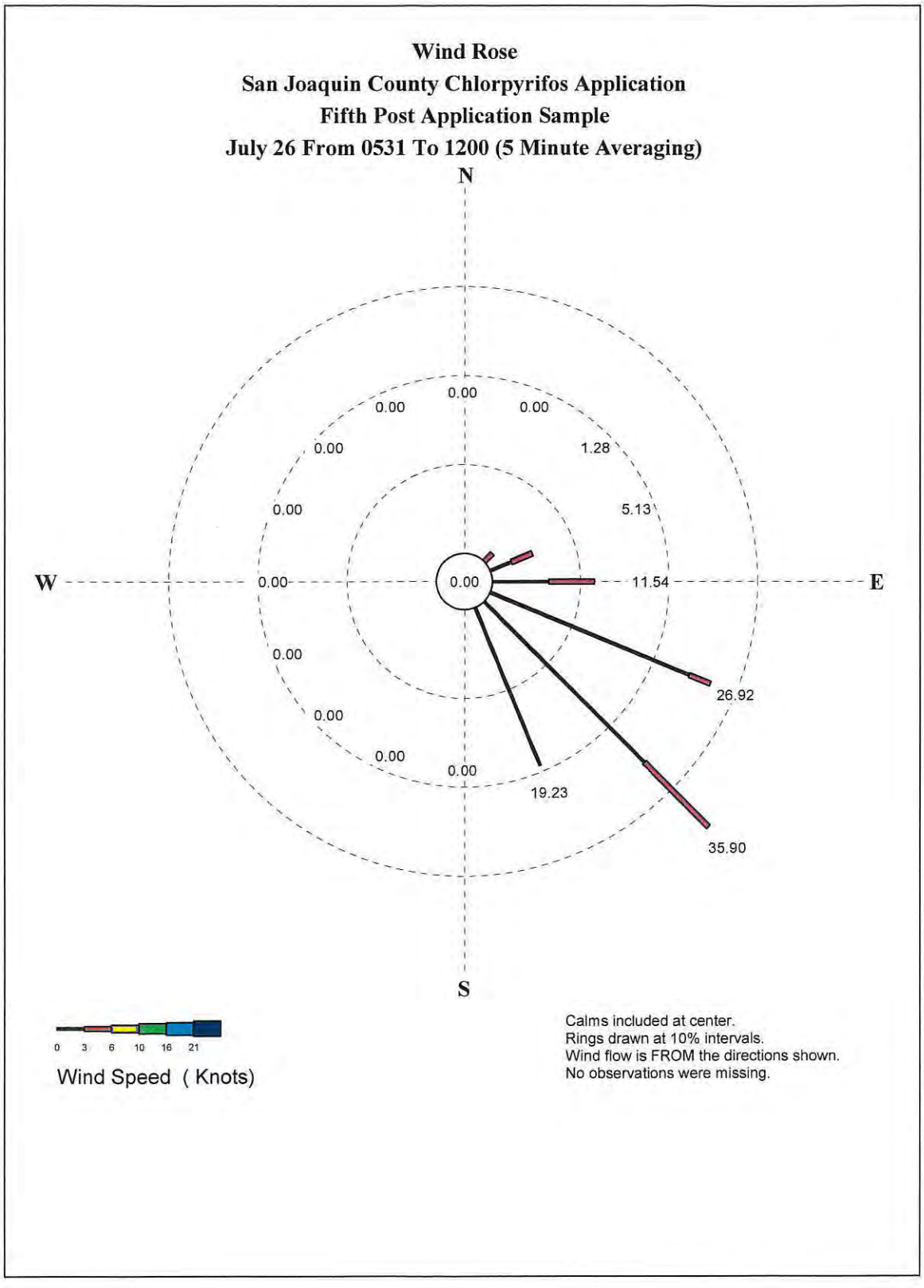


Figure 10 – Wind Rose for Fifth Post-Application Sampling Period

Table 2 – Sampling Results

Site Location	Log #	Sample Name	Sample Start Date	Elapsed Time (Hours)	Elapsed Time (Minutes)	Avg. Flow (LPM)	Volume (Liters)	Volume (m3)	Chlorpyrifos (µg/Sample)	Chlorpyrifos (µg/m3)	Oxon (µg/Sample)	Oxon (µg/m3)
South	6	BKG-S	7/23/15	8.2	492	3.03	1490.33	1.49	0.03	0.02	<EQL	<EQL
	16	S-1	7/23/15	8	480	3.01	1446.81	1.45	33.55	23.19	<EQL	<EQL
	26	S-2	7/24/15									
	36	S-3	7/24/15	11.5	690	3.03	2090.09	2.09	6.60	3.16	<EQL	<EQL
	46	S-4	7/25/15	12.1	726	2.99	2173.83	2.17	2.16	1.00	0.17	0.08
	56	S-5	7/25/15	11.9	714	3.02	2159.24	2.16	1.80	0.83	<EQL	<EQL
	66	S-6	7/26/15	6.3	378	2.96	1118.65	1.12	0.41	0.36	0.07	0.06
SW	7	BKG-SWC	7/23/15	8.1	486	3.03	1472.15	1.47	0.05	0.03	<EQL	<EQL
	17	SWC-1	7/23/15	8.2	492	3.03	1490.33	1.49	46.76	31.38	<EQL	<EQL
	27	SWC-2	7/24/15	12.2	732	2.97	2173.57	2.17	8.78	4.04	0.56	0.26
	37	SWC-3	7/24/15	11.6	696	3.00	2087.47	2.09	8.45	4.05	0.08	0.04
	47	SWC-4	7/25/15	12.1	726	3.05	2213.60	2.21	1.47	0.66	0.16	0.07
	57	SWC-5	7/25/15	11.8	708	3.03	2144.62	2.14	2.60	1.21	<EQL	<EQL
	67	SWC-6	7/26/15	6.3	378	2.94	1113.01	1.11	0.31	0.28	<EQL	<EQL
West	8	BKG-W	7/23/15	8.1	486	3.02	1467.31	1.47	0.03	0.02	<EQL	<EQL
	18	W-1	7/23/15	8.3	498	3.05	1518.42	1.52	3.65	2.41	<EQL	<EQL
	28	W-2	7/24/15	12.3	738	2.96	2187.71	2.19	0.77	0.35	0.08	0.03
	38	W-3	7/24/15	11.5	690	3.03	2090.09	2.09	2.39	1.14	<EQL	<EQL
	48	W-4	7/25/15	12.1	726	2.97	2159.37	2.16	0.24	0.11	0.07	0.03
	58	W-5	7/25/15	11.8	708	3.03	2144.62	2.14	0.62	0.29	<EQL	<EQL
	68	W-6	7/26/15	6.3	378	2.94	1111.12	1.11	0.09	0.08	<EQL	<EQL
NW	9	BKG-NWC	7/23/15	8.1	486	3.00	1457.63	1.46	0.02	0.02	<EQL	<EQL
	19	NWC-1	7/23/15	8.4	504	3.01	1519.15	1.52	0.71	0.47	<EQL	<EQL
	29	NWC-2	7/24/15	12.2	732	2.98	2184.51	2.18	0.10	0.04	<EQL	<EQL
	39	NWC-3	7/24/15	11.6	696	3.03	2108.27	2.11	1.49	0.71	<EQL	<EQL
	49	NWC-4	7/25/15	12.1	726	2.97	2155.76	2.16	0.10	0.05	0.06	0.03
	59	NWC-5	7/25/15	11.8	708	3.03	2144.62	2.14	0.31	0.14	<EQL	<EQL
	69	NWC-6	7/26/15	6.2	372	2.95	1097.19	1.10	0.06	0.05	<EQL	<EQL

***RED = Invalidated samples**

Chlorpyrifos EQL = 0.023 µg/sample, Chlorpyrifos-Oxon EQL = 0.05 µg/sample

Table 2 – Sampling Results (Continued)

Site Location	Log #	Sample Name	Sample Start Date	Elapsed Time (Hours)	Elapsed Time (Minutes)	Avg. Flow (LPM)	Volume (Liters)	Volume (m3)	Chlorpyrifos (µg/Sample)	Chlorpyrifos (µg/m3)	Oxon (µg/Sample)	Oxon (µg/m3)
North	10	BKG-N	7/23/15	8.2	492	2.90	1426.62	1.43	0.02	0.02	<EQL	<EQL
	20	N-1	7/23/15	8.5	510	3.00	1532.15	1.53	4.21	2.75	<EQL	<EQL
	30	N-2	7/24/15	12.2	732	2.98	2184.51	2.18	1.40	0.64	0.16	0.07
	40	N-3	7/24/15	11.5	690	3.03	2090.09	2.09	4.22	2.02	<EQL	<EQL
	50	N-4	7/25/15	12.2	732	2.98	2184.51	2.18	0.41	0.19	0.09	0.04
	60	N-5	7/25/15	11.7	702	3.03	2126.44	2.13	1.42	0.67	<EQL	<EQL
	70	N-6	7/26/15	6.2	372	2.97	1104.60	1.10	0.18	0.16	<EQL	<EQL
NE	1	BKG-NEC	7/23/15	7.9	474	3.02	1433.44	1.43	0.04	0.03	<EQL	<EQL
	11	NEC-1	7/23/15	8	480	3.02	1449.20	1.45	3.46	2.38	<EQL	<EQL
	21	NEC-2	7/24/15	12.2	732	2.94	2151.70	2.15	1.13	0.52	0.10	0.05
	31	NEC-3	7/24/15	11.6	696	3.05	2122.13	2.12	2.77	1.30	<EQL	<EQL
	41	NEC-4	7/25/15	12.1	726	2.94	2137.68	2.14	0.35	0.16	0.09	0.04
	51	NEC-5	7/25/15	3.1	186	3.00	558.00	0.56	0.05	0.09	<EQL	<EQL
	61	NEC-6	7/26/15	6.4	384	2.94	1128.76	1.13	0.16	0.14	0.06	0.05
East	2	BKG-E	7/23/15	7.9	474	3.03	1438.16	1.44	<EQL	<EQL	<EQL	<EQL
	12	E-1	7/23/15	8	480	3.01	1446.81	1.45	14.81	10.24	<EQL	<EQL
	22	E-2	7/24/15	12.2	732	2.97	2177.22	2.18	21.96	10.09	0.05	0.02
	32	E-3	7/24/15	11.7	702	3.03	2126.44	2.13	8.19	3.85	0.10	0.05
	42	E-4	7/25/15	12	720	2.98	2145.11	2.15	2.77	1.29	0.14	0.07
	52	E-5	7/25/15	7.4	444	3.00	1332.00	1.33	1.60	1.20	<EQL	<EQL
	62	E-6	7/26/15	6.5	390	3.00	1170.00	1.17	0.86	0.74	<EQL	<EQL

***BLUE = Batteries stolen during sampling period. Sample flagged for not having a final measured flow rate. Final flow rate assumed to be the same as starting flow rate.**

Chlorpyrifos EQL = 0.023 µg/sample, Chlorpyrifos-Oxon EQL = 0.05 µg/sample

Table 2 – Sampling Results (Continued)

Site Location	Log #	Sample Name	Sample Start Date	Elapsed Time (Hours)	Elapsed Time (Minutes)	Avg. Flow (LPM)	Volume (Liters)	Volume (m3)	Chlorpyrifos (µg/Sample)	Chlorpyrifos (µg/m3)	Oxon (µg/Sample)	Oxon (µg/m3)
SE	3	BKG-SEC	7/23/15	7.9	474	3.03	1435.80	1.44	<EQL	<EQL	<EQL	<EQL
	4	BKG-SEC-C	7/23/15	8	480	3.02	1449.20	1.45	0.03	0.02	<EQL	<EQL
	13	SEC-1	7/23/15	7.9	474	2.99	1416.92	1.42	21.98	15.51	0.05	0.04
	14	SEC-1C	7/23/15	8.3	498	3.03	1508.50	1.51	21.96	14.56	<EQL	<EQL
	23	SEC-2	7/24/15	12.2	732	2.95	2162.64	2.16	10.21	4.72	0.50	0.23
	24	SEC-2C	7/24/15	12.2	732	2.96	2166.28	2.17	8.40	3.88	0.43	0.20
	33	SEC-3	7/24/15	11.6	696	3.03	2108.27	2.11	5.02	2.38	0.06	0.03
	34	SEC-3C	7/24/15	11.5	690	3.03	2090.09	2.09	5.36	2.56	0.06	0.03
	43	SEC-4	7/25/15	12.1	726	2.96	2148.52	2.15	2.12	0.99	0.13	0.06
	44	SEC-4C	7/25/15	12.1	726	2.97	2155.76	2.16	2.33	1.08	0.21	0.10
	53	SEC-5	7/25/15	6.6	396	3.00	1188.00	1.19	0.79	0.66	<EQL	<EQL
	54	SEC-5C	7/25/15	6.6	396	3.00	1188.00	1.19	0.79	0.67	<EQL	<EQL
	63	SEC-6	7/26/15	2.4	144	3.00	432.00	0.43	0.30	0.70	<EQL	<EQL
	64	SEC-6C	7/26/15	6.4	384	2.96	1136.41	1.14	0.58	0.51	0.07	0.06

***BLUE = Batteries stolen during sampling period. Sample flagged for not having a final measured flow rate. Final flow rate assumed to be the same as starting flow rate.**

Chlorpyrifos EQL = 0.023 µg/sample, Chlorpyrifos-Oxon EQL = 0.05 µg/sample

6.0 Quality Control Results

Field QC samples consisted of seven collocated samples, seven field spikes, one trip spike, one trip blank, and one field blank.

The Relative Percent Difference (RPD) of the collocated samples for chlorpyrifos ranged from -31.7% to 9.1% with an average of -6.9%. The RPD of the collocated samples for the chlorpyrifos-oxon ranged from -16.3% to 48.3% with an average of -0.17%. Some values were not quantifiable due to the concentrations being under the EQL. Please see Table 3 below.

The formula for calculating the RPD for Table 3 is as follows:

$$RPD = \frac{Collocated\ \mu g/m^3 - Sample\ \mu g/m^3}{(Collocated\ \mu g/m^3 + Sample\ \mu g/m^3) \div 2}$$

Table 3 – Collocated Relative Percent Difference for Chlorpyrifos and Chlorpyrifos-Oxon

Log #	Sample Name	Chlorpyrifos (µg/Sample)	Chlorpyrifos (µg/m3)	Oxon (µg/Sample)	Oxon (µg/m3)	Chlorpyrifos RPD	Oxon RPD
3	BKG-SEC	<EQL	<EQL	<EQL	<EQL	N/A	N/A
4	BKG-SEC-C	0.03	0.02	<EQL	<EQL		
13	SEC-1	21.98	15.51	0.05	0.04	-6.4%	N/A
14	SEC-1C	21.96	14.56	<EQL	<EQL		
23	SEC-2	10.21	4.72	0.50	0.23	-19.6%	-16.3%
24	SEC-2C	8.40	3.88	0.43	0.20		
33	SEC-3	5.02	2.38	0.06	0.03	7.4%	0.9%
34	SEC-3C	5.36	2.56	0.06	0.03		
43	SEC-4	2.12	0.99	0.13	0.06	9.1%	48.3%
44	SEC-4C	2.33	1.08	0.21	0.10		
53	SEC-5	0.79	0.66	<EQL	<EQL	0.6%	N/A
54	SEC-5C	0.79	0.67	<EQL	<EQL		
63	SEC-6	0.30	0.70	<EQL	<EQL	-31.7%	N/A
64	SEC-6C	0.58	0.51	0.07	0.06		

***BLUE = Batteries stolen during sampling period. Sample flagged for not having a final measured flow rate. Final flow rate assumed to be the same as starting flow rate.**

Chlorpyrifos EQL = 0.023 µg/sample, Chlorpyrifos-Oxon EQL = 0.05 µg/sample

The chlorpyrifos field spike recoveries ranged from -783.9% to 981.7% with an average of -9.0%. A definitive cause for the wide range of recovery values cannot be determined, but a possible cause may be the volatility of chlorpyrifos in the sample media. It may also be attributed to the low concentration spike in the high concentration samples. The concentrations of the collected chlorpyrifos samples ranged from 1.4 to 147 times the spike concentration (0.15 µg/sample). A more suitable spike concentration could not have been easily determined prior to the start of the study due to the many variables associated with a pesticide application study. The early stoppage of the pumps (from the equipment theft) in samples #53, 54, and 63 may also lead to imprecise comparisons due to unequal sampling between the primary samples and spikes. The RPD for the background sampling period could not be calculated due to the concentrations being under the EQL. Field spike percent recoveries for chlorpyrifos are shown in Table 4. When viewing Table 4, please reference the following equations:

$$Field\ Spike\ \frac{\mu g}{m^3} = Field\ Recovery\ \frac{\mu g}{sample} \div Total\ Volume\ \frac{sample}{m^3}$$

$$Net\ Spike\ \frac{\mu g}{m^3} = Field\ Spike\ Concentration\ \frac{\mu g}{m^3} - Primary\ Sample\ \frac{\mu g}{m^3}$$

$$Net\ Spike\ \frac{\mu g}{sample} = Net\ Spike\ \frac{\mu g}{m^3} \times Total\ Volume\ \frac{m^3}{sample}$$

$$Spike\ Percent\ Recovery\ \frac{\mu g}{sample} = Net\ Spike\ \frac{\mu g}{sample} \div Lab\ Spike\ Value\ \frac{\mu g}{sample} \times 100\%$$

Table 4 – Chlorpyrifos Field Spike Percent Recovery

Log #	Sample Name	Volume (m3)	Chlorpyrifos (µg/Sample)	Chlorpyrifos (µg/m3)	Net Spike (µg/m3)	Net Spike (µg/Sample)	Lab Spike Value (µg/Sample)	Spike Percent Recovery
3	BKG-SEC	1.44	<EQL	<EQL				
5	BKG-SEC-FS	1.32	0.21	0.16	<EQL	<EQL	0.15	N/A
13	SEC-1	1.42	21.98	15.51				
15	SEC-1FS	1.46	21.51	14.71	-0.80	-1.18	0.15	-783.9%
23	SEC-2	2.16	10.21	4.72				
25	SEC-2FS	2.17	10.60	4.89	0.17	0.37	0.15	248.5%
33	SEC-3	2.11	5.02	2.38				
35	SEC-3FS	2.11	6.49	3.08	0.70	1.47	0.15	981.7%
43	SEC-4	2.15	2.12	0.99				
45	SEC-4FS	2.14	2.34	1.09	0.11	0.23	0.15	151.9%
53	SEC-5	0.61	0.79	1.29				
55	SEC-5FS	0.36	0.44	1.24	-0.06	-0.02	0.15	-13.8%
63	SEC-6	0.22	0.30	1.37				
65	SEC-6FS	1.14	0.60	0.53	-0.84	-0.96	0.15	-638.4%

***BLUE** = **Batteries stolen during sampling period. Sample flagged for not having a final measured flow rate. Final flow rate assumed to be the same as starting flow rate.**
Chlorpyrifos EQL = 0.023 µg/sample, Chlorpyrifos-Oxon EQL = 0.05 µg/sample

The chlorpyrifos trip spike recovery was 97.9%. See Table 5 (Trip Spike Recovery).

The formula for calculating the Recovery % for Table 5 is as follows:

$$Recovery\,\% = \left(Measured\ \frac{ng}{sample} \div Expected\ \frac{ng}{sample} \right) \times 100\%$$

Table 5 – Trip Spike Recovery

Log #	Sample Name	Chlorpyrifos (µg/Sample)	Lab Spike Value (µg/Sample)	Spike Percent Recovery
71	Trip Spike	0.14	0.15	97.9%

Concentrations of both chlorpyrifos and chlorpyrifos-oxon were not detected in either the trip or field blanks.

Table 6 – Trip and Field Blank Results

QC Type	Log #	Sample Name	Chlorpyrifos (µg/Sample)	Oxon (µg/Sample)
Trip Blank	72	TB	<EQL	<EQL
Field Blank	73	FB	<EQL	<EQL

Laboratory spike values can be seen in Table 6.

Table 7 – Quality Control Laboratory Spike Recovery

QC Type	Laboratory ID	Date Analyzed	Chlorpyrifos Amount (µg/Sample)	Percent Recovery
Lab Spike	LS001	8/6/2015	0.16	117.0%
	LS002	8/18/2015	0.13	93.6%
	LS003	8/19/2015	0.13	93.6%
	LS004	8/21/2015	0.14	95.7%

7.0 Summary

One sample was invalidated due to pump failure. In addition, six samples were flagged due to early stoppage of the pumps due to battery theft. The batteries powering the pumps on the north east corner, east side, and south east corner of the orchard were affected during the fourth and fifth post-application periods. The affected samples (#51, 52, 53, 54, 55, and 63) are not representative of the entire sunset to sunrise or sunrise to sunset time periods on July 25th and July 26th. These conditions should be considered when utilizing the results of this study.

The highest values of chlorpyrifos for each individual sampler were seen during the application sampling period. The highest overall chlorpyrifos concentration reported (31.38 µg/m3) was collected at the south west corner location and the wind was coming out of the south east during that sampling period which was not expected. Although staff did not observe any nearby applications during that night, the dissociation may be attributed to a nearby secondary application. Another possible reason for the high values at the non-downwind sampling location may be the sampler's proximity to the field.

During the post-application sampling period, the samples with the highest values were observed at different locations. For all of the sampling periods, the predominant wind was coming out of the south east. The wind direction did not seem to foretell which samples would have the highest

concentrations for each sampling period. During each sampling period, the locations of the highest concentrations were as follows:

1. Background Sampling Period - South west and north east corner locations identical (0.03 µg/m3)
2. Application Sampling Period - South west corner (31.38 µg/m3)
3. First Post-Application Sampling Period – East Side (10.09 µg/m3)
4. Second Post-Application Sampling Period - South west corner (4.05 µg/m3)
5. Third Post-Application Sampling Period - East corner during (1.29 µg/m3)
6. Fourth Post-Application Sampling Period - South west corner (1.21 µg/m3)
7. Fifth Post-Application Sampling Period - South east corner (0.70 µg/m3)

APPENDIX A

Use Information and Air Monitoring Recommendation

USE INFORMATION AND AIR MONITORING RECOMMENDATION FOR CHLORPYRIFOS IN CALIFORNIA

June 2013

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Environmental Scientist

ENVIRONMENTAL HAZARD ASSESSMENT PROGRAM
State of California
Environmental Protection Agency
Department of Pesticide Regulation
Environmental Monitoring Branch
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Sacramento, CA, 95812-4015

Table of Contents

1. INTRODUCTION

An addendum (DPR, 2013) to the California Department of Pesticide Regulation's (CDPR) original request (DPR, 2011) to the Air Resources Board (ARB) for monitoring Chlorpyrifos and chlorpyrifos oxygen analog breakdown product in 2013 was submitted. Due to its use on many crops makes this organophosphate a high priority for risk assessment (CDPR, 2013).
This recommendation contains general information regarding the physical and chemical properties of the pesticide active ingredient chlorpyrifos and its reported historical uses in California after evaluating 2009-2011 pesticide use data (CalPIP, 2013) The CDPR provides this information to assist the California Air Resources Board (CARB) in its selection of appropriate locations for conducting pesticide air monitoring operations.

2. CHEMICAL DESCRIPTION

Chlorpyrifos (CAS number: 2921-88-2) is a colorless to white crystalline solid and is the common name for the chemical with IUPAC name of *O, O*-diethyl *O*-3,5,6-trichloro-2-pyridyl-phosphorothioate (Figure 1). Chlorpyrifos has a mild mercaptan (thiol) odor, similar to the smell of sulfur compounds found in rotten eggs, onions, garlic and skunks. Chlorpyrifos is moderately toxic and chronic exposure has been linked to neurological effects, developmental disorders, and autoimmune disorders.

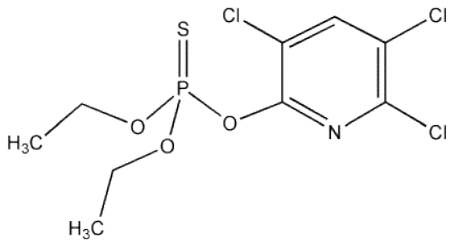

Figure 1. Chemical structure of chlorpyrifos.

2.1 Physical and Chemical Properties

The chemical and physical properties and some identifiers of Chlorpyrifos can be found in Table 1. Chlorpyrifos belongs to the chlorinated organophosphate (OP) chemical family. The value of K_{oc} has been shown to vary depending upon soil type and environmental conditions (DPR, 2010; IUPAC, 2013). Thus, its value ranges from 360-31000 ml/g (Table 1). The water solubility of chlorpyrifos is low. The CDPR determined that pesticides with a water solubility greater than 3 mg/L could be classified as having the potential to leach (Johnson, 1991). Thus, chlorpyrifos' potential to leach to groundwater is low, but contamination of groundwater would still be a possibility due to other environmental and soil factors. Typically, pesticides with high vapor pressure

(greater than 10^{-6} mm Hg) can readily volatilize. Based on its vapor pressure, chlorpyrifos can be classified as having moderate air pollution potential. Thus, chlorpyrifos is capable of volatilization and can potentially drift away from the application site.

Table 1. Physical and Chemical Properties of Chlorpyrifos (National Pesticide Information Center [NPIC], 2009; US EPA, 2002, Russell et al., 1978; The International Union of Pure and Applied Chemistry [IUPAC], 2013)

Common Name	Chlorpyrifos Dursban, Empire 20, Equity, Whitmire PT 270, Lorsban,
Chemical name (IUAPC)	*O*,*O*-diethyl *O*-3,5,6-trichloro-2-pyridyl phosphorothioate
CAS Registry Number	2921-88-2
Chemical Formula	$C_9H_{11}Cl_3NO_3PS$
Molecular Weight	350.59 g/mol
Physical form	white crystalline or irregularly flaked solid
Water Solubility	0.0014 g/L (25 ^oC) (Graebing and Chib, 2004) 0.00105 g/L (20 ^oC)
Density	1.398 g/cm^3 (43.5 ^oC) 1.49 g/cm^3 at (27 ^oC)
Octanol/water partition coefficient, Log K_{ow}	4.70 (Graebing and Chib, 2004; DPR, 2010)
Aqueous Photolysis Half-life	29.6 days (IUPAC, 2010)
Hydrolysis Half-life	35-78 days (pH 7.0; 25 ^oC) (Howard, 1991) 72.1 days (pH 7.0; 25 ^oC) DPR (2010) 72.8 days (pH 5.0; 25 ^oC) DPR (2010)
Vapor Pressure	1.87 x 10^{-5} mmHg (25 ^oC)
Boiling Point	108 ^oC
Melting Point	41.5-42.5 ^oC
K_{oc}	Ranges from 360 ml/g to 31000 ml/g, depending on soil type and environmental conditions
Henry's Law Constant	4.2 x 10^{-6} atm·m^3/mol at 25 ^oC and 6.7 x 10^{-6} atm·m^3/mol

3. ENVIRONMENTAL FATE

3.1 Fate in air

Henry's law constant, vapor pressure and volatilization are all interrelated for determining the fate of a pesticide in air. The best measure to describe a pesticide's fate in air is its half-life. The half-life is the time takes ½ amount of chemical to volatilize into the gas phase from any surface (Linde, 1994). The half-life of chlorpyrifos due to volatilization is 72 hours (Lyman et al., 1990). In their recent study, Hayward et al. (2010) found that the half-life of chlorpyrifos is 14 hours indicating that it is degraded more quickly in air and shows a much shorter atmospheric residence time. Howard (1991) reported that the degradation half-life of chlorpyrifos in air due to photolysis is 6.34 hours.

3.1.1 Air Monitoring Studies in California

The extensive use of chlorpyrifos on crops could result in detectable air concentrations due to its moderate volatility and drift from its application site. An initial study was conducted to determine the levels of chlorpyrifos in ambient air collected at residential sites in Salinas, Monterey County (Sawa, 1985). In this study, Sawa (1985) found very low levels of Chlorpyrifos (minimum detectable levels between 0.009-0.035 $\mu g/m^3$). Stein and White (1993) studied aerial movement of chlorpyrifos outside of the application area during a two week period during summer months in Fresno and Monterey counties. The maximum detected concentrations of chlorpyrifos were 0.0011 $\mu g/m^3$ and 0.0263 $\mu g/m^3$ for Fresno and Monterey counties, respectively. Mongar et al. (1998) reported the results of application and ambient air monitoring in Tulare County for chlorpyrifos during peak use period in May and June. Application site concentrations during seven sampling periods ranged from 2.6 – 47.2 $\mu g/m^3$ for the east side, 0.16-25.4 $\mu g/m^3$ for the south side, and 0.25-27.7 $\mu g/m^3$ for north of the field. The observed maximum ambient air concentrations from five different locations ranged from 0.0389 – 0.815 $\mu g/m^3$ (Mongar et al., 1998). Segawa et al. (2003) reported results of an ambient air monitoring study conducted at five locations in 2000 in Lompoc, Santa Barbara County, to determine concentration levels of 31 pesticides and their breakdown products. The highest air concentrations for 24 h, 14 days, and 10 weeks were 0.0151, 0.00405, and 0.00191 $\mu g/m^3$, respectively. A recent study conducted in Parlier, Fresno County, by Wofford et al. (2009) indicated that the insecticide chlorpyrifos was among the pesticides found most often. The results showed that the highest 1-day concentration was 0.150 $\mu g/m^3$ and the 14-day average concentration was 0.0961 $\mu g/m^3$ for chlorpyrifos.

3.2 Fate in water

Chlorpyrifos has a half-life of 14 days in an aqueous environment due to hydrolysis (McEwen and Stephenson, 1979). However, Howard (1991) reported half-lives ranges for chlorpyrifos in water at pH 7.0 and 25 ^oC from 35 to78 days due to hydrolysis.

Moreover, the degradation half-life of chlorpyrifos in water is 22 days due to photolysis (Howard, 1991).

3.3 Fate in soil

According to Tomlin (2000), the degradation half-life of chlorpyrifos in soil is 94 days. Other researchers also found that soil half-life ranged from 14 to 84 days in the field and under lab conditions (Chapman and Harris, 1980; Pike and Getzin, 1981). Furthermore, Graebing and Chib (2004) investigated soil photolysis of chlorpyrifos in a moisture and temperature controlled environment. They found that the irradiated half-life of chlorpyrifos on moist soil was 10 days, compared to 14 days on air-dry soil. When non-irradiated conditions were introduced, the half-life of chlorpyrifos was 18 and 30 days, respectively, for moist and air-dry conditions in sandy soil. Menon et al. (2004) studied the dissipation of chlorpyrifos in sandy loam and loamy sand soils. They found that chlorpyrifos showed moderately stable properties with half-lives of 13 and 17 days in loamy sand and sandy loam soils, respectively. Furthermore, they concluded that the rapid dissipation from soil post application might be caused by low sorption and its low organic matter content whereas fast dissipation from top soil might be the result of volatilization and photochemical degradation. In aerobic soils, the soil half-lives of chlorpyrifos ranged from 11 to 141 days in seven soils ranging in texture from loamy sand to clay and with soil pHs from 5.4 to 7.4. In anaerobic soils, the half-life was 15 days in loam and 58 days in clay soil (US EPA, 1989).

4. POTENTIAL HEALTH EFFECTS

Chlorpyrifos is an insecticide. Rat, rabbit, and mouse developmental toxicity studies on file at DPR did not indicate clear developmental toxicity. Signs of fetal toxicity (decreased ossification, retarded growth, decreased body weight) occurred only at or above dose levels causing clear maternal toxicity. A rat developmental neurotoxicity study had a No-Observed-Effect-Level (NOAEL) of 1 mg/kg for decreased pup survival and growth (Szabo et al., 1988). In addition to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) toxicity studies, there is an extensive database of chlorpyrifos studies in the open literature. Several of these studies, including some human epidemiology studies, suggest adverse effects on neurologic and behavioral development (Nolan et al., 1984). In 2008, the Developmental and Reproductive Toxicant Identification Committee considered chlorpyrifos as a developmental toxin, but did not identify it as one. In a 2009 revised risk assessment scoping document, US EPA states, "Prenatal developmental toxicity in rats and rabbits and the rat reproduction studies provided no evidence of increased susceptibility of the fetuses or offspring. The developmental neurotoxicity study also did not provide clear indications of increased *quantitative* susceptibility in the offspring, although there were concerns for *qualitative* susceptibility in the offspring. However, the DNT study together with a growing body of studies in the open literature suggests that gestational and early postnatal exposure to pups may result in persistent alterations as indicated by various assessments of the animals when they reach adulthood". The US EPA maintained the same critical studies and points of departure used in the 2001 Interim Reregistration Eligibility Decision

(IRED) (US EPA, 2002). The IRED addressed short-term inhalation using a subchronic rat inhalation study. Rats were exposed 6 hours per day, 5 days per week. The highest dose level was 297 µg/m^3, and no effects were seen at any dose level, making 297 µg/m^3 a health-protective NOAEL. For an acute screening level, the 297 µg/m^3 is adjusted by 6/24 to give a 24-hour NOAEL of 74 µg/m^3 and a human (woman 13+ years) equivalent NOEL of 326 µg/m^3. In addition to the conventional uncertainty factor of 100X, US EPA applied an Food Quality Protection Act (FQPA)-safety factor of 10X to address the potential impacts of chlorpyrifos on neurological development. This would lead to an acute RfC or screening level of 326 ng/m^3 (including the FQPA factor).

5. CHLORPYRIFOS USE PROFILE IN CALIFORNIA

5.1 Chlorpyrifos use by county

The cumulative annual use of chlorpyrifos in California during 2009-2011 was obtained from the Pesticide Use Reporting Database (PUR). The results of annual use by counties are given in Table 2. Table 2 shows that the total use of chlorpyrifos increased from 1,240,475 lbs (2009) to 1,293,299 lbs (2011). Based on the sum of three years' (2009-

Table 2. Annual chlorpyrifos use by county and year in California during 2009-2011.

County	2009	2010	2011	Average†	Sum‡
			lbs ai		
Kern	281,686	227,656	218,387	281,686	727,730
Fresno	174,904	227,151	257,586	174,904	659,641
Tulare	143,961	191,678	244,843	143,961	580,483
Kings	52,262	110,738	124,261	52,262	287,261
Stanislaus	69,400	64,710	56,473	69,400	190,583
San Joaquin	71,823	58,685	39,984	71,823	170,492
Imperial	45,309	49,387	71,022	45,309	165,718
Monterey	50,011	49,728	38,286	50,011	138,024
Merced	57,736	41,392	34,033	57,736	133,162
Madera	36,824	29,334	23,527	36,824	89,686
Ventura	33,226	34,170	18,829	33,226	86,225
Glenn	22,582	34,385	20,376	22,582	77,343
Sutter	24,175	23,699	27,000	24,175	74,874
Butte	26,056	22,217	24,721	26,056	72,994
Santa Barbara	29,869	24,192	15,915	29,869	69,976
Solano	14,560	14,983	6,832	14,560	36,374
Tehama	14,142	11,457	8,176	14,142	33,775
Yuba	12,111	8,899	12,740	12,111	33,749

Table 2. continued.

County	2009	2010	2011	Average†	Sum‡
			lbs ai		
Colusa	10,560	8,935	8,751	10,560	28,245
Riverside	12,674	6,407	7,685	12,674	26,767
Yolo	9,470	9,057	6,465	9,470	24,992
San Luis Obispo	8,541	5,880	2,694	8,541	17,115
Sacramento	8,929	4,269	2,966	8,929	16,164
San Benito	3,338	1,738	2,828	3,338	7,903
Sonoma	1,939	4,197	1,323	1,939	7,459
San Bernardino	1,379	2,720	1,841	1,379	5,940
Napa	4,923	897	112	4,923	5,932
San Diego	1,642	1,499	2,260	1,642	5,402
Placer	2,185	1,846	1,363	2,185	5,394
Shasta	1,055	2,403	1,441	1,055	4,899
Modoc	3,060	0	1,644	3,060	4,704
Santa Cruz	1,262	1,193	1,714	1,262	4,170
Santa Clara	1,038	1,637	1,448	1,038	4,123
Lassen	728	224	2,602	728	3,554
Siskiyou	2,332	719	379	2,332	3,429
Contra Costa	1,496	430	971	1,496	2,897
San Mateo	964	1,200	637	964	2,802
Los Angeles	1,304	1,114	0	1,304	2,418
Orange	465	410	462	465	1,336
Calaveras	306	349	171	306	826
Lake	120	92	263	120	475
Mendocino	95	92	21	95	209
Mono	0	0	182	0	182
Amador	14	68	51	14	133
Alameda	0	29	34	0	63
Del Norte	14	3	0	14	16
Humboldt	4	4	4	4	12
Average§	26,393	27,274	27,517		
Sum¶	1,240,475	1,281,876	1,293,299		3,815,650

†Average yearly use by county.
‡Total use (2009-2011) by county.
§ Average use by year.
¶ Total use by year and grand total for California (2009-2011)

2011) use, Kern County recorded the overall highest use of chlorpyrifos (19 % of total statewide use). Kern County is followed by Fresno (17 %), Tulare (15 %), Kings (7.5 %), and Stanislaus counties (4.9 %). Table 3 lists the monthly use of chlorpyrifos within the years of 2009 through 2011 for the top ten counties. The general trend of significant use occurred between the months of January and August. However, the amount of use changed within given years but the peak use of chlorpyrifos was generally during the months of July and August in all counties (Table 3). The highest average use of chlorpyrifos was 20,451 lbs and 22,179 lbs in the months of July and August ,respectively, by all top ten counties,

5.2 Chlorpyrifos use by commodity and county

The total amount of chlorpyrifos used (and corresponding percentages) on treated acres in the top ten commodities/agricultural crops in California from 2009 through 2011 are given in Table 4. Although the highest chlorpyrifos use (823,990 lbs) in almond crop with 21.6 % of statewide use, the applied area (406,315 ac) for almond crop was the second highest in the state. After the almond crop, rank of commodities/agricultural crops' use of chlorpyrifos, in descending order, is as follows: Alfalfa (14 %), Walnut (13.6 %), Orange (13 %), Cotton (9.1 %), Grapes (8.9 %), Broccoli (3.5 %), Corn (2.8 %), Lemon (2.5 %), and Sugarbeet (2.2 %). A summary of chlorpyrifos use on the primary commodities/agricultural crops in the top five counties is presented in Table 5. Chlorpyrifos was used predominantly on almonds in three of the top five counties (Kern, Fresno, and Stanislaus). Meanwhile, oranges and cotton received the highest chlorpyrifos application in Tulare and Kings counties, respectively. Interestingly, almonds took fourth place in chlorpyrifos use in both counties (Table 5).

5.3 Chlorpyrifos use by method of application

Chlorpyrifos was mostly applied by ground application (67.1 %) in California between 2009 and 2011 (Table 6). Aerial application (32.3 %) ranks second in methods of application of chlorpyrifos in statewide use. The average applied amount of chlorpyrifos for both ground and other methods of application (41 and 42 lbs ai, respectively) were close. The average applied chlorpyrifos amount was 50 lbs ai in the aerial application. However, the average field size was smaller in ground (22 acre) than in aerial (57 acre) and other types (52 acres) of application methods. Therefore, ground application produced the highest average application rate (1.8 lbs ai/ac); the application rate for aerial and other types of application methods were quite similar to one another (Table 6).

5.3.1 Distribution of Chlorpyrifos use

Figure 2 depict the distribution of the total amount of active ingredient used (lbs), area treated with chlorpyrifos, and application rates (lbs ai/acre) for individual applications in the top ten counties in California between 2009 and 2011. There was almost no difference with respect to chlorpyrifos use within given years except at the 95th percentile level (Figure 2A).

Table 3. Monthly chlorpyrifos use by county and year (2009-2011) for the top ten counties in California.

County	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		lbs ai											
Kern	2009	24391	12980	43043	7093	36898	13007	22361	4679	1479	5943	518	109294
	2010	18856	10473	25502	4897	41395	9484	42644	22610	22981	13456	8984	6376
	2011	37800	8601	26366	13144	25566	10795	21444	38306	19245	7224	1749	8147
Fresno	2009	13641	5384	11884	2001	5604	5352	75883	35737	16370	2370	392	286
	2010	11345	5749	8965	1805	20683	11717	58042	65281	35003	5282	1757	1522
	2011	15214	6301	9200	2075	8033	11015	30725	117643	46145	8466	2268	501
Tulare	2009	5873	3137	17104	8934	21960	21903	39370	12385	8057	4900	158	180
	2010	5436	3551	19461	3610	13397	29483	50267	42838	14276	7712	1463	185
	2011	4308	3294	17157	4409	22162	35137	60259	62193	22122	12850	734	217
Kings	2009	0	192	2484	1050	7397	4198	14153	17350	4823	616	0	0
	2010	816	76	2153	312	5798	6673	31182	49339	13997	330	0	62
	2011	556	155	3123	980	1118	5774	21135	66704	22139	2156	150	271
Stanislaus	2009	5962	2539	2525	2981	16611	6013	21144	6504	1252	2401	543	926
	2010	4769	1530	1518	878	9251	10178	21033	7405	1897	2203	2859	1188
	2011	656	4541	1152	583	9626	6949	11504	15177	3625	1563	855	242
San Joaquin	2009	177	8	13693	1616	6191	4398	19728	11042	4686	7877	2394	12
	2010	4590	1277	7008	3727	1603	5472	9578	16153	2195	5151	1933	0
	2011	38	679	3611	614	5465	1973	8335	10669	6858	1599	113	30

Table 3. continued.

County	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		lbs ai											
Imperial	2009	5338	7398	4256	141	1538	1464	400	279	4212	14659	2407	3218
	2010	2727	1632	3758	2025	1536	85	43	608	12335	20560	3139	940
	2011	4996	6130	5163	985	222	648	1074	3138	9202	25545	5734	8185
Monterey	2009	2305	6514	7315	2691	3985	5628	6653	5316	1212	1234	4343	2815
	2010	2650	6177	5450	2915	4648	6239	6907	4768	1173	1251	5233	2318
	2011	1886	3283	4095	2556	3721	4586	5761	5254	2106	817	1973	2247
Merced	2009	37	2699	28685	1733	4495	4055	4592	5380	3714	2155	191	0
	2010	875	395	2820	1104	2826	2811	8604	11099	3048	6668	1142	0
	2011	178	176	4316	3754	3256	1527	6303	6417	2332	594	3064	2115
Madera	2009	0	81	4403	284	3737	3597	8605	8857	1996	2525	2741	0
	2010	306	607	1506	36	3788	3500	4313	7541	2465	2955	2319	0
	2011	75	517	1297	971	2432	1744	4199	4702	1715	3821	2054	0
Average		5860	3536	9634	2663	9831	7847	20541	22179	9755	5829	2040	5043

Table 4. Top ten commodities/agricultural crops based on total use (mass of active ingredient), corresponding percentage, and acres treated in California (2009-2011).

Commodity	Total use	Percentage	Area applied
	lbs ai	%	Acre
Almond	823,990	21.6	406,315
Alfalfa	535,920	14.0	1,121,517
Walnut	519,824	13.6	281,843
Orange	496,081	13.0	147,715
Cotton	345,663	9.1	372,735
Grapes	340,639	8.9	181,971
Broccoli	132,885	3.5	97,717
Corn	106,006	2.8	131,798
Lemon	95,730	2.5	29,913
Sugarbeet	82,161	2.2	123,557

Table 5. Chlorpyrifos use by year and average annual value for the top ten 0 commodities/agricultural crops in the top five counties.

County	Crop	Year			Average
		2009	2010	2011	
		lbs ai			lbs ai
Kern	Almond	173,083	70,210	186,265	143,186
	Alfalfa	18,977	41,109	151,484	70,523
	Grapes	51,414	51,819	66,073	56,435
	Orange	23,722	33,438	78,333	45,164
	Tangerine	6,821	8,343	51,269	22,144
	Cotton	125	8,217	26,130	11,491
	Lemon	3,083	6,524	8,649	6,086
	Sorghum	732	268	8,081	3,027
	Onion	348	1,515	6,703	2,855
	Wheat	235	1,847	5,968	2,683
Fresno	Almond	73,669	84,179	180,183	112,677
	Cotton	13,864	33,684	194,741	80,763
	Orange	21,529	42,313	82,804	48,882
	Alfalfa	24,202	21,522	57,747	34,490

Table 5. continued.

County	Crop	Year			Average
		2009	2010	2011	
			lbs ai		lbs ai
Fresno	Grapes	15,128	14,950	34,715	21,598
	Tangerine	2,989	5,204	17,554	8,583
	Peach	7,344	6,392	8,900	7,545
	Walnut	2,364	2,773	12,137	5,758
	Corn	3,827	3,399	8,142	5,123
	Nectarine	3,233	3,101	7,637	4,657
Tulare	Orange	66,374	87,329	314,092	155,931
	Alfalfa	13,317	36,629	92,272	47,406
	Walnut	17,225	11,422	41,235	23,294
	Almond	8,309	12,638	41,157	20,702
	Corn	4,402	8,848	42,322	18,524
	Grapes	12,594	12,977	19,095	14,889
	Tangerine	5,193	5,503	14,334	8,343
	Lemon	1,863	4,279	10,749	5,630
	Nectarine	3,104	2,381	5,018	3,501
	Wheat	4,447	1,280	4,484	3,404
Kings	Cotton	22,020	70,216	217,037	103,091
	Alfalfa	10,938	20,677	62,113	31,243
	Walnut	10,948	7,050	12,888	10,295
	Almond	3,031	8,094	5,884	5,669
	Corn	3,044	2,704	6,679	4,142
	Sorghum	718	1,068	3,716	1,834
	Grapes	1,014	446	825	762
	Wheat	440	75	1,394	636
	Onion	0	0	1,045	348
	Nectarine	0	36	262	99
Stanislaus	Almond	23,837	23,916	53,688	33,814
	Corn	65,737	4,056	21,332	30,375
	Walnut	23,949	25,212	41,581	30,247
	Grapes	5,663	5,035	5,815	5,505
	Alfalfa	3,311	2,382	6,139	3,944
	Sweet potato	889	729	6,129	2,583
	Citrus Fruits	0	952	3,338	1,430

Table 5. continued.

County	Crop	Year 2009	2010	2011	Average
			lbs ai		lbs ai
Stanislaus	Peach	1,199	866	0	688
	Apple	907	791	183	627
	Outdoor grown plants	20	187	603	270

Table 6. Statewide chlorpyrifos use by method of application in 2009-2011.

Application method	Total Number	Sum Applied Amount	Average Applied Amount	Sum Applied Area	Average Area	Average Rate
		lbs ai		ac		lbs ai/ac
Ground	55,407	2,257,671	41	1,231,927	22	1.8
Aerial	21,693	1,085,502	50	1,235,480	57	0.9
Other	454	19,283	42	23,511	52	0.8
Sum	77,554	3,362,455		2,490,918		

Similar patterns can be observed in the cumulative distribution of treated area whereas there are small discrepancies between years at the 90th percentile level (Figure 2B). The application rate of chlorpyrifos differentiates slightly at the 95th percentile level between years (4.0 lbs ai/ac in 2009, 5.1 lbs ai/ac in 2010, and 5.6 lbs ai/ac in 2011) (Figure 2C). For grapefruit, lemons, oranges and other citrus fruits, the recommended maximum label application rate for chlorpyrifos is 6 lbs ai/acre.

6. AIR MONITORING RECOMMENDATIONS

Using recent pesticide use report information for 2009-2011, CPDR suggests that the CARB monitors one ground application (67 %) on site for chlorpyrifos and its oxygen analog. Based on a preliminary assessment of the toxicology data, CDPR requests targeting to the concentration level of 0.03 µg/m^3 as the quantitation limits for chlorpyrifos and the chlorpyrifos oxygen analog (CDPR, 2013).

6.1 Application site monitoring

Table 4 indicates that almost 81 % of Chlorpyrifos use was on the orchards, cotton, and grapes. The selection of county and time of monitoring can be made based on the data

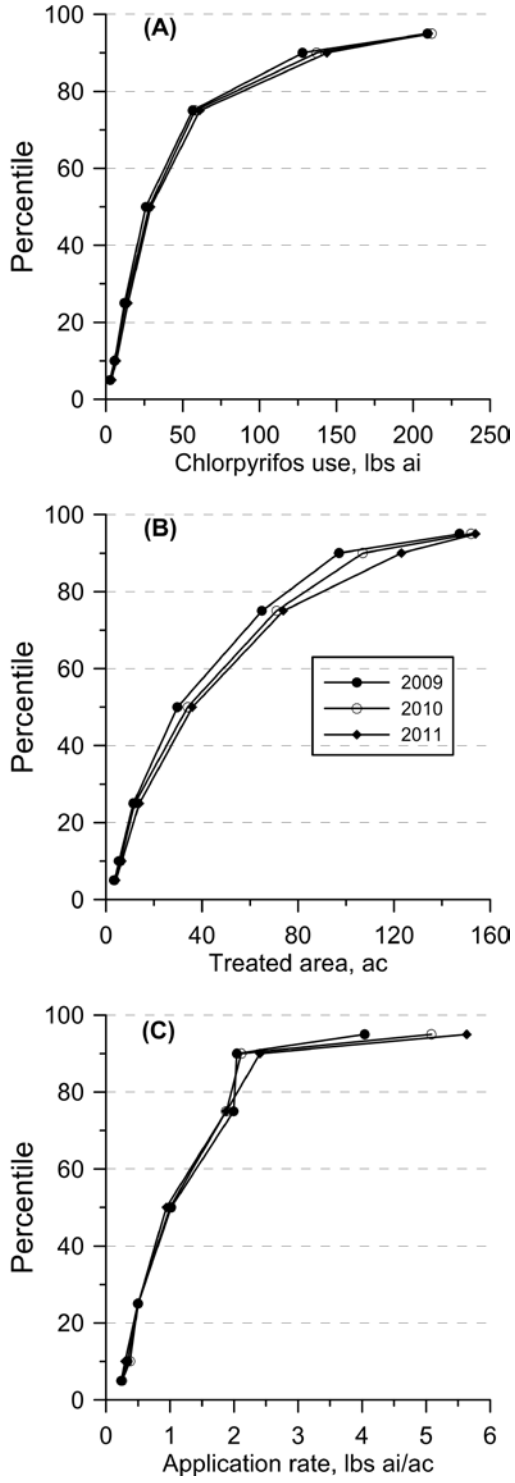

Figure 2. Cumulative frequency plot of chlorpyrifos for (A) amount applied (lbs ai), (B) treated area (ac) per application, and (C) rate of application, vs. percentile by year (2009–2011) in California's top ten counties.

provided in Tables 3 and 4. The CDPR suggests that ground application should be chosen as the method of application in the monitoring study with an application rate of 2-3 lbs ai/ac to a treated field of between 20-40 acres in size.

A minimum of eight samplers should be positioned around the application site, one on each side of the site and one at each corner. A ninth replicate sampler should be collocated at one position. Ideally, samplers should be placed a minimum of 20 m from the application area. CDPR recommends that CARB coordinate with the County Agricultural Commissioner for site selection. If a site is located on private property, permission from the property owner must be obtained before monitoring. Air samples should be taken before, during, and after application and for three daytime/overnight sampling periods. The start and end of the application should occur during daylight hours. Table 7 denotes the recommended sampling periods for collecting air monitoring samples before (pre-application), during (application), after application (post-application), and for three day time/overnight sampling periods.

Table 7. Sampling periods recommended for air monitoring an onsite.

Sampling periods	Start time	End time
1. Pre-application	12-24 h prior to application	Prior to application start
2. Application	Start of application	Until 1 h before sunset
3. Post-application	1 h before sunset 1 h after sunrise 1 h before sunset 1 h after sunrise 1 h before sunset	1 h after sunrise† 1 h before sunset 1 h after sunrise† 1 h before sunset 1 h after sunrise†

† All overnight samples must include the period from one hour before sunset to one hour after sunrise.

Moreover, the field spikes and trip blanks should be prepared in the laboratory and run in the field with the samples for quality assurance. When CARB prepares the monitoring reports, CDPR requests the following information to be included accurately (use GPS coordinates if applicable with World Geodetic System [WGS84] of 1984):

1) A record of the application site, including topographic features.
2) A record of the positions of the monitoring equipment with respect to the application site, including the exact direction and distance of the samplers from the edge of the application site.
3) A record of pesticide application, including application dosage or quantity of pesticide applied, application starting and ending time, method and application rate, etc.

4) A drawing of the monitoring site showing the precise location of the meteorological equipment, trees, buildings, and other obstacles with respect to North (identified as either true or magnetic North).
5) Meteorological data collected at 5-minute intervals including wind speed and direction, humidity, air temperature and comments regarding degree of cloud cover.

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APPENDIX B

Sampling Protocol

California Environmental Protection Agency
AIR RESOURCES BOARD

Monitoring and Laboratory Division
Air Quality Surveillance Branch

Sampling Protocol for O, O-diethyl O-3,5,6-trichloro-2-pyridyl-phosphorothioate (Chlorpyrifos) Application Study

July 23, 2015

Prepared by:

James Pham
Air Pollution Specialist
Special Purpose Monitoring Section

Signatures:

_____

Kenneth R. Stroud, Chief Date
Air Quality Surveillance Branch
Air Resources Board

_____

Mac McDougall, Manager Date
Special Purpose Monitoring
Air Quality Surveillance Branch

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Appendix

1.0 Introduction

The California Department of Pesticide Regulation's (DPR) memorandum dated February 19, 2014, "Proposed Toxic Air Contaminant Monitoring For 2014", requests that the Air Resources Board (ARB) conduct a comprehensive air monitoring study for the insecticide O, O-diethyl O-3,5,6-trichloro-2-pyridyl-phosphorothioate (Chlorpyrifos) during a ground application.

This study will consist of eight sampling periods.

1) A background sample period duration time minimum 12-24 hours (begin Thursday)
2) Application sampling period begins Thursday Evening/Friday Morning until one (1) hour after end of application
3) The first post application **daytime** sampling period begins Friday morning one (1) hour after end of application until one (1) hour before sunset.
4) Post application #2 **overnight** sampling period begins Friday evening one (1) hour before sunset and is removed one (1) hour after sunrise on Saturday morning.
5) Post application #3 **daytime** sampling period begins Saturday morning one (1) hour after sunrise and is removed one (1) hour before sunset.
6) Post application #4 **overnight** sampling period begins Saturday evening one (1) hour before sunset and is removed one (1) hour after sunrise Sunday morning.
7) Post application #5 **daytime** sampling period begins Sunday morning one (1) hour after sunrise and is removed one (1) hour before sunset.

The background sampling period will be performed 12 to 24 hours prior to the application of Chlorpyrifos. The application sampling period will begin 1 hour prior to the application of Chlorpyrifos and stop 1 hour after application completion. There will be a total of 85 resin sorbent tube samples: 63 background/application/post application, nine (9) field spikes, one (1) trip spike, one (1) trip blank, one (1) field blank, and ten (10) spares.

Background sampling will be started the day before the application and end approximately one (1) hour prior to the start of the application or when the elapsed time reaches a minimum of 12 hours. Eight (8) background samplers will be placed around the perimeter of the field along with one (1) collocated sampler and one (1) field spike sampler on the downwind side.

2.0 Project Goals and Objectives

The primary goal of this monitoring project is to measure the concentrations of Chlorpyrifos in the ambient air during and after application.

To achieve the project goal, the following objectives should be met:

1) Identification of monitoring sites that mutually satisfies criteria for ambient air sampling and DPR's requirements.
2) Appropriate application of sampling/monitoring equipment to determine Chlorpyrifos concentrations in the air adjacent to the application.
3) Application of relevant field quality assurance/quality control practices to ensure the integrity of field samples.

4) A final report containing all relevant information, data and results gathered in the course of MLD's activities during the planning and execution of this project

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4.0 Study Location

A Chlorpyrifos application is planned for July in the town of Linden, CA in San Joaquin County. The field is located at coordinates 37.992133, -121.096870. The field is located at the intersection of Duncan Road and Wagner Lane.

5.0 Study Design

The Chlorpyrifos sampling schedule is listed in Table 1 (Sampling Periods). For July 2015, sunrise occurs at 0500 PST (6:00 AM PDT) and sunset occurs at 0710 PST (08:10PM PDT).

TABLE 1: SAMPLING PERIODS

All overnight samples must include the period from one hour before sunset to one hour after sunrise.

a) Background sampling will start the day before the application for a minimum of 12 hours, but no more than 24 hours. The background samples will be removed at least one (1) hour prior to the start of the application. The background samplers will be installed at all four corners and at each of the four sides of the field at quarterly lengths with one (1) field spike sampler and one (1) collocated sampler next to the downwind site for a total of ten (10) samplers. The field spike samples will be pre-spiked with a concentration of 0.05 µg of Chlorpyrifos per sample.

b) The application sampling period will start approximately 30 minutes prior to the ground application of Chlorpyrifos and will continue until six (6) hours into the application (note percentage of field covered if application is still in progress) or until 1 hour after the completion of the application, whichever is sooner. The first post application sample will start one (1) hour after end of application until one (1) hour after sunrise. Second post application **daytime** sampling period will start one (1) hour after sunrise and continue until one (1) hour before sunset. Third post application **overnight** sampling period will start one (1) hour before sunset and will continue until one (1) hour after sunrise. Fourth post application **daytime** sampling period will start one (1) hour after sunrise and will continue until one (1) hour before sunset. Fifth post application **overnight** sampling period will start one (1) hour before sunset and will continue until one (1) hour after sunrise.

c) There will be eight (8) sampling sites around the field. For a square field, four (4) sites will be located at each corner and four (4) sites will be located at quarterly lengths on each side. The projected downwind site will have two additional samplers, one (1) collocated and one (1) field spike, located within 0.6 meters of the primary sampler. All sampler intakes will be 1.7 meters (67 $\pm$ 6 inches) above the ground. Samplers will be placed 20 $\pm$10 meters (33 to 98 feet) from the edge of the field.

d) Each sample will be collected by passing a measured volume of ambient air through one XAD-2 resin sorbent tube that is mounted on a sampling tree as shown in Figure 1. Sample flow is controlled by an inline rotameter (flow range of 0-5 LPM) and the resin sorbent tube will be protected from direct sunlight or rain. Prior to each sampling period, the sampler is checked for leaks. After the sample resin sorbent tube is installed, the flow rate will be set at 3.0 liters per minute

(lpm) using a digital mass flow meter. The flow rate will be checked at the end of each sampling period and the average of the start and stop flows shall be 3.0 lpm ±20%. At the end of each sampling period, the tubes will be placed in culture tubes with an identification label affixed and placed in a dry ice cooler. The field log sheet and resin sorbent tube label will contain the following information: log #, sample name, sampler ID number, start and end date/time, start/end elapsed time meter reading, start/end mass flow meter display reading, comments (if applicable), weather conditions and the start/end initials of the operator. The exposed XAD-2 resin sorbent tubes (SKC #226-30-06) with 400 and 200 mg of packing are stored in an ice chest (on dry ice) or in a freezer until extracted in the laboratory.

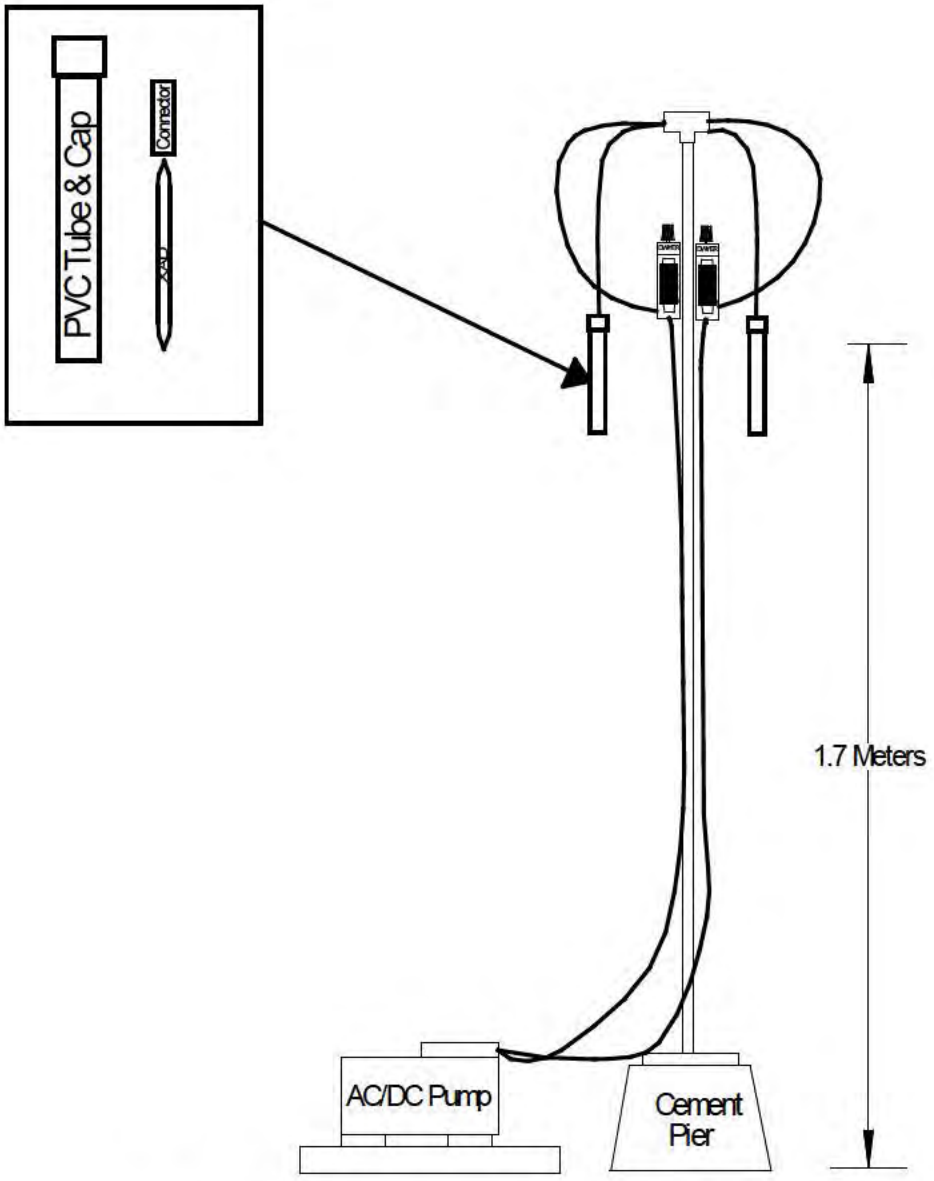

FIGURE 1: AIR SAMPLER TREE WITH PUMP

e) In order to reduce direct exposure to ARB staff during the pesticide application period all samplers will begin a minimum of thirty minutes prior to the start of the

application. At the end of each sampling period the following general procedure will occur at each site; flows will be verified, documentation completed, all resin sorbent tubes removed, the batteries replaced, a new resin sorbent tube installed and flows adjusted if necessary. Field notes and observations will be recorded (such as Chlorpyrifos application flow rate and total amount of Chlorpyrifos applied).

f) Meteorological data will be collected using a Met-One Automet portable meteorology system. The Automet will be located no closer than twenty meters from the edge of the field being monitored. The meteorological sensors will be installed between 7.5 meters above the ground. The AutoMet station will continuously measure and record 5 minute averages for wind speed, wind direction, ambient temperature and percent relative humidity throughout the background and application sampling periods.

g) The MLD will provide DPR with a final report containing all relevant information, collected data and analytical results gathered during the course of the study.

6.0 Sampling and Analysis Procedures

Special Purpose Monitoring Section (SPM) staff will hand-carry resin sorbent tubes to and from MLD's laboratory in Sacramento, and to and from the sampling location. The resin sorbent tubes will not be exposed to extreme conditions or subjected to rough handling that might cause loss or degradation of sample. At the end of the each sampling period, all resin sorbent tubes will be removed from the sampler, placed in a culture tube, labeled, and secured in a dry ice cooler.

After each sampling period, the operator will replace the batteries for each pesticide sampler with charged batteries, install a new resin sorbent tube, and install the rain/sun shield over the resin tube at each sampling site. The resin sorbent tube field log sheet (See Figure 2) shall be filled out along with the resin sorbent tube label. Prior to any sampling, flows will be set to 3.0 $\pm$ 0.3 lpm. At the start of each sampling period, the pesticide samplers will be manually turned on and the start date, time, elapsed time meter reading and indicated flow rate will be recorded. At the end of each sampling period, the flow rate will be measured, the pesticide sampler manually shut off and the following recorded on the resin sorbent tube field log sheet; end date, time, elapsed time meter reading and flow.

Sampling will occur as scheduled unless ambient conditions at the start include rain or instantaneous gusts of wind over ten (10) miles per hour. All reported sampling times, including meteorological data, will be reported in Pacific Standard Time (PST).

The Northern Laboratory Branch (NLB) will supply Special Purpose Monitoring with 85 resin sorbent tube samples: 63 background/application/post application include nine (9) collocated, nine (9) field spikes, one (1) trip spike, one (1) trip blank, one (1) field blank, and ten (10) spares. A label will be affixed around the top section of the resin sorbent tube identifying the sample. Spikes and other QC resin sorbent tubes will be identified. The NLB will perform analyses for Chlorpyrifos on all collected samples and report results to SPM in electronic format (Excel) and hardcopy. Laboratory analysis will be

performed in accordance with the draft standard operating procedures, "Method Development for the Sampling and Analysis of O, O-diethyl O-3,5,6-trichloro-2-pyridyl-phosphorothioate ..." The current analytical Method Detection Limit (MDL) is 0.002 ug/mL for Chlorpyrifos. The laboratory's operating procedure is included in this Protocol as Appendix A.

The following resin sorbent tube validation and analytical quality control criteria will be followed during pesticide analysis.

1. **Sample Hold Time**: Sample hold time criteria will be consistent with the laboratory's operation procedure stated 28 days.

2. **Duplicate Analysis**: Laboratory to provide duplicate analytical results and the corresponding relative percent difference (RPD)

3. **Method Detection Limit (MDL)**: Sample analysis results less than the MDL shall be reported as a less than numerical value. This less than numerical value shall incorporate any dilutions (dilution factor will be included in the report)

4. **Analytical Linear Range**: Analytical results greater than 10% of the highest calibration standard shall be diluted and reanalyzed within the calibrated linear range.

7.0 List of Field Equipment

Quantity	Item Description
(1)	Met-One Automet portable meteorology system consisting of a data logger and calibrated sensors measuring 5 minute averages for wind speed, direction, ambient temperature, and relative humidity.
(1)	Measuring Wheel
(1)	200 foot measuring tape
(1)	Tripod and compass
(1)	Global Positioning System (GPS) with backup batteries and carrying case
(1)	Digital Camera with backup batteries and carrying case
(2)	Aalborg certified mass flow meter 0-5 lpm
(92)	Resin sorbent tubes (10 field spikes, 1 trip spike, 1 trip blank, 56 background/application/post application and 10 spares)
(10)	Pesticide sampler each equipped with one (1) each sampling train and voloflows setup to sample one (1) resin tube.
(12)	Pump, 12 VDC.
(80)	Battery, 12 VDC 40 amps.
(6)	Chargers

8.0 Quality Control

Quality control procedures will be observed to ensure the integrity of samples collected in the field. National Institute of Standards and Technology (NIST) traceable transfer

standards will be used to calibrate meteorological sensors and measure sample flow rates.

The sample flow rate of the pesticide samplers will be measured using certified mass flow meters with a range of 0-5 liters per minute.

The metrological sensors will be calibrated and aligned following the procedures outlined in the standard operating procedures on the Air Monitoring Web Manual at the following link.

http://arb.ca.gov/airwebmanual/amwmn.php?c=5&t=sop

A label will be affixed around the top section of the resin sorbent tube identifying the sample with the following information: log #, sample name, sampler ID number, start and end date and time, start and end elapsed time meter (ETM) reading, start and end mass flow meter display reading and operators initials. Collocated (side-by-side) air samplers will operate at one site during the study period. This collocated site will be located at the projected downwind site.

Field Spike (FS): Ten (10) field spikes will be prepared by the laboratory by injecting resin sorbent tubes with a known concentration of Chlorpyrifos. The field spike resin sorbent tubes will be coupled with a pesticide sampler and collocated next to the projected downwind sampler. One (1) each field spike will be collected during each sampling period.

Trip Spike (TS): A trip spike will be prepared by the laboratory by injecting a resin sorbent tube with a known concentration of Chlorpyrifos with the same level as the field spikes. The trip spike resin sorbent tube accompanies the sample resin sorbent tubes from the lab to the field but is not sampled.

Trip Blank (TB): A trip blank will be prepared by the field staff. The trip blank resin sorbent tube accompanies the sample resin sorbent tubes from the lab to the field and back to the lab but is not sampled.

Collocated (C): Collocated samples will be collected at the designated down wind sampling site during all sampling periods.

Valid samples are those that have a final corrected average flow within ± 20% of 3.0 LPM.

Site/Sample Identification

The Chlorpyrifos application sampling sites will be named accordingly for the background, ambient, application, and post application. The naming convention will follow the formula “Site Location – Sample Number.” The background samples will have a name leading with “BKG.” Collocated and field spikes will have an additional C or FS in the name.

Background Site Naming:
BKG - *Site Location*

Application and Post-Application Site Naming:
Site Location - *Sample Number* (C/FS, if applicable)

Letter Abbreviations:
N = North Side
NE = North-east Corner
E = East Side
SE = South-east Corner
S = South Side
SW = South-west Corner
W = West Side
NW = North-west Corner

C = Collocated
FS = Field Spike

TS = Trip Spike
TB = Trip Blank
FB = Field Blank

Following the quality control procedures listed above will ensure the quality and integrity of the samples collected in the field and will insure accurate field and laboratory results.

9.0 Deliverables

9.1 Northern Laboratory Branch (NLB) Deliverables

Within 90 days after the last collected sample is received at the laboratory, the NLB will provide SPM with a report that will include the following topics:

1) Table(s) of sample to include:
   a. Sample identification (name).
   b. Date sample received from field.
   c. Date sample analyzed.
   d. Dilution ratio.
   e. Analytical results.
2) All equations used in calculating analytical results.
3) Table of duplicate results including calculated relative percent difference (RPD) when applicable.
4) Table of collocated results.
5) Table of analytical results from all field, trip and laboratory spikes including percent recoveries when applicable.
6) Table of analytical results from all trip blanks.
7) Table of analytical results from all laboratory blanks, standards and control checks performed, including dates performed and relative percent recoveries when applicable.

8) Copy or location of analytical method or Standard Operating Procedures (SOP) used for analysis.
9) Section or provision listing or reporting any and all deviations from analytical SOP and this protocol.

9.2 Air Quality Surveillance Branch Deliverables

Within 90 days from receipt of the final results report from the NLB, AQSB will provide DPR with a report containing the following topics:

1) Sampling Protocol.
2) Personnel Contact List.
3) Site Maps.
4) Site Photographs.
5) Site Descriptions and Measurements (site, sampler, GPS coordinates, inlet height, distance to roads, site-specific comments, Chlorpyrifos application rate, and total pounds or gallons of Chlorpyrifos applied).
6) Sample Summary Table.
7) Field Log Sheets.
8) Laboratory Analysis Reports with calculations in electronic format.
9) Met Station and Sampler Calibration Reports.
10) Transfer Standards' Certification Reports.
11) Disk containing electronic files of 5-minute averaged Meteorological Data.
12) Disk containing electronic files of Report.

XAD-2 RESIN SORBENT TUBE FIELD LOG SHEET

Project: Chlorpyrifos Pesticide Application Air Monitoring

Start Flow Set: 3.0 ±0.3 lpm End Flow Criteria: 3.0 lpm ±20%

Log #	Sample Name	Sampler ID Number	Date & Time Entry Example (6/14/08 13:42)		Elapsed Time Meter (ETM)		Mass Flow Meter Display		Corrected Average Flow	Comment Number	Weather K,P,C,F&R		Initials	
			Start	End	Start	End	Start	End			Start	End	Start	End

MFM Used #: _____ **Slope:** _____ **Intercept:** _____

1 of 6

Weather Codes: K = Clear, P = Partly Cloudy, C = ≥67% Cloudy, F = Fog and R = Rain (any)

Figure 2: Resin Sorbent Tube Field Log Sheet

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APPENDIX C

Laboratory Analysis Method

California Environmental Protection Agency

Air Resources Board

Method Development for the Sampling and Analysis of *O*, *O*-diethyl *O*-3,5,6-trichloro-2-pyridyl-phosphorothioate (Chlorpyrifos) and its Oxygen Analog (Chlorpyrifos-Oxon) in Application Air using Gas Chromatography/Flame Photometric Detector

Special Analysis Section
Northern Laboratory Branch
Monitoring and Laboratory Division

DRAFT

Revision 1
7/3/13

Approved by:

Russell Grace, Manager
Special Analysis Section

1. SCOPE

The current method is for the analysis of O, O-diethyl O-3,5,6-trichloro-2-pyridyl-phosphorothioate (Chlorpyrifos) and its Oxygen Analog (Chlorpyrifos-Oxon) using a gas chromatograph with a flame photometric detector. The procedure is for the analysis of application air monitoring of Chlorpyrifos and Chlorpyrifos-Oxon using XAD-2 resin tubes. The Department of Pesticide Regulation (DPR) asked the Air Resources Board (ARB) to analyze for Chlorpyrifos and Chlorpyrifos-Oxon during agricultural application monitoring with an estimated quantitation limit of 0.03 $\mu g/m^3$.

2. SUMMARY OF METHOD

Resin tubes, XAD-2, are placed on the sampler for 24 hours at a flow rate of 3.0 liters per minute (LPM). The samples are stored in an ice chest or refrigerator until extracted with dichloromethane (DCM). A gas chromatograph with a flame photometric detector (FPD) is used for analysis.

3. INTERFERENCES/LIMITATIONS

Interferences may be caused by contaminants in solvents, reagents, glassware and other processing apparatus that can lead to discrete artifacts or elevated baselines. A method blank, including both solvent and resin, must be analyzed with each batch of samples to detect any possible interference.

4. EQUIPMENT AND CONDITIONS

A. Instrumentation

Agilent 7890A Series gas chromatograph with flame photometric detector

Injector: Splitless, Liner: sp/less single taper liner with glass wool
Heater 220◦C, Pressure 10 psi

Column: Agilent 19091J-413 HP-5 5% Phenyl Methyl Siloxane, 30 meter, 320 µm i.d., 0.25 µm thickness, or equivalent

GC Temperature Program: Oven initial 150◦C, hold 2 min. Ramp to 230°C @ 10°C/min., hold 7.0 min.

Flows: Column: He: 1.34 ml/min, 10.0 psi. (average velocity: 28.968 cm/sec)
Detector: H2: 95 ml/min, Air: 75 ml/min, Makeup (N2): 30 ml/min

Retention times: Chlorpyrifos-Oxon 10.883 min; Chlorpyrifos 11.037 min

B. Auxiliary Apparatus

1. Precleaned vials, 8 ml capacity with Teflon caps
2. Whatman Disposable Glass Microfiber Syringe Filter 25mm GD/X
3. Disposable syringes, 3 ml
4. Sonicator
5. GC vials with septum caps

C. Reagents and Sampling Media

1. Dichloromethane, Pesticide grade or better
2. Chlorpyrifos, Chem Service lot# 1361200 Chlorpyrifos, Chem Service lot# 1408200, Chlorpyrifos-Oxon, Chem Service lot# 1284900
3. XAD-2 resin sorbent tubes, Cat. No. 226-30-06, SKC, Inc. Eighty Four, PA

5. ANALYSIS OF SAMPLES

1. It is necessary to analyze a solvent blank with each batch of samples. The blank must be free of interferences. A solvent blank must be analyzed after any sample that may result in possible carry-over contamination.

2. A five-point calibration curve shall be analyzed with each batch of samples. Due to instrument sensitivity, Chlorpyrifos-Oxon will be calibrated at a concentration two and a half times the concentration of Chlorpyrifos. The calibration will be 0.02-0.20 µg/ml for Chlorpyrifos and 0.05-0.50 for Chlorpyrifos-Oxon.

3. A calibration check sample is run after the calibration, after every ten samples and at the end of the sample batch. The value of the calibration check must be within $\pm 3\sigma$ (the standard deviation) or $\pm$10% of the expected value whichever is greater. If the calibration check is outside this limit, then those samples in the batch after this calibration check need to be reanalyzed.

4. With each batch of XAD-2 samples analyzed, a laboratory blank and a laboratory control spike will be run concurrently. A laboratory blank is XAD-2 extracted and analyzed the same way as the samples. A laboratory control spike is XAD-2 spiked with a known amount of standard. The laboratory control sample is extracted and analyzed the same way as the samples. Laboratory control samples should have recoveries that are greater than or equal to 70% of the theoretical spiked value.

5. For XAD-2 analysis, score and snap the sample resin tube, transfer the front bed of the resin tube into an 8-ml vial. (Save the back-up bed for future analysis if necessary.) Rinse the tube with 3.0 ml of DCM into the extraction

vial. Cap and place the vial in the sonicator for one hour. Filter the samples using a 3-ml syringe capped with a glass microfiber syringe filter directly into a GC vial and cap securely.

6. The atmospheric concentration of the XAD-2 samples is calculated according to:

   Concentration ($\mu g/m^3$) = Extract Concentration (µg/ml) X 3 ml / Air Volume Sampled (m^3)

6. QUALITY ASSURANCE

A. Instrument Reproducibility

The reproducibility of the instrument and analytical method was established by analyzing five (5) 1.0 µl injections of Chlorpyrifos/Chlorpyrifos-Oxon standard at three concentrations (low, mid, and high). The low, mid and high concentrations were 0.02/0.05, 0.05/0.125 and 0.20/0.50 µg/ml, respectively. Table 1 and Table 2 show the results of the instrument reproducibility for Chlorpyrifos and Chlorpyrifos-Oxon.

TABLE 1

REPRODUCIBILITY STUDY
CHLORPYRIFOS

Sample Number	Target Concentration (µg/ml)		
	Low Level 0.02	**Mid Level 0.05**	**High Level 0.20**
1	0.02	0.05	0.19
2	0.02	0.05	0.19
3	0.02	0.05	0.19
4	0.02	0.05	0.19
5	0.02	0.05	0.19
Average	**0.02**	**0.05**	**0.19**
SD	**0.00**	**0.00**	**0.00**
RSD	**2.04**	**1.44**	**0.85**

TABLE 2

REPRODUCIBILITY STUDY
CHLORPYRIFOS-OXON

Sample Number	Target Concentration (µg/ml)		
	Low Level 0.05	**Mid Level 0.125**	**High Level 0.50**
1	0.057	0.114	0.474
2	0.055	0.119	0.475
3	0.056	0.113	0.491
4	0.056	0.112	0.501
5	0.057	0.113	0.502
Average	**0.056**	**0.114**	**0.489**
SD	**0.001**	**0.003**	**0.013**
RSD	**1.679**	**2.334**	**2.745**

B. Calibration

A five-point calibration curve is made ranging from 0.02/0.05 µg/ml to 0.20/0.50 µg/ml for Chlorpyrifos and Chlorpyrifos-Oxon.

C. Calibration Check

A calibration check sample is run after the calibration, after every ten samples and at the end of the sample batch to verify the system is in calibration. The value of the check must be within $\pm 3\sigma$ (the standard deviation) or $\pm 25\%$ of the expected value whichever is greater. If the calibration check is outside the limit, then those samples in the batch after this calibration check need to be reanalyzed.

D. Method Detection Limit

The method detection limit (MDL) is based on US EPA MDL calculation. Using the analysis of seven (7) replicates of a low-level matrix spike, the method detection limits (MDL) and the estimated quantitation limits (EQL) for Chlorpyrifos and Chlorpyrifos-Oxon are calculated by: MDL = 3.14*(std dev values), where std dev = the standard deviation of the concentration calculated for the seven replicate spikes. Table 3 shows the results of the EQL determination.

TABLE 3

METHOD DETECTION LIMIT AND ESTIMATED QUANTITATION LIMIT DETERMINATION

low standard replicate#	Chlorpyrifos (µg/ml)	Chlorpyrifos-oxon (µg/ml)
1	0.017	0.058
2	0.016	0.061
3	0.016	0.061
4	0.015	0.063
5	0.017	0.064
6	0.015	0.067
7	0.017	0.069
average	0.016	0.063
std deviation	0.001	0.004
MDL	0.002	0.012
MDL (µg/ml)*	0.007	0.036
EQL (µg/m3)**	0.01	0.04

MDL = 3.143*STD * per sample, assuming a 3 ml extract volume
EQL = 5*MDL ** assuming a sampler flow rate of 3 liters per minute

Results below the EQL but greater than or equal to the MDL are reported to one significant figure. Results less than MDL are reported as the calculated MDL to one significant figure.

E. Collection and Extraction Efficiency (Recovery)

Chlorpyrifos and Chlorpyrifos-Oxon at low and high-end concentrations was spiked on XAD-2 tubes (four at each concentration). The spiked tubes are placed on a field sampler with airflows of 3 LPM for 24 hours. The samples were extracted with DCM and prepared as described in section 5. The average percent recovery of Chlorpyrifos should be $\pm$ 20% of the expected value. The average percent recovery of the low spikes and high spikes was greater than 80%. Tables 4 and 5 show the results of the recovery study.

TABLE 4

COLLECTION AND EXTRACTION EFFICIENCY OF CHLOPYRIFOS

Spike Level (µg/ml)	Sample 1 (µg/ml)	Sample 2 (µg/ml)	Sample 3 (µg/ml)	Sample 4 (µg/ml)	Average (µg/ml)	Standard Deviation	Average % Recovery
low level (0.02 µg/ml)	0.016	0.018	0.021	0.017	0.018	0.002	89.01
high level (0.20 µg/ml)	0.189	0.190	0.186	0.195	0.190	0.003	95.14

TABLE 5

COLLECTION AND EXTRACTION EFFICIENCY OF CHLORPYRIFOS-OXON

Spike Level (µg/ml)	Sample 1 (µg/ml)	Sample 2 (µg/ml)	Sample 3 (µg/ml)	Sample 4 (µg/ml)	Average (µg/ml)	Standard Deviation	Average % Recovery
low level (0.05 µg/ml)	0.080	0.084	0.076	0.079	0.080	0.003	159.54
high level (0.50 µg/ml)	0.633	0.661	0.634	0.671	0.650	0.016	129.93

F. Breakthrough

A breakthrough study was conducted using XAD-2 tubes spiked with low and high concentrations of Chlorpyrifos and Chlorpyrifos-Oxon. The spiked tubes were placed on field samplers with airflows of 3 LPM for 24 hours. Chlorpyrifos and Chlorpyrifos-Oxon were not detected in the secondary section of the XAD-2 cartridges.

G. Storage Stability

A 28-day storage stability study for Chlorpyrifos and Chlorpyrifos-Oxon was conducted with spiked XAD cartridges. Fifteen XAD cartridges were spiked with 0.02/0.05 µg/ml Chlorpyrifos/Chlorpyrifos-Oxon and fifteen XAD cartridges were spiked with 0.20/0.50 µg/ml Chlorpyrifos/Chlorpyrifos-Oxon. Three XAD cartridges were analyzed at each concentration the same day they were spiked to give day 0 results. The remaining spiked cartridges were stored in a freezer until analyzed at days 7, 14, 21, and 28 of the study. Chlorpyrifos and Chlorpyrifos-Oxon were stable up to 28 days at both concentrations. The results of the storage stability study are shown in Tables 6 and 7.

TABLE 6

STORAGE STABILITY STUDY
CHLOPYRIFOS

Spike Level (µg/ml)	Day 0 Avg (µg/ml)	Day 7 Avg (µg/ml)	Day 14 Avg (µg/ml)	Day 21 Avg (µg/ml)	Day 28 Avg (µg/ml)	Average Day 0-28 (µg/ml)	Standard Deviation	Average % Recovery
low level (0.02 µg/ml)	0.018	0.017	0.019	0.018	0.018	0.018	0.001	88.38
high level (0.20 µg/ml)	0.178	0.195	0.196	0.194	0.195	0.192	0.007	95.83

TABLE 7

STORAGE STABILITY STUDY
CHLOPYRIFOS-OXON

Spike Level (µg/ml)	Day 0 Avg (µg/ml)	Day 7 Avg (µg/ml)	Day 14 Avg (µg/ml)	Day 21 Avg (µg/ml)	Day 28 Avg (µg/ml)	Average Day 0-28 (µg/ml)	Standard Deviation	Average % Recovery
low level (0.05 µg/ml)	0.087	0.078	0.090	0.068	0.061	0.077	0.011	153.23
high level (0.50 µg/ml)	0.629	0.616	0.638	0.719	0.733	0.667	0.049	133.37

H. Safety

This procedure does not address all of the safety concerns associated with chemical analysis. It is the responsibility of the analyst to establish appropriate safety and health practices. For hazard information and guidance refer to the material safety data sheets (MSDS) of any chemicals used in this procedure.

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APPENDIX D

Laboratory Results Report

California Environmental Protection Agency

Air Resources Board

Analytical Results for Application Air Monitoring Samples in San Joaquin County for *O*, *O*-Diethyl *O*-3,5,6-trichloro-2-pyridyl-phosphorothioate (Chlorpyrifos) and its Oxygen Analog (Chlorpyrifos-Oxon).

DATE: October 2015

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1.0 INTRODUCTION

The Department of Pesticide Regulation (DPR) requested that the Air Resources Board (ARB) conduct application air monitoring analysis for o, o-Diethyl o-3,5,6-trichloro-2-pyridyl-phosphorothioate (Chlorpyrifos) and its oxygen analog (Chlorpyrifos-Oxon). This report covers the method development, analytical results, and quality assurance results for Chlorpyrifos and Chlorpyrifos-Oxon during an application study in San Joaquin County in 2015. DPR requested a method estimated quantitation limit (EQL) of 0.04 microgram per cubic meter (µg/m^3) for both Chlorpyrifos and Chlorpyrifos-Oxon. The EQL values achieved during this project were 0.01 µg/m^3 and 0.02 µg/m^3 for Chlorpyrifos and Chlorpyrifos-Oxon, respectively.

2.0 METHOD

2.1 Overview

XAD-2 resin tubes were used to collect the application air samples. After sampling, the resin tubes were stored at or below 4 degrees centigrade (°C) before extraction. The resin tubes were extracted with three milliliters (mL) of dichloromethane (DCM) and desorbed in an ultrasonic bath for 60 minutes. Sample extracts were then analyzed using a gas chromatograph with a flame photometric detector (GC-FPD). Sample analysis and quantitation used an external calibration method. The requested EQL for this method using XAD-2 resin tubes was to be calculated using a 24 hours (3 m^3) sampling period. However, sampling was performed at 12 hours, therefore the EQL calculated was based on 12 hours (1.5 m^3) of air collected. With the final extracted volume of 3 mLs, the EQL was determined to be 0.01 µg/m^3 and 0.02 µg/m^3 for Chlorpyrifos and Chlorpyrifos-Oxon, respectively

2.2 Method Detection Limit (MDL) and Estimated Quantitation Limit (EQL)

The determination of the MDL for this method followed the United States Environmental Protection Agency (U.S. EPA) procedures found in 40CFR Part 136 Appendix B. The MDL was determined by analyzing seven (7) replicates of low level matrix spikes at concentrations of 0.020 µg/mL and 0.050 µg/mL (0.06 µg/sample and 0.15 µg/sample) for Chlorpyrifos and Chlorpyrifos-Oxon, respectively.

Using five times the MDL value, the EQLs were determined to be 0.025 µg/sample and 0.05 µg/sample for Chlorpyrifos and Chlorpyrifos-Oxon, respectively.

An example calculation for the MDL and EQL are shown below in Table 1.

TABLE 1: Example Calculations for MDL and EQL.

For Chlorpyrifos: s = 0.00049µg/mL
*MDL = 3.143 x **s** = 3.143 x 0.00049 µg/mL = 0.0015µg/mL*
*MDL for total µg/sample = 3 x 0.0015µg/mL = 0.005µg/sample**
EQL = 5 x MDL = 5 x 0.0015µg/mL = 0.010µg/mL
*EQL for total µg/sample = 5 x 0.005µg/sample= 0.025µg/sample**

For Chlorpyrifos-Oxon: s = 0.001µg/ml
*MDL = 3.143 x **s** = 3.143 x 0.001µg/mL = 0.003µg/mL*
*MDL for total µg/sample = 3 x 0.003µg/mL = 0.010µg/sample**
EQL = 5 x MDL = 5 x 0.003µg/mL = 0.15µg/mL
*EQL for total µg/sample = 5 x 0.010 µg/sample = 0.05µg/sample**

***s** = the standard deviation of the concentration calculated for the seven replicate spikes*
** assuming a 3mL final extract volume*

3.0 CHLORPYRIFOS AND CHLORPYRIFOS-OXON RESULTS SUMMARY

The laboratory received a total of 63 application samples plus seven field spikes, one field blank, one trip blank, and one trip spike on July 27, 2015. Initial analyses of all application air samples and the corresponding quality control (QC) samples were performed within analytical hold times. The calibration range utilized was 0.02 µg/mL to 0.2 µg/mL for Chlorpyrifos and 0.05 µg/mL to 0.5 µg/mL for Chlorpyrifos-Oxon. The target concentration for the continuing calibration verification (CCV) standard for the sample analysis was 0.14 µg/mL and 0.34 µg/mL for Chlorpyrifos and Chlorpyrifos-Oxon, respectively.

Many of the samples required dilutions and /or re-analysis for Chlorpyrifos because the analyte concentrations exceeded the upper calibration range. The GC-FPD was recalibrated with an elevated calibration range of 0.02 µg/mL to 10 µg/mL for Chlorpyrifos and 0.05 µg/mL to 5.0 µg/mL for Chlorpyrifos-Oxon. The CCV for the re-analyzed samples was 5.0 µg/mL and 2.5 µg/mL, for Chlorpyrifos and Chlorpyrifos-Oxon, respectively. The re-analyses were performed after the 28 day hold time period.

4.0 ANALYTICAL QUALITY CONTROL RESULTS

4.1 System Blanks

A system blank was analyzed with each analytical batch, after each CCV, after every tenth sample, and after any samples that contained high levels of Chlorpyrifos or co-

extracted contaminants. System blanks were analyzed to insure the solvent and instrument did not contribute interferences to the analysis and to minimize possible carryover from high level samples. No target analytes were detected in any system blanks.

4.2 Method Blanks

The method blank is an XAD-2 resin tube prepared and analyzed as described for the application samples with each analytical batch. Fourteen (14) method blanks were analyzed and no target analytes were detected. All data were reported as less than EQL.

4.3 Laboratory Control Spike (LCS)

An LCS was spiked with 0.05 µg of Chlorpyrifos, extracted and analyzed as described for the samples, and analyzed with each analytical batch. The LCS recoveries were evaluated against the established control limits for this method and all were within the criteria limit.

4.4 Continuing Calibration Verification Standards (CCV)

A CCV was analyzed after every calibration curve, after every tenth sample, and at the end of each analytical batch. The CCV recoveries were evaluated against the established control limits for this method and all were within the criteria limit.

4.5 Laboratory Duplicates

Duplicates were analyzed with each batch after every 10 samples. All duplicates were within criteria limits.

5.0 FIELD SPIKES, TRIP SPIKES, TRIP AND FIELD BLANK RESULTS

5.1 Field Spikes

Seven XAD-2 resin tubes were spiked with 0.05 µg Chlorpyrifos. One of these spiked tubes was used for sample collection during each sampling period. Recovery results varied from 0.21 µg/sample to 21.51 µg/sample. Results for the associated unspiked collocated samples varied from 0.58 µg/sample to 21.96 µg/sample. The percent recovery for Chlorpyrifos in the field spike samples ranged from 47.4 percent to 132.5 percent.

5.2 Trip Spikes

One trip spike was prepared by spiking an XAD-2 resin tube with 0.05 µg Chlorpyrifos. The trip spike recovery was 97.9 percent.

5.3 Trip and Field Blanks

No target analytes were detected in the field and trip blanks. Results are reported as less than EQL.

6.0 DISCUSSION

The overall results for Chlorpyrifos ranged from <0.025 µg/sample to 46.76 µg/sample. The breakdown product, Chlorpyrifos-Oxon, was also detected in some of the samples ranging from 0.05 µg/sample to 0.56 µg/sample. Several samples required dilution and/or re-analyses because concentrations were outside the calibration range. Even though the re-analyses were done outside the 28 day hold time, results were within 10 percent of the initial results indicating no analyte loss. Results are summarized in Table 2.

Concentrations above the EQL were detected for Chlorpyrifos in the background samples collected at the Northeast Corner, South, Southwest Corner, and West sites. No Chlorpyrifos-Oxon was detected in any of the background samples.

Table 3 summarizes the results for the QC samples that were analyzed in this study. The trip spike and four laboratory control spikes had an average recovery of 93.5 percent. The laboratory control spikes were prepared and analyzed on the day of sample extraction and analyses. During re-analyses, the laboratory control spikes were re-analyzed with the new calibration curve to ensure that the low level detection for target analytes did not change. On 08/20/2015, no laboratory control spike was analyzed with the analytical batch due to a laboratory procedural error. A field blank and the trip blank were analyzed. Neither Chlorpyrifos nor Chlorpyrifos-Oxon was detected in either sample.

Seven field spikes were analyzed for this study. Collocated samplers were placed at the southeast corner of the field to collect primary and spiked samples. The average field spike recovery was 104 percent.

During the 4th and 5th post-application periods, seven (7) batteries that powered the samplers were stolen. The seven samples affected were NEC-5, E-5, SEC-5, SEC-C-5, SEC-FS-5, E-6 and SEC-6. The sampling durations ranged from three to eight hours for these samples. These samples were analyzed to determine if Chlorpyrifos and Chlorpyrifos-Oxon were collected during the abbreviated sampling periods.

Sample NEC-5 had the lowest concentration for Chlorpyrifos of 0.05 µg/sample and only three hours sampling duration. The field spike recovery results for SEC-FS-5 had the lowest percent recovery, 47.4 percent, compared to the other field spikes analyzed due to incomplete sampling of both the primary and collocated spiked samples. The other field spike samples shown in Table 3 had recoveries that were within the acceptable recovery range.

For every ten samples in each analytical batch, one sample was analyzed in duplicate. The precision was calculated as the percent difference (%D) of the sample results. All duplicate results were within the +/-25 percent criteria for each analyte. Duplicate results are summarized in Table 4.

Table 2: Air Monitoring Results, San Joaquin County 2015.

Site	Log Number	Sample ID	Date Sampled	Analysis Date	Chlorpyrifos Amount (µg/sample)	Chlorpyrifos-Oxon Amount (µg/sample)
Northeast Corner	1	BKG-NEC	7/23/15	8/18/15	0.04	<0.05
	11	NEC-1	7/23/15	10/07/15	3.46	<0.05
	21	NEC-2	7/24/15	10/07/15	1.13	0.10
	31	NEC-3	7/24/15	10/05/15	2.77	<0.05
	41	NEC-4	7/25/15	8/20/15	0.35	0.09
	51	NEC-5	7/25/15	8/20/15	0.05	<0.05
	61	NEC-6	7/26/15	8/21/15	0.16	0.06
East	2	BKG-E	7/23/15	8/18/15	<0.025	<0.05
	12	E-1	7/23/15	10/07/15	14.81	<0.05
	22	E-2	7/24/15	10/08/15	21.96	0.05
	32	E-3	7/24/15	10/05/15	8.19	0.10
	42	E-4	7/25/15	10/06/15	2.77	0.14
	52	E-5	7/25/15	10/09/15	1.60	<0.05
	62	E-6	7/26/15	10/08/15	0.86	<0.05
Southeast Corner	3	BKG-SEC	7/23/15	8/18/15	<0.025	<0.05
	13	SEC-1	7/23/15	10/07/15	21.98	0.05
	23	SEC-2	7/24/15	10/07/15	10.21	0.50
	33	SEC-3	7/24/15	10/05/15	5.02	0.06
	43	SEC-4	7/25/15	10/06/15	2.12	0.13
	53	SEC-5	7/25/15	10/09/15	0.79	<0.05
	63	SEC-6	7/26/15	8/21/15	0.30	<0.05
Southeast Corner Collocated	4	BKG-SEC-C	7/23/15	8/18/15	<0.025	<0.05
	14	SEC-C-1	7/23/15	10/07/15	21.96	<0.05
	24	SEC-C-2	7/24/15	10/07/15	8.40	0.43
	34	SEC-C-3	7/24/15	10/05/15	5.36	0.06
	44	SEC-C-4	7/25/15	10/06/15	2.33	0.21
	54	SEC-C-5	7/25/15	10/09/15	0.79	<0.05
	64	SEC-C-6	7/26/15	8/21/15	0.58	0.07
South	6	BKG-S	7/23/15	8/18/15	0.03	<0.05
	16	S-1	7/23/15	10/08/15	33.55	<0.05
	26	S-2	7/24/15	10/07/15	9.30	0.40
	36	S-3	7/24/15	10/05/15	6.60	<0.05
	46	S-4	7/25/15	10/06/15	2.16	0.17
	56	S-5	7/25/15	10/09/15	1.80	<0.05
	66	S-6	7/26/15	8/21/15	0.41	0.07

Table 2 (Continued): Air Monitoring Results, San Joaquin County 2015.

Site	Log Number	Sample ID	Date Sampled	Analysis Date	Chlorpyrifos Amount (µg/sample)	Chlorpyrifos-Oxon Amount (µg/sample)
Southwest Corner	7	BKG-SWC	7/23/15	8/18/15	0.05	<0.05
	17	SWC-1	7/23/15	10/08/15	46.76	<0.05
	27	SWC-2	7/24/15	10/07/15	8.78	0.56
	37	SWC-3	7/24/15	10/05/15	8.45	0.08
	47	SWC-4	7/25/15	10/06/15	1.47	0.16
	57	SWC-5	7/25/15	10/09/15	2.60	<0.05
	67	SWC-6	7/26/15	8/21/15	0.31	<0.05
West	8	BKG-W	7/23/15	8/18/15	0.03	<0.05
	18	W-1	7/23/15	10/07/15	3.65	<0.05
	28	W-2	7/24/15	10/07/15	0.77	0.08
	38	W-3	7/24/15	10/05/15	2.39	<0.05
	48	W-4	7/25/15	8/20/15	0.24	0.07
	58	W-5	7/25/15	8/20/15	0.62	<0.05
	68	W-6	7/26/15	8/21/15	0.09	<0.05
Northwest Corner	9	BKG-NWC	7/23/15	8/18/15	<0.025	<0.05
	19	NWC-1	7/23/15	10/07/15	0.71	<0.05
	29	NWC-2	7/24/15	8/19/15	0.10	<0.05
	39	NWC-3	7/24/15	10/05/15	1.49	<0.05
	49	NWC-4	7/25/15	8/20/15	0.10	0.06
	59	NWC-5	7/25/15	8/20/15	0.31	<0.05
	69	NWC-6	7/26/15	8/21/15	0.06	<0.05
North	10	BKG-N	7/23/15	8/18/15	<0.025	<0.05
	20	N-1	7/23/15	10/07/15	4.21	<0.05
	30	N-2	7/24/15	10/07/15	1.40	0.16
	40	N-3	7/24/15	10/05/15	4.22	<0.05
	50	N-4	7/25/15	8/20/15	0.41	0.09
	60	N-5	7/25/15	10/08/15	1.42	<0.05
	70	N-6	7/26/15	8/21/15	0.18	<0.05
Trip Blank	72	TB	7/26/15	8/21/15	<0.025	<0.05
Field Blank	73	FB	7/26/15	8/21/15	<0.025	<0.05

Table 2 Notes: Application Monitoring Sample Characterization.

µg = microgram
BKG = background

Sample ID (Sample Identification) followed by the letter “C” are collocated samples.

Site location identification:

E:	East Side
N:	North Side
NEC:	Northeast Corner
NWC:	Northwest Corner
S:	South Side
SEC:	Southeast Corner
SWC:	Southwest Corner
W:	West Side

Table 3: Quality Control Results, San Joaquin County 2015.

	Log Number	Laboratory ID/Sample ID	Date Spiked	Date Sampled	Analysis Date	Chlorpyrifos Amount (µg/sample)	Percent Spike Recovery (%SR)
Laboratory Control Spike (0.15 µg/sample)	--	LS001	8/6/2015	--	8/18/15	0.16	117.0
	--	LS002	8/18/2015	--	8/18/15	0.13	93.6
	--	LS003	8/19/2015	--	8/19/15	0.13	93.6
	--	LS004	8/21/2015	--	8/21/15	0.14	95.7
Trip Spike (0.15 µg/sample)	71	TS	7/23/15	7/26/15	8/21/15	0.14	97.9
Field Spike (0.15 µg/sample)	5	BKG-SEC-FS	7/22/15	7/23/15	8/18/15	0.21	129.6
	15	SEC-FS-1	7/22/15	7/23/15	10/07/15	21.51	97.2
	25	SEC-FS-2	7/22/15	7/24/15	10/07/15	10.60	102.3
	35	SEC-FS-3	7/22/15	7/24/15	10/5/15	6.49	125.5
	45	SEC-FS-4	7/22/15	7/25/15	10/6/15	2.34	103.0
	55	SEC-FS-5	7/22/15	7/25/15	8/20/15	0.44	47.4
	65	SEC-FS-6	7/22/15	7/26/15	8/21/15	0.60	132.5

Table 4: Duplicate Results, San Joaquin County 2015.

Compound	Sample Name	Analysis Date	Result (µg/sample)	Duplicate (µg/sample)	% Diff	Criteria Limit	Detection Limit (µg/sample)
Chlorpyrifos	BKG-NEC	8/18/2015	0.041	0.041	0.0%	25%	0.025
	NEC-4	8/20/2015	0.35	0.37	7.5%		
	NEC-5	8/20/2015	0.052	0.055	5.6%		
	NEC-6	8/21/2015	0.16	0.19	17.2%		
	N-6	8/21/2015	0.18	0.20	12.8%		
	NEC-3	10/5/2015	2.77	2.91	5.1%		
	E-4	10/6/2015	2.78	2.82	1.8%		
	NEC-1	10/7/2015	3.46	3.49	1.0%		
	NEC-2	10/7/2015	1.13	1.12	0.9%		
	E-6	10/8/2015	0.86	0.93	7.8%		
	E-5	10/9/2015	1.60	1.61	0.8%		
Chlorpyrifos-Oxon	BKG-NEC	8/18/2015	<0.05	<0.05	0.0%	25%	0.05
	NEC-4	8/20/2015	0.087	0.093	6.7%		
	NEC-5	8/20/2015	<0.05	<0.05	0.0%		
	NEC-6	8/21/2015	0.064	<0.05	No RPD		
	N-6	8/21/2015	<0.05	<0.05	0.0%		
	NEC-3	10/5/2015	<0.05	<0.05	0.0%		
	E-4	10/6/2015	0.141	0.144	2.1%		
	NEC-1	10/7/2015	<0.05	<0.05	0.0%		
	NEC-2	10/7/2015	0.102	0.105	2.9%		
	E-6	10/8/2015	<0.05	<0.05	0.0%		
	E-5	10/9/2015	<0.05	<0.05	0.0%		

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APPENDIX E

Monitoring Field Log Sheets

XAD-2 RESIN SORBENT TUBE FIELD LOG SHEET

Chlorpyrifos Pesticide Application - San Joaquin County 2015

Start Flow Set: 3.0 ±0.3 lpm End Flow Criteria:3.0 lpm ±20%

Application started at 10:19p PST 7/23/15
Application finished at 4:10a PST 7/24/15

Log #	Sample Name	Sampler ID Number	Date & Time		Elapsed Time Meter (ETM) (Hours)		Mass Flow Meter Display (LPM)		Corrected Average Flow	Comment Number	Weather K,P,C,F&R		Initials	
			Start	End	Start	End	Start	End			Start	End	Start	End
001	BKG-NEC	2981	7/23/15 - 11:58	7/23/15 - 7:50p	989.5	997.4	2.94	2.99	3.02		K	K	JP/MM	AS/MM
002	BKG-E	4673	7/23/15 - 12:02	7/23/15 - 7:58p	1343.0	1350.9	2.94	3.01	3.03		K	K	JP/MM	AS/MM
003	BKG-SEC	4672	7/23/15 - 12:06	7/23/15 - 8:05p	999.1	1007.0	2.94	3.00	3.03		K	K	JP/MM	AS/MM
004	BKG-SEC-C	4657	7/23/15 - 12:06	7/23/15 - 8:08p	872.7	880.7	2.94	2.98	3.02		K	K	JP/MM	AS/MM
005	BKG-SEC-FS	4662	7/23/15 - 12:31	7/23/15 - 8:11p	407.1	414.4	2.94	2.99	3.02		K	K	JP/MM	AS/MM
006	BKG-S	3007	7/23/15 - 12:09	7/23/15 - 8:16p	879.7	887.9	2.94	3.00	3.03		K	K	JP/MM	AS/MM
007	BKG-SWC	4677	7/23/15 - 12:12	7/23/15 - 8:21p	1035.8	1043.9	2.94	3.00	3.03		K	K	JP/MM	AS/MM
008	BKG-W	4671	7/23/15 - 12:19	7/23/15 - 8:27p	817.5	825.6	2.94	2.98	3.02		K	K	JP/MM	AS/MM
009	BKG-NWC	4646	7/23/15 - 12:23	7/23/15 - 8:33p	560.5	568.6	2.94	2.94	3.00		K	K	JP/MM	AS/MM
010	BKG-N	4644	7/23/15 - 12:27	7/23/15 - 8:43p	816.9	825.1	2.94	2.74	2.90		K	K	JP/MM	AS/MM
011	NEC-1	2981	7/23/15 - 9:52p	7/24/15 - 5:45	997.4	1005.4	2.94	2.98	3.02		K	K	AS/MM	AS/MM
012	E-1	4673	7/23/15 - 9:51p	7/24/15 - 5:51	1351.0	1359.0	2.94	2.97	3.01		K	K	AS/MM	AS/MM
013	SEC-1	4672	7/23/15 - 9:57p	7/24/15 - 5:56	1007.1	1015.0	2.94	2.92	2.99		K	K	AS/MM	AS/MM
014	SEC-C-1	4657	7/23/15 - 9:57p	7/24/15 - 5:59	880.5	888.8	2.94	3.00	3.03		K	K	AS/MM	AS/MM
015	SEC-FS-1	4662	7/23/15 - 9:57p	7/24/15 - 6:03	414.8	422.9	2.94	2.96	3.01		K	K	AS/MM	AS/MM
016	S-1	3007	7/23/15 - 9:59p	7/24/15 - 6:09	888.0	896.0	2.94	2.97	3.01		K	K	AS/MM	AS/MM
017	SWC-1	4677	7/23/15 - 10:00p	7/24/15 - 6:15	1044.0	1052.2	2.94	3.00	3.03		K	K	AS/MM	AS/MM
018	W-1	4671	7/23/15 - 10:02p	7/24/15 - 6:21	825.7	834.0	2.94	3.04	3.05	Sampler cover wet	K	K	AS/MM	AS/MM
019	NWC-1	4646	7/23/15 - 10:04p	7/24/15 - 6:27	568.7	577.1	2.94	2.97	3.01		K	K	AS/MM	AS/MM
020	N-1	4644	7/23/15 - 10:05p	7/24/15 - 6:35	825.2	833.7	2.94	2.95	3.00		K	K	AS/MM	AS/MM

MFM Used #: 20062240 **Slope:** 0.996 **Intercept:** 0.071

Weather Codes: K = Clear, P = Partly Cloudy, C = ≥67% Cloudy, F = Fog, and R = Rain (any)

XAD-2 RESIN SORBENT TUBE FIELD LOG SHEET

Chlorpyrifos Pesticide Application - San Joaquin County 2015

Start Flow Set: 3.0 ±0.3 lpm End Flow Criteria:3.0 lpm ±20%

Log #	Sample Name	Sampler ID Number	Date & Time		Elapsed Time Meter (ETM) (Hours)		Mass Flow Meter Display (LPM)		Corrected Average Flow	Comment Number	Weather K,P,C,F&R		Initials	
			Start	End	Start	End	Start	End			Start	End	Start	End
021	NEC-2	2981	7/24/15 - 5:47	7/24/15 - 6:01p	1005.4	1017.6	2.94	2.82	2.94		K	K	AS/MM	AS/MM
022	E-2	4673	7/24/15 - 5:53	7/24/15 - 6:07p	1359.0	1371.2	2.94	2.89	2.97		K	K	AS/MM	AS/MM
023	SEC-2	4672	7/24/15 - 5:58	7/24/15 - 6:12p	1015.1	1027.3	2.94	2.85	2.95		K	K	AS/MM	AS/MM
024	SEC-C-2	4657	7/24/15 - 6:01	7/24/15 - 6:14p	888.8	901.0	2.94	2.86	2.96		K	K	AS/MM	AS/MM
025	SEC-FS-2	4662	7/24/15 - 6:06	7/24/15 - 6:17p	422.9	435.1	2.94	2.86	2.96		K	K	AS/MM	AS/MM
026	S-2	3007	7/24/15 - 6:10	7/24/15 - 6:23p	896.1	906.5	2.94	0.00	1.54	Pump not running	K	K	AS/MM	AS/MM
027	SWC-2	4677	7/24/15 - 6:16	7/24/15 - 6:29p	1052.2	1064.4	2.94	2.88	2.97		K	K	AS/MM	AS/MM
028	W-2	4671	7/24/15 - 6:21	7/24/15 - 6:37p	834.0	846.3	2.94	2.87	2.96		K	K	AS/MM	AS/MM
029	NWC-2	4646	7/24/15 - 6:28	7/24/15 - 6:44p	577.1	589.3	2.94	2.91	2.98		K	K	AS/MM	AS/MM
030	N-2	4644	7/24/15 - 6:35	7/24/15 - 6:48p	833.7	845.9	2.94	2.91	2.98		K	K	AS/MM	AS/MM
031	NEC-3	2981	7/24/15 - 6:03p	7/25/15 - 5:39	1017.6	1029.2	2.94	3.04	3.05		K	K	AS/MM	AS/MM
032	E-3	4673	7/24/15 - 6:08p	7/25/15 - 5:43	1371.2	1382.9	2.94	3.00	3.03		K	K	AS/MM	AS/MM
033	SEC-3	4672	7/24/15 - 6:13p	7/25/15 - 5:48	1027.3	1038.9	2.94	3.00	3.03		K	K	AS/MM	AS/MM
034	SEC-C-3	4657	7/24/15 - 6:16p	7/25/15 - 5:51	901.1	912.6	2.94	3.00	3.03		K	K	AS/MM	AS/MM
035	SEC-FS-3	4662	7/24/15 - 6:19p	7/25/15 - 5:54	435.1	446.7	2.94	3.00	3.03		K	K	AS/MM	AS/MM
036	S-3	4665	7/24/15 - 6:25p	7/25/15 - 5:59	597.0	608.5	2.94	3.00	3.03		K	K	AS/MM	AS/MM
037	SWC-3	4677	7/24/15 - 6:30p	7/25/15 - 6:04	1064.4	1076.0	2.94	2.94	3.00		K	K	AS/MM	AS/MM
038	W-3	4671	7/24/15 - 6:38p	7/25/15 - 6:10	846.3	857.8	2.94	3.00	3.03		K	K	AS/MM	AS/MM
039	NWC-3	4646	7/24/15 - 6:45p	7/25/15 - 6:15	589.3	600.9	2.94	3.00	3.03		K	K	AS/MM	AS/MM
040	N-3	4644	7/24/15 - 6:49p	7/25/15 - 6:18	845.9	857.4	2.94	3.00	3.03		K	K	AS/MM	AS/MM

MFM Used #: 20062240 **Slope:** 0.996 **Intercept:** 0.071

Weather Codes: K = Clear, P = Partly Cloudy, C = ≥67% Cloudy, F = Fog, and R = Rain (any)

XAD-2 RESIN SORBENT TUBE FIELD LOG SHEET

Chlorpyrifos Pesticide Application - San Joaquin County 2015

Start Flow Set: 3.0 ±0.3 lpm End Flow Criteria:3.0 lpm ±20%

Log #	Sample Name	Sampler ID Number	Date & Time		Elapsed Time Meter (ETM) (Hours)		Mass Flow Meter Display (LPM)		Corrected Average Flow	Comment Number	Weather K,P,C,F&R		Initials	
			Start	End	Start	End	Start	End			Start	End	Start	End
041	NEC-4	2981	7/25/15 - 5:40	7/25/15 - 5:30p	1029.2	1041.3	2.94	2.83	2.94		K	K	AS/MM	AS/MM
042	E-4	4673	7/25/15 - 5:44	7/25/15 - 5:47p	1382.9	1394.9	2.94	2.90	2.98		K	K	AS/MM	AS/MM
043	SEC-4	4672	7/25/15 - 5:49	7/25/15 - 5:53p	1038.9	1051.0	2.94	2.86	2.96		K	K	AS/MM	AS/MM
044	SEC-C-4	4657	7/25/15 - 5:52	7/25/15 - 5:56p	912.6	924.7	2.94	2.88	2.97		K	K	AS/MM	AS/MM
045	SEC-FS-4	4662	7/25/15 - 5:55	7/25/15 - 5:59p	446.7	458.8	2.94	2.85	2.95		K	K	AS/MM	AS/MM
046	S-4	4665	7/25/15 - 6:00	7/25/15 - 6:04p	608.5	620.6	2.95	2.92	2.99		K	K	AS/MM	AS/MM
047	SWC-4	4677	7/25/15 - 6:06	7/25/15 - 6:11p	1076.0	1088.1	2.94	3.04	3.05		K	K	AS/MM	AS/MM
048	W-4	4671	7/25/15 - 6:11	7/25/15 - 6:16p	857.8	869.9	2.94	2.89	2.97		K	K	AS/MM	AS/MM
049	NWC-4	4646	7/25/15 - 6:16	7/25/15 - 6:26p	600.9	613.0	2.94	2.88	2.97		K	K	AS/MM	AS/MM
050	N-4	4644	7/25/15 - 6:18	7/25/15 - 6:30p	857.4	869.6	2.94	2.91	2.98		K	K	AS/MM	AS/MM
051	NEC-5	2981	7/25/15 - 5:41p	7/26/15 - 5:31	1041.3	1044.4	2.94	0.00	1.54	Batteries stolen	K	K	AS/MM	AS/MM
052	E-5	4673	7/25/15 - 5:48p	7/26/15 - 5:38	1394.9	1402.3	2.94	0.00	1.54	Batteries stolen	K	K	AS/MM	AS/MM
053	SEC-5	4672	7/25/15 - 5:55p	7/26/15 - 5:44	1051.0	1057.6	2.94	0.00	1.54	Batteries stolen	K	K	AS/MM	AS/MM
054	SEC-C-5	4657	7/25/15 - 5:56p	7/26/15 - 5:44	924.7	931.3	2.94	0.00	1.54	Batteries stolen	K	K	AS/MM	AS/MM
055	SEC-FS-5	4662	7/25/15 - 5:59p	7/26/15 - 5:44	458.8	462.7	2.94	0.00	1.54	Batteries stolen	K	K	AS/MM	AS/MM
056	S-5	4665	7/25/15 - 6:05p	7/26/15 - 5:54	620.6	632.5	2.94	2.99	3.02		K	K	AS/MM	AS/MM
057	SWC-5	4677	7/25/15 - 6:12p	7/26/15 - 6:00	1088.1	1099.9	2.94	3.00	3.03		K	K	AS/MM	AS/MM
058	W-5	4671	7/25/15 - 6:18p	7/26/15 - 6:06	869.9	881.7	2.94	3.00	3.03		K	K	AS/MM	AS/MM
059	NWC-5	4646	7/25/15 - 6:27p	7/26/15 - 6:12	613.0	624.8	2.94	3.00	3.03		K	K	AS/MM	AS/MM
060	N-5	4644	7/25/15 - 6:30p	7/26/15 - 6:16	869.6	881.3	2.94	3.00	3.03		K	K	AS/MM	AS/MM

MFM Used #: 20062240 **Slope:** 0.996 **Intercept:** 0.071

Weather Codes: K = Clear, P = Partly Cloudy, C = ≥67% Cloudy, F = Fog, and R = Rain (any)

XAD-2 RESIN SORBENT TUBE FIELD LOG SHEET

Chlorpyrifos Pesticide Application - San Joaquin County 2015

Start Flow Set: 3.0 ±0.3 lpm End Flow Criteria:3.0 lpm ±20%

Log #	Sample Name	Sampler ID Number	Date & Time		Elapsed Time Meter (ETM) (Hours)		Mass Flow Meter Display (LPM)		Corrected Average Flow	Comment Number	Weather K,P,C,F&R		Initials	
			Start	End	Start	End	Start	End			Start	End	Start	End
061	NEC-6	2981	7/26/15 - 5:31	7/26/15 - 12:00p	1044.4	1050.8	2.94	2.82	2.9		K	K	AS/MM	AS/MM
062	E-6	4673	7/26/15 - 5:38	7/26/15 - 12:05p	1402.3	1408.8	2.94	2.85	3.0	Batteries Stolen	K	K	AS/MM	AS/MM
063	SEC-6	4672	7/26/15 - 5:44	7/26/15 - 12:09p	1057.6	1060.0	2.94	0	1.5	Batteries Stolen	K	K	AS/MM	AS/MM
064	SEC-C-6	4657	7/26/15 - 5:44	7/26/15 - 12:09p	931.3	937.7	2.94	2.86	3.0		K	K	AS/MM	AS/MM
065	SEC-FS-6	4662	7/26/15 - 5:44	7/26/15 - 12:12p	462.7	469.1	2.94	2.86	3.0		K	K	AS/MM	AS/MM
066	S-6	4665	7/26/15 - 5:54	7/26/15 - 12:15p	632.5	638.8	2.94	2.86	3.0		K	K	AS/MM	AS/MM
067	SWC-6	4677	7/26/15 - 6:00	7/26/15 - 12:18p	1099.9	1106.2	2.94	2.83	2.9		K	K	AS/MM	AS/MM
068	W-6	4671	7/26/15 - 6:06	7/26/15 - 12:21p	881.7	888.0	2.94	2.82	2.9		K	K	AS/MM	AS/MM
069	NWC-6	4646	7/26/15 - 6:12	7/26/15 - 12:26p	624.8	631.0	2.94	2.84	2.9		K	K	AS/MM	AS/MM
070	N-6	4644	7/26/15 - 6:16	7/26/15 - 12:30p	881.3	887.5	2.94	2.88	3.0		K	K	AS/MM	AS/MM
071	Trip Spike		7/26/15 - 12:30p	7/26/15 - 12:30p									JP/MM	JP/MM
072	Trip Blank		7/26/15 - 12:31p	7/26/15 - 12:31p									JP/MM	JP/MM
073	Field Blank		7/26/15 - 12:32p	7/26/15 - 12:36p									JP/MM	JP/MM
074														
075														
076														
077														
078														
079														
080														

MFM Used #: 20062240 **Slope:** 0.996 **Intercept:** 0.071

Weather Codes: K = Clear, P = Partly Cloudy, C = ≥67% Cloudy, F = Fog, and R = Rain (any)

XAD-2 RESIN SORBENT TUBE FIELD LOG SHEET

Chlorpyrifos Pesticide Application - San Joaquin County 2015

Start Flow Set: 3.0 ±0.3 lpm End Flow Criteria:3.0 lpm ±20%

Log #	Sample Name	Sampler ID Number	Date & Time		Elapsed Time Meter (ETM) (Hours)		Mass Flow Meter Display (LPM)		Corrected Average Flow	Comment Number	Weather K,P,C,F&R		Initials	
			Start	End	Start	End	Start	End			Start	End	Start	End

MFM Used #: _____ **Slope:** _____ **Intercept:** _____

Weather Codes: K = Clear, P = Partly Cloudy, C = ≥67% Cloudy, F = Fog, and R = Rain (any)

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APPENDIX F

Calibration and Certification Reports

ARB Calibration Report - % Relative Humidity

Calibration Summary:

ID Information:

Station Name:	Pre-Pesticide Study	Manufacturer:	MetOne	AS-IS:	X
Site #:	Chlorpyrifos II	Model #:	083V-0-6	FINAL:	
Station Address:	TBD	Serial #:	D6881	Calibration Date:	07/22/15
Agency:	ARB	Translator #:	20005304	Report Date:	07/22/15
		Serial #:	X1042	Previous Cal. Date:	

Calibration Info.:

Calibration Results:

Component:		Relative Humidity
Instrument Range (Percent Relative Humidity):		0 to 100
Relative Humidity Best Fit Line	Slope:	1.019
	Intercept:	1.109
	Correlation:	0.99725
Absolute Average Percent Difference (%RH):		2.1
AS-IS Meets PSD Requirements:		YES

Meteorology:

Temperature (°C):	24.2
Elevation (Ft.):	25
Pressure (mmHg):	760.0

Sensor Height:

Feet Above Ground:	20.5
Feet Above Roof:	N.A.

Calibration Standards:

Standard:	I.D. #:	Cert. Date:	Cert. Factor:
Rotronic ER25 Calibration Device:	None	Factory	N.A.
Rotronic EA10 Salt Standard:	101201	01/25/12	(10 x 1)+0
Rotronic EA35 Salt Standard:	351103	11/21/11	(35 x 1)+0
Rotronic EA50 Salt Standard:	501103	11/16/11	(50 x 1)+0
Rotronic EA80 Salt Standard:	801201	02/24/12	(80 x 1)+0

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Calibration Data:

Translator:

Zero Scale:		Full Scale:	
DMM Voltage:	%RH:	DMM Voltage:	%RH:
N.A.	N.A.	N.A.	N.A.

% Relative Humidity Accuracy (If Any Difference > 5.0%RH, adjust so Avg. Diff. Is <2.0%RH Difference)

TRUE %RH (y)	DAS %RH (x)	DAS Voltage	Difference DAS - True	Meets PSD Criteria
0	-1.1	N.A.	N.A.	YES
10.1	7.0	N.A.	-3.1	1
35.1	35.5	N.A.	0.4	1
50.1	49.6	N.A.	-0.5	1
80.0	75.6	N.A.	-4.4	1
		ABS Avg. Diff.:	2.1	

Relative Humidity Regression Data

Regression Results:

x Coefficient (Slope):	1.0189
y Constant (Intercept):	1.1088
Number of Observations:	4
Correlation:	0.997251

Corrected %RH:

(DAS * x) + y
0.0
8.2
37.3
51.6
78.1
100.0

Comments:	Pre Chorpyrifos II Calibration As found: Slope=100 Offset=0		
Calibrated by:	Hquan	Checked by:	

Rev. 07/00 (SUR)

ARB Calibration Report - Resultant Wind Direction

Calibration Summary:

ID Information:

Station Name:	Pre-Pesticide	Manufacturer:	Met One	AS-IS:	X
Site #:	Chlorpyrifos II	Model #:	020C-1	FINAL:	
Station Address:	TBD	Serial #:	A6978	Calibration Date:	07/16/15
Agency:	ARB	Translator #:	466A	Report Date:	
		Serial #:	X1042	Previous Cal. Date:	

Calibration Info.:

Calibration Results:

Component:		Wind Direction
Instrument Range (degrees):		0 to 360
AS-IS Azimuth in relation to True North (deg):		0.0
AS-IS Starting Torque (gm-cms):		3.0
AS-IS Absolute Average Difference (degrees):		2.4
Wind Direction Best Fit Line	Slope:	1.022
	Intercept:	-5.001
	Correlation:	0.99999
AS-IS Meets Both PSD Requirements:		YES

For FINAL, see next page.

Meteorology:

Temperature (°C):	28.0
Elevation (Feet.):	25
Pressure (mmHg):	760.0

Sensor Height:

Feet Above Ground:	22.5
Roof height in feet.:	0.0
Calculated data to meet EPA height:	10.3
To meet EPA height:	-22.5
	10.3

Calibration Standards:

Standard:	I.D. #:	Cert. Date:	Cert. Factor:
Brunton 5008 Pocket Transit	5081192140	Factory	WYSIWYG
R.M. Young 18310 Torque Disk	N.A.	Factory	N.A.
Met One 040 Degree Fixture	N.A.	Factory	WYSIWYG

==========

Calibration Data:

AS-IS Condition (0 to 360° only):

		Translator:	DMM Voltage:	Degrees:
Declination of Site (Degrees East):				
Calculated True North Heading:	360.0	Zero Scale:	N.A.	N.A.
Crossarm Orientation Uncorrected Transit Reading:		Half Scale:	N.A.	N.A.
Crossarm Degrees in Relation to True North:	0.0		gram-centimeters:	3
DAS Output with Vane Parallel to Crossarm:		Starting	K Factor:	38
DAS Output Degrees off from True North:	-360.0	Torque:	Speed in m/sec.:	0.28
Azimuth computed from above measurements:	0.0		Meets torque std.:	YES

Direction Accuracy:

True Degrees (y):	DAS Degrees (x):	Difference DAS - True	Calculated Data to Meet PSD Direction
10	14.8	4.8	
90	92.5	2.5	1
180	181.4	1.4	1
270	269.7	-0.3	1
350	347.1	-2.9	1

PSD Correction:
0.0
Absolute Avg. Diff.:
2.4
Meets PSD Difference Standard:
YES

Wind Direction Regression Data

Regression Results:

x Coefficient (Slope):	1.0215
y Constant (Intercept):	-5.0005
Number of Observations:	5
Correlation:	0.999995

Corrected RWD:

(DAS * x) + y
10.1
89.5
180.3
270.5
349.6

ARB Calibration Report - Resultant Wind Direction

FINAL Condition (0 to 360° only):

Declination of Site (Degrees East):	0.0	FINAL PSD Correction	Calculated Data to Meet PSD Direction
Calculated True North Heading:	360.0		
Crossarm Orientation Uncorrected Transit Reading:		0.0	
Crossarm Degrees in Relation to True North:	0.0	FINAL Meets Direction Standard	1
DAS Output with Vane Parallel to Crossarm:			1
DAS Output Degrees off from True North:	-360.0		1
Azimuth computed from above measurements:	0.0	YES	1

Comments:	Pre-Metam Sodium application cal.			
Calibrated by:	H Quan		Checked by:	

ARB Calibration Report - Resultant Wind Speed

Calibration Summary:

ID Information:

Station Name:	Pre-Pesticide Study	Manufacturer:	Met One	AS-IS:	X
Site #:	Chlorpyrifos II	Model #:	010C	FINAL:	
Station Address:	TBD	Serial #:	A6703	Calibration Date:	07/16/15
Agency:	ARB	Translator #:	20005304	Report Date:	07/16/15
		Serial #:	X1042	Previous Cal. Date:	

Calibration Info.:

Calibration Results:

Component:		Wind Speed
Instrument Range (knots per hour):		0 to 86.84
AS-IS Starting Torque (gm-cm):		0.38
AS-IS Absolute Avg Speed Difference (Knots):		0.02
Wind Speed Best Fit Line	Slope:	1.000
	Intercept:	-0.011
	Correlation:	1.00000
AS-IS Meets Both PSD Requirements:		YES

Meteorology:

Temperature (°C):	28.0
Elevation (Feet.):	25
Pressure (mmHg):	760.0

Sensor Height:

Feet Above Ground:	22.5
Roof height in feet.:	0.0
Calculated data to meet EPA height:	10.3
To meet EPA height:	-22.5
	10.3

Calibration Standards:

Standard:	I.D. #:	Cert. Date:	Cert. Factor:
R.M. Young 18310 Torque Disc (0 to 15 gm-cm):	N.A.	N.A.	N.A.
R.M. Young 18810 Selectable Drive (10-1,000 rpm):	3196	02/19/09	RPM=(Meter*10)+0

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Calibration Data:

Translator:

Zero Scale:		Full Scale:	
DMM Voltage:	Knots:	DMM Voltage:	Knots:
N.A.	N.A.	N.A.	N.A.

Starting Torque:

In gm-cms:	0.2	Starting speed in meters/sec:	0.38
K Factor:	1.4	Meets PSD torque standard:	YES

Speed Accuracy (@ 0 <0.54 & Difference DAS - True <±5% of True)

RPM:	True (y): Knots per Hour	DAS (x): Knots	Difference DAS - True	PSD Difference Data	Meets PSD Difference Standard:
0	0.52	0.50	-0.02	1	YES
50	3.11	3.14	0.03	0.9%	
110	6.22	6.25	0.03	0.5%	Absolute Avg. Diff.:
220	11.92	11.91	-0.01	0.0%	0.02
450	23.83	23.87	0.04	0.2%	
920	48.17	48.18	0.01	0.0%	

Wind Speed Regression Data

Regression Results:

x Coefficient (Slope):	0.9998
y Constant (Intercept):	-0.0112
Number of Observations:	6
Correlation:	0.999999

Corrected RWS:

(DAS * x) + y
0.49
3.13
6.24
11.90
23.85
48.16

Comments:	Pre-Chlorpyrifos II Study		
Calibrated by:	H. Quan		Checked by:

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ARB Calibration Report - Outside Temperature

Calibration Summary:

ID Information:

Station Name:	Pre-Pesticide Study	Manufacturer:	Met One	AS-IS:	X
Site #:	Chlorpyrophos	Model #:	060A-2	FINAL:	
Station Address:	TBD	Serial #:	X1748	Calibration Date:	07/16/15
Agency:	ARB	Translator #:	20005304	Report Date:	
		Serial #:	X1042	Previous Cal. Date:	

Calibration Info.:

Calibration Results:

	Component:	Outside Temp.
	Instrument Range (degrees centigrade):	-50 to +50
	AS-IS Average Ice Bath Difference (°C):	0.16
	AS-IS Average Ambient Bath Difference (°C):	-0.27
	AS-IS Average Hot Bath Difference (°C):	-0.07
	Slope:	1.005
Outside Temperature Best Fit Line	Intercept:	-0.071
	Correlation:	0.99997
AS-IS Meets PSD °C Difference Requirement:		YES

Meteorology:

Temperature (°C):	16.0
Elevation (Feet.):	25
Pressure (mmHg):	760.0

Sensor Height:

Feet Above Ground:	20.5
Feet Above Roof:	N.A.

Calibration Standards:

Standard:	I.D. #:	Cert. Date:	Slope:	Intercept:
Omega 450 ATH	105967		1.0000	0.0000
Thermistor Thermometer		N.A.	N.A.	N.A.

==========

Calibration Data:

If Average Difference of any bath is >0.50°C, correct.

Reference Bath	DAS Degree C (x)	Digital Degree C	True Degree C (y)	Difference DAS - True
ICE	0.26	0.10	0.10	0.16
	0.26	0.10	0.10	0.16
	0.26	0.10	0.10	0.16
Average	0.26		0.10	0.16
AMBIENT	26.80	27.10	27.10	-0.30
	26.90	27.10	27.10	-0.20
	26.80	27.10	27.10	-0.30
Average	26.83		27.10	-0.27
HOT	48.40	48.50	48.50	-0.10
	48.50	48.50	48.50	0.00
	48.40	48.50	48.50	-0.10
Average	48.43		48.50	-0.07

Transalator:

Zero Scale:	
N.A.	N.A.
DMM Volts	Degrees C
N.A.	N.A.
Full Scale:	
Regression & Graph Data:	
x	y
0.26	0.10
26.83	27.10
48.43	48.50
PSD Data:	0.16
	-0.27
	-0.07

Outside Temperature Regression Data

Regression Results:

x Coefficient (Slope):	1.0051
y Constant (Intercept):	-0.0715
Number of Observations:	3
Correlation:	0.999974

Corrected OTEMP:

(DAS * x) + y
0.19
26.90
48.61

Comments:	Pre Chlorpyrifos II Study Current Setting: Slope=178.7 Offset= -73.2 Previous setting: Slope=179.34 Offset= -73.09		
Calibrated by:	H Quan	Checked by:	

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Appendix G

Pesticide Use Recommendation and Product Labels

Product Use Recommendation

[redacted])

[redacted]	Proposed Date / Timing **2015-07-23**	Expire Date **2015-07-25**	PCA & License [redacted]
	Applicator [redacted]		Grower & Permit Number [redacted]

County	Site Commodity	Method	Proposed	Treated	Tank Volume	No. Tanks	Spray Volume
San Joaquin	**WALNUT**	**Ground**	**26 Acres**	**26 Acres**			**100 Ga**

Site ID / STR	Location	Planted Area	Proposed Area	Treated Area	Row	Band
[redacted]	[redacted]	26 Acres	26 Acres	26 Acres		

*** * * ALWAYS READ AND FOLLOW LABEL DIRECTIONS * * ***

* * In addition, adhere to all State and local regulations governing the use of these products * *

The execution of this recommendation certifies that alternative and mitigation measures that would substantially lessen any significant adverse impact on the environment have been considered and, if feasible, adopted.

Product Name	Signal Word	Labeled Commodity	Pest	Rate	Per Full Tank	Mat. Req.
RNA Corporation RNA BU-pH-ER (1051181-50002)	Danger	Not Applicable	Na	1.6 Pt / 100ga		5.2 Ga
NOI MANA Vulcan (66222-233) (39.50% - Chlorpyrifos)	Caution	Walnut	Aphid, Mealy Plum	4 Pt / A		13 Ga
Valent U.S.A. Corporation Zeal(r) Miticide(1) (59639-138) (72.00% - Etoxazole)	Caution	Walnut, English	Spider Mite, Pacific	3 Oz / A		4.88 Lb
MANA Pasada 1.6F (66222-228) (17.70% - Imidacloprid)	Caution	Walnut, English	Aphid	6.4 Floz / A		1.3 Ga
Brandt Brandt Insect Bait (48813-50006) (99.70% - Corn Steep Liquor)	Caution	Agricultural Area	Na	4 Pt / A		13 Ga
Miller Nu Film P (72-50022)	Caution	Agricultural Area	Na	6.4 Floz / A		1.3 Ga

Pre-Harvest Interval : 28 Days

Re-Entry Interval : 24 Hours

Restrictions: Avoid Drift -- Certified Applicator Required -- Closed Mixing System Required -- Notice of Intent Required -- Posting Required -- Toxic To Bees -- Toxic To Birds -- Toxic To Fish -- See Label Regarding Feeding/Grazing

Species Toxic To: Shrimp; Oyster; Marine/Estuarine Aquatic Invertebrates; Freshwater Aquatic Invertebrates; Wildlife; Bees; Aquatic Invertebrates; Small Mammals; Fish; Birds; Aquatic Organisms

Criteria Used For Determining Recommendation: Prevention -- Pest is Present

Advisor Comments: [redacted]

I certify that the product recommendations contained in this document are consistent with my review and understanding of the product notices beginning on the following page and the product(s) label.

Label Instructions & Notices **Rec No. 2792141**

Notice 1 of 40 (RNA BU-pH-ER) GENERAL INFORMATION RNA BU-pH-ER is a spray adjuvant designed to improve the effectiveness of certain agricultural chemicals by reducing the pH of higher alkaline water. May be used with suitable wetting agents.

Notice 2 of 40 (RNA BU-pH-ER) DIRECTIONS FOR USE Use the rate of 1-4 pints per 100 gallons of spray solution. Maximum amount to be used will depend on the pH of the water supply. PHYTOTOXICITY: Excessive buffering of a spray solution that contains a combination of wettable powders or liquids may cause phytotoxicity to certain fruits and vegetables. Excessive buffering of sulfur, metal oxides, metal sulfates, metal oxychlorides, metal hydroxides, metal carbonates, lime-reacted metals, or neutral based metals such as basic copper or zinc may cause phytotoxicity to the buds, leaves or fruit. Please contact the manufacturer of the plant protection material for their recommended spray solution pH.

Notice 3 of 40 (Vulcan) User Safety Requirements - Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. - Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

Notice 4 of 40 (Vulcan) SPRAY DRIFT MANAGEMENT Avoiding spray drift at the application site is the responsibility of the applicator and the grower. The interaction of many equipment-and weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions regarding spraying. Apply only as a medium or coarser spray (ASABE standard 572.1) or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles. Apply only when the wind speed is 2 - 10 mph at the application site. For ground applications - Wind speed must be measured adjacent to the application site on the upwind side, immediately prior to application. - For ground boom applications, apply using a nozzle height of no more than 4 feet above the ground or crop canopy. - For airblast applications, turn off outward pointing nozzles at row ends and when spraying the outer two rows. To minimize spray loss over the top in orchard applications, spray must be directed into the canopy. For aerial applications - The distance of the outermost nozzles on the boom must not exceed 3/4 the length of the wingspan or 90% of the rotor blade diameter. Nozzles must always point backward parallel with the air stream and never be pointed downward more than 45 degrees. Where states have more stringent regulations, they should be observed. The applicator should be familiar with and take into account the information covered in the Spray Drift Management section. To avoid spray drift, do not apply under windy conditions. Avoid spray overlap as crop injury may result. Information on Droplet Size The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential but will not prevent drift if applications are made improperly or under unfavorable environmental conditions (see Wind, Temperature and Humidity and Temperature Inversions sections). Controlling Droplet Size - Volume - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets. - Pressure - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure. - Number of nozzles - Use the minimum number of nozzles that provide uniform coverage. - Nozzle Orientation - Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential. - Nozzle Type - Use a nozzle-type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift. Boom Length For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width. Application Height Applications should be made at the lowest height consistent with efficacy and flight safety. Do not make at a height greater than 10 feet above the top of the largest plants unless a greater height is recommended for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind. Swath Adjustment When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase with increasing drift potential (higher wind, smaller drops, etc.). Wind Drift potential is lowest between wind speeds of 2-10 mph. However, many factors including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift. Temperature and Humidity When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry. Temperature Inversions Applications should not occur during a temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small, suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Notice 5 of 40 (Vulcan) BUFFER ZONES Do not allow spray to drift from the application site and contact people, structures people occupy at any time and the associated property, parks and recreation areas, nontarget crops, aquatic and wetland areas, woodlands, pastures, rangelands, or animals. - For ground boom applications, do not apply within 25 feet of rivers, natural ponds, lakes, streams, reservoirs, marshes, estuaries, and commercial fish ponds. Apply with nozzle height no more than 4 feet above the ground or crop canopy and when wind speed is 10 mph or less at the application site as measured by an anemometer. Use fine or coarser spray according to ASAE 572 definition for standard nozzles or VMD for spinning atomizer nozzles. - For orchard/vineyard airblast applications, do not apply within 50 feet of rivers, natural ponds, lakes, streams, reservoirs, marshes, estuaries, and commercial fish ponds. Direct spray above trees/vines and turn off outward pointing nozzles at row ends and outer rows. Apply only when wind speed is 3-10 mph at the application site as measured by an anemometer outside of the orchard/vineyard on the upwind side. - For aerial applications, do not apply within 150 feet of rivers, natural ponds, lakes, streams, reservoirs, marshes, estuaries, and commercial fish ponds. The boom width must not exceed 75% of the wingspan or 90% of the rotary blade. Use upwind swath displacement and apply only when wind speed is 3-10 mph as measured by an anemometer. Use fine or coarser spray according to ASAE 572 definition for standard nozzles or VMD for spinning atomizer nozzles. If application includes a no-spray zone, do not release spray at a height greater than 10 feet above the ground or the crop canopy. - For overhead chemigation, do not apply within 25 feet of rivers, natural ponds, lakes, streams, reservoirs, marshes, estuaries, and commercial fish ponds. Apply only when

wind speed is 10 mph or less. The applicator also must use all other measures necessary to control drift. The buffer distance specified in the buffer distance table are the distances in feet that must exist to separate sensitive sites from the targeted application site. Buffers are measured from the edge of the sensitive site to the edge of the application site. Sensitive sites are areas frequented by non-occupational bystanders (especially children). These include residential lawns, pedestrian sidewalks, outdoor recreational areas such as school grounds, athletic fields, parks and all property associated with buildings occupied by humans for residential or commercial purposes. Sensitive sites include homes, farmworker housing, or other residential buildings, schools, daycare centers, nursing homes, and hospitals. Non-residential agricultural buildings, including barns, livestock facilities, sheds and outhouses are not included in this proh bition. Please see the table located on page 5 of Vulcan Insecticide Label for Buffer Distance. Only pesticide handlers are permitted in the setback area during application of this product. Do not apply this product if anyone other than a mixer, loader, or applicator, is in the setback area. Exception: Vehicles and persons riding bicycles that are passing through the setback area on public or private roadways are permitted.

Notice 6 of 40 (Vulcan) USE RESTRICTIONS Do not formulate this product into other end use products. Attention: Do not cut or weld container.

Notice 7 of 40 (Vulcan) PRODUCT INFORMATION Part of the Voxien family of products. Vulcan(R) insecticide forms an emulsion when diluted with water and is suitable for use in all conventional spray equipment. Consult your State Agricultural Experiment Station or State Extension Service for proper timing of applications. When an adjuvant is to be used with this product, ADAMA suggests the use of a Chemical Producers and Distr butors Association certified adjuvant.

Notice 8 of 40 (Vulcan) DIRECTIONS FOR USE It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. Read entire label before using this product. This label must be in the possession of the user at the time of pesticide application. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the Agency responsible for pesticide regulation.

Notice 9 of 40 (Vulcan) ENVIRONMENTAL HAZARDS This pesticide is toxic to fish, aquatic invertebrates, small mammals, and birds. Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. Do not contaminate water when disposing of equipment washwater or rinsate. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area. Protective information may be obtained from your cooperative agricultural extension service.

Notice 10 of 40 (Vulcan) PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS CAUTION Harmful is swallowed. Causes moderate eye irritation. Avoid contact with eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

Notice 11 of 40 (Vulcan) ENGINEERING CONTROL STATEMENT Mixers and loaders supporting aerial applications must use a mechanical transfer system that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4)) for dermal protection, and must: -Wear the personal protective equipment required above for mixers/loaders -Wear protective eyewear Pilots must use an enclosed cockpit in a manner that meets the requirements listed in the WPS for agricultural pesticides [40 CFR 170.240(d)(6)]. Use of human flaggers is prohibited. Mechanical flagging equipment must be used. When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the WPS for agricultural pesticides [40 CFR I70.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

Notice 12 of 40 (Vulcan) USER SAFETY RECOMMENDATIONS Users should: - Wash hands thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse. - Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. - Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Notice 13 of 40 (Vulcan) - Do not use on almond, filbert or walnut in Mississippi. - Do not aerially apply this product in Mississippi.

Notice 14 of 40 (Vulcan) TREE FRUITS, ALMOND, AND WALNUT (Dormant/Delayed Dormant Sprays) Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 days for tree fruits and 24 hours for almond and walnut unless PPE required for early entry is worn. For Apple, Almond, Cherry, Nectarine, Peach, Pear, Plum, Prune, and Walnut: Use Vulcan as a dormant or delayed dormant spray at the rates indicated to control the pests listed in this table. While Vulcan can be used without oil, use oil to control additional pests such as European red mite and brown almond mite. Applications can be made on pears after harvest. See specific use directions in this table. Dormant or Delayed Dormant Spray: For control of additional pest such as European red mite, mix Vulcan with oil, although it can be used without oil. Using conventional, power-operated spray equipment, apply as a concentrate or dilute spray. For dilute sprays (greater than 200 gpa), use sufficient spray volume to saturate tree foliage, but not to point of runoff. For concentrate sprays (less than 200 gpa), evenly distribute an equivalent amount of product per acre. For dilute spray, tank mix the specified dosage with 1 to 2 gallons of a petroleum spray oil specified for dormant use in 100 gallons of water and spray the entire tree by application to run off using suitable ground spray equipment. For low volume (concentrate) sprays (less than 200 gallons of spray mixture per acre), use the same amount of Vulcan as for a dilute spray and apply in a manner that will ensure thorough coverage of the trees. Use the higher dosage of Vulcan for severe infestations. Use oil as specified by your State Agricultural Experiment Station or State Extension Service Specialist. Use Restrictions: - Do not apply more than 4 pints/A (1.88 lbs a.i./A) of Vulcan. - Do not apply Vulcan until winter rains or irrigation has replenished soil moisture such that bark and twigs are not desiccated since cold or dry conditions can cause Vulcan plus oil sprays to infuse trees resulting in bud damage or drop. - Make only one application during the dormant/delayed dormant season, applying no more than 4 pints/A (1.88 lbs a.i./A) per cropping season. - Do not make more than one application of any chlorpyrifos-containing product per year. - The application can either be a prebloom dormant/dormant delayed spray to the canopy or the trunk, OR a post-bloom application to the lower 4 feet of the trunk. For postbloom application instructions and restrictions for apple, See the Apple (Tree Trunk) section. - Do not make a soil or foliar application within 10 days of a dormant/delayed dormant application of chlorpyrifos to the orchard. - Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 days for tree fruits and 24 hours for almond and walnut unless PPE required for early entry is worn. - Do not allow meat or dairy animals to graze in treated orchards.

Notice 15 of 40 (Vulcan) Dormant/Delayed Dormant Spray ADDITIONAL PRECAUTIONS SPECIFIC TO CALIFORNIA: Use a minimum of 100 gallons of total spray volume per acre. Do not use more than 4 gallons of spray oil per acre on almonds, and 6 gallons per acre on peaches and nectarines. Do not use any adjuvants or surfactants in addition to or as a substitute for a petroleum spray oil in a tank mix with Vulcan. Do not apply on almonds in the following counties in California: Butte, Colusa, Glenn, Solano, Sutter, Tehama, Yolo, and Yuba. Do not use more than 1% dormant oil in almond orchards less than 4 years old.

Notice 16 of 40 (Vulcan) TREE NUTS Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn. Foliar Spray: Use Vulcan at the dosage indicated by application as a foliar spray to control pests listed in the table. Mix the required dosage in sufficient water to ensure thorough and complete coverage of the foliage and crop, and apply as a concentrate or dilute spray using conventional, power-operated spray equipment. For dilute sprays applied to tree nut crops, mix the required dosage in sufficient water to allow for spray to runoff. For concentrate sprays, apply an equivalent amount of Vulcan per acre. Treat when pests appear or in accordance with local conditions. Insect control by aerial application may be less than control by ground application because of less coverage. Consult your state agricultural experiment station, certified pest control advisor, or extension service specialist for specific use information in your area. To avoid contamination of irrigation floodwaters, do not flood irrigate within 24 hours following an application of Vulcan. Use Restrictions: - Cold or dry conditions can cause this product and oil mixtures to infuse into trees, resulting in bud damage or bud drop. Do not apply until winter rains or irrigation has replenished soil moisture so that bark and twigs are not desiccated. Do not flood irrigate within 24 hours of application of this product to avoid contamination of irrigation tail waters. - Vulcan is highly toxic to bees exposed to direct treatment. Do not apply when bees are actively foraging in the treated area. - Make no more than 3 foliar applications of Vulcan or other product containing chlorpyrifos per season on almonds, filberts, and pecans and no more than 2 applications per season on walnuts. - Make no more than one application of chlorpyrifos during the dormant season. Do not make a soil or foliar application of Vulcan or products containing chlorpyrifos within 10 days of a dormant/delayed dormant application. - Do not apply within 14 days of harvest of almonds, filberts, and walnuts, or 28 days of harvest of pecans. Do not allow livestock to graze in treated orchards. Do not apply more than 8 pints (3.76 bs a.i.) of Vulcan per acre per season as a foliar spray. Do not make a second application within 10 days of the first application. Do not apply more than 4 pints of Vulcan (1.88 lbs a.i.) per acre per season as a dormant/delayed dormant application.

Notice 17 of 40 (Vulcan) NONRESIDENTIAL TURF AND OTHER NONRESIDENTIAL OUTDOOR USES Vulcan is an emulsifiable concentrate for control of pests located around industrial buildings (turf and ornamental), road medians (turf and ornamentals), and golf course turf only. Pests controlled by Vulcan are listed in the following tables. Vulcan is compatible with fungicides, insecticides, and miticides commonly specified except for alkaline materials such as Bordeaux mixtures and lime. Always conduct a small jar compatibility test using proper proportions of chemicals and water to check for physical compatibility prior to tank mixing. Restrictions: Use on residential turf is prohibited. Keep out of fish pools and other bodies of water. Do not treat vegetable gardens. Do not allow livestock to graze in treated areas. Do not feed treated grass cuttings (hay) or seed screenings to livestock or use hay for livestock bedding. Do not use Vulcan in poultry houses.

Notice 18 of 40 (Vulcan) AGRICULTURAL USE REQUIREMENTS Use this product in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry intervals. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard. Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of: - 4 days for fruit trees - 5 days for citrus - 3 days for cauliflower - 24 hours for all other crops not listed above Notify workers of the application by warning them orally and by posting warning signs at entrances to treated areas.

Notice 19 of 40 (Vulcan) RESISTANCE MANAGEMENT Vulcan contains a Group 1B insecticide. Insect/mite biotypes with acquired resistance to Group 1B may eventually dominate the insect/mite population if Group 1B insecticides/acaricides are used repeatedly in the same field or in successive years as the primary method of control for targeted species. This may result in partial or total loss of control of those species by Vulcan or other Group 1B. To delay insecticide resistance consider: - Avoiding the consecutive use of Vulcan or other group 1B insecticides/acaricides that have a similar target site of action, on the same insect/mite species. - Using tank-mixtures or premixes with insecticides/acaricides from a different target site of action Group as long as the involved products are all registered for the same use and have different sites of action. - Basing insecticide/acaricide use on a comprehensive IPM program. - Monitoring treated insect/mite populations for loss of field efficacy. - Contacting your local extension specialist, certified crop advisors, and/or manufacturer for insecticide/acaricide resistance management and/or IPM recommendations for the specific site and resistant pest problems.

Notice 20 of 40 (Zeal(r) Miticide(1)) NOTICE: Tank mixing or use of this product with any other product which is not specifically and expressly authorized by the label shall be the exclusive risk of user, applicator and/or application advisor, to the extent allowed by applicable law. Read and follow the entire label of each product to be used in the tank mix with this product.

Notice 21 of 40 (Zeal(r) Miticide(1)) RESISTANCE MANAGEMENT RECOMMENDATIONS Zeal is a Group 10B insecticide. Mite biotypes with acquired resistance to Group 10B may eventually dominate the mite population if Group 10B insecticides are used repeatedly in the same field or in successive years as the primary method of control for targeted species. This may result in partial or total loss of control of those species by Zeal or other Group 10B insecticides. To delay insecticide resistance consider: - Avoiding the consecutive use of Zeal or other Group 10B insecticides that have a similar target site of action, on the same mite species. - Using tank mixtures or premixes with insecticides from different target site of action Group as long as the involved products are all registered for the same use and have different sites of action. - Basing insecticide use on a comprehensive Integrated Pest Management (IPM) program. - Monitoring treated mite populations for loss of field efficacy. - Contacting your local extension specialist, certified crop advisors and/or manufacturer for insecticide resistance management and/or IPM recommendations for specific site and resistant pest problems. For further information or to report suspected resistance, you may contact Valent U.S.A. Corporation at the following toll-free number: 1-800-682-5368.

Notice 22 of 40 (Zeal(r) Miticide(1)) Zeal(tm) Trademark of Valent U.S.A. Corporation. Danitol(r) Registered trademark of Sumitomo Chemical Company. Danitol is a restricted use pesticide.

Notice 23 of 40 (Zeal(r) Miticide(1)) Apply by ground with airblast equipment as a full coverage spray. Best results are achieved when mite populations are low. Zeal Miticide(1) is predominately an ovicide/larvicide. Apply Zeal Miticide(1) at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations. Restrictions - Do not apply within twenty-eight (28) days of harvest. - Do not make more than one (1) Zeal Miticide(1) application per season. - Do not apply more than 3.0 oz Zeal Miticide(1) per acre per season.

Notice 24 of 40 (Zeal(r) Miticide(1)) The Table for "NUMBER OF ZEAL WATER SOLUBLE PACKETS REQUIRED TO TREAT SPECIFIED NUMBER OF ACRES" you can find on page 4 of the label.

Notice 25 of 40 (Zeal(r) Miticide(1)) WATER SOLUBLE PACKAGING MIXING INSTRUCTIONS Water Soluble Packaging The bag contains water soluble packets of Zeal Miticide(1). Do not handle the packets with wet gloves or allow the packets to become wet prior to mixing. If all packets are not used, close and reseal outer container to protect remaining packet(s). Do not add any liquid fertilizers, micronutrients or adjuvants to the spray solution until after the water soluble packets and their contents have completely dissolved. Water soluble packet(s) should completely dissolve in approximately five minutes. Dissolution rate may be slowed by cold water, lack of agitation, or water containing high concentrations of boron or sulfur. High concentration of boron or sulfur may result in spray screen or nozzle clogging due to the incomplete dissolution of the water soluble packet material. 1. Fill clean spray tank 1/2 to 2/3 of desired level with clean water. 2. While agitating, add the correct number of Zeal Miticide1 water soluble packets and make sure that they have dissolved completely before proceeding. Agitation should create a rippling or rolling action on the water surface. 3. Fill spray tank to desired level with water. Continue agitation until all spray solution has been applied. 4. Mix only the amount of spray solution that can be applied the day of mixing. Apply Zeal Miticide(1) within 6 hours of mixing. 5. Refer to the chart below to determine the number of Zeal Miticide1 water soluble packets required to treat a given number of acres at a specific rate.

Notice 26 of 40 (Zeal(r) Miticide(1)) ENVIRONMENTAL HAZARDS: This pesticide is toxic to freshwater and marine/estuarine aquatic invertebrates, including oysters and shrimp. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply when weather conditions favor drift from treated areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in water adjacent to treated areas. Do not contaminate water when disposing of equipment washwaters or rinsate.

Notice 27 of 40 (Zeal(r) Miticide(1)) MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Zeal Miticide1 should be used in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

Notice 28 of 40 (Pasada 1.6F) ENVIRONMENTAL HAZARDS Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops/plants or weeds. Do not apply this product or allow it to drift to blooming crops/plants or weeds if bees are foraging. This product is toxic to wildlife and highly toxic to aquatic invertebrates. This chemical demonstrates the properties and characteristics associated with chemicals detected in ground water. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination.

Notice 29 of 40 (Pasada 1.6F) OBSERVE THE FOLLOWING PRECAUTIONS WHEN MIXING AND APPLYING IN THE VICINITY OF AQUATIC AREAS SUCH AS LAKES, RESERVOIRS, RIVERS, PERMANENT STREAMS, MARSHES OR NATURAL PONDS, ESTUARIES, AND COMMERCIAL FISH FARM PONDS. SPRAY DRIFT MANAGEMENT The interaction of many equipment- and weather-related factors determines the potential for spray drift. The applicator is responsible for considering all of these factors when making application decisions. Avoiding spray drift is the respons bility of the applicator. Mixing and Loading Requirements To avoid potential contamination of groundwater, the use of a properly designed and maintained containment pad for mixing and loading of any pesticide into application equipment is recommended. If containment pad is not used, maintain a minimum distance of 25 feet between mixing and loading area and potential surface to groundwater conduits such as field sumps, uncased well heads, sinkholes, or field drains. For Aerial Applications For aerial applications, the spray boom should be mounted on the aircraft so as to minimize drift caused by wing tip vortices. The minimum practical boom length should be used and must not exceed 75% of the wing span or rotor diameter. Spray should be released at the lowest possible height consistent with good pest control and flight safety. Applications more than 10 feet above the crop canopy should be avoided. Importance of Droplet Size An important factor influencing drift is droplet size. Small droplets (

Notice 30 of 40 (Pasada 1.6F) RESISTANCE MANAGEMENT Some insects are known to develop resistance to insecticides after repeated use. As with any insecticide, the use of this product should conform to resistance management strategies established for the use area. Pasada 1.6F Flowable Insecticide contains a Group 4A insecticide. Insect biotypes with acquired or inherent tolerance to Group 4A insecticides may eventually dominate the insect population if Group 4A insecticides are used repeatedly as the predominant method of control for targeted species. This may eventually result in partial or total loss of control of those species by Pasada 1.6F Flowable Insecticide and to other Group 4A insecticides. The active ingredient in Pasada 1.6F Flowable Insecticide is a member of the neonicotinoid chemical class. Insect pests resistant to other chemical classes have not shown cross-resistance to Pasada 1.6F Flowable Insecticide . Avoid using a block of more than three consecutive applications of Pasada 1.6F Flowable Insecticide and/or other Group 4A products having the same or similar mode of action. Following a neonicotinoid block of treatments, Makhteshim Agan of North America, Inc. strongly encourages the rotation to a block of applications with effective products with a different mode of action before using additional applications of neonicotinoid products. Using a block rotation or windowed approach along with other IPM practices is considered an effective use strategy for preventing or delaying an insect's ability to develop resistance to this class of chemistry. Do not use Pasada 1.6F Flowable Insecticide or other Group 4A products from the neonicotinoid chemical class for foliar applications on crops previously treated with long-residual, soil-applied products from the neonicotinoid chemical class. Other Group 4A neonicotinoid products used as foliar treatments include: Actara(R), Alias(R), Assail(R), Calypso(R), Centric(R), Clutch(R), Couraze(R), Gallant(TM), Impulse(TM), Intruder(R), Leverage(R), Nuprid(TM), Provado(R), Trimax(TM) Pro, and Venom(R). Other Group 4A neonicotinoid products used as soil/seed treatments include: Admire(R) Pro, Advise(TM), Alias, Belay(R), Couraze, Cruiser(R), Gaucho(R), Macho(TM), Macho Max, Nuprid, Platinum(R), Venom, and Widow(TM). Contact your Cooperative Extension specialist, certified crop advisor, and/or product manufacturer for additional insect resistance management recommendations. Also, for more information on Insect Resistance Management (IRM), visit the Insecticide Resistance Action Committee (IRAC) on the web at http://www.irac-online.org/.

Notice 31 of 40 (Pasada 1.6F) DIRECTIONS FOR USE It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. See individual crops for specific pollinator protection application restrictions. If none exist under the specific crop, for foliar applications, follow these application directions for crops that are contracted to have pollinator services or for food/feed crops and commercially grown ornamentals that are attractive to pollinators. FOR CROPS UNDER CONTRACTED POLLINATION SERVICES Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen unless the following condition has been met: If an application must be made when managed bees are at the treatment site, the beekeeper providing the pollination services must be notified no less than 48-hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying. FOR FOOD/FEED CROPS AND COMMERCIALLY GROWN ORNAMENTALS NOT UNDER CONTRACT FOR POLLINATION SERVICES BUT ARE ATTRACTIVE TO POLLINATORS Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen unless one of the following conditions is met: - The application is made to the target site after sunset - The application is made to the target site when temperatures are below 55 degrees F - The application is made in accordance with a government-initiated public health response - The application is made in accordance with an active state-administered apiary registry program where beekeepers are notified no less than 48-hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying - The application is made due to an imminent threat of significant crop loss, and a documented determination consistent with an IPM plan or predetermined economic threshold is met. Every effort should be made to notify beekeepers no less than 48-hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the Agency responsible for pesticide regulation.

Notice 32 of 40 (Pasada 1.6F) APPLICATION DIRECTIONS RESTRICTION: Do not apply Pasada 1.6F Flowable Insecticide in enclosed structures such as planthouses or greenhouses. Apply foliar applications of Pasada 1.6F Flowable Insecticide as a directed or a broadcast foliar spray. Thorough coverage of foliage is necessary without runoff for optimum insecticidal efficacy. Use adequate spray volumes, properly calibrated application equipment, and spray adjuvant if necessary to obtain thorough coverage. Failure to provide adequate coverage and retention of Pasada 1.6F Flowable Insecticide on leaves and fruit may result in loss of insect control or delay in onset of activity. Apply Pasada 1.6F Flowable Insecticide with properly calibrated ground or aerial application equipment. Minimum spray volumes, unless otherwise specified on crop-specific application sections, are 10 gallons per acre by ground and 5 gallons per acre by air. Pasada 1.6F Flowable Insecticide may also be applied by overhead chemigation (see additional information in CHEMIGATION section of this label below) if allowed in crop-specific application section. Pasada 1.6F Flowable Insecticide is not allowed for use on crops grown for production of true seed intended for private or commercial planting unless specified under state-specific 24(c) labeling. Do not allow exposure of Pasada 1.6F Flowable Insecticide to honeybees. RESTRICTION: Regardless of formulation or method of application, do not apply more than 0.5 pounds of active ingredient imidacloprid per acre per year, including seed treatment, soil, and foliar uses, unless specified within a crop-specific application section for a given crop.

Notice 33 of 40 (Pasada 1.6F) ROTATIONAL CROPS(Plant cover crops for soil building or erosion control at any time, but do not graze or harvest for food or feed.) Replant treated areas with any crop specified on an imidacloprid label or any crop for which a tolerance exists for the active ingredient as soon as practical following the last application. For crops not listed on an imidacloprid label, or for crops for which no tolerances for the active ingredient have been established, a 12-month plant-back interval must be observed. IMMEDIATE PLANT-BACK: All crops on this label plus the following crops not on this label: barley, canola, corn (field, pop, and sweet), rapeseed, sorghum, soybean, sugarbeet, and wheat 30-DAY PLANT-BACK: Cereals (including buckwheat, millet, oats, rice, rye, and triticale) and safflower 10-MONTH PLANT-BACK: Onion and bulb vegetables 12-MONTH PLANT-BACK: All Other Crops

Notice 34 of 40 (Pasada 1.6F) Restrictions: - Pre-Harvest Interval (PHI): 7 days - Minimum interval between applications: 6 days - Maximum Pasada 1.6F Flowable Insecticide broadcast or directed foliar spray applications allowed per year: 28.8 fluid ounces/Acre (0.36 lb. AI/Acre) - Minimum application volume (water): 50 GPA- ground application, 25 GPA- aerial application - Do not apply pre-bloom or during bloom or when bees are foraging. Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide with other insecticides for knockdown of pests or for improved control of other pests. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced control relative to results from ground application. For tree and vine crops, application rates are based on full-size, mature trees or vines.

Notice 35 of 40 (Pasada 1.6F) PROTECTION OF POLLINATORS APPLICATION RESTRICTIONS EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS. Look for the bee hazard icon in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators. This product can kill bees and other insect pollinators. Bees and other insect pollinators will forage on plants when they flower, shed pollen, or produce nectar. Bees and other insect pollinators can be exposed to this pesticide from: - Direct contact during foliar applications, or contact with residues on plant surfaces after foliar applications - Ingestion of residues in nectar and pollen when the pesticide is applied as a seed treatment, soil, tree injection, as well as foliar applications. When Using This Product Take Steps To: - Minimize exposure of this product to bees and other insect pollinators when they are foraging on pollinator attractive plants around the application site. - Minimize drift of this product on to beehives or to off-site pollinator attractive habitat. Drift of this product onto beehives or off-site to pollinator attractive habitat can result in bee kills. Information on protecting bees and other insect pollinators may be found at the Pesticide Environmental Stewardship website at: http://pesticidestewardship.org/PollinatorProtection/Pages/default.aspx. Pesticide incidents (for example, bee kills) should immediately be reported to the state/tribal lead agency. For contact information for your state, go to: www.aapco.org/officials.html. Pesticide incidents should also be reported to the National Pesticide Information Center at: www.npic.orst.edu or directly to EPA at: beekill@epa.gov

Notice 36 of 40 (Brandt Insect Bait) ENVIRONMENTAL HAZARDS Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

Notice 37 of 40 (Brandt Insect Bait) DIRECTIONS FOR USE BRANDT INSECT BAIT is a corn derived, proteinaceous liquid that enhances the effectiveness of agricultural insecticides. The protein bait acts as a food attractant and its success in an IPM program is based on the immature female fruit flies' need of a protein meal for developing mature eggs. Read and follow the precautions, restrictions and recommendations on the labels of insecticides used with BRANDT INSECT BAIT. Use according to the most restrictive label directions for each product in any tank mix. BRANDT INSECT BAIT may be used on agricultural, aquatic, forestry, turf and ornamental, industrial and non-cropland sites.

Notice 38 of 40 (Brandt Insect Bait) RECOMMENDATIONS: Specific use rates will vary with conditions of application such as water hardness, application method, equipment, spray droplet size, condition of foliage, etc. Also, higher rates than those below may be used if recommended by pesticide labeling. Follow pesticide label directions. However, do not add this product at a rate which exceeds 5% of the finished spray volume. AIR or Ground : Use 2-8 pints per acre with sufficient water for thorough coverage. Due to the attractant mode of action, overall coverage of the plant canopy is unnecessary and a "spot spraying technique" is adequate. Bait spraying is most effective in "area" treatment programs. It is ideal for medium to large fields and orchards or where adjacent properties use the technique.

Notice 39 of 40 (Nu Film P) GENERAL INFORMATION MILLER NU FILM P is a superior SPREADER STICKER adjuvant with non-ionic properties designed to improve the contact, wetting and adhesion of pesticides onto the plant surface. MILLER NU FILM P forms a soft film, which polymerizes. This film reduces the effects of rainfall erosion, volatility and ultraviolet (UV) degradation on pesticide spray deposits. Under most conditions, apply sprays containing MILLER NU FILM P at least one hour, during daylight, before an anticipated rain. Sunlight, direct or indirect, for this time period is needed for the film to set. MILLER NU FILM P forms a soft, elastic film which tenaciously holds the pesticide on the crop foliage and greatly reduces rainfall and overhead irrigation erosion of the spray residue. The MILLER NU FILM P film will withstand about 1 inch of rain for seven to ten days, thus insuring that pesticide sprays are not lost shortly after application. MILLER NU FILM P will not foam, freeze or clog nozzles. It has been proven effective when applied by any aircraft or ground sprayer. It improves the initial pesticide deposit and allows excellent re-distribution of aircraft and concentrate sprayer deposits, to give complete coverage. Miller Chemical certifies that this product is a Synthetic substance allowed for use in organic crop production in compliance with 7 CFR Part 205, Subpart A, 205.601(m)(1). MILLER NU FILM P is Approved under Washington State's Department of Agriculture Organic Food Program.

Notice 40 of 40 (Nu Film P) DIRECTIONS FOR USE MILLER NU FILM P may be used with products registered for: Agricultural, Forestry, Ornamental, Industrial Vegetation and Non-Cropland uses. MILLER NU FILM P may be applied by ground or aerial spray equipment in concentrate or dilute sprays. In most applications, use enough MILLER NU FILM P to allow for uniform wetting and deposition of the spray onto leaf surfaces without excess runoff. GROUND: Dosage per acre Fungicides, Insecticides, Plant Growth Regulators 4 oz to 1 pt Foliar Nutrients 4 oz to 1 pt Herbicides 4 oz to 1 pt Dilute Sprays: Greater than 100 gallons of spray solution per acre. Use 4 oz. to 1 pint per 100 gallons. AIR: Use 4 oz to 1 pt per acre SPRINKLER or PIVOT IRRIGATION: Use 8 oz to 1 pint per acre.

Warnings **Rec No. 2792141**

Your label commodity of Not Applicable for RNA BU-pH-ER does not match your site commodity of WALNUT. Review the site/label mismatch, and verify this product is allowed on this commodity for this specific use scenario noting label exceptions.
Your label commodity of Agricultural Area for Brandt Insect Bait does not match your site commodity of WALNUT. Review the site/label mismatch, and verify this product is allowed on this commodity for this specific use scenario noting label exceptions.
Your label commodity of Agricultural Area for Nu Film P does not match your site commodity of WALNUT. Review the site/label mismatch, and verify this product is allowed on this commodity for this specific use scenario noting label exceptions.

Additional Notices **Rec No. 2792141**

COMPATIBILITY: BRANDT INSECT BAIT is compatible with most insecticides .However, if the desired combination has not been previously used, a compatibility test is recommended .Using this product with copper compounds or shortly after an application of copper may reduce effectiveness

Conditions **Rec No. 2792141**

Vulcan:
- Other Cases
- Dormant/Delayed Dormant

Personal Protective Equipment Information

Rec No. 2792141

NOTE: The personal protective equipment (PPE) information described here is based solely on the manufacturer's label. Your county or state may have additional restrictions or requirements.

Rna Bu-Ph-Er

Wear eye protection. Wear rubber or chemical-resistant gloves. Wash thoroughly after handling.

Medical Number: 800-222-1222 **Response Number: 800-424-9300**

Vulcan

Materials that are chemical resistant to this product are barrier laminate and viton >=14 mils. Mixers and loaders using a mechanical transfer loading system and applicators using aerial application equipment must wear: - Long-sleeved shirt and long pants - Shoes and socks - Protective eyewear In addition to the above, mixers and loaders using a mechanical transfer loading system must wear: - Chemical-resistant gloves - Chemical-resistant apron - A NIOSH-approved dust mist filtering respirator with MSHA/NIOSH approval number prefix TC-21 Cor a NIOSH-approved respirator with any R, P, or HE filter See Engineering Control Statement for additional requirements. All other mixers, loaders, applicators and handlers must wear: - Coveralls over long-sleeved shirt and long pants - Chemical-resistant gloves - Chemical-resistant apron when mixing or loading or exposed to the concentrate - Chemical-resistant footwear plus socks - Chemical-resistant headgear for overhead exposure - A NIOSH-approved dust mist filtering respirator with MSHAINIOSH approval number prefix TC-21C or a NIOSH-approved respirator with any R, P, or HE filter. User Safety Requirements - Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. - Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

Medical Number: 877-250-9291 **Response Number: 800-535-5053**

Zeal(r) Miticide(1)

Applicators and other handlers must wear: longsleeved shirt and long pants, chemical-resistant gloves made of any waterproof material such as polyethylene or polyvinyl chloride and shoes plus socks.

Medical Number: 800-892-0099 **Response Number: 800-424-9300**

Pasada 1.6f

Applicators and other handlers must wear: - Long-sleeved shirt and long pants - Chemical-resistant gloves made of any waterproof material such as barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyethylene, polyvinylchloride (PVC), or Viton - Shoes plus socks Follow manufacturer's instructions for cleaning/maintaining personal protective equipment, PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Medical Number: 877-250-9291 **Response Number: 800-535-5053**

Brandt Insect Bait

Wear long sleeved shirt, long pants, and shoes plus socks when mixing or handling concentrate.

Medical Number: 800-424-9300 **Response Number: 800-424-9300**

Nu Film P

Control Measures Respiratory Protection A RESPIRATOR APPROVED BY NIOSH/MSHA SHOULD BE WORN WHERE VAPOR INHALATION COULD OCCUR. Ventilation Local Exhaust NA Special NA Mechanical PREFERRED Other NA Protective Gloves CHEMICAL RESISTANT (e.g. rubber) Eye protection CHEMICAL SPLASH GOGGLES Other Protective Clothing or Equipment CHEMICAL RESISTANT APRON, CLEAN BODY-COVERING CLOTHING, BOOTS, HAT Work/Hygienic Practices PREVENT EATING, DRINKING, TOBACCO USAGE AND COSMETIC APPLICATION TO PREVENT EXPOSURE.

Medical Number: 800-424-9300 **Response Number: 800-424-9300**

Re-entry Personal Protective Equipment Information

Rec No. 2792141

NOTE: The re-entry personal protective equipment (Re-entry PPE) information described here is based solely on the manufacturer's label. Your county or state may have additional restrictions or requirements.

Rna Bu-Ph-Er

Vulcan

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water is: - Coveralls over short sleeved shirt and shirt pants - Chemical resistant gloves made out of any waterproof material - Chemical resistant footwear plus socks - Chemical Resistant headgear for over head exposures. Certified crop advisors or persons entering under their direct supervision under certain circumstances may be exempt from the early reentry requirement pursuant to 40 CFR Part 170.

Zeal(r) Miticide(1)

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water, is: long sleeved shirt and long pants, chemical-resistant gloves made of any waterproof material and shoes plus socks.

Pasada 1.6f

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated such as plants, soil, or water is: - Coveralls - Chemical-resistant gloves made of any waterproof material such as barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyethylene, polyvinylchoride (PVC), or Viton - Shoes plus socks

Brandt Insect Bait

Nu Film P

Shared With - Mid Valley Ag - Linden, CA,Barbara Kaiser,Eric Van Groningen,Aaron Johnson,Maggie Erickson,Peter DeBoer,Ed Chambers,Cybil Gordon,Emily Solari,Michael Alberg,Chris Rowerdink

Brandt® Insect Bait

Attractant

Principal Functioning Agents:	
Corn steep liquor	99.7%
Constituents Ineffective as Spray Adjuvant:	0.3%
Total:	100.0%

CA Reg. No. 48813-50006

KEEP OUT OF REACH OF CHILDREN

CAUTION

FIRST AID

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Call a Poison Control Center or doctor for treatment advice.

IF SWALLOWED: Call a Poison Control Center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to by a Poison Control Center or doctor. Do not give anything by mouth to an unconscious person.

IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance then give artificial respiration, preferably mouth-to-mouth if possible. Call a Poison Control Center or doctor for further treatment advice.

Have the product container or label with you when calling a Poison Control Center or doctor or going for treatment.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION: Causes moderate eye irritation. Harmful if swallowed or inhaled. Avoid contact with eyes or clothing. Avoid breathing spray mist. Wear long sleeved shirt, long pants, and shoes plus socks when mixing or handling concentrate. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.

ENVIRONMENTAL HAZARDS

Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

DIRECTIONS FOR USE

BRANDT INSECT BAIT is a corn derived, proteinaceous liquid that enhances the effectiveness of agricultural insecticides. The protein bait acts as a food attractant and its success in an IPM program is based on the immature female fruit flies' need of a protein meal for developing mature eggs.

Read and follow the precautions, restrictions and recommendations on the labels of insecticides used with BRANDT INSECT BAIT. Use according to the most restrictive label directions for each product in any tank mix.

BRANDT INSECT BAIT may be used on agricultural, aquatic, forestry, turf and ornamental, industrial and non-cropland sites. NOT FOR AQUATIC USE IN WASHINGTON.

COMPATIBILITY: BRANDT INSECT BAIT is compatible with most insecticides. However, if the desired combination has not been previously used, a compatibility test is recommended. Using this product with copper compounds or shortly after an application of copper may reduce effectiveness.

MIXING: Shake well before using. Although this product may contain a small amount of suspended solids, they should not interfere with spray nozzle performance. Fill spray tank ½ full of water and begin agitation. Add pesticides as directed by label or in the following sequence and continue filling tank: (1) Dry flowables or water dispersing granules, (2) Wettable powders, (3) Flowables, (4) Solutions, (5) Emulsifiable concentrates. Add BRANDT INSECT BAIT last and continue agitation until spray solution is completely mixed. Continuous agitation of finished spray is recommended. If spray solution has been allowed to stand, thoroughly agitate and remix before application.

RECOMMENDATIONS: Specific use rates will vary with conditions of application such as water hardness, application method, equipment, spray droplet size, condition of foliage, etc. Also, higher rates than those below may be used if recommended by pesticide labeling. Follow pesticide label directions. However, do not add this product at a rate which exceeds 5% of the finished spray volume.

AIR or GROUND: Use 2-8 pints per acre with sufficient water for thorough coverage. Due to the attractant mode of action, overall coverage of the plant canopy is unnecessary and a 'spot spraying technique' is adequate. Bait spraying is most effective in 'area' treatment programs. It is ideal for medium to large fields and orchards or where adjacent properties use the technique.

STORAGE AND DISPOSAL

DO NOT CONTAMINATE WATER, FOOD OR FEED BY STORAGE OR DISPOSAL.

STORAGE: Store in original container away from children, animals, foods, feeds and seeds. Handle in accordance with Precautionary Statements. In the event of spillage or leakage, soak up the material with absorbent clay, sand, sawdust or other absorbent material. Scrape up and dispose in accordance with Product Disposal.

PRODUCT DISPOSAL: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL: Triple rinse (or equivalent) during mixing and loading. Recycling decontaminated containers is the best option of container disposal. The Agricultural Container Recycling Council (ACRC) operates the national recycling program. To contact your state or local ACRC recycler, visit the ACRC web page at www.acrecycle.org. Decontaminated containers may also be disposed of in a sanitary landfill.

WARRANTY: Seller warrants that the product conforms to its chemical description and is reasonably fit for the purpose stated on the label when used in accordance with directions under normal conditions of use; but neither this warranty nor any other warranty of merchantability or fitness of a particular product expressed or implied, extends to the use of this product contrary to label conditions, or under conditions not reasonably foreseeable to the seller; and buyer assumes the risk of any such use.

NET CONTENTS: ____ GALLONS / ____ LITERS

BRANDT

Manufactured by:
Brandt Consolidated, Inc.
2935 South Koke Mill Road
Springfield, Illinois 62711 USA
www.brandt.co
800 300 6559
2013-07

Pasada® 1.6F

FLOWABLE INSECTICIDE

ACTIVE INGREDIENT:	% BY WT.
Imidacloprid; 1-[(6-Chloro-3-pyridinyl)methyl]-*N*-nit o-2-imidazolidinimine	17 7%
OTHER INGREDIENTS:	82 3%
TOTAL	100 0%

Contains 1 6 lbs. of active ingredient per gallon

EPA Reg. No. 66222-228
EPA Est. No. 37429-GA-001(BT); 37429-GA-002(BO)
Letter(s) in lot number correspond(s) to superscript in EPA Est. No.

KEEP OUT OF REACH OF CHILDREN
CAUTION

For additional First Aid, precautionary, handling, and use statements, see inside of this booklet.

PRECAUTIONARY STATEMENTS
Hazards to Humans and Domestic Animals

CAUTION

Harmful if absorbed th ough skin. Harmful if swallowed. Causes moderate eye irritation. Avoid contact wi h skin, eyes, or clo hing.

MANA

Manufactu ed for:
Makhteshim Agan of North America, Inc.
3120 Highwoods Blvd
Suite 100
Raleigh, NC 27604

EPA 120313/Rev A
14171

Net Contents: 1 Gallon

FIRST AID	
IF ON SKIN OR CLOTHING:	• Take off contaminated clo hing. • Rinse skin immediately wi h plenty of water for 15-20 minutes. • Call a poison cont ol center or doctor for treatment advice.
IF SWALLOWED:	• Call a poison cont ol center or doctor immediately for treatment advice. • Have person sip a glass of water if able to swallow. • Do not induce vomiting unless told to do so by a poison cont ol center or doctor. • Do not give any hing by mou h to an unconscious person.
IF IN EYES:	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after he first 5 minutes; then continue rinsing eye. • Call a poison cont ol center or doctor for treatment advice.
Have he p oduct container or label wi h you when calling a poison cont ol center or doctor or going for treatment. You may also contact PROSAR at 1-877-250-9291 for emergency medical treatment information.	
NOTE TO PHYSICIAN: No specific antidote is available. Treat the patient symptomatically.	

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION

Harmful if absorbed h ough skin. Harmful if swallowed. Causes moderate eye irritation. Avoid contact wi h skin, eyes, or clo hing.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves made of any waterp oof material such as barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polye hylene, polyvinylchloride (PVC), or Viton
- Shoes plus socks

Follow manufacturer's instructions for cleaning/maintaining personal p otective equipment, PPE. If no such instructions for washables, use detergent and hot water. Ke ep and wash PPE separately f om other laundry.

ENGINEERING CONTROLS STATEMENT

When handlers use closed systems, enclosed cabs, or aircraft in a manner hat meets he requirements listed in the Worker P otection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in he WPS.

USER SAFETY RECOMMENDATIONS

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using he toilet.
- Remove clo hing/PPE immediately if pesticide gets inside. Then wash tho oughly and put on clean clothing.
- Remove PPE immediately after handling this p oduct. Wash he outside of gloves before removing. As soon as possible, wash ho oughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters.

This p oduct is highly toxic to bees exposed to direct treatment or residues on blooming c ops/plants or weeds. Do not apply this p oduct or allow it to drift to blooming c ops/plants or weeds if bees are foraging. This p oduct is toxic to wildlife and highly toxic to aquatic invertebrates.

This chemical demonstrates he p operties and characteristics associated with chemicals detected in g ound water. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in g ound water contamination.

PROTECTION OF POLLINATORS

APPLICATION RESTRICTIONS EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.

Look for he bee hazard icon  in he Directions for Use for each application site for specific use restrictions and instructions to p otect bees and o her insect pollinators.

This product can kill bees and other insect pollinators.

Bees and other insect pollinators will forage on plants when hey flower, shed pollen, or p oduce nectar.

Bees and other insect pollinators can be exposed to his pesticide f om:

- Direct contact during foliar applications, or contact with residues on plant surfaces after foliar applications
- Ingestion of residues in nectar and pollen when the pesticide is applied as a seed treatment, soil, tree injection, as well as foliar applications.

When Using This P oduct Take Steps To:

- Minimize exposure of his p oduct to bees and other insect pollinators when hey are foraging on pollinator attractive plants a ound the application site.
- Minimize drift of his p oduct on to beehives or to off-site pollinator attractive habitat. Drift of his p oduct onto beehives or off-site to pollinator attractive habitat can result in bee kills.

Information on p otecting bees and o her insect pollinators may be found at he Pesticide Envi onmental Stewardship website at: http://pesticidestewardship org/PollinatorProtection/Pages/default.aspx.

Pesticide incidents (for example, bee kills) should immediately be reported to the state/tribal lead agency. For contact information for your state, go to: www.aapco org/officials html. Pesticide incidents should also be reported to the National Pesticide Information Center at: www npic.orst.edu or directly to EPA at: beekill@epa.gov

OBSERVE THE FOLLOWING PRECAUTIONS WHEN MIXING AND APPLYING IN THE VICINITY OF AQUATIC AREAS SUCH AS LAKES, RESERVOIRS, RIVERS, PERMANENT STREAMS, MARSHES OR NATURAL PONDS, ESTUARIES, AND COMMERCIAL FISH FARM PONDS.

SPRAY DRIFT MANAGEMENT

The interaction of many equipment- and wea her-related factors determines he potential for spray drift. The applicator is responsible for considering all of hese factors when making application decisions. Avoiding spray drift is he responsibility of the applicator.

Mixing and Loading Requirements

To avoid potential contamination of g oundwater, the use of a p operly designed and maintained containment pad for mixing and loading of any pesticide into application equipment is recommended. If containment pad is not used, maintain a minimum distance of 25 feet between mixing and loading area and potential surface to g oundwater conduits such as field sumps, uncased well heads, sinkholes, or field drains.

For Aerial Applications

For aerial applications, he spray boom should be mounted on he aircraft so as to minimize drift caused by wing tip vortices. The minimum practical boom leng h should be used and must not exceed 75% of the wing span or otor diameter. Spray should be released at he lowest possible height consistent with good pest con- t ol and flight safety. Applications more han 10 feet above the c op canopy should be avoided.

Importance of Droplet Size

An important factor influencing drift is d oplet size. Small d oplets (<150-200 mic ons) drift to a greater extent han large d oplets. Wi hin typical equipment specifications, applications should be made to deliver he largest d oplet spectrum hat p ovides sufficient cont ol and coverage. Formation of very small d oplets may be minimized by app opriate nozzle selection, by orienting nozzles away f om the airstream as much as possible, and by avoiding excessive spray boom pressure.

Wind Speed Restrictions

Drift potential increases at wind speeds of less han 3 mph (due to inversion potential) or more han 10 mph. However, many factors, including d oplet size, canopy, and equipment specifications determine drift potential at any given wind speed. Do not apply when winds are greater than 15 mph and avoid gusty and windless conditions. Risk of exposure to sensitive aquatic areas can be reduced by avoiding applications when wind direction is toward he aquatic area.

Restrictions During Temperature Inversions

Do not make aerial or g ound applications during temperature inversions. Drift potential is high during temperature inversions. Temperature inversions restrict vertical air mixing, which causes small suspended d oplets to remain close to he g ound and move laterally in a concentrated cloud. Temperature inversions are characterized by increasing temperature with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as he sun sets and often continue into the mo ning. Their presence can be indicated by g ound fog; however, if fog is not present, inversions can also be identified by he movement of smoke f om a g ound source. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke hat moves upward and rapidly dissipates indicates good vertical mixing.

Airblast (Air Assist) for Tree Crops and Vineyards

Airblast sprayers carry d oplets into he canopy of trees/vines via a radially or laterally directed airstream. The following specific drift management practices should be followed:

- Adjust deflectors and aiming devices so hat spray is only directed into he canopy.
- Block off upward-pointed nozzles when here is no ove hanging canopy.

- Use only enough air volume to penetrate he canopy and p ovide good coverage.
- Do not allow the spray to go beyond the edge of he cultivated area (i.e., tu n off sprayer when tu ning at end ows).
- Only spray inward, toward he orchard or vineyard, for application to the outside ows.

No-Spray Zone Requirements for Soil and Foliar Applications

Do not apply by g ound within 25 feet or by air wi hin 150 feet of lakes, reservoirs, rivers, permanent streams, marshes or natural ponds, estuaries, and commercial fish farm ponds.

Runoff Management

Do not cultivate within 10 feet of the aquatic areas to allow g ow h of a vegetative filter strip. When using Pasada® 1.6F Flowable Insecticide on e odible soils, Best Management Practices for minimizing runoff should be employed. Consult your local Natural Resources Conservation Service for recommendations in your use area.

Endangered Species Notice

Under he Endangered Species Act, it is a Federal offense to use any pesticide in a manner hat results in the dea h of a member of an endangered species. Consult your local county bulletin, County Extension Agent, or Pesticide State Lead Agency for information conce ning endangered species in your area.

RESISTANCE MANAGEMENT

Some insects are known to develop resistance to insecticides after repeated use. As with any insecticide, the use of his p oduct should conform to resistance management strategies established for he use area.

Pasada 1.6F Flowable Insecticide contains a G oup 4A insecticide. Insect biotypes wi h acquired or inherent tolerance to G oup 4A insecticides may eventually dominate he insect population if G oup 4A insecticides are used repeatedly as he predominant me hod of cont ol for targeted species. This may eventually result in partial or total loss of cont ol of hose species by Pasada 1.6F Flowable Insecticide and to o her G oup 4A insecticides.

The active ingredient in Pasada 1.6F Flowable Insecticide is a member of the neonicotinoid chemical class. Insect pests resistant to o her chemical classes have not shown c oss-resistance to Pasada 1.6F Flowable Insecticide. Avoid using a block of more than hree consecutive applications of Pasada 1.6F Flowable Insecticide and/or other G oup 4A p oducts having he same or similar mode of action. Following a neonicotinoid block of treatments, Makhteshim Agan of North America, Inc. st ongly encourages he otation to a block of applications with effective p oducts with a different mode of action before using additional applications of neonicotinoid p oducts. Using a block otation or windowed app oach along wi h o her IPM practices is considered an effective use strategy for preventing or delaying an insect's ability to develop resistance to his class of chemistry.

Do not use Pasada 1.6F Flowable Insecticide or o her Group 4A p oducts f om he neonicotinoid chemical class for foliar applications on c ops previously treated with long-residual, soil-applied p oducts f om the neonicotinoid chemical class.

Other G oup 4A neonicotinoid p oducts used as foliar treatments include: Actara®, Alias®, Assail®, Calypso®, Centric®, Clutch®, Couraze®, Gallant™, Impulse™, Intruder®, Leverage®, Nuprid™, P ovado®, Trimax™ P o, and Venom®.

Other G oup 4A neonicotinoid p oducts used as soil/seed treatments include: Admire® P o, Advise™, Alias, Belay®, Couraze, Cruiser®, Gaucho®, Macho™, Macho Max, Nuprid, Platinum®, Venom, and Widow™.

Contact your Cooperative Extension specialist, certified c op advisor, and/or p oduct manufacturer for additional insect resistance management recommendations. Also, for more information on Insect Resistance Management (IRM), visit the Insecticide Resistance Action Committee (IRAC) on he web at http://www.irac-online org/.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this p oduct in a manner inconsistent wi h its labeling.

See individual c ops for specific pollinator protection application restrictions. If none exist under the specific c op, for follar applications, follow these application directions for c ops hat are contracted to have pollinator services or for food/feed crops and commercially g own o namentals that are attractive to pollinators.

FOR CROPS UNDER CONTRACTED POLLINATION SERVICES

Do not apply his p oduct while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen unless he following condition has been met:

If an application must be made when managed bees are at he treatment site, he beekeeper p oviding he pollination services must be notified no less han 48 hours prior to he time of he planned application so that he bees can be removed, covered or otherwise p otected prior to spraying.

FOR FOOD/FEED CROPS AND COMMERCIALLY GROWN ORNAMENTALS NOT UNDER CONTRACT FOR POLLINATION SERVICES BUT ARE ATTRACTIVE TO POLLINATORS

Do not apply his p oduct while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen unless one of he following conditions is met:

- The application is made to the target site after sunset
- The application is made to the target site when temperatures are below 55°F
- The application is made in accordance with a gove nment-initiated public heal h response
- The application is made in accordance with an active state-administered apiary registry p ogram where beekeepers are notified no less han 48- hours prior to the time of the planned application so hat he bees can be removed, covered or o herwise p otected prior to spraying
- The application is made due to an imminent threat of significant c op loss, and a documented determination consistent wi h an IPM plan or predetermined economic threshold is met. Every effort should be made to notify beekeepers no less han 48-hours prior to the time of he planned application so that he bees can be removed, covered or otherwise p otected prior to spraying.

Do not apply this p oduct in a way hat will contact workers o r other persons, either directly or th ough drift. Only p otected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult he Agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this p oduct in accordance wi h its labeling and w th he Worker P otection Standard, 40 CFR Part 170. This Standard contains requirements for he p otection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to he statements on his label about personal p otective equipment (PPE) and restricted-entry intervals. The requirements in his box only apply to uses of his p oduct hat are covered by he Worker P otection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 12 hours.

PPE required for early entry to treated areas hat is permitted under the Worker P otection Standard and hat involves contact wi h any hing that has been treated such as plants, soil, or water is:

- Coveralls
- Chemical-resistant gloves made of any waterp oof material such as barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyethylene, polyvinylchoride (PVC), or Viton
- Shoes plus socks

APPLICATION DIRECTIONS

RESTRICTION: Do not apply Pasada 1.6F Flowable Insecticide in enclosed structures such as planthouses or greenhouses.

Apply foliar applications of Pasada 1.6F Flowable Insecticide as a directed or a b oadcast foliar spray. Tho ough coverage of foliage is necessary without runoff for optimum insecticidal efficacy. Use adequate spray volumes, p operly calibrated application equipment, and spray adjuvant if necessary to obtain tho ough coverage. Failure to p ovide adequate coverage and retention of Pasada 1.6F Flowable Insecticide on leaves and fruit may result in loss of insect cont ol or delay in onset of activity. Apply Pasada 1.6F Flowable Insecticide wi h p operly calibrated g ound or aerial application equipment. Minimum spray volumes, unless o herwise specified on c op-specific application sections, are 10 gallons per acre by g ound and 5 gallons per acre by air. Pasada 1.6F Flowable Insecticide may also be applied by ove head chemigation (see additional information in **CHEMIGATION** section of his label below) if allowed in crop-specific application section.

Pasada 1.6F Flowable Insecticide is not allowed for use on c ops grown for p oduction of true seed intended for private or commercial planting unless specified under state-specific 24(c) labeling. Do not allow exposure of Pasada 1.6F Flowable Insecticide to honeybees.

RESTRICTION: Regardless of formulation or method of application, do not apply more han 0.5 pounds of active ingredient imidacloprid per acre per year, including seed treatment, soil, and foliar uses, unless specified wi hin a c op-specific application section for a given c op.

MIXING INSTRUCTIONS

Shake the Pasada 1.6F Flowable Insecticide container well before using. To prepare the application mixture, add a portion of the required amount of water to the spray tank and with agitation, add Pasada 1.6F Flowable Insecticide. Complete filling tank with balance of water needed. Maintain sufficient agitation during both mixing and application. Pasada 1.6F Flowable Insecticide may also be used with other pesticides and/or fertilizer solutions. Please see **Compatibility** section of this label. When tank mixtures of Pasada 1.6F Flowable Insecticide and other pesticides are involved, prepare the tank mixture as instructed above and follow suggested **Mixing Order** below.

Mixing Order

When pesticide mixtures are needed, add wettable powders or wettable granules first, Pasada 1.6F Flowable Insecticide and other suspension concentrate (flowable) products second, and emulsifiable concentrates last. Ensure good agitation as each component is added. Do not add an additional component until the previous is thoroughly mixed. If a fertilizer solution is added, a fertilizer/pesticide compatibility agent may be needed. Maintain constant agitation during both mixing and application to ensure uniformity of spray mixture.

Compatibility

Test compatibility of the intended mixture before adding Pasada 1.6F Flowable Insecticide to the spray or mix tank. Add proportionate amounts of each ingredient in the appropriate order to a pint or quart jar, cap, shake for 5 minutes, and let set for 5 minutes. Do not use if poor mixing or formation of precipitates that do not readily redisperse occurs which indicates an incompatible mixture.

CHEMIGATION

Types of Irrigation Systems: Make foliar chemigation applications of Pasada 1.6F Flowable Insecticide to crops through overhead sprinkler systems if specified in crop-specific application sections. **RESTRICTION:** Do not apply Pasada 1.6F Flowable Insecticide through any other type of irrigation system. Make foliar chemigation applications of Pasada 1.6F Flowable Insecticide as concentrated as possible. Retention of Pasada 1.6F Flowable Insecticide on target site of insect infestation is necessary for optimum activity. **RESTRICTION:** Do not chemigate Pasada 1.6F Flowable Insecticide in water volumes exceeding 0.10 inch per acre. See crop-specific application sections of the label for more information.

Uniform Water Distribution and System Calibration: The irrigation system must provide uniform distribution of treated water. Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from non-uniform distribution of treated water. The system must be calibrated to uniformly apply the rates specified. If you have questions about calibration, contact Cooperative Extension Service specialists, equipment manufacturers, or other experts.

Chemigation Monitoring: A person knowledgeable of the chemigation system and responsible for its operation, or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise.

Drift: Do not apply when wind speed favors drift beyond the area intended for treatment.

Required System Safety Devices: The system must contain a functional check valve, vacuum-relief valve, and low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow. The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump. The pesticide injection pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down. The system must contain functional interlocking controls to auto-

matically shut off the pesticide injection pump when he water pump motor stops. The irrigation line or water pump must include a functional pressure switch which will stop he water pump motor when the water pressure decreases to he point where pesticide distribution is adversely affected. Systems must use a metering pump such as a positive displacement injection pump (e.g. diaphragm pump) effectively designed and constructed of materials hat are compatible with pesticides and capable of being fitted wi h a system interlock.

Using Water from Public Water Systems: Public water systems means a system for the p ovision to he public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of he year. Chemigation systems connected to public water systems must contain a functional reduced-pressure zone, back flow preventer (RPZ), or he functional equivalent in the water supply line upstream f om the point of pesticide int oduction. As an option to the RPZ, he water f om he public water system should be discharged into a reservoir tank prior to pesticide int oduction. There shall be a complete physical break (air gap) between the outlet end of he fill pipe and to top or overflow rim of he reservoir tank of at least twice he inside diameter of the fill pipe. The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward he injection. The pesticide injection pipeline must contain a functional, normally closed, solenoid-operated valve located on the intake side of he injection pump and connected to the system interlock to prevent fluid f om being withdrawn f om he supply tank when he irrigation system is either automatically or manually shut down. The system must contain functional interlocking cont ols to automatically shut off he pesticide injection pump when he water pump motor stops or in cases where there is no water pump, when he water pressure decreases to he point where pesticide distribution is adversely affected. Systems must use a metering pump such as a positive displacement injection pump (e.g. diaphragm pump) effectively designed and constructed of materials hat are compatible w th pesticides and capable of being fitted with a system interlock.

ROTATIONAL CROPS*

Replant treated areas wi h any c op specified on an imidacloprid label or any c op for which a tolerance exists for he active ingredient as soon as practical following he last application. For crops not listed on an imidacloprid label, or for c ops for which no tolerances for he active ingredient have been established, a 12-month plant-back interval must be observed.
IMMEDIATE PLANT-BACK: All c ops on his label plus he following c ops not on his label: barley, canola, co n (field, pop, and sweet), rapeseed, sorghum, soybean, sugarbeet, and wheat
30-DAY PLANT-BACK: Cereals (including buckwheat, millet, oats, rice, rye, and triticale) and safflower
10-MONTH PLANT-BACK: Onion and bulb vegetables
12-MONTH PLANT-BACK: All O her C ops

*Plant cover c ops for soil building or e osion cont ol at any time, but do not graze or harvest for food or feed.

FIELD CROPS
Application Directions – Pasada 1.6F Flowable Insecticide

COTTON

Pests Controlled	Rate: Fluid ounces per acre
Cotton aphid, Cotton fleahopper, Bandedwinged whitefly, Plant bugs (excludes *Lygus hesperus*), Green stink bug, Southe n green stink bug, Bollworm/budworm (ovicidal effect)	2.5-5.0
Pests Suppressed	**Rate: Fluid ounces per acre**
Lygus bug *(Lygus hesperus)*, Whiteflies (o her han bandedwinged whitefly)	3.8-5.0

Restrictions:
- Pre-Harvest Interval (PHI): 14 days
- Minimum interval between applications: 7 days
- Maximum Pasada 1.6F Flowable Insecticide foliar application amount allowed per year: 25.0 fluid ounces per acre (0.31 lb. AI per acre)
- Do not graze treated fields after any application of Pasada 1.6F Flowable Insecticide.
- Apply Pasada 1.6F Flowable Insecticide h ough p operly calibrated g ound, aerial, or chemigation application equipment.

Applications: Apply specified rate per acre as a b oadcast or directed foliar spray to an infested area as pest populations begin to build. Tho ough uniform coverage is necessary to achieve optimum cont ol. Use a spray adjuvant to imp ove coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve cont ol. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h o her insecticides for knockdown of pests or for imp oved cont ol of o her pests.

Tank Mix Instructions

Pests Controlled (in addition to pests listed above)	Pasada 1.6F Flowable Insecticide Rate fluid ounces per acre	Bidrin® 8* Rate: Fluid ounces per acre
For early-season control of: Thrips	2.5-3.8	1.6-3.2
For mid- to late-season control of: Plant bugs, Stink bugs (including B own stink bug), Grasshoppers, Saltmarsh caterpillar, Cotton leaf-perforator	2.5-3.8	4.0-8.0

Restrictions (in addition to Restrictions listed above):
*Refer to he Bidrin® 8 p oduct label; follow the most restrictive precautions and limitations on he labeling of all p oducts used in mixtures.

PEANUT [1]

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Lea hoppers, Whiteflies	3.5

Restrictions:
- Pre-Harvest Interval (PHI): 14 days
- Minimum interval between applications: 5 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 10.5 fluid ounces per acre (0.13 lb. AI per acre)

[1] Use not permitted in Califo nia.

Applications: Apply specified rate per acre as a b oadcast or directed foliar spray to an infested area as pest populations begin to build. Tho ough uniform coverage is necessary to achieve optimum cont ol. Use a spray adjuvant to imp ove coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve cont ol. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h o her insecticides for knockdown of pests or for imp oved cont ol of o her pests.

POTATO

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Colorado potato beetle, Flea beetles, Lea hoppers, Psyllids	3.8

Restrictions:
- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 7 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 16.0 fluid ounces per acre (0.2 lb. AI per acre)

Applications: Apply specified rate per acre as a b oadcast or directed foliar spray to an infested area as pest populations begin to build. Tho ough uniform coverage is necessary to achieve optimum cont ol. Use a spray adjuvant to imp ove coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve cont ol. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h o her insecticides for knockdown of pests or for imp oved cont ol of o her pests.

TOBACCO

Pests Controlled	Rate: Fluid ounces per acre
Aphids	2.0-4.0
Flea beetles, Japanese beetle	4.0

Restrictions:
- Pre-Harvest Inte val (PHI): 14 days
- Minimum interval between applications: 7 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 22.4 fluid ounces per acre (0.28 lb. AI per ac e)

Applications: Apply specified rate per ac e as a broadcast or directed foliar spray to an infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be equi ed to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h other insecticides for knockdown of pests or for improved control of o her pests.

VEGETABLE AND SMALL FRUIT CROPS

Application Directions – Pasada 1.6F Flowable Insecticide

FRUITING VEGETABLES[1]

C ops of G oup 8 plus Okra including: Eggplant, G ound cherry, Okra, Pepper (including bell, chili, cooking, pimento, and sweet), Tomato, Pepinos, Tomatillo

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Colorado potato beetle, Leafhoppers, Whiteflies	3.8-6.2
Pepper weevil	6.2

Restrictions:
- Pre-Harvest Interval (PHI): 0 day
- Minimum interval between applications: 5 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per crop season: 19 2 fluid ounces per acre (0 24 lb. AI per acre)

[1]Not for use on crops grown for seed unless allowed by state-specific 24(c) labeling.

Applications: Apply specified rate per acre as a broadcast or dir ected foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-t eat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h other insecticides for knockdown of pests or for improved control of other pests.

For pepper weevil, apply specified dosage of Pasada 1.6F Flowable Insecticide by ground equipment only, timing applications prior to establishment of a damaging population. Good coverage of foliage and fruit is necessary for optimum control. Applications of Pasada 1.6F Flowable Insecticide must be incorporated into a full-season program where alte nations of effective products from multiple classes of chemistry and different modes of action are utilized in a blocked or windowed approach. For additional information, please contact your Makhteshim Agan of North America, Inc. ep esentative, Extension Specialist, or crop advis-or.

For adult whiteflies, use higher listed rates.

GLOBE ARTICHOKE

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Lea hoppers	4.0-10.0

Restrictions:
- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 14 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 40.0 fluid ounces per acre (0.5 lb. AI per acre)

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-t eat if needed. Tank mix Pasada 1.6F Flowable Insecticide w th o her insecticides for knockdown of pests or for improved control of other pests.

HERBS

Crops of Crop Subgroup 19A including: Angelica, Balm (lemon balm), Basil (fresh and dried), Borage, Bumet, Camomile, Catnip, Chervil (dried), Chinese chive, Chive, Clary, Coriander (cilant o or Chinese parsley leaves), Costmary, Culant o (leaf), Curry (leaf), Dillweed, Horehound, Hyssop, Lavender, Lemongrass, Lovage (leaf), Marigold, Marjoram, Nasturtium, Parsley (dried), Penny oyal, Rosemary, Rue, Sage, Savory (summer and winter), Sweet bay (bay leaf), Tansy, Tarragon, Thyme, Wintergreen, Woodruff, Wormwood

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Flea beetles, Lea hoppers, Whiteflies	3.5

Restrictions:
- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 5 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per crop season: 10.5 fluid ounces per acre (0.13 lb. AI per acre)

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-t eat if needed. Tank mix Pasada 1.6F Flowable Insecticide w th o her insecticides for knockdown of pests or for improved control of other pests. Note: Exercise care when t eating crops above as not all he crops and/or varieties have been tested for susceptibility to Pasada 1.6F Flowable Insecticide. Treat only small areas or numbers of plants to evaluate safety of Pasada 1.6F Flowable Insecticide before comme cial use on he entire crop.

BRASSICA (COLE) LEAFY VEGETABLES[1]

Crops of Crop Group 5 including: B occoli, B occoli raab (rapini), Brussels sp outs, Cabbage, Cauliflower, Cavalo b occoli, Chinese (gai lon) b occoli, Chinese (bok choy) cabbage, Chinese (napa) cabbage, Chinese mustard (gai choy) cabbage, Collards, Kale, Kohlrabi, Mizuna, Mustard greens, Mustard spinach, Rape greens

Pests Controlled	Rate: Fluid ounces per acre
Aphids, flea beetles, Lea hoppers, Whiteflies	3.8

Restrictions:
- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 5 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per crop season: 19 2 fluid ounces/Acre (0 24 lb. AI per acre)

[1]Not for use on crops grown for seed unless allowed by state-specific 24(c) labeling.

Applications: Apply specified rate per acre as a broadcast or dir ected foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-t eat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h other insecticides for knockdown of pests or for improved control of other pests.

LEAFY VEGETABLES[1]

Crops of Crop Subgroup 4A plus Watercress including: Amaran h (leafy amaran h, Chinese spinach, tampala), Arugula (Roquette), Chervil, Chrysan hemum (edible leaved and garland), Cilant o, Co n salad, Cress (garden), Cress (upland, yellow ocket, winter cress), Dandelion, Dock (sorrel), Endive (esca ole), Lettuce (head and leaf), Orach, Parsley, Purslane (garden and winter), Radicchio (red chicory), Spinach (including New Zealand and vine (Malabar spinach, Indian spinach)), Watercress (commercial p oduction only, applications must not be made to native cress g owing in streams or o her bodies of water), W atercress (upland)

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Flea beetles, Lea hoppers, Whiteflies	3.8

Restrictions:
- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 5 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per crop season: 19 2 fluid ounces per acre (0 24 lb. AI per acre)

[1]Not for use on crops grown for seed unless allowed by state-specific 24(c) labeling.

Applications: Apply specified rate per acre as a broadcast or dir ected foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-t eat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h other insecticides for knockdown of pests or for improved control of o her pests.

LEGUME VEGETABLES[1] except soybean, dry
Crops of Crop Group 6 including: Edible Podded and Succulent Shelled Pea and Bean and Dried Shelled Pea and Bean
Bean (*Lupinus* spp., includes grain lupin, sweet lupin, white lupin, and white sweet lupin)
Bean (*Phaseolus* spp., includes field bean, kidney bean, lima bean, navy bean, pinto bean, runner bean, snap bean, tepary bean, wax bean)
Bean (*Vigna* spp., includes adzuki bean, asparagus bean, blackeyed pea, catjang, Chinese longbean, cowpea, Cowder pea, moth bean, mung bean, rice bean, Southern pea, urd bean, yardlong bean)
Pea (*Pisum* spp., includes dwarf pea, edible-pod pea, English pea, field pea, garden pea, green pea, snow pea, sugar snap pea)
Other Beans and Peas (Broad bean (fava), Chickpea (garbanzo bean), Guar, Jackbean, Lablab bean (hyacinth bean), Lentil, Pigeon pea, Soybean (immature seed), Sword bean)

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Leafhoppers, Whiteflies	3.5

Restrictions:
- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 7 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per crop season: 10.5 fluid ounces per acre (0.13 lb. AI per acre)

[1]Not for use on crops grown for seed unless allowed by state-specific 24(c) labeling.

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide with other insecticides for knockdown of pests or for improved control of other pests.

ROOT VEGETABLES[1]

Crops of Crop Subgroup 1B except Sugarbeet including: Beet (garden)[2], Burdock (edible)[2], Car ot[2], Celeriac[2], Chervil (tu nip- ooted)[2], Chicory[2], Ginseng, Horseradish, Kava[2,3], Parsley (tu nip-rooted), Parsnip[2], Radish[2], Oriental radish (diakon)[2], Rutabaga[2], Salsify (oyster plant), Salsify (black)[2], Salsify (Spanish), Skirret, Tu nip[2]

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Flea beetles, Lea hoppers, Whiteflies	3.5

Restrictions:

- Pre-Harvest Inte val (PHI): 7 days
- Minimum inte val between applications: 5 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per crop season: 3.5 fluid ounces per acre (0.044 lb. AI per acre) on radish, 10.5 fluid ounces per acre (0.13 lb. AI per ac e) on other crops
- Maximum Pasada 1.6F Flowable Insecticide application(s) per crop season: 1 on radish, 3 on all other crops

[1]Not for use on crops grown for seed unless allowed by state-specific 24(c) labeling.

[2]Tops or greens from hese crops may be utilized for food or feed.

[3]Use not permitted in Califo nia.

Applications: Apply specified rate per ac e as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-t eat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h other insecticides for knockdown of pests or for improved control of o her pests.

TUBEROUS and CORM VEGETABLES[1]

Crops of Crop Subgroup 1C including: Arracacha, Ar ow oot, Artichoke (Chinese and Jerusalem), Canna (edible, Queensland ar ow oot), Cassava (bitter and sweet)[2], Chayote (oot), Chufa, Dasheen (taro)[2], Ginger, Leren, Sweetpotato[2], Tanier (cocoyam)[2], Turmeric, Yam bean (jicama, manioc pea), Yam (true)[2] (For applications on potato, see **FIELD CROPS** section)

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Flea beetles, Lea hoppers, Whiteflies	3.5

Restrictions:

- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 5 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per crop season: 10.5 fluid ounces per ac e (0.13 lb. AI per acre) on all crops
- Maximum Pasada 1.6F Flowable Insecticide application(s) per crop season: 3 on all crops

[1]Not for use on crops grown for seed unless allowed by state-specific 24(c) labeling.

[2]Tops or greens from these crops may be utilized for food or feed.

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be requi ed to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h o her insecticides for knockdown of pests or for improved control of other pests.

STRAWBERRY

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Spittlebugs, Whiteflies	3.8

Restrictions:
- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 5 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per crop season: 11.4 fluid ounces per acre (0.14 lb. AI per acre)
- Do not apply during bloom or within 10 days prior to bloom or when bees are foraging.

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be equired to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h o her insecticides for knockdown of pests or for improved control of other pests.

TREE, BUSH, and VINE CROPS
Application Directions – Pasada 1.6F Flowable Insecticide

BANANA and PLANTAIN

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Lea hoppers, Thrips	8.0

Restrictions:
- Pre-Harvest Interval (PHI): 0 day
- Minimum interval between applications: 14 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 40.0 fluid ounces per acre (0.5 lb. AI per acre)

Applications: Apply specified rate per acre as a broadcast or directed foliar spray hrough properly calibrated ground or aerial application equipment. Thorough uniform coverage is necessary to achieve optimum control. To improve coverage and pest control, add an organosilicone adjuvant at a rate not to exceed 2.0 fluid ounces per 100 gallons in the finished spray solution. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide wi h o her insecticides for knockdown of pests or for improved control of o her pests. Aerial application of Pasada 1.6F Flowable Insecticide may esult in slower activity and educed control relative to results from ground application. For tree and vine crops, application rates are based on full-size, mature trees or vines.

BUSHBERRY

Crops of Crop Subgroup 13B Including: Blueberry, Currant, Elderberry, Gooseberry, Huckleberry, Juneberry, Ligonberry, Salal

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Lea hoppers/Sharpshooters	3.0-4.0
Blueberry maggot, Japanese beetle (adults), Thrips (foliage-feeding hrips only)	6.0-8.0

Restrictions:

- Pre-Harvest Interval (PHI): 3 days
- Minimum interval between applications: 7 days
- Maximum Pasada 1.6F Flowable Insecticide broadcast or di ected foliar spray applications allowed per year: 40.0 fluid ounces per acre (0.5 lb. AI per ac e)
- Maximum number of Pasada 1.6F Flowable Insecticide applications per year: 5
- Minimum application volume (water): 20 0 GPA-ground, 5.0 GPA-aerial
- Do not apply pre-bloom or during bloom or when bees are foraging.

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be equired to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide w th other insecticides for knockdown of pests or for improved control of o her pests. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced control relative to results from ground application. For tree and vine crops, application rates are based on full-size, mature t ees or vines.

For Japanese beetle adults, Pasada 1.6F Flowable Insecti cide will p ovide initial cont ol; however, residual cont ol will diminish as Pasada 1.6F Flowable Insecticide is absorbed into he foliage. Adult knockdown will persist for 7-10 days. Under conditions of heavy beetle pressure, re-infestation, or adverse envi onmental conditions, reapplication of Pasada 1.6F Flowable Insecticide may be necessary.

CANEBERRY[1]
Crops of Crop Subgroup 13A including:
Blackberry (*Rubus* spp. including Andean blackberry, Arctic blackberry, Bingleberry, Black satin berry, Boysenberry, B ombeere, Califo nia blackberry, Che okee blackberry, Chesterberry, Cheyenne blackberry, Common blackberry, Coryberry, Dar owberry, Dewberry, Dirksen tho nless berry, Evergreen blackberry, Himalayaberry, Hullberry, Lavacaberry, Loganberry, Lowberry, Lucretiaberry, Mammo h blackberry, Marionberry, Moras, Mures de once, Nectarberry, Nor he n dewberry, Olallieberry, Oregon evergreen berry, Phenomenalberry, Rangeberry, Ravenberry, Rossberry, Shawnee blackberry, So-u he n dewberry, Tayberry, Youngberry, Zarzamora, and varieties and/or hybrids of hese)
Raspberry (*Rubus* spp. including Bababerry, Black raspberry, Blackcap, Caneberry, Framboise, Frambueso, Himbeere, Keriberry, Mayberry, Red raspberry, Thimbleberry, Tulameen, Yellow raspberry, and varieties and/or hybrids of hese, and Wild raspberry)

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Lea hoppers, Thrips	8.0

Restrictions:
- Pre-Harvest Interval (PHI): 3 days
- Minimum interval between applications: 7 days
- Maximum Pasada 1.6F Flowable Insecticide broadcast or di ected foliar spray applications allowed per year: 24.0 fluid ounces per acre (0.3 lb. AI per ac e)
- Minimum application volume (water): 20 0 GPA-ground, 5.0 GPA-aerial
- Do not apply pre-bloom or during bloom or when bees are foraging.

[1]Use not permitted in Califo nia.
Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be equired to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide w th other insecticides for knockdown of pests or for improved control of o her pests. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced control relative to results from ground application. For tree and vine crops, application rates are based on full-size, mature t ees or vines.

CITRUS

Crops of Crop Group 10 Including: Calamondin, Citrus cit on , Citrus hybrids (includes chi onja, tangelo, and tangor), Grapefruit, Kumquat, Lemon, Lime, Mandarin (tangerine), Pummelo, Orange (sweet and sour), Satsuma mandarin, Tangelo, and other cultivars and/or hybrids of hese

Pests Controlled	**Rate: Fluid ounces per acre**
Aphids, Asian citrus psyllid, Blackfly, Lea hoppers/Sharpshooters, Leafminers, Mealybugs, Scales, Whiteflies	10.0-20.0 (depending on tree size, target pest, and infestation pressure)
Pest Suppressed	**Rate: Fluid ounces per acre**
Thrips (foliage-feeding thrips only)	10.0-20.0

Restrictions:

- Pre-Harvest Inte val (PHI): 0 day
- Minimum interval between applications: 10 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 40.0 fluid ounces per acre (0.5 lb. AI per acre)
- Do not apply during bloom or wi hin 10 days prior to bloom or when bees are foraging.

Applications: Apply specified rate per acre as a broadcast or di ected foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessa y to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide w th o her insecticides for knockdown of pests or for improved control of other pests. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced control elative to results from ground application. For tree and vine crops, application rates are based on full-size, mature trees or vines.

For scale control, time applications to the crawler stage and treat each generation.

COFFEE

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Lea hoppers, Whiteflies	8.0
Pest Suppressed	**Rate: Fluid ounces per acre**
Scales	8.0

Restrictions:
- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 7 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 40.0 fluid ounces per acre (0.5 lb. AI/Acre)
- Do not apply pre-bloom or during bloom or when bees are foraging.

Applications: Apply specified dosage as a b oadcast or directed spray to infested area as pest populations begin to build. Apply Pasada 1.6F Flowable Insecticide h ough p operly calibrated g ound or aerial application equipment ensuring ho ough coverage. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced cont ol relative to results f om g ound application. Use a spray adjuvant to imp ove coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve cont ol. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide with o her insecticides for knockdown of pests or for imp oved cont ol of o her pests. For tree and vine c ops, application rates are based on full-size, mature trees or vines.

GRAPE

Including: American bunch grape, Muscadine grape, and Vinifera grape

Pests Controlled	Rate: Fluid ounces per acre
Lea hoppers/Sharpshooters, Mealybugs	3.0-4.0
Grapeleaf skeletonizer	3.8-4.0

Restrictions:
- Pre-Harvest Interval (PHI): 0 days
- Minimum interval between applications: 14 days
- Maximum Pasada 1.6F Flowable Insecticide broadcast or directed foliar spray applications allowed per year: 8.0 fluid ounces/Acre (0.1 lb. AI/Acre)
- Apply Pasada 1.6F Flowable Insecticide by ground application only.

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide w th other insecticides for knockdown of pests or for improved control of other pests. For tree and vine crops, application rates are based on full-size, mature trees or vines.

HOP

Pests Controlled	Rate: Fluid ounces per acre
Aphids	8.0

Restrictions:
- Pre-Harvest Interval (PHI): 28 days
- Minimum interval between applications: 21 days
- Maximum Pasada 1.6F Flowable Insecticide broadcast or directed foliar spray applications allowed per year: 24.0 fluid ounces per acre (0.3 lb. AI/Acre)

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested a ea as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be equired to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide with other insecticides for knockdown of pests or for improved control of other pests. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced control relative to esults from ground application. For t ee and vine crops, application rates are based on full-size, matu e trees or vines.

POME FRUIT

Crops of Crop Group 11 Including: Apple, Crabapple, Loquat, Mayhaw, Pear (including Oriental pear), Quince

Pests Controlled	Rate: Fluid ounces per acre
Lea hoppers	4.0-8.0
Aphids (except Woolly apple aphid), Apple maggot, Leafminers, San Jose scale	8.0
FOR PEAR ONLY: Mealybugs, Pear psylla	20.0

Restrictions:
- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 10 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 40.0 fluid ounces per ac e (0.5 lb. AI/Acre)
- Do not apply pre-bloom or during bloom or when bees are foraging.

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide w th other insecticides for knockdown of pests or for improved control of other pests. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced control relative to esults from ground application. For tree and vine crops, application rates are based on full-size, mature t ees or vines. **For apple maggot sprays**, combine Pasada 1.6F Flowable Insecticide with an approved sticker at the manufacturer's specified rates.

POMEGRANATE

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Lea hoppers/Sharpshooters, Whiteflies	8.0
Pests Suppressed	**Rate: Fluid ounces per acre**
Scales	8.0

Restrictions:
- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 7 days
- Maximum Pasada 1.6F Flowable Insecticide broadcast or directed foliar spray applications allowed per year: 24.0 fluid ounces per acre (0.3 lb. AI per acre)
- Do not apply p e-bloom or during bloom or when bees are foraging.

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested a ea as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be equired to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide with other insecticides for knockdown of pests or for improved control of other pests. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced control relative to esults from ground application. For t ee and vine crops, application rates are based on full-size, matu e trees or vines.

STONE FRUIT

Crops of Crop Group 12 Including: Apricot, Cherry (including sweet and tart), Nectarine, Peach, Plum (including Chickasaw, Damson, and Japanese), Plumcot, Prune (fresh and dried)

Pests Controlled	**Rate: Fluid ounces per acre**
Aphids, Green June beetle, Japanese beetle, Lea hoppers/Sharpshooters, Plant bugs, Rose chafer, San Jose scale	4.0-8.0
Cherry fruit fly	6.0-8.0
Pests Suppressed	**Rate: Fluid ounces per acre**
Plum curculio, Stink bugs	8.0

Restrictions for Apricot, Nectarine, Peach:

- Pre-Harvest Interval (PHI): 0 day
- Minimum interval between applications: 7 days
- Maximum Pasada 1.6F Flowable Insecticide broadcast or directed foliar spray applications allowed per year: 24.0 fluid ounces/Acre (0.3 lb. AI/Acre)
- Minimum application volume (water): 50 GPA – ground application, 25 GPA – aerial application
- Do not apply pre-bloom or during bloom or when bees are foraging.

Restrictions for Cherries, Plums, Plumcot, Prune:

- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 10 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per season: 40.0 fluid ounces/Acre (0.5 lb. AI/Acre)
- Minimum application volume (water): 50 GPA – ground application, 25 GPA – aerial application
- Do not apply pre-bloom or during bloom or when bees are foraging.

Applications: Apply specified rate per acre as a broadcast or directed foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessary to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide w th other insecticides for knockdown of pests or for improved control of other pests. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced control relative to esults from ground application. For tree and vine crops, application rates are based on full-size, mature t ees or vines.

TREE NUTS

Crops of Crop Group 14 (except almonds) Including: Beechnut, Brazil nut, Butte nut, Cashew, Chestnut, Chinquapin, Filbert, Hickory nut, Macadamia nut, Pecan, Pistachio, Walnut (black and English)

Pests Controlled	Rate: Fluid ounces per acre
Aphids (except black pecan aphid), Lea hoppers/Sharpshooters, Phylloxera spp. (leaf infestations), Spittlebugs, Whiteflies	3.5-7.0
Black pecan aphid, Mealybugs, San Jose scale	8.0

Restrictions:

- Pre-Harvest Interval (PHI): 7 days
- Minimum interval between applications: 6 days
- Maximum Pasada 1.6F Flowable Insecticide b oadcast or directed foliar spray applications allowed per year: 28.8 fluid ounces/Acre (0.36 lb. AI/Acre)
- Minimum application volume (water): 50 GPA- g ound application, 25 GPA- aerial application
- Do not apply pre-bloom or during bloom or when bees are foraging.

Applications: Apply specified rate per acre as a b oadcast or directed foliar spray to infested area as pest populations begin to build. Tho ough uniform coverage is necessary to achieve optimum cont ol. Use a spray adjuvant to imp ove coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve cont ol. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide with o her insecticides for knockdown of pests or for imp oved cont ol of o her pests. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced cont ol relative to results f om g ound application. For tree and vine c ops, application rates are based on full-size, mature trees or vines.

For San Jose scale, time applications of Pasada 1.6F Flowable Insecticide to the crawler stage, treating each successive generation. Two applications on a 10- to 14-day interval may be required to achieve cont ol.

TROPICAL FRUIT

Including: Ace ola, Atemoya, Avocado, Birida, Black sapote, Canistel, Cherimoya, Custard apple, Feijoa, Jaboticaba, Guava, Llama, Longan, Lychee, Mamey sapote, Mango, Papaya, Passionfruit, Persimmon, Pulasan, Rambutan, Sapodilla, Soursop, Spanish lime, Star apple, Starfruit, Sugar apple, Wax jambu

Pests Controlled	**Rate: Fluid ounces per acre**
Aphids, Lea hoppers/Sharpshooters, Mealybugs, Thrips (foliage-feeding thrips only), Whiteflies	8.0
Pest Suppressed	**Rate: Fluid ounces per acre**
Scales	8.0

Restrictions:

- Pre-Harvest Inte val (PHI): 7 days
- Minimum interval between applications: 10 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 40.0 fluid ounces/Acre (0.5 lb. AI/Ac e)
- Do not apply pre-bloom or during bloom or when bees a e foraging.

Applications: Apply specified rate per acre as a broadcast or di ected foliar spray to infested area as pest populations begin to build. Thorough uniform coverage is necessa y to achieve optimum control. Use a spray adjuvant to improve coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve control. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide w th o her insecticides for knockdown of pests or for improved control of other pests. Aerial application of Pasada 1.6F Flowable Insecticide may result in slower activity and reduced control elative to results from ground application. For tree and vine crops, application rates are based on full-size, mature trees or vines.

OTHER SITES

Application Directions – Pasada 1.6F Flowable Insecticide

CHRISTMAS TREE

Pests Controlled	**Rate: Fluid ounces per acre**
Aphids, Adelgids, Sawflies	4.0-8.0

Restrictions:

- Minimum interval between applications: 7 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 40.0 fluid ounces/Acre (0.5 lb. AI/Acre)

Applications: Apply specified rate per acre as a b oadcast or directed foliar spray to infested area as pest populations begin to build. Tho ough uniform coverage is necessary to achieve optimum cont ol. Use a spray adjuvant to imp ove coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve cont ol. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide with o her insecticides for knockdown of pests or for imp oved cont ol of o her pests.

For control of gall-forming adelgids, time applications to coincide with full bud-swell of the earliest bud-breaking trees. Once galls form, spraying will be ineffective.

POPLAR/COTTONWOOD[1]
(includes members of he genus *Populus* g own for pulp or timber)

Pests Controlled	Rate: Fluid ounces per acre
Aphids, Leaf beetles	4.0-8.0

Restrictions:
- Minimum interval between applications: 10 days
- Maximum Pasada 1.6F Flowable Insecticide allowed per year: 40.0 fluid ounces per acre (0.5 lb. AI per acre)
- Do not apply pre-bloom or during bloom or when bees are foraging.

[1]Use not permitted in Califo nia unless otherwise directed by state-specific 24(c) labeling.

Applications: Apply specified rate per acre as a b oadcast or directed foliar spray to infested area as pest populations begin to build. Tho ough uniform coverage is necessary to achieve optimum cont ol. Use a spray adjuvant to imp ove coverage. Pasada 1.6F Flowable Insecticide may not knock down established and heavy insect populations. Two applications may be required to achieve cont ol. Scout fields and re-treat if needed. Tank mix Pasada 1.6F Flowable Insecticide with o her insecticides for knockdown of pests or for imp oved cont ol of o her pests.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

PESTICIDE STORAGE: Store in a cool, dry place and in such a manner as to prevent c oss contamination wi h o her pesticides, fertilizers, food, and feed. Keep pesticide in original container. Do not put concentrate or dilute into food or drink containers. Do not store diluted spray.

PESTICIDE DISPOSAL: Wastes resulting from he use of his p oduct may be disposed of on site or at an app oved waste disposal facility.

CONTAINER HANDLING:

Nonrefillable Container (five gallons or less): Nonrefillable container. Do not reuse or refill his container. Offer for recycling, if available. Clean container p omptly after emptying. Triple rinse as follows: Empty he remaining contents into application equipment or a mix tank and drain for 10 seconds after he flow begins to drip. Fill he container 1/4 full wi h water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat his p ocedure two more times. Offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or if allowed by State and local authorities, by bu ning. If bu ned, stay out of smoke.

LIMITATION OF WARRANTY AND LIABILITY

Read he entire Directions for Use, Conditions of Warranties and Limitations of Liability before using this product. If terms are not acceptable, retu n the unopened p oduct container at once.

By using this p oduct, user or buyer accepts the following **CONDITIONS, DISCLAIMER OF WARRANTIES** and **LIMITATIONS OF LIABILITY.**

CONDITIONS: The directions for use of his p oduct are believed to be adequate and must be followed carefully. However, it is impossible to eliminate all risks associated with the use of this p oduct. C op injury, ineffectiveness or other unintended consequences may result because of such factors as wea her conditions, presence of other materials, or the manner of use or application, all of which are beyond he cont ol of Makhteshim Agan of Nor h America, Inc. All such risks shall be assumed by the user or buyer.

DISCLAIMER OF WARRANTIES: To he extent consistent with applicable law, Makhteshim Agan of Nor h America, Inc. makes no o her warranties, express or implied, of merchantability or of fitness for a particular purpose or o herwise, that extend beyond he statements made on his label. No agent of Makhteshim Agan of North America, Inc. is au horized to make any warranties beyond hose contained herein or to modify he warranties contained herein. To the extent consistent with applicable law, Makhteshim Agan of North America, Inc. disclaims any liability whatsoever for special, incidental or consequential damages resulting f om he use or handling of his p oduct.

LIMITATIONS OF LIABILITY: To he extent consistent w th applicable law, he exclusive remedy of he user or buyer for any and all losses, injuries or damages resulting f om the use or handling of his p oduct, whe her in contract, warranty, tort, negligence, strict liability or o herwise, shall not exceed he purchase price paid or at Makhteshim Agan of Nor h America, Inc.'s election, the replacement of p oduct.

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Pasada is a registered trademark.
Couraze is a trademark of Cheminova, Inc.
Macho and Impulse are trademarks of Albaugh, Inc.
Advise and Gallant are trademarks of Agriliance, LLC.
Widow is a trademark of Loveland P oducts, Inc.
Nuprid is a trademark of Nufarm America, Inc.

GROUP 10B INSECTICIDE

VALENT®

Zeal®

MITICIDE[1]

Active Ingredient	By Wt.
*Etoxazole	72%
Other Ingredients	28%
Total	100%

*2-(2,6-difluorophenyl)-4-[4-(1,1-dimethylethyl)-2-ethoxyphenyl]-4,5-dihydrooxazole

EPA Reg. No. 59639-138 EPA Est. 67545-AZ-01

KEEP OUT OF REACH OF CHILDREN

CAUTION

SEE BELOW FOR ADDITIONAL PRECAUTIONARY STATEMENTS.

FIRST AID

If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

If swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.

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FIRST AID (continued)
HOT LINE NUMBER

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact **800-892-0099** for emergency medical treatment information.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS & DOMESTIC ANIMALS
CAUTION

Causes moderate eye irritation. Avoid contact with eyes, skin and clothing. Avoid breathing dust.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

Some of the materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category A on an EPA chemical-resistance category selection chart.

Applicators and other handlers must wear: long-sleeved shirt and long pants, chemical-resistant gloves made of any waterproof material such as polyethylene or polyvinyl chloride and shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE. If there are no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to freshwater and marine/estuarine aquatic invertebrates, including oysters and shrimp. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply when weather conditions favor drift from treated areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in water adjacent to treated areas. Do not contaminate water when disposing of equipment washwaters or rinsate.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ ENTIRE LABEL. USE STRICTLY IN ACCORDANCE WITH PRECAUTIONARY STATEMENTS AND

DIRECTIONS, AND WITH APPLICABLE STATE AND FEDERAL REGULATIONS.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific equipment (PPE), and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water is: long-sleeved shirt and long pants, chemical-resistant gloves made of any waterproof material and shoes plus socks.

DISCLAIMER, RISKS OF USING THIS PRODUCT, LIMITED WARRANTY AND LIMITATION OF LIABILITY

IMPORTANT: Read the entire Label including this Disclaimer, Risks of Using this Product, Limited Warranty, and Limitation of Liability before using this product. If the terms are not acceptable THEN DO NOT USE THE PRODUCT; rather, return the unopened product within 15 days of purchase for a refund of the purchase price.

RISKS OF USING THIS PRODUCT

The Buyer and User (referred to collectively herein as "Buyer") of this product should be aware that there are inherent unintended risks associated with the use of this product which are impossible to eliminate. These risks include, but are not limited to, injury to plants and crops to which this product is applied, lack of control of the target pests or weeds, resistance of the target pest or weeds to this product, injury caused by drift, and injury to rotational crops caused by carryover in the soil. Such risks of crop injury, non-performance, resistance or other unintended consequences are unavoidable and may result because of such

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factors as weather, soil conditions, disease, moisture conditions, irrigation practices, condition of the crop at the time of application, presence of other materials either applied in the tank mix with this product or prior to application of this product, cultural practices or the manner of use or application, (or a combination of such factors) all of which are factors beyond the control of Valent. The Buyer should be aware that these inherent unintended risks may reduce the harvested yield of the crop in all or a portion of the treated acreage, or otherwise affect the crop such that additional care, treatment and expense are required to take the crop to harvest. If the Buyer chooses not to accept these risks, THEN THIS PRODUCT SHOULD NOT BE APPLIED. By applying this product Buyer acknowledges and accepts these inherent unintended risks AND TO THE FULLEST EXTENT ALLOWED BY LAW, AGREES THAT ALL SUCH RISKS ASSOCIATED WITH THE APPLICATION AND USE ARE ASSUMED BY THE BUYER.

Valent shall not be responsible for losses or damages (including, but not limited to, loss of yield, increased expenses of farming the crop or such incidental, consequential or special damages that may be claimed) resulting from use of this product in any manner not set forth on the label. Buyer assumes all risks associated with the use of this product in any manner or under conditions not specifically directed or approved on the label.

LIMITED WARRANTY

Valent warrants only that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated in the label, under average use conditions, when used strictly in accordance with the label **and subject to the Risks of Using This Product as described above. To the extent consistent with applicable law AND AS SET FORTH ABOVE, VALENT MAKES NO OTHER WARRANTIES, EITHER EXPRESSED OR IMPLIED**. No agent or representative of Valent or Seller is authorized to make or create any other express or implied warranty.

LIMITATION OF LIABILITY

To the fullest extent allowed by law, Valent or Seller is not liable for any incidental, consequential, indirect or special damages resulting from the use or handling of this product. The limitation includes, but is not limited to, loss of yield on all or any portion of the treated acreage, increased care, treatment or other expenses required to take the crop to harvest, increased finance charges or altered finance ratings, emotional or mental distress and/or exemplary damages. TO THE FULLEST EXTENT ALLOWED BY LAW, THE EXCLUSIVE REMEDY OF THE BUYER, AND THE EXCLUSIVE MAXIMUM LIABILITY OF VALENT OR SELLER FOR ANY

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AND ALL CLAIMS, LOSSES, INJURIES OR DAMAGES (INCLUDING CLAIMS BASED ON BREACH OF WARRANTY, CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT SHALL BE THE RETURN OF THE PURCHASE PRICE OF THIS PRODUCT OR, AT THE ELECTION OF VALENT OR SELLER, THE REPLACEMENT OF THE PRODUCT.

PROMPT NOTICE OF CLAIM
Valent must be provided with prompt notice of any claim so that an immediate inspection of the affected property or plants can be made. To the extent applicable law allows such requirement, notice of a claim shall be given promptly to Valent, whether the claim is based on contract, negligence, strict liability, or other tort or otherwise be barred from any remedy.

NO AMENDMENTS
Valent and Seller offer this product, and Buyer accepts it, subject to the foregoing **Disclaimer, Risks of Using This Product, Limited Warranty** and **Limitation of Liability,** which may not be modified by any oral or written agreement.

TANK MIXES

NOTICE: Tank mixing or use of this product with any other product which is not specifically and expressly authorized by the label shall be the exclusive risk of user, applicator and/or application advisor, to the extent allowed by applicable law.

Read and follow the entire label of each product to be used in the tank mix with this product.

CHEMIGATION

RESTRICTION: Do not apply this product through any type of irrigation or chemigation system.

RESISTANCE MANAGEMENT RECOMMENDATIONS

Zeal® Miticide[1] is a Group 10B insecticide. Mite biotypes with acquired resistance to Group 10B may eventually dominate the mite population if Group 10B insecticides are used repeatedly in the same field or in successive years as the primary method of control for targeted species. This may result in partial or total loss of control of those species by *Zeal* Miticide[1] or other Group 10B insecticides.

To delay insecticide resistance consider:
- Avoiding the consecutive use of *Zeal* Miticide[1] or other Group 10B insecticides that have a similar target site of action, on the same mite species.

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RESISTANCE MANAGEMENT RECOMMENDATIONS (continued)

- Using tank mixtures or premixes with insecticides from different target site of action Group as long as the involved products are all registered for the same use and have different sites of action.
- Basing insecticide use on a comprehensive Integrated Pest Management (IPM) program.
- Monitoring treated mite populations for loss of field efficacy.
- Contacting your local extension specialist, certified crop advisors and/or manufacturer for insecticide resistance management and/or IPM recommendations for specific site and resistant pest problems.

For further information or to report suspected resistance, you may contact Valent U.S.A. Corporation at the following toll-free number: 800-682-5368.

WATER SOLUBLE PACKAGING INFORMATION

MIXING INSTRUCTIONS

This bag contains water soluble packets of *Zeal* Miticide[1]. Do not handle the packets with wet gloves or allow the packets to become wet prior to mixing. If all packets are not used, close and reseal outer container to protect remaining packet(s). Do not add any liquid fertilizers, micronutrients or adjuvants to the spray solution until after the water soluble packets and their contents have completely dissolved. Water soluble packet(s) should completely dissolve in approximately five minutes. Dissolution rate may be slowed by cold water, lack of agitation, or water containing high concentrations of boron or sulfur. High concentration of boron or sulfur may result in spray screen or nozzle clogging due to the incomplete dissolution of the water soluble packet material.

1. Fill clean spray tank 1/2 to 2/3 of desired level with clean water.
2. While agitating, add the correct number of *Zeal* Miticide[1] water soluble packets and make sure that they have dissolved completely before proceeding. Agitation should create a rippling or rolling action on the water surface.
3. Fill spray tank to desired level with water. Continue agitation until all spray solution has been applied.
4. Mix only the amount of spray solution that can be applied the day of mixing. Apply *Zeal* Miticide[1] within 6 hours of mixing.
5. Refer to the chart below to determine the number of *Zeal* Miticide[1] water soluble packets required to treat a given number of acres at a specific rate.

NUMBER OF *ZEAL* MITICIDE[1] WATER SOLUBLE PACKETS REQUIRED TO TREAT SPECIFIED NUMBER OF ACRES

RATE (OZ/A)	NUMBER OF ACRES TO BE TREATED	NUMBER OF 3 OZ PACKETS REQUIRED
0.66	45	10
1.0	30	10
2.0	15	10
3.0	10	10
4.0	7.5	10

CANEBERRY (subgroup 13-07 A)

CROPS	PEST	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Blackberry Loganberry Raspberry, Black Raspberry, Red Raspberry, Wild Cultivars, varieties and/or hybrids of these	European Red Spider Mite McDaniel Spider Mite Two-spotted Spider Mite Yellow Spider Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A)	Apply by ground as a full coverage spray in a minimum of 50 gals/A of water. Applications of *Zeal* Miticide[1] must be done using enough carrier (water) to ensure thorough coverage of the crop's vegetative and reproductive parts, which mites are using for dispersal, feeding and reproduction. Use higher water volumes on older trees and varieties that have more compact and dense foliage. Higher volumes of water coupled with well calibrated equipment will help to provide better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 0 day. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 3.0 oz (0.135 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

FIELD CORN, POPCORN, CORN (Grown For Seed Production)

CROP	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Field Corn Popcorn Corn (grown for seed production)	Banks Grass Mite[A] Carmine Spider Mite Pacific Spider Mite Strawberry Spider Mite Two-spotted Spider Mite	1.0 to 3.0 (0.045 to 0.135 lb ai/A)	Apply with ground equipment in adequate water for uniform coverage (a minimum of 10 gals/A). Coverage is essential for good control. Use of higher water volume will assure better coverage. Applications of *Zeal* Miticide[1] are recommended before tasseling stage to allow good coverage and provide better control. For field corn utilized for seed production apply *Zeal* Miticide[1] before or at tasseling growth stage. If a second application is needed wait for 14 days to re-treat with *Zeal* Miticide[1]. Best results are achieved when mite populations are below threshold or beginning to build up on the plants. *Zeal* Miticide[1] is predominately an ovicide/larvicide and should be used early in the life cycle of mites. Always follow the recommended threshold for your area. Do not use rates below 1.0 oz/A (0.045 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Do not apply within twenty-one (21) days of harvest. • Do not make more than two (2) *Zeal* Miticide[1] applications per season. • Do not apply treatments less than 14 days apart. • Do not apply more than 6.0 oz (0.27 lb ai) of *Zeal* Miticide[1] per acre per season.		

[A]Applications targeting exclusively Banks grass mites may require higher rates particularly if populations have exceeded the established threshold in the fields to be treated with *Zeal* Miticide[1]. Also, under extreme drought conditions and higher populations Banks grass mites might require more than one application of a miticide.

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with other miticides that have different modes of action and/or with other chemical classes of miticides. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

COTTON

CROP	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Cotton	Carmine Spider Mite Pacific Spider Mite Two-spotted Spider Mite	0.66 to 1.0 (0.03 to 0.045 lb ai/A)	Apply with air or ground equipment in adequate water for uniform coverage (3 to 10 gals/A by air or 10 to 50 gals/A by ground). Coverage is essential for good control. Use of higher water volume will assure better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide and should be used early in the life cycle of mites. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 0.66 oz/A (0.03 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 28 days. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 1.0 oz (0.045 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

CUCURBIT VEGETABLES (Crop Group 9)

CROPS	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Acorn Squash Balsam Apple Balsam Pear Bittermelon Butternut Squash Calabaza Squash Cantaloupe Chayote (fruit) Chinese Cucumber Chinese Okra Chinese Waxgourd (Chinese Preserving Melon) Citron Melon Cucumber Cucuzza Gherkin Gourd, Edible Hechima Hubbard Squash Hyotan *Momordica* spp. Muskmelon Pumpkin Spaghetti Squash Summer Squash Watermelon Winter Squash	Two-spotted Spider Mite Carmine Spider Mite Pacific Spider Mite Strawberry Spider Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A)	Apply with ground equipment in adequate water for uniform coverage (a minimum of 10 gals/A). Coverage is essential for good control. Use of higher water volume will assure better coverage. Applications of *Zeal* Miticide[1] must be made using enough carrier (water) to ensure thorough coverage of the crop's vegetative and reproductive parts, which mites use for dispersal, feeding and reproduction. Use higher water volumes on more mature plants and varieties that have more compact and dense foliage. Higher volumes of water coupled with well calibrated equipment will help to provide better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 7 days. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 3.0 oz (0.135 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

HOPS

CROP	PEST	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Hops	Two-spotted Spider Mite	3.0 to 4.0 (0.135 to 0.18 lb ai/A)	Apply with ground equipment in a minimum of 50 gals/A of water. Coverage is essential for good control. Use of higher water volume will assure better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 3.0 oz/A (0.135 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 7 days. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 4.0 oz (0.18 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

LOW GROWING BERRY (Subgroup 13-07G)

CROPS	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Bearberry Bilberry Blueberry, Lowbush Cloudberry Cranberry Lingonberry Muntries Partridgeberry Strawberry Cultivars, varieties and/or hybrids of these	European Red Mite Pacific Spider Mite Two-spotted Spider Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A)	Apply with ground equipment in a minimum of 100 gals/A of water. Coverage is essential for good control. Use of higher water volume will assure better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide and should be used early in the life cycle of mites. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. *Zeal* Miticide[1] will not control Cyclamine Mite. Another miticide registered for this pest should be used if these mites are a problem. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Two-spotted Spider Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A) + 10-2/3 fl oz Danitol® 2.4 EC Insecticide (0.2 lb ai/A)	Apply with ground equipment in adequate water for uniform coverage (using a minimum of 100 gals/A). Alternate with other non-pyrethroid insecticides if retreatment is needed in less than 30 days to comply with local IPM programs. Comply with all applicable directions, restrictions and precautions on the registered label for *Danitol* 2.4 EC Insecticide.
	Restrictions • Preharvest interval (PHI) is 1 day. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 3.0 oz (0.135 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

MINT

CROP	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Mint (Peppermint and Spearmint)	Pacific Spider Mite Strawberry Spider Mite Two-spotted Spider Mite	2.0 to 4.0 (0.09 to 0.18 lb ai/A)	Apply with ground equipment in adequate water for uniform coverage (minimum of 50 gals/A). Coverage is essential for good control. Use of higher water volume will assure better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 7 days. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 4.0 oz (0.18 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state, and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

PEPPER AND EGGPLANT (Subgroup 8-10B)

CROPS	PEST	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
African Eggplant Bell Pepper Eggplant Martynia Non-Bell Pepper Okra Pea Eggplant Pepino Roselle Scarlet Eggplant Cultivars, varieties and/or hybrids of these	Two-spotted Spider Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A)	Apply with ground equipment in a minimum of 20 gals/A of water. Applications of *Zeal* Miticide[1] must be made using enough carrier (water) to ensure thorough coverage of the crop's vegetative and reproductive parts, which mites use for dispersal, feeding and reproduction. Use higher water volumes on more mature plants and varieties that have more compact and dense foliage. Higher volumes of water coupled with well calibrated equipment will help to provide better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 7 days. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 3.0 oz (0.135 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

POME FRUIT (Crop Group 11)

CROPS	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Apple Crabapple Loquat Mayhaw Pear Pear, Asian Quince	European Red Mite McDaniel Spider Mite Pacific Spider Mite Two-spotted Spider Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A)	Apply by ground with airblast equipment in a minimum of 100 gals/A. Coverage is essential for good control. Use of higher water volume will assure better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide and should be used early in the life cycle of mites. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. *Zeal* Miticide[1] will not control Rust Mites or Blister Mites. If these pests are a problem, use an alternative miticide registered for that use. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 14 days. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 3.0 oz (0.135 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

SMALL FRUIT VINE CLIMBING, EXCEPT FUZZY KIWIFRUIT (Subgroup 13-07 F)

CROPS	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Amur River Grape Gooseberry Grape Kiwifruit, Hardy Maypop Schisandra Berry Cultivars, varieties and/ or hybrids of these	European Red Mite Pacific Spider Mite Two-spotted Spider Mite Willamette Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A)	Apply by ground as a full coverage spray in a minimum of 25 gals/A of water. Coverage is essential for good control. Use of higher water volume will assure better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide and should be used early in the life cycle of mites. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. *Zeal* Miticide[1] will not control Rust Mites or Blister Mites. If these pests are a problem, use an alternative miticide registered for that use. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 14 days. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 3.0 oz (0.135 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

STONE FRUIT (Crop Group 12)

CROPS	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Apricot Cherry (sweet and tart) Nectarine Peach Plum Plum, Chickasaw Plum, Damson Plum, Japanese Plumcot Prune (fresh)	European Red Mite Pacific Spider Mite Two-spotted Spider Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A)	Apply with ground equipment in a minimum of 50 gals/A of water. Coverage is essential for good control. Use of higher water volume will assure better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 7 days. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 3.0 oz (0.135 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

NON-BEARING FRUIT TREES

CROP	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Non-Bearing Fruit Trees	European Red Mite McDaniel Spider Mite Pacific Spider Mite Two-spotted Spider Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A)	Apply by ground with airblast equipment as a full coverage spray. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Do not harvest fruit from treated trees within one (1) year of application. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 3.0 oz (0.135 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

TREE NUTS

CROPS	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Almond Beech Nut Brazil Nut Butternut Cashew Chestnut Chinquapin Filbert (Hazelnut) Hickory Nut Macadamia Nut Pecan Pistachio Walnut Black English	European Red Mite Pacific Spider Mite Two-spotted Spider Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A)	Apply by ground with airblast equipment as a full coverage spray. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 28 days. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 3.0 oz (0.135 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

TROPICAL AND SUB-TROPICAL FRUIT (INEDIBLE PEEL)

CROPS	PESTS	PRODUCT RATE OZ/ACRE	SPECIAL INSTRUCTIONS
Avocado Canistel Mango Papaya Sapodilla Sapote, Black Sapote, Mamey Star Apple	Avocado Brown Mite Persea Mite Two-spotted Spider Mite	2.0 to 3.0 (0.09 to 0.135 lb ai/A)	Apply with ground equipment in adequate water for uniform coverage (minimum 50 gals/A). Applications of *Zeal* Miticide[1] must be made using enough carrier (water) to ensure thorough coverage of the crop's vegetative and reproductive parts, which mites use for dispersal, feeding and reproduction. Use higher water volumes on more mature plants and varieties that have more compact and dense foliage. Higher volumes of water coupled with well calibrated equipment will help to provide better coverage. Best results are achieved when mite populations are low. *Zeal* Miticide[1] is predominately an ovicide/larvicide. Apply *Zeal* Miticide[1] at or prior to threshold for your area but not greater than the maximum rate listed. Do not use below use rate 2.0 oz/A (0.09 lb ai/A) as this may result in poor control and contribute to the development of resistance to etoxazole among mite populations.
	Restrictions • Preharvest interval (PHI) is 1 day. • Do not make more than one (1) *Zeal* Miticide[1] application per season. • Do not apply more than 3.0 oz (0.135 lb ai) of *Zeal* Miticide[1] per acre per season.		

MANAGING RESISTANCE: Repeated use of the same class of miticides or miticides with similar modes of action can lead to the buildup of resistant mite strains. Use *Zeal* Miticide[1] in alternation with miticides having different modes of action and/or that belong to different chemical classes. Follow local, state and federal Integrated Pest Management (IPM) and Resistance Management (RM) recommendations. Read and follow all product labels before applying any miticide.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage, disposal or cleaning of equipment.

PESTICIDE STORAGE

Keep pesticide in original container.
Do not put concentrate or dilute into food or drink containers.
Store in cool, dry place.
Do not store diluted spray.
For help with any spill, leak, fire or exposure involving this material, call day or night **800-892-0099.**

PESTICIDE DISPOSAL

Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility. Open dumping is prohibited.

CONTAINER HANDLING

Nonrefillable outer bag. Do not reuse or refill the outer bag. Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

***Danitol* is a restricted use product.**

Manufactured for
Valent U.S.A. Corporation
P.O. Box 8025
Walnut Creek CA 94596-8025
Made in U.S.A.
Form 1570-I
EPA Reg. No. 59639-138 EPA Est. 67545-AZ-01

Information contained in this booklet is accurate at the time of printing. Since product testing is a continuous process, please read and follow the directions on the product label for the most current directions and precautionary statements.

Always check with your state to verify state registration status or call 800-6-VALENT (682-5368).

For state registration and/or supplemental labels, please call or visit us online.

Products That Work, From People Who Care® | **valent.com** | 800-6-VALENT (682-5368)

Always read and follow label instructions.

RESTRICTED USE PESTICIDE

FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S CERTIFICATION.

Vulcan®

GROUP 1B INSECTICIDE

For control of listed insects infesting certain field, fruit, nut, and vegetable crops.

ACTIVE INGREDIENT:	% BY WT.
Chlorpyrifos: 0,0-diethyl-0-(3,5,6-trichloro-2-pyridinyl)phosphorothioate	39.50%
OTHER INGREDIENTS	60.50%
TOTAL	100.00%

Contains 3.76 pounds of chlorpyrifos per gallon

*Contains petroleum distillates

EPA Reg. No. 66222-233 **EPA Est. No. 37429-GA-001[BT] 37429-GA-002[BO]**

Letter(s) in lot number correspond(s) to superscript in EPA Est. No.

KEEP OUT OF REACH OF CHILDREN

CAUTION/PRECAUCIÓN

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand this label, find someone to explain it to you in detail.)

INSECTICIDE

VOXIEN™

FORMULATIONS

Vulcan is an emulsifiable concentrate (EC) miticide/insecticide formulated as part of the Voxien family of products.

For First Aid, Precautionary Statements, and Directions for Use, see inside of this booklet.

How can we help? 1-866-406-6262

Net Contents:

2.5 gallons

ADAMA

FIRST AID Organophosphate	
IF SWALLOWED:	• Call a poison control center or doctor immediately for treatment advice. • Do not give any liquid to a person. • Do not induce vomiting unless told to do so by a poison control center or doctor. • Do not give anything by mouth to an unconscious person.
IF IN EYES:	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
IF ON SKIN OR CLOTHING:	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
IF INHALED:	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. • Call a poison control center or doctor for further treatment advice.
Note to Physician: This product contains an organophosphate that inhibits cholinesterase. Treat symptomatically. If exposed, plasma and red blood cell cholinesterase tests may indicate significance of exposure (baseline data are useful). Atropine, only by injection, is the preferable antidote. Oximes, such as 2-PAM/protopam, may be therapeutic if used early; however, use only in conjunction with atropine. In case of severe acute poisoning, use antidote immediately after establishing an open airway and respiration. Contains petroleum distillate. Vomiting may induce aspiration pneumonia.	
Have the product container or label with you when calling a poison control center or doctor or going for treatment. For emergency medical treatment information, call Prosar 24 hours a day at 1-877-250-9291.	

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
CAUTION

Harmful is swallowed. Causes moderate eye irritation. Avoid contact with eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Materials that are chemical resistant to this product are barrier laminate and viton ≥14 mils. Mixers and loaders using a mechanical transfer loading system and applicators using aerial application equipment must wear:

- Long-sleeved shirt and long pants
- Shoes and socks
- Protective eyewear

In addition to the above, mixers and loaders using a mechanical transfer loading system must wear:

- Chemical-resistant gloves
- Chemical-resistant apron
- A NIOSH-approved dust mist filtering respirator with MSHA/NIOSH approval number prefix TC-21 Cor a NIOSH-approved respirator with any R, P, or HE filter

See ***Engineering Control Statement*** for additional requirements.

All other mixers, loaders, applicators and handlers must wear:

- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant gloves
- Chemical-resistant apron when mixing or loading or exposed to the concentrate
- Chemical-resistant footwear plus socks
- Chemical-resistant headgear for overhead exposure
- A NIOSH-approved dust mist filtering respirator with MSHAINIOSH approval number prefix TC-21C or a NIOSH-approved respirator with any R, P, or HE filter.

User Safety Requirements

- Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them.
- Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

ENGINEERING CONTROL STATEMENT

Mixers and loaders supporting aerial applications must use a mechanical transfer system that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4)) for dermal protection, and must:

- Wear the personal protective equipment required above for mixers/loaders
- Wear protective eyewear

Pilots must use an enclosed cockpit in a manner that meets the requirements listed in the WPS for agricultural pesticides [40 CFR 170.240(d)(6)]. Use of human flaggers is prohibited. Mechanical flagging equipment must be used.

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the WPS for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

USER SAFETY RECOMMENDATIONS

Users should:

- Wash hands thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish, aquatic invertebrates, small mammals, and birds. Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. Do not contaminate water when disposing of equipment washwater or rinsate.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area. Protective information may be obtained from your cooperative agricultural extension service.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

Read entire label before using this product. This label must be in the possession of the user at the time of pesticide application.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the Agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry intervals. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of:

- **4 days for fruit trees**
- **5 days for citrus**
- **3 days for cauliflower**
- **24 hours for all other crops not listed above**

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water is:

- Coveralls over short sleeved shirt and shirt pants
- Chemical resistant gloves made out of any waterproof material
- Chemical resistant footwear plus socks
- Chemical Resistant headgear for over head exposures.

Certified crop advisors or persons entering under their direct supervision under certain circumstances may be exempt from the early reentry requirement pursuant to 40 CFR Part 170.

Notify workers of the application by warning them orally and by posting warning signs at entrances to treated areas.

NON AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides [40CFR Part 170]. The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses. Keep children, pets and other unprotected persons out of treated area until sprays have dried.

PRODUCT INFORMATION

Part of the Voxien family of products. Vulcan® insecticide forms an emulsion when diluted with water and is suitable for use in all conventional spray equipment. Consult your State Agricultural Experiment Station or State Extension Service for proper timing of applications.

When an adjuvant is to be used with this product, ADAMA suggests the use of a Chemical Producers and Distributors Association certified adjuvant.

USE RESTRICTIONS

Do not formulate this product into other end use products. **Attention:** Do not cut or weld container.

RESISTANCE MANAGEMENT

Vulcan contains a Group 1B insecticide. Insect/mite biotypes with acquired resistance to Group 1B may eventually dominate the insect/mite population if Group 1B insecticides/acaricides are used repeatedly in the same field or in successive years as the primary method of control for targeted species. This may result in partial or total loss of control of those species by Vulcan or other Group 1B.

To delay insecticide resistance consider:

- Avoiding the consecutive use of Vulcan or other group 1B insecticides/acaricides that have a similar target site of action, on the same insect/mite species.
- Using tank-mixtures or premixes with insecticides/acaricides from a different target site of action Group as long as the involved products are all registered for the same use and have different sites of action.
- Basing insecticide/acaricide use on a comprehensive IPM program.
- Monitoring treated insect/mite populations for loss of field efficacy.
- Contacting your local extension specialist, certified crop advisors, and/or manufacturer for insecticide/acaricide resistance management and/or IPM recommendations for the specific site and resistant pest problems.

SPRAY DRIFT MANAGEMENT

Avoiding spray drift at the application site is the responsibility of the applicator and the grower. The interaction of many equipment-and weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions regarding spraying.

Apply only as a medium or coarser spray (ASABE standard 572.1) or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles.

Apply only when the wind speed is 2–10 mph at the application site.

For ground applications

- Wind speed must be measured adjacent to the application site on the upwind side, immediately prior to application.
- For ground boom applications, apply using a nozzle height of no

more than 4 feet above the ground or crop canopy.
- For airblast applications, turn off outward pointing nozzles at row ends and when spraying the outer two rows. To minimize spray loss over the top in orchard applications, spray must be directed into the canopy.

For aerial applications
- The distance of the outermost nozzles on the boom must not exceed 3/4 the length of the wingspan or 90% of the rotor blade diameter. Nozzles must always point backward parallel with the air stream and never be pointed downward more than 45°.

Where states have more stringent regulations, they should be observed.
The applicator should be familiar with and take into account the information covered in the ***Spray Drift Management*** section.

To avoid spray drift, do not apply under windy conditions. Avoid spray overlap as crop injury may result.

Information on Droplet Size
The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential but will not prevent drift if applications are made improperly or under unfavorable environmental conditions (*see **Wind, Temperature and Humidity** and **Temperature Inversions*** sections).

Controlling Droplet Size
- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of nozzles** - Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle-type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Boom Length
For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

Application Height
Applications should be made at the lowest height consistent with efficacy and flight safety. Do not make at a height greater than 10 feet above the top of the largest plants unless a greater height is recommended for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment
When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase with increasing drift potential (higher wind, smaller drops, etc.).

Wind
Drift potential is lowest between wind speeds of 2-10 mph. However, many factors including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. **Note:** Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity
When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions
Applications should not occur during a temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small, suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

BUFFER ZONES

Do not allow spray to drift from the application site and contact people, structures people occupy at any time and the associated property, parks and recreation areas, nontarget crops, aquatic and wetland areas, woodlands, pastures, rangelands, or animals.
- For ground boom applications, do not apply within 25 feet of rivers, natural ponds, lakes, streams, reservoirs, marshes, estuaries, and commercial fish ponds. Apply with nozzle height no more than 4 feet above the ground or crop canopy and when wind speed is 10 mph or less at the application site as measured by an anemometer. Use fine or coarser spray according to ASAE 572 definition for standard nozzles or VMD for spinning atomizer nozzles.
- For orchard/vineyard airblast applications, do not apply within 50 feet of rivers, natural ponds, lakes, streams, reservoirs, marshes, estuaries, and commercial fish ponds. Direct spray above trees/vines and turn off outward pointing nozzles at row ends and outer rows. Apply only when wind speed is 3-10 mph at the application site as measured by an anemometer outside of the orchard/vineyard on the upwind side.
- For aerial applications, do not apply within 150 feet of rivers, natural ponds, lakes, streams, reservoirs, marshes, estuaries, and commercial

fish ponds. The boom width must not exceed 75% of the wingspan or 90% of the rotary blade. Use upwind swath displacement and apply only when wind speed is 3-10 mph as measured by an anemometer. Use fine or coarser spray according to ASAE 572 definition for standard nozzles or VMD for spinning atomizer nozzles. If application includes a no-spray zone, do not release spray at a height greater than 10 feet above the ground or the crop canopy.

- For overhead chemigation, do not apply within 25 feet of rivers, natural ponds, lakes, streams, reservoirs, marshes, estuaries, and commercial fish ponds. Apply only when wind speed is 10 mph or less.

The applicator also must use all other measures necessary to control drift.

The buffer distance specified in the buffer distance table are the distances in feet that must exist to separate sensitive sites from the targeted application site. Buffers are measured from the edge of the sensitive site to the edge of the application site.

Sensitive sites are areas frequented by non-occupational bystanders (especially children). These include residential lawns, pedestrian sidewalks, outdoor recreational areas such as school grounds, athletic fields, parks and all property associated with buildings occupied by humans for residential or commercial purposes. Sensitive sites include homes, farmworker housing, or other residential buildings, schools, daycare centers, nursing homes, and hospitals. Non-residential agricultural buildings, including barns, livestock facilities, sheds and outhouses are not included in this prohibition.

Buffer Distance				
Application rate (lb ai/A)	Nozzle Droplet Type	Required Setback (Buffer Zones) (feet)		
		Aerial	Airblast	Ground
>0.5-1	Coarse or very coarse	10	10	10
>0.5-1	Medium	25	10	10
>1-2	Coarse or very coarse	50	10	10
>1-2	Medium	80	10	10
>2-3	Coarse or very coarse	80[1]	10	10
>2-3	Medium	100[1]	10	10
>3-4	Medium or coarse	NA[2]	25	10
>4	Medium or coarse	NA	50	10

[1]Aerial application of greater than 2 lb ai/A is only permitted for Asian Citrus Psylla control, up to 2.3 lb ai/A.
[2]NA is not allowed.

Only pesticide handlers are permitted in the setback area during application of this product. Do not apply this product if anyone other than a mixer, loader, or applicator, is in the setback area. Exception: Vehicles and persons riding bicycles that are passing through the setback area on public or private roadways are permitted.

SPRAY MIX DIRECTIONS

To prepare the spray, add a portion of the required amount of water to the spray tank and with agitation, add the Vulcan. Complete filling the tank with the balance of water needed. Maintain sufficient agitation during both mixing and application to ensure uniformity of the spray mixture.

Vulcan can also be used in tank mixtures with certain herbicides and/or with non-pressure fertilizer solutions as specified under specific crop use directions. Prepare tank mixtures in the same manner as specified above for use of Vulcan alone. When tank mixtures of Vulcan and herbicides are involved, add wettable powders first, flowables second and emulsifiable concentrates last. Where a fertilizer solution is involved, use a fertilizer pesticide compatibility agent such as Unite or Compex. Maintain constant agitation during both mixing and application to ensure uniformity of the spray mixture. Do not allow spray mixtures to stand overnight.

Note: Test compatibility of the intended tank mixture before adding Vulcan to the spray or tank mix. Add proportionate amounts of each ingredient to a pint or quart jar, cap, shake, and let set 15 minutes. Formation of precipitates that do not readily redisperse indicates an incompatible mixture that must not be used.

SPRINKLER IRRIGATION

Vulcan can be applied by sprinkler irrigation for the following crop uses: alfalfa, almond (orchard floors only), citrus orchard floors, corn (field and sweet), cotton, cranberry, mint (peppermint and spearmint), pecan and walnut orchard floors, sorghum, soybeans, sugar beet, and wheat.

See the use sections for the individual crops for further application information. Do not apply this product to the above listed crops through any other type of irrigation system. Do not apply this product by chemigation to any other crop.

SPRINKLER USE DIRECTIONS

The following use directions are to be followed when Vulcan is applied through sprinkler irrigation systems. Thoroughly clean the injection system and tank of any fertilizer or chemical residues, and dispose of the residues according to state and federal laws. Flush the injector with soap and water. Determine the amount of insecticide needed to cover the desired acreage. Pump the required Vulcan into a steel tank, start mechanical or hydraulic agitation, and add in order the non-emulsifiable oil and/or water. Continually agitate the mixture containing Vulcan. Set the sprinkler system to deliver the desired inches of water per acre. Start the water pump and sprinkler, and let the system achieve the desired pressure and speed before starting the injector. Start the injector and calibrate the injector system according to number 14 in ***SPRINKLER USE PRECAUTIONS*** section. The mixture containing Vulcan must be injected continuously and uniformly into the irrigation water line as the sprinkler is moving. This procedure is necessary to deliver the desired rate per acre in a uniform manner. When the application is finished, allow the entire irrigation and injec-

tor system to be thoroughly flushed clean before stopping the system.

SPRINKLER USE PRECAUTIONS

The following use precautions will result in a safe and successful application of mixture containing Vulcan.

1. Apply this product only through sprinkler irrigation systems including center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, micro sprinkler, or hand move. Do not apply this product through any other type of irrigation system.
2. Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from non-uniform distribution of treated water.
3. If you have questions about calibration, contact state extension service specialist, equipment manufacturers, or other experts.
4. Do not connect an irrigation system (including greenhouse systems) used for pesticide application to a public water system.
5. A person knowledgeable of the chemigation system and responsible for its operation, or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise.
6. The system must contain a functional check valve, vacuum relief valve, and a low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow. Refer to the American Society of Agricultural Engineer's Engineering Practice 409 for more information.
7. The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump.
8. The pesticide injection pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
9. The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
10. The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
11. Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock. The metering pump must provide a greater pressure than that of the irrigation system at the point of injection. The pump must meet Section 675 for "Electrically Driven or Controlled Irrigation Machines" NEC 70 and must contain Viton or Teflon seals.
12. To insure uniform mixing of the insecticide into the water line, inject the mixture through a nozzle place in the fertilizer injection port or just ahead of an elbow or tee in the irrigation line so that the turbulence created at those points will assist in mixing. It is suggested that the injection point be higher than the insecticide tank to prevent siphoning.
13. The steel tank holding the insecticide mixture should be large enough to allow the system to complete a revolution with one filling. It should be free of rust, fertilizer sediment, and foreign material, and equipped with an in-line strainer situated between the tank and the injector pump.
14. In order to calibrate the irrigation system and injector to apply the mixture containing Vulcan, determine the following: 1) Calculate the number of acres irrigated by the system; 2) Set the irrigation rate and determine the number of minutes for the system to cover the intended treatment area; 3) Calculate the total gallons of insecticide mixture needed to cover the desired acreage. Divide the total gallons of insecticide mixture needed by the number of minutes to cover the treatment area. This value equals the gallons per minute output that the injector must deliver. Convert the gallons per minute to milliliters or ounces per minute. Calibrate the injector pump with the system in operation at the desired irrigation rate. It is suggested that the injector pump be calibrated at least twice before operation, and monitor the system.
15. Do not apply when wind speed favors drift beyond the area intended for treatment. End guns must be turned off during the application if they irrigate nontarget areas.
16. Do not allow irrigation water to collect or runoff and pose a hazard to livestock, wells, or adjoining crops.
17. Allow foliage to dry before reentering the field.
18. Do not apply through sprinkler systems that deliver a low coefficient of uniformity such as certain water drive units.

ALFALFA

(Not for use in Mississippi)Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

Use Vulcan to control the following pests at the dosages indicated by application as a broadcast foliar spray:

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Alfalfa	Corn rootworm adults (spotted cucumber beetle), Grasshoppers, Leafhoppers	0.5 - 1 pint	Use a higher rate in the rate range for increased pest pressure. For Egyptian alfalfa weevil control in California, apply the specified dosage in a minimum of 5 gallons of water per acre when larvae are actively feeding and populations reach 15 to 20 larvae per 180° sweep with a 15 inch diameter net. Use higher rates to control spotted alfalfa aphid in California and Nevada. Stubble spray can be applied to control leafhopper in the Northeast. Mix the required dosage with enough water to ensure thorough coverage of crop foliage and apply using aerial (fixed-wing or helicopter) or power-operated ground spray equipment. For aerial application, use 2 to 5 gallons of water per acre. For best coverage when using ground application, use a minimum of 20 gallons of water per acre with hollow cone nozzles. Control may be reduced at low spray volumes under high temperature and wind conditions. Treat when field counts or crop injury indicates that damaging pest populations are developing or present; however, do not apply more than once per crop cutting. Some reduction in insect control may be evident under excessively cool conditions Vulcan can also be applied through sprinkler irrigation systems as a postemergence broadcast application to control the listed foliar pests. Use the listed rate of Vulcan per acre. Maintain vigorous tank agitation to assure uniformity of the application throughout the injection period. See ***SPRINKLER IRRIGATION*** section for further information. Some phytotoxic symptoms may be observed on young, tender, rapidly growing alfalfa when treated with Vulcan. Alfalfa will outgrow the symptoms and no yield loss should be expected.
	Alfalfa blotch leafminer, Alfalfa caterpillar, Alfalfa looper, Alfalfa weevil larvae and adults, Armyworms, Blue alfalfa aphid, Chinch bug, Cowpea aphid, Crickets, Cutworms, Egyptian alfalfa weevil larvae and adults, Greenbugs, Green June beetle grubs, Leafhoppers, Mites (such as clover, Bermuda grant stunt, two-spotted, winter grain), Pea aphid, Plant bugs, Sod webworm, Sowbugs, Spittlebugs, Spotted alfalfa aphid	1 - 2 pints	
	Alfalfa webworm	1.5 pints	

Use Restrictions:

- Do not cut or graze treated alfalfa within 7 days after application of 0.5 pint (0.24 lbs a.i.) of Vulcan per acre, within 14 days after application of 1 pint (0.47 lbs a.i.) per acre, or within 21 days after application of rates above 1 pint (0.47 lbs a.i.) per acre.
- Do not make more than 4 applications of Vulcan or other product containing chlorpyrifos per year or apply more than once per crop cutting. Do not make a second application of Vulcan within 10 days of the first application.
- To avoid contamination of irrigation floodwaters, do not flood irrigate within 24 hours following an application of Vulcan.
- The maximum single application rate is 0.94 lbs a.i. chlorpyrifos per acre (2 pints Vulcan).
- This product is highly toxic to bees exposed to direct treatment on alfalfa. Do not apply if nearby bees are clustered outside of hives and bees are foraging. Protective information may be obtained from your agricultural extension service.

Do not tank mix Vulcan with pesticides, surfactants, or fertilizer formulations unless prior use has shown the combination noninjurious under your current conditions of use.

APPLE (TRUNK SPRAY)
(Not for use in Mississippi)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 days unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Apple Trunk	American plum borer, Apple bark borer, Broad necked root borer, Dogwood borer, Flatheaded apple tree borer, Roundheaded apple tree borer, Tilehorned prionus	1.5 qts.	Mix 1.5 qts (1.4 lbs a.i.) of Vulcan with 100 gallons of water and using a low-volume handgun or shielded spray apply directly to the trunk from a distance no further than 4 ft.

Use Restrictions:

- For use only in states East of the Rockies (except Mississippi).
- Do not allow spray to contact foliage or fruit.
- Do not apply within 28 days before harvest.
- Make no more than one application to the tree trunk per year as either a pre-bloom or post-bloom application. Do not apply if a pre-bloom application of any other product containing chlorpyrifos has been made during the year using any other chlorpyrifos product.
- Do not allow meat or dairy animals to graze in treated orchards.
- Treat the lower 4 feet of the trunk only.
- If wind speed is greater than 10 mph, do not apply.

ASPARAGUS

For use only in Arizona, California, Idaho, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oregon, South Dakota, Washington, and Wisconsin Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Asparagus	armyworms, asparagus aphids, asparagus beetles, cutworms, grasshoppers	2 pints (0.94 lbs a.i.)	Mix the specified dosage in sufficient water to ensure thorough coverage of treated plants and apply a ground broadcast foliar spray. Use sufficient volume of finished spray to ensure thorough coverage of crop foliage. **Note:** Vulcan can be applied aerially or with ground equipment for control of armyworms and grasshoppers. For cutworms, it is preferable to apply Vulcan when the soil is moist and worms are active on or near the soil surface. Applications can be made during the fern stage for control of asparagus beetles and asparagus aphids when field counts or crop injury indicates that damaging pest populations are developing or present. For symphylans, apply at least two weeks before harvest for optimum control.

Use Restrictions:

- Do not make more than one preharvest application per season or apply within one day of harvest. Do not make more than two postharvest applications during the fern stage. Do not make a second application of Vulcan within 10 days of the first application.
- Based on available residue data, the use of Vulcan on asparagus is limited to the Midwest and Pacific Northwest (AZ, CA, ID, IL, IN, IA, KS, MI, MN, MO, NE, ND, OH, OR, SD, WA, WI).
- The maximum single application rate preharvest or postharvest is 0.94 lbs a.i. chlorpyrifos per acre.

CHERRIES (Trunk Spray)
(Not for use in Mississippi)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 days unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Cherry (Trunk)	Lesser peach tree borer, Greater peach tree borer, American plum borer by application as a trunk spray	1.5 - 3 qts.	Mix 1.5 to 3 quarts (1.4 to 2.8 lbs a.i.) of Vulcan with 100 gallons of water and apply as a coarse, low-pressure spray to give uniform coverage of tree trunks and lower limbs. Make a second application two weeks after the first one and a third application after harvest. Avoid contact with foliage in sweet cherries as premature leaf drop may result. Consult your State Agricultural Experiment Station or State Extension Service Specialist for proper time to treat in your area.
	San Jose scale, Peach twig borer, Climbing cutworm	0.5 - 1 pint	In addition, one of the three allowable applications per year can be applied as a dormant spray for control of San Jose scale, peach twig borer, and climbing cutworm. For control of these pests, tank mix 0.5 to 1 pint (0.24 to 0.47 lbs a.i.) of Vulcan with 1 to 2 gallons of a petroleum oil specified for dormant use in 100 gallons of water and spray the entire tree by application to runoff using ground spray equipment. For low volume (concentrate) sprays (40 to 100 gallons of spray mixture per acre), use the same amounts of Vulcan and spray oil per acre required for application as a dilute spray and apply in a manner that will ensure thorough coverage of the trees. Use the higher dosage of Vulcan for severe infestations. Use oil as specified by your State Agricultural Experiment Station or State Extension Service Specialist.

Use Restrictions:

- Make only three applications per year of Vulcan or other products containing chlorpyrifos. Do not apply within 21 days before harvest.
- Do not allow meat or dairy animals to graze in treated orchards.
- Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 days unless PPE required for early entry is worn.

CHRISTMAS TREE PLANTATIONS

(Not for use in Mississippi)Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours days unless PPE required for early entry is worn.

Use Vulcan at the rate indicated to control the following insects on the tree varieties listed.

TREE VARIETY	PEST	PRODUCT RATE PER ACRE	REMARKS
Balsam fir, Concolor fir, Douglas fir, Eastern white pine, Fraser fir, Grand fir, Noble fir, Scotch pine, White spruce	Ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), Aphids, Adelgids (Cooley, Eastern spruce gall), Douglas fir needle midge, European pine shoot moth, European pine sawfly, Grasshopper, Gypsy moth, Mites (European red spider, Two spotted spider) [except in WA & OR], Pales weevil (adult), Pine needle midge, Pine spittlebug, Plant bugs, Spittlebugs, Spruce budworm, Spruce needleminer, Scale (Pine needle, Pine tortoise, Spruce bud, Black pine, Striped pine)	1 quart	Do not treat plants under extreme heat and drought stress. Apply as a foliar spray using ground equipment. Thorough coverage of foliage is essential. Use a minimum 10 gpa of finished spray. Use higher volume of finished spray, 20 gpa or more, when foliage is dense and/or pest density is high and/or under high temperature and wind conditions. For effective control of adult spider mites if large numbers of eggs are present, apply a second spray 7 to 10 days after initial treatment to control newly hatched nymphs. Not for control of mites in Washington and Oregon. For scale control, apply when scale crawlers are active. To avoid injury, do not apply under conditions of extreme heat or drought stress. Environmental factors and varietal differences significantly influence potential phytotoxic expression. Before treating other conifer species, make application and observe for 7 to 10 days for symptoms of phytotoxicity. The user is responsible for determining if it is safe to treat other conifer species under commercial growing conditions.
	Pales weevil	3 quarts/100 gal	Apply as a cut stump drench.

Use Restrictions:

- Do not allow livestock to graze in treated areas.
- Do not make more than 3 applications of Vulcan or other product containing chlorpyrifos per season. Do not make a second application of Vulcan within 7 days of the first application.
- Do not apply by aerial application.

CITRUS FRUITS

(Not for use in Mississippi)Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 5 days unless PPE required for early entry is worn.

Use Vulcan at the rates indicated according to the designated geographic area to control the following pests. Use the lower rates for light infestations and increase the dosage for heavier infestations. A petroleum spray oil specified for use on citrus trees can be added to dilute spray mixtures only at a rate of up to 1.8 gallons per 100 gallons of water to improve control of aphids, mealybugs, scale insects, and thrips. Treat when insects become a problem or in accordance with the local spray schedule specified by your state extension service specialist.

Read and carefully follow all applicable directions, restrictions, and precautions on labeling for products used in combination with Vulcan. See MIX DIRECTIONS for further instruction.

Observe local use directions for tank-mix combinations especially in regard to applications of Vulcan plus spray oil. Consult with a county farm advisor, county agency, extension service personnel, agricultural commissioner, or pest control advisor for such information regarding a given locality.

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 5 days unless PPE required for early entry is worn.

CROP	GEOGRAPHIC LOCATION	PEST	DOSAGE PT/ACRE	SPRAY VOLUME GAL/ACRE	USE DIRECTIONS
Calamondin, Chironja, Citrus Citron, Citrus Hybrids, Grapefruit, Kumquat, Lemons, Limes, Mandarin (tangerine), Oranges, Pummelo, Satsuma mandarin, Tangelo, Tangor	California-Fresno, Tulare, Kern, Kings, and Madera Counties Only	Red scale	8-12	Ground: 100-2400	Do not use a spray concentration of Vulcan of less than 0.5 pt/100 gal of total volume. **Additional Precautions for California and Arizona:** Do not use Vulcan in combination with spray oil when temperatures are expected to exceed 95°F the day of application or for several consecutive days thereafter. Do not apply during the months of December, January, or February.
	California, Arizona	Aphids, glassywinged sharpshooter, Katydids, Lepidopterous larvae, Avocado leafroller, Cutworms, Fruit-tree leafroller, Orange tortrix, Western tussock moth	2-7	Ground: 100-750 Aerial: min. 15	Do not use a spray concentration of Vulcan of less than 0.5 pt/100 gal of total volume. **Additional Precautions for California and Arizona:** Do not use Vulcan in combination with spray oil when temperatures are expected to exceed 95°F the day of application or for several consecutive days thereafter. Do not apply during the months of December, January, or February.
		Scale insects (Black scale, Brown soft scale, California red scale)	8	100-2400	
		Thrips (suppression) Mealybugs	6-12	100-750	
	Florida	Aphids, Grasshoppers, Orangedogs, Mealybugs, Scale insects (Snow scale, Florida red scale, Purple scale, Long scale, Chaff scale, Black scale, Brown soft scale)	2-4	Ground: 100-1400 Aerial: min. 20	Do not use a spray concentrate of Vulcan of less than 0.5 pt/100 gal of water per acre. Lubber grasshoppers must be controlled when they are small (less than 1 inch in length) by direct contact with spray.
		Citrus psylla	5	100-700	Add citrus spray oil at 2% v/v in a tank mix with Vulcan.
		Citrus rust mites	4-7	100-700	Do not use a spray concentration of Vulcan of less than 1 pt/100 gal of water per acre.
	Texas	Aphids, Cutworms, Katydids, Mealybugs, Scale insects (Brown soft scale, California red scale, Chaff scale)	4-7	200-700	Do not use less than 0.5 pt of Vulcan per 100 gallons of water in dilute applications.
		Citrus rust mites (suppression)	4-7	200-700	

Small Transplanted Grapefruit, Orange, and other listed citrus trees	Texas	Aphids, Cutworms, Katydids, Mealybugs, Scale insects (Brown soft scale, California red scale, Chaff scale)	Max of 7		Apply Vulcan at a rate of 1 fl oz/1 gal of water with a backpack sprayer. Apply to runoff.

Use Restrictions:

- Do not apply more than 2 applications (does not include citrus orchard floor) or more than 16 pints (7.52 lbs a.i.) of Vulcan or other chlorpyrifos product per acre per year. Do not make second foliar application within 30 days of the first application. Do not treat within 21 days of harvest for applications up to 7 pints (3.3 lbs a.i.) of Vulcan per acre or within 35 days for application of rates above 7 pints (3.3 lbs a.i.) per acre.
- Do not allow livestock to graze in treated areas.
- The use of application rates greater than 8.5 pints (4 lbs a.i.) per acre are allowed only in the following California counties: Fresno, Tulare, Kern, Kings, Madera. Do not allow meat or dairy animals to graze in treated areas.
- Do not apply when trees are stressed by drought or high temperatures.
- Do not tank mix Vulcan with penetrating surfactants as crop injury may occur.
- Vulcan is highly toxic to bees exposed to direct treatment. Do not apply when bees are actively visiting the area. During the bloom period in California, apply from one hour after sunset until two hours before sunrise.

CITRUS ORCHARD (FLOORS)
(Not for use in Mississippi)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 5 days unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Citrus Orchard (Floors)	ant species (except fire ants, carpenter ants, harvester ants, and pharaoh ants),	0.75 to 1 quart (0.71 to 0.94 lb a.i.)	Apply the specified dose in 25 or more gallons of water with ground application equipment that will uniformly apply the spray to the orchard floor. For best insect control, uniform coverage of the orchard floor is necessary. Foliar applications of Vulcan can be made in addition to the orchard floor, but must comply with the 10 day retreatment interval. Vulcan can also be applied to citrus orchard floors through sprinkler irrigation systems only if the system uniformly covers the soil surface at the base of the tree. Use the listed amount of Vulcan per acre. See ***SPRINKLER IRRIGATION*** section for further information. Application with Dry Bulk Fertilizer: Most dry fertilize s can be used for impregnation with Vulcan. Apply Vulcan at the equivalent broadcast rate using a minimum of 200 lbs per acre of dry bulk fertilizer. Impregnation of Dry Bulk Fertilizer: Use of a closed rotary drum mixer suitable for blending of dry bulk fertilizer equipped with an internal spray nozzle. Add the dry fertilizer to the mixer followed by the appropriate amount of Vulcan. After mixing the dry ingredients to ensure uniformity, add water through the spray nozzle in an amount sufficient to just dampen the mixture (4 to 8 pints of water per ton of fertilizer). Position the spray nozzle within the mixer to provide uniform coverage of the tumbling mixture of fertilizer and Vulcan. Addition of water will cause Vulcan to uniformly adhere to the dry bulk fertilizer. Bulk fertilizers impregnated with Vulcan must be applied immediately, not stored. Foliar applications of Vulcan can be made in addition to the orchard floor treatments.

Use Restrictions:

- Do not apply where weed growth or other obstructions would impede uniform coverage of the orchard floor.
- Do not apply in tank mixtures with Evik herbicide.
- Do not apply last treatment within 28 days before harvest.
- Do not allow livestock or dairy animals to graze in treated areas.
- Do not allow spray to contact foliage or fruit.
- Do not apply more than 3 quarts (2.82 lbs a.i.) per acre per year. Do not make more than 3 applications of Vulcan or other product containing chlorpyrifos per year (does not include foliar applications to citrus trees). Do not make a second application of Vulcan or other product containing chlorpyrifos within 10 days of the first application.
- The maximum single application rate is 0.94 lbs a.i. chlorpyrifos per acre.

Compliance with any and all federal and state laws and regulations relating to the Vulcan and fertilizer mixture is the responsibility of the person offering such mixture for sale or distribution.

CORN (FIELD), CORN (SWEET) (INCLUDING CORN GROWN FOR SEED

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

Conservation Tillage: Preplant, At-Plant, or Preemergence Applications
Apply as a broadcast spray to surface trash and exposed soil using power-operated ground spray equipment. Use a total spray volume of 20 gpa or more. Use a higher rate in the rate range to extend residual control.

Tank-Mixing: Vulcan can also be applied in tank mixtures with paraquat or glyphosate and/or liquid fertilizer solutions. See **MIX DIRECTIONS** section in this label for tank mixing instructions. Read and carefully follow all applicable directions, restrictions, and precautions on labeling for each product used in combination with Vulcan.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Corn (field and sweet) (Including corn grown for seed) Conservation Tillage: Preplant, At-Plant, or Preemergence Applications	Armyworms, Cutworms	1-2 pints	Apply as a broadcast spray to surface trash and exposed soil using power-operated ground spray equipment. Use a total spray volume of 20 gpa or more. Use a higher rate in the rate range to extend residual control.
Postemergence Application			Apply as a postemergence broadcast spray using sufficient spray volume to ensure thorough coverage of treated plants, but no less than 15 gallons per acre (gpa) for ground spray equipment or 2 to 5 gpa for aircraft equipment. Control may be reduced at low spray volumes under high temperature and wind conditions. Vulcan can be tank-mixed with glyphosate products such as Glyphomax® XRT herbicide or Durango™ herbicide when application is to be made to glyphosate-tolerant corn
Chemigation	Grasshoppers	0.5-1 pint	Vulcan can be broadcast applied postemergence through sprinkler irrigation systems at listed application rates to control listed foliar pests. For best results, tank mix Vulcan with 2 pints of non-emulsifiable oil. See ***SPRINKLER IRRIGATION*** section of this product label for application instructions.
	Aphids, Armyworms, Chinch bugs [1], Corn rootworm adults[2], Cutworms[3], European corn borer[5], Flea beetle adults [1], Southern corn leaf beetle, Webworms[4], Western bean cutworm	1-2 pints	
	Corn earworm, Southwestern corn borer[6]	1.5-2 pints	
	Billbugs[8], Common stalk borer [9], Corn rootworm larvae [7],[8], Lesser cornstalk borer Brown marmorated stink bug	2 pints	

Use Restrictions:

- Do not apply within 21 days before harvest of grain, ear, forage or fodder.
- Do not apply more than 3 lbs a.i. chlorpyrifos (6.4 pints of Vulcan) per acre per season. Do not make more than 3 applications per season of any product containing chlorpyrifos including the maximum allowed of 2 granular applications at the 1 lbs a.i. chlorpyrifos rate. Do not make a second application of Vulcan or other product containing chlorpyrifos within 10 days of the first application.
- The maximum single application rate is 1 lb. a.i. chlorpyrifos (2.13 pints of Vulcan) per acre. Do not apply in tank mixes with Steadfast or Lightning herbicides.
- If more than 1 lb. a.i. granular chlorpyrifos per acre is applied at-plant (for a maximum of 1.3 lb. a.i. per acre per season) only 1 additional application of a liquid product containing chlorpyrifos at 1 lb. a.i. per acre is allowed per season, for a total of 2.3 lb. a.i. chlorpyrifos per acre per season.
- Do not aerially apply this product in Mississippi.

Pest Specific Use Directions:

1. For best billbug, chinch bug, or flea beetle control, ground apply in a minimum spray volume of 20 to 40 gpa at 40 psi. If corn is less than 6 inches tall, apply in a 9 to 12 inch wide band over the row. For corn greater than 6 inches tall, apply using drop nozzles directed to the base of the plant. Do not reduce the application rate for banded or directed applications. Concentrate the full labeled dosage rate in the treated zone. When chinch bugs continue to immigrate to corn over a prolonged period or under extreme pest pressure, a second application may be needed.
2. The listed dosage will control silk clipping by corn rootworm adults.
3. For cutworms, it is preferable to apply Vulcan when soil is moist and worms are active on or near the soil surface. If ground is dry, cloddy, or crusted at time of treatment, worms may be protected from the spray and effectiveness will be reduced. Shallow incorporation using a rotary hoe or other suitable equipment immediately before or soon after treatment may improve control. A second application may be required if damage or density levels exceed economic thresholds established for your area.
4. For webworm control, shallow incorporation using a rotary hoe or other suitable equipment immediately before or soon after treatment is necessary.
5. For European corn borer control, use 1.5 to 2 pints per acre when application is made with power-operated ground or aerial equipment or 1 to 2 pints per acre when application is made through a sprinkler irrigation system. University research indicates that achieving greater than 50% control of first-generation European borer with a single liquid insecticide treatment is highly dependent upon timing, insecticide placement, and weather conditions.
6. For southwestern corn borer, a second application can be applied 21 days later if needed due to reinfestation.
7. For postemergence control of corn rootworm larvae apply at cultivation. Direct the spray to both sides of the row at the base of the plants just ahead of the cultivator shovels. Cover the insecticide with soil around the brace roots. A cultivation application of Vulcan may be made in addition to an at-planting application of Chlorpyrifos 15G.
8. Vulcan can also be applied through sprinkler irrigation systems at the rate of 2 pints per acre to control corn rootworm larvae. Time the application to coincide with the appearance of the second instar larvae. Apply with enough water to wet the root zone to the depth control needed. If soils are wet, allow enough soil drying to occur such that an application using a minimum amount of water will not produce surface runoff. See ***SPRINKLER IRRIGATION*** section of this label for application instructions.
9. Do not use Vulcan in combination with a burndown herbicide for control of common stalk borer. For common stalk borer control, treat approximately 11 days after application of glyphosate or after burndown with paraquat herbicide is complete (3 to 5 days).

COTTON

(Not for use in Mississippi)Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Cotton	Cotton fleahopper, Plant bugs (Lygus, Mirids)	3/8-1 pint	The listed dosage rate of 3/8 pint per acre will not achieve the high degree of control of the highest label rate but will minimize the damage done by plant bugs and cotton fleahopper and allow the beneficial insects to survive, build up, and be available to aid in the control of bollworms infesting cotton. For infestations of cotton aphids that are difficult to control, use a higher dosage within the indicated rate range. For infestations of spider mites, when large numbers of eggs are present, scout the treated area in 3 to 5 days. If newly hatched nymphs are present, make a follow-up application of a non-chlorpyrifos product that is effective against mites. For best results against bollworms and budworms, scout fields twice per week and make applications when worms are 1/4 inch or less in length.
	Fall armyworm, Grasshopper, Thrips, Yellowstriped armyworm	0.5 - 1 pint	
	Cotton aphid	0.5 - 2 pints	
	Spider mites	1 pint	
	Beet armyworm, Cotton bollworm, Tobacco budworm, Cutworms, Pink bollworm, Salt marsh caterpillar, Brown marmorated stink bug	1.5 - 2 pints	
	In California and Arizona: Armyworms, Cotton Aphid, Cotton fleahopper, Lygus, Salt marsh caterpillar, silverleaf whitefly, Thrips	1 - 2 pints	The 2-pint rate will aid in the suppression of cotton leaf perforator and spider mites. Mix the required dosage with sufficient water to ensure thorough coverage of plants and apply using aerial or power-operated ground spray equipment. For aerial application, use at least 2 gallons of spray per acre. For ground application, use sufficient spray volume to ensure thorough coverage of treated plants but not less than 10 gallons of spray per acre. Increase spray volume when foliage is dense and/or when pests populations are high, and/or under high temperature and wind conditions. Treat when field counts indicate damaging insect populations are developing or present. Retreat as necessary to maintain control. Vulcan can also be applied through sprinkler irrigation systems as a postemergence broadcast application to control the above listed foliar pests. For best results, use the listed rate of Vulcan per acre. Maintain vigorous tank agitation to assure uniformity of the application throughout the injection period. See ***SPRINKLER IRRIGATION*** section for further information. For effective control of spider mites when large numbers of eggs are present, apply a second spray 3 to 5 days after initial treatment to control newly hatched nymphs. For silverleaf whitefly, apply in tank mix combination with the specified rate of a pyrethroid insecticide labeled for control or suppression. For best results on bollworms and budworms, it is suggested that fields be scouted twice per week and treatments made when worms are 1/4 inch or less in length.
	In California and Arizona: Cotton bollworm, Cotton leaf perforator (suppression), Tobacco budworm, Boll weevil, Cutworms, Pink bollworm, spider mites (suppression), brown marmorated stink bug	2 pints	

Use Restrictions:

- Do not apply within 14 days before harvest or make more than 3 applications of Vulcan or other product containing chlorpyrifos per crop per season.
- Do not apply more than 6 pints (2.82 lbs a.i.) Vulcan per acre per season. Do not make a second application within 10 days of the first application.
- Do not allow meat or dairy animals to graze in treated areas. Do not feed gin trash or treated forage to meat or dairy animals.
- The maximum single application rate is 0.94 lbs a.i. Vulcan per acre.

CRANBERRIES

(Not for use in Mississippi)Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Cranberries	brown spanworm, cranberry fruitworm, cranberry weevil, cutworms, fireworms, and *Sparganothis* fruitworm	3 pints (1.41 lbs a.i.)	Mix the specified dosage in enough water to ensure thorough coverage and apply no less than 5 gallons of spray per acre when using aerial equipment or no less than 15 gallons of spray per acre when using ground equipment. For weevil control, apply once at flower bud development (late May, early June) and, if weevils are present, once after 100% bloom (early to mid-July). For other insects, treat when field counts indicate damaging insect populations are developing or present. Apply only after the winter flood has been removed. To avoid pesticide contamination of flood water, make no applications while bogs are flooded. Vulcan can also be applied through sprinkler irrigation systems to control the above listed pests. Use the listed rate of Vulcan per acre. Maintain vigorous tank agitation to assure uniformity of the application throughout the injection period. See ***SPRINKLER IRRIGATION*** section for further information.

Use Restrictions:

- Do not make more than two applications of Vulcan or other product containing chlorpyrifos per year or apply within 60 days before harvest. Do not make a second application within 10 days of the first application.
- The maximum single application rate is 1.41 lb a.i. chlorpyrifos (3 pints Vulcan) per acre.

FIGS
(For Use only in California)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 days unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Figs	dried fruit beetle	2 quarts (1.88 lbs a.i.)	Apply in sufficient water to the soil surface followed by incorporation into the top 3 inches of soil. Apply to fig orchard soil as a dormant application in late winter prior to beetle emergence and prior to leaf formation. Use a spray volume of 10 gallons per acre or more and apply as a broadcast spray to the soil surface using ground equipment. On the day of treatment incorporate into the top 3 inches of soil using suitable equipment.

Use Restrictions:

- Make only one application per year of Vulcan or other product containing chlorpyrifos.
- Do not apply within 7 months (217 days) of harvest.
- Based on available residue data, use of Vulcan on figs is restricted to California.
- The maximum single application rate is 1.88 lb a.i. chlorpyrifos (2 quarts Vulcan) per acre.

GRAPES

(Not for use in Mississippi)Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Grapes	grape root borer	4⅓ pints (2.12 lbs a.i.)	**Soil Surface Application (For use in areas east of the Continental Divide Only):** Use Vulcan as a soil surface application by application just before the pest emerges from the soil. Mix with 100 gallons of water and apply 2 quarts of the diluted spray mixture to the soil surface on a 15 square foot area around the base of each vine. Do not allow spray to contact fruit or foliage.
	climbing cutworm grape mealybug	1 quart (0.94 lb a.i.)	**Prebloom Application (For use only in areas east of the Continental Divide):** For climbing cutworm, apply one quart per acre as a spray drench ground application using a minimum spray volume of 25 gallons per acre. For grape mealybug control, apply one quart per acre as a spray drench ground applications using a minimum of 50 gallons per acre prior to late bud-break. Applications after budbreak may result in transient leaf yellowing (Concords). Do not use prebloom applications in conjunction with soil surface application for grape borer control.

Use Restrictions:

- Do not make more than one application per season or apply within 35 days before harvest.
- Based upon available residue data, the use of Vulcan in grapes is restricted to states east of the Rocky Mountains/Continental Divide.
- Do not make more than one application per season of Vulcan or other product containing chlorpyrifos.
- The maximum single application rate for soil surface application is 2.12 lbs a.i. chlorpyrifos (4.5 pints Vulcan) per 100 gallons. The maximum single application rate for prebloom application is 0.94 lbs a.i. chlorpyrifos (2 pints Vulcan) per acre.
- Not for use in Mississippi.

LEGUME VEGETABLES (Succulent or Dried) (except soybean)
(Not For Use in Mississippi)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Legume Vegetables including adzuki bean, asparagus bean, bean, black-eyed pea, broad bean (dry and succulent), catjang, chickpea, Chinese longbean, cowpea, crowder pea, dwarf pea, edible pod pea, English pea, fava bean, field bean, field pea, garbanzo bean, garden pea, grain lupin, grean pea, guar, gyacinth bean, jackbean, kidney bean, lablab bean, lentil, lima bean, moth bean, mung bean, navy bean, pea, pigeon pea, pinto bean, rice bean, runner bean, snap bean snow pea, southern pea, sugar snap pea, sweet lupin, sword bean, tepary bean, urd bean, wax bean, white lupin, white sweet lupin, yardlong bean	seed maggots	2 pints	Apply Vulcan in a minimum of 10 gpa of spray to the soil surface using suitable ground equipment. Vulcan must be incorporated in the top 1 to 3 inches of soil to improve the activity against seed maggots. To apply an At Plant T-Band Application, apply 1.8 fl oz of Vulcan per 1000 feet of row at 30 inch row spacing. To achieve shallow incorporation, apply the spray in a 3 to 5 inch wide band over the row behind the planter shoe and in front of the press wheel to achieve shallow incorporation. Mix the specified dosage in the table below in a minimum of 10 gpa of spray and apply to the soil surface as a ground spray. Equivalent rates of insecticide spray required per 100 feet of row for listed row spacing are given in the table below. Incorporate Vulcan into the top 0.5 to 1 inch of soil to improve activity against seed maggots. Insecticides, including Vulcan, may contribute to the stress of plants under certain environmental conditions. This stress may reduce plant stand or interfere with normal plant development. Herbicides used pre-plant incorporated may interact with insecticides and enhance this stress.

Use Restrictions:

- Do not make more than one application of Vulcan per year. Do not apply Vulcan at-plant if the field was treated with a preplant incorporated treatment of Vulcan.
- Do not apply more than 2 pints of Vulcan (0.94 lbs a.i.) per acre.
- Not for use in Mississippi.

Soil Treatment: Fluid Ounces of Spray Required Per 100 Feet of Row for Various Row Spacing

Spray volume Per Acre (Gallons)	30 inch	28 inch	24 inch	22 inch
10	7.3	6.9	5.9	5.4
15	11	10.3	8.8	8.1
20	14.7	13.7	11.8	10.8

MINT (Peppermint and Spearmint)

(Not For Use in Mississippi)Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Mint	cutworms	2 to 4 pints (0.94 to 1.88 lbs a.i.)	Mix the specified dosage in water to give no less than 10 gallons of spray per acre and apply using ground spray equipment. For cutworm control, treat during May and June when field counts indicate damaging insect populations are developing or present. When larvae are less than 3/4 inch in length, use the 2 pint rate. When larvae are 3/4 inch or more in length, use the higher rate. For garden symphylans, apply preplant to the soil surface. On the same day of treatment, incorporate the insecticide into the top 2 to 4 inches of soil using a disc, field cultivator, or equivalent equipment. For mint root borer control, apply postharvest when field counts indicate damaging insect populations are developing or present. Follow treatment with approximately 1 acre inch of sprinkler irrigation immediately after application to incorporate the insecticide into the soil. Vulcan can also be applied through sprinkler irrigation systems as a postemergence broadcast application to control the above listed pests. For best results, use the listed rate of Vulcan per acre. Maintain vigorous tank agitation to assure uniformity of the application throughout the injection period. See **SPRINKLER IRRIGATION** for further information.
	garden symphylans mint root borer	4 pints (1.88 lbs a.i.)	

Use Restrictions:

- Do not apply within 90 days before harvest.
- Make only one application of Vulcan or other product containing chlorpyrifos during the growing season. Do not make more than one preplant incorporated application in the spring.
- Do not use in conjunction with a broadcast foliar application for cutworm control. Make only one postharvest application per season. The maximum single application rate is 1.88 lb a.i. chlorpyrifos (2 quarts Vulcan) per acre.
- Not for use in Mississippi.

NECTARINES, PEACHES, ALMONDS (Trunk Spray or Preplant Dip)
(Not For Use in Mississippi)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 days for nectarines and peaches and 24 hours for almond unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Nectarines Peaches Almonds (Trunk or Preplant dip)	peach tree borers	3 quarts (2.82 lbs a.i.)	Apply with 100 gallons of water. Apply as a coarse, low-pressure spray to give uniform coverage of tree trunks. Thoroughly wet all bark areas from ground level to scaffold limbs. Do not allow spray to contact fruit. Use a higher rate in the rate range when there is increased pest pressure. Consult your State Agricultural Experiment Station or State Extension Service Specialist's written specifications for proper time to treat in your area. Vulcan can also be used as a preplant dip application for non-bearing peach and nectarine trees (only) at the equivalent application rate of 3 quarts (2.82 lbs a.i.) per 100 gallons of water for control of peach tree borer. Dip trees several inches above the grafting bud scar and plant immediately or allow to dry before returning to storage. Do not allow peach trees to remain in contact with the dip solution. For control of peach tree borer in established trees, apply before newly hatched borers enter the tree.

Use Restrictions:

- Make only one application per season in almonds, peaches and nectarines. Do not apply within 14 days before harvest in almonds, peaches and nectarines.
- Do not allow meat or dairy animals to graze in treated orchards.

ONIONS (DRY BULB)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT USE RATE	REMARKS
Onions (dry bulb)	onion maggot	32 fl oz (0.94 lb. a.i.)/ acre	**At Plant Soil Drench Application:** Banded Application: Apply in a 2 to 4 inch wide band over the row at planting time in a minimum of 40 gpa. Shallow incorporation is necessary.
		1.1 fluid ounce per 1000 linear feet of row	In-furrow Application: Apply Vulcan at the rate of 1.1 fluid ounce per 1000 linear feet of row at 18 inch row spacing. Use a minimum of 40 gallons of total drench per acre. Incorporate to a depth of 1 to 2 inches.
	onion maggot seedcorn maggot	1 quart (0.94 lb a.i.)/ acre	**Post Plant Soil Drench Application:** Apply as an early season directed spray to the base of onion seedlings or transplants during peak onion maggot and seedcorn maggot egg-laying. Use a minimum of 100 gallons per acre for thorough wetting.

Use Restrictions:

- Do not make more than two applications per year (at plant plus post plant).
- The maximum single application rate is 0.03 lb a.i. chlorpyrifos per 1000 feet of row.
- Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.
- Do not harvest within 60 days of application

PEANUTS

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Peanut	wireworm suppression	4 pints (1.88 lbs a.i.)	Apply as a preplant broadcast spray to the soil surface followed by immediate soil incorporation to a depth of 3 to 4 inches. Use a minimum of 10 gallons of total spray per acre.

Use Restrictions:

- Do not make more than one application per season. The maximum single application rate is 1.88 lbs a.i. chlorpyrifos (4 pints Vulcan) per acre. The combined total of preplant and postplant applications of Vulcan or other product containing chlorpyrifos must not exceed 4 lbs a.i. chlorpyrifos per acre per season.
- Do not harvest within 21 days after treatment.
- Do not feed treated peanut forage or hay to meat or dairy animals.
- Aerial application to peanuts is prohibited in Mississippi.
- Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

PEARS
(California, Oregon and Washington)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Pears	codling moth	4 pints (1.88 lbs a.i.)	Apply in 100 to 400 gallons of spray per acre. Apply using an airblast speed sprayer or other suitable ground equipment.

Use Restrictions:

- Do not make more than one post harvest application prior to dormancy per year.
- Do not harvest or use treated fruit for food or feed.
- Do not allow meat or dairy animals to graze in treated orchards.
- If unauthorized entry into a treated orchard cannot be prevented, then the orchard shall be posted with appropriate signs according to the Worker Protection Standard while treated, unharvested fruit remains on the tree.

SORGHUM-GRAIN SORGHUM (MILO)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Sorghum	Sorghum midge	0.5 pint Apply when 30 to 50% of the seed heads are in bloom. Repeat at 3 day intervals if necessary.	Mix the specified dosage in enough water to ensure thorough coverage and apply using suitable aerial or ground spray equipment. To minimize chemical injury, do not apply Vulcan to drought stressed grain sorghum within 3 days following irrigation or rain except where the product is applied in irrigation water. Vulcan can also be applied through sprinkler irrigation systems as a postemergence broadcast application to control the above listed foliar pests. For best results, use the listed rate of Vulcan per acre. Maintain vigorous tank agitation to assure uniformity of the application throughout the injection period. See ***SPRINKLER IRRIGATION*** section for further information. **Note**: Sorghum lines used in seed production fields may be more susceptible to chemica injury. Susceptible inbred lines or hybrids are likely to be at greater risk of yield-reducing chemical injury when treated at the higher application rates. User should not apply more than 1 pint of Vulcan Insecticide per acre to seed sorghum if the additional risk of crop injury is unacceptable.
	Grasshoppers, Yellow sugar cane aphid and other aphids	0.5 - 1 pint	
	Greenbug	0.5 - 2 pints For infestations of greenbug that are difficult to control, use a higher dosage within the indicated rate range.	
	Chinch bugs, Lesser corn-stalk borer	1 - 2 pints Apply as a directed spray toward the base of the plant using power-operated ground spray equipment with sufficient water to ensure coverage of an 8-12 inch band centered on the row. On plants less than 6 inches high, apply an 8 to 12 inch band over the row. Do not reduce the dosage for banded or directed applications. Concentrate the full labeled dosage rate in the treated zone.	
	Webworms	1 pint	
	Corn earworm	2 pints	
	Armyworms, Cutworms	1 - 2 pints	
	European and Southwestern corn borer, Brown marmorated stink bug	1.5 - 2 pints	

Use Restrictions:

- The treated crop is not to be used for grain, forage, fodder, hay, or silage within 30 days after application of 1 pint (0.47 lbs a.i.) of Vulcan per acre or within 60 days after application of rates above 1 pint (0.47 lbs a.i.) per acre.
- Do not treat sweet varieties of sorghum.
- Do not apply more than 3 pints (1.41 lbs a.i.) of Vulcan per acre per season. Do not make more than 3 applications of Vulcan Insecticide or other product containing chlorpyrifos per season. Do not make a second application within 10 days of the first application.
- Do not apply by air in Mississippi.

SOYBEANS
(Not For Use in Mississippi)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Soybeans	cutworms lesser cornstalk borer	1 to 2 pints (0.47 to 0.94 lbs a.i.)	**Soil Treatment:** Mix the specified dosage in a minimum of 10 gallons of spray per acre and apply to the soil surface using suitable ground spray equipment. Equivalent rates of insecticide spray required per 100 feet of row for various row spacing are given in the accompanying table. For at-plant treatments, apply the insecticide over the row in a 4 to 6 inch band in front of the planter shoe or press wheel or after the press wheel followed by a drag chain for light incorporation. Do not apply as an in-furrow treatment. For postemergence rescue treatments, apply as a directed spray in a 9 to 12 inch band at the base of the plant. To plants under 6 inches high, apply over-the-top in a 6 to 12 inch band. Treat when field counts or conditions indicate that pests are or may become a problem.
	European corn borer, Southern green stink bug, Brown marmorated stink bug	2 pints	**Foliar Treatment:** Use in sufficient water to ensure thorough coverage of treated plants: Apply as a broadcast spray using either aerial or ground equipment when field counts indicate damaging insect populations are developing or present; retreat as necessary to maintain control. Mix the specified dosage in a minimum of 15 gallons of spray per acre for ground spray equipment or 5 gallons of spray per acre for aircraft equipment. For effective control of spider mites when large numbers of eggs are present, apply a second spray 3 to 5 days after initial treatment to control newly-hatched nymphs. On determinate soybeans, do not apply more than one application after pod set. Vulcan insecticide can also be applied through sprinkler irrigation systems as a postemergence broadcast application to control the above listed foliar pests. For best results, use the listed rate of Vulcan per acre. Maintain vigorous tank agitation to assure uniformity of the application throughout the injection period. See ***SPRINKLER IRRIGATION*** section for further information.
	Bean leaf beetle, Cutworms, Corn earworm, Saltmarsh caterpillar and other woollybears, soybean aphid, potato leafhopper, thistle caterpillar (painted lady butterfly)	1 - 2 pints	
	Mexican bean, beetle, Armyworms	1 - 1.5 pints	
	Velvetbean caterpillar, Grasshoppers, Green cloverworm, Spider mites	0.5 - 1 pint	

Use Restrictions:

- Do not apply more than 6 pints (2.82 lbs a.i.) of Vulcan per acre per season. Do not make more than 3 applications per season of Vulcan insecticide or other product containing chlorpyrifos.
- Do not apply last treatment within 28 days before harvest nor apply last two treatments closer than 10 days apart.
- Do not allow livestock to graze in treated areas or otherwise feed treated soybean forage, hay, and straw to meat or dairy animals.
- Not for use in Mississippi.

Soil Treatment: Fluid Ounces of Spray Required Per 100 Feet of Row for Various Row Spacing

Volume of Spray Per Acre	36 inch	32 inch	28 inch	24 inch
10 gallons	8.8	7.9	6.9	5.9
15 gallons	13.2	11.8	10.3	8.8
20 gallons	17.6	15.7	13.7	11.8

STRAWBERRIES
(Not For Use in Mississippi)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Strawberries	Garden symphylans, grub	4 pints	**Preplant Incorporation Treatment:** Apply in sufficient water to the soil surface and incorporate into the soil in the spring for protection of strawberries during the following year.
	strawberry bud weevil (clipper)	1 quart (0.94 lbs a.i.)	**Foliar Application:** Apply as a broadcast foliar spray in a minimum of 40 gallons of spray per acre when buds first appear and 10 to 14 days later. Do not apply after berries start to form or when berries are present. Do not tank mix Vulcan with pesticides, surfactants, or fertilizer formulations unless prior use has shown the combination noninjurious under your current conditions of use. Phytotoxicity may occur when Vulcan is applied to strawberries experiencing high temperature and drought stress.
	strawberry crown moth	1 quart (0.94 lbs a.i.)	**Post Harvest Application:** Apply as a directed spray to crown of strawberry plants immediately after harvest and after plants are topped. Use a minimum spray volume of 100 gallons per acre and repeat application if required 14 to 18 days later. Do not sprinkle irrigate for one week following application.

Use Restrictions:

- For prebloom use only, do not apply after berries start to form or when berries are present.
- Do not apply within 21 days before harvest.
- For preplant application, do not make more than one application of Vulcan or other product containing chlorpyrifos per year. For foliar and post harvest applications, do not make more than two applications per year. Do not make a second application within 10 days of the first foliar application and within 14 days for post harvest application.
- The maximum single application rate is 1.88 lbs a.i. chlorpyrifos (2 quarts Vulcan) per acre for foliar application and 0.94 lbs a.i. chlorpyrifos (1 quart Vulcan) per acre for postharvest application.
- Not for use in Mississippi.

SUGAR BEETS

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE		REMARKS
Sugar beets	Grasshoppers	1 pint (0.47 lbs a.i.)		**Soil Treatment (At Planting or Preplant Incorporated):** To reduce feeding damage from early season insects such as cutworms, apply at planting or as a preplant treatment and incorporate to a depth of 1 to 2 inches. Do not apply as an in-furrow treatment. Apply 1 pint (0.47 lbs a.i.) of Vulcan per planted acre to a 10 inch wide band centered over the row for furrows 30 inches apart. (For rows 30 inches apart, this is equivalent to 9.2 fl oz of Vulcan per 10,000 feet of row). For other row widths, adjust the spray volume per planted acre in proportion to the length of row actually treated.
Sugar beets	Grasshoppers	Broadcast (pint/acre)	Band (pint/acre)	**Postemergence Treatment:** Treat when field counts indicate that damaging insect populations are developing or present. **Broadcast Application:** Apply the specified dosage in water using 2 to 5 gallons per acre of finished spray when using aerial spray equipment or 10 to 30 gallons per acre when using ground spray equipment. Vulcan can also be applied through sprinkler irrigation systems as a postemergence broadcast application to control the listed foliar pests. Use the listed rate of Vulcan per acre. Maintain vigorous tank agitation to assure uniformity of the application throughout the injection period. See ***SPRINKLER IRRIGATION*** section for further information. **Banded Foliar Spray:** Apply the specified rate within the band using a minimum of 7 gallons of spray volume in a 5- to 7 inch wide band centered over the row. Do not reduce the rate for band applications. Concentrate the full labeled dosage rate (see band rates in table below) in the treated zone. For best results, lightly incorporate band-applied treatments, either mechanically or with irrigation. For grasshopper control, the low rate will control small nymphs (1st through 3rd instar). For sugarbeet root maggot adults, apply anytime from 7 days before until 3 days after peak adult emergence in order to target adults present at time of application based on local field trap monitoring. For sugarbeet root maggot larvae, use as primary treatment to control root maggot larvae. Base application timing on local field trap monitoring. Apply anytime from 7 days before until 3 days after peak adult emergence. Use as a supplemental postemergence treatment following an at-plant insecticide application for control of root maggot larvae. Base application timing on local field trap monitoring. Apply anytime from 7 days before until 3 days after peak adult emergence. To prevent potential development of insecticide resistance in sugarbeet root maggot, producers are encouraged to take the following steps: (1) avoid making more than 2 applications of Vulcan per season when adults are active; (2) If an organophosphate insecticide was applied at planting, make no more than one postemergence application of Vulcan when adults are active.
		1/2 - 1	–	
	Leafminers, Spider mites	1	2/3	
	Tarnished plant (Lygus)	1	–	
	Fall armyworms, yellowstriped armyworm, webworms	1 - 2	2/3-1 1/3	
	Beet armyworm	1 1/2 - 2	1 – 1 1/3	
	Cutworms, flea beetle adults	2	1 1/3	
	Sugarbeet root maggot adults	1/2 - 1	–	
	Sugarbeet root maggot larvae	–	1 1/3 - 2	
	Sugarbeet root maggot larvae	2	1 1/3 – 2	
	Aphids	1 - 2	–	

Use Restrictions:

- Do not apply within 30 days before harvest of beet roots and tops.
- Do not make more than 3 applications of Vulcan or other product containing chlorpyrifos per season. Do not apply more than a total of 6 pints (2.82 lbs a.i.) per acre per season.
- The maximum single application rate is 0.94 lb. a.i. chlorpyrifos (2 pints Vulcan) per acre. Do not make a second application within 10 days of the first application.
- Do not allow livestock to graze in treated areas nor harvest treated beet tops as feed for meat or dairy animals within 30 days after last treatment.
- Not for use in Mississippi. To avoid unacceptable crop injury, do not tank mix Vulcan with Quadris® or Headline® with any EC formulation or any tank mix containing an oil adjuvant.

SUNFLOWERS
(Not For Use in Mississippi)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Sunflowers	Cutworms	2 - 4 pints	**Preplant Incorporation Treatment:** Use listed rate in not less than 10 gallons of water per acre and apply as a broadcast spray to the soil surface using suitable power-operated ground spray equipment. On the same day of treatment, incorporate the insecticide into the top 2 to 4 inches of soil using a disc, field cultivator, or equivalent equipment. Use a higher rate in the rate range when there is increased pest pressure.
	Cutworms	2 - 3 pints	**Postemergence Treatment:** Use Vulcan for control of the following pests at the dosage indicated by application in sufficient water to ensure thorough coverage of treated plants, but no less than 15 gallons of water per acre for ground equipment or 2 to 5 gallons of water per acre for aircraft equipment. Use a higher rate in the rate range when there is increased pest pressure. Apply as a broadcast spray using either aerial (fixed-wing or helicopter) or power-operated ground spray equipment when field counts indicate that pests are or may become a problem. For cutworm control, a second treatment can be made 7 to 10 days later if needed. For stem weevil control, optimal treatment time is within 5 to 7 days after adult weevils begin to appear. For sunflower moth control, make first application during early 1 to 5 percent bloom stage. A second treatment can be made 10 days later if needed. For seed weevil control, treat when field counts indicate there are 10 to 12 adults per plant for oil crops and 1 to 3 adults per plant on confectionery crops. Make additional treatments at successive 10 day intervals if field counts indicate need to retreat. For sunflower beetle larvae or adult control, treat when field counts indicate there are 10 larvae or 1 to 2 adults per seedling. Additional treatments can be made at successive 10 day intervals if field counts indicate need to retreat. For tarnished plant bug control, apply at the onset of pollen spread or approximately 10% bloom (R-5 growth stage). For best control, make a second application 10 days later. Use sufficient water to ensure thorough coverage of treated plots.
	Sunflower beetle larvae and adults, Stem weevil, Sunflower moth, Banded sunflower moth, Woollybears, Seed weevil	1–1.5 pints	
	Grasshoppers	1 pint	
	Tarnished plant bug (Lygus), brown marmorated stink bug	1 - 2 pints	

Use Restrictions:

- Do not apply more than 6 pints (2.82 lbs a.i.) of Vulcan per acre per season. Do not make more than 3 applications of Vulcan or other product containing chlorpyrifos per season.
- Do not apply within 42 days before harvest. Do not make a second application within 10 days of the first application.
- Do not allow livestock to graze in treated areas.
- The maximum single application rate is 1.88 lbs a.i. chlorpyrifos (4 pints Vulcan) per acre for preplant incorporation and 0.94 lbs a.i. chlorpyrifos (2 pints Vulcan) per acre for postemergence broadcast treatment.
- Not for use in Mississippi.

SWEET POTATOES

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Sweet Potatoes	*Conderus* wireworm, *Systena* flea beetle, Sweet potato flea beetle	4 pints (1.88 lbs a.i.)	Use Vulcan to reduce the feeding damage caused by populations of the pests listed in this table. Apply as a broadcast (overall) spray to the soil surface followed by incorporation. Mix the specified dosage with enough water to obtain uniform coverage and apply as a coarse spray using suitable ground spray equipment. Incorporate the insecticide to a depth of 4 to 6 inches as soon as possible after application by using a rotary hoe, disc cultivator, or other suitable incorporation equipment. Plant the crop in the usual manner no later than 14 days after treatment (any delay in planting will reduce the length of time that Vulcan will protect against feeding damage). Vulcan will not control false wireworms or whitefringed beetle or other grubs that attack sweet potatoes.

Use Restrictions:

- Do not apply more than 4 pints/A (1.88 lbs a.i./A) of Vulcan per application.
- Do not make more than one application of Vulcan or any other product containing chlorpyrifos per cropping season.
- Do not harvest within 125 days of treatment.
- Do not apply by aerial application equipment in the State of Mississippi.

TOBACCO*

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Tobacco	Cutworms larvae, Flea beetles, Mole crickets, Root maggots, Wireworms	2 pints (0.94 lbs ai)	Use Vulcan for preplant treatment to control the pests listed in this section of the table. Apply this product rate per acre in not less than 10 gallons of water as a broadcast (overall) spray to the soil surface one week before transplanting. Immediately following application, incorporate the insecticide into the soil to a depth of 2 to 4 inches using suitable equipment.
	Cutworms larvae, Flea beetles, Mole crickets, Root maggots, Wireworms, Rootknot nematodes (low to moderate populations)	2 pints (0.94 lbs ai)	To control the pests listed in this section of the table and in all tobacco growing regions, use Vulcan at the application rate in this section of the table.
	Cutworms larvae, Flea beetles, Mole crickets, Root maggots, Wireworms, Rootknot nematodes (moderate populations)	Tank Mix with Nemacur* 3 2 quarts (1.88 lbs ai) of Vulcan PLUS 4 quarts of Nemacur 3 nematicide	To control the pests listed in this section of the table and in all tobacco growing regions, use the tank mix rates in this section of the table. Read and carefully follow all applicable directions, restrictions, and precautions on labeling for Nemacur 3 used in combination with Vulcan.

Use Restrictions:

- Do not apply more than 2 pints/A (0.94 lbs a.i./A) of Vulcan per application.
- Do not make more than one application of Vulcan or any other product containing chlorpyrifos per cropping season.
- Do not apply more than 2 pints/A (0.94 lbs a.i./A) of Vulcan per cropping season.
- Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.
- Do not apply by aerial application equipment in the State of Mississippi.

* For all sections of this table:
Apply the specified dosage in not less than 10 gallons of water as a broadcast (overall) spray to the soil surface 24 to 48 hou s before bedding and transplanting.
Immediately following application, incorporate into the soil surface 24 to 48 hours before bedding and transplanting.
Immediately following application, incorporate into the soil to a depth of at least 4 inches using suitable equipment.
Where the nematode species *Meloidogyne arenaria* or *M. Javanica* are present or high populations of *M. incognita*, apply Telone* II soil fumigant at the listed label rate.

TREE FRUITS, ALMOND, AND WALNUT (Dormant/Delayed Dormant Sprays)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 days for tree fruits and 24 hours for almond and walnut unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER 100 GALLONS of SPRAY (Based on 200 to 600 gallons/A as a dilute spray)	REMARKS
Apples	Rosy apple aphid, San Jose scale, Lygus, *Pandemis* leafroller, Climbing cutworms Obliquebanded leafroller	0.5 - 1 pint (Use a minimum of 1.5 pints/acre)	For Apple: Only one application of any chlorpyrifos-containing product can be made per year. The application can either be a prebloom dormant/dormant delayed spray to the canopy or the trunk, OR a post-bloom application to the lower 4 feet of the trunk. For postbloom application instructions and restrictions for apple, see the Apple Tree Trunk crop section. In orchards with high overwintering populations of European red mite or brown almond mite, use higher sprayer volumes that allow for the use of higher per acre rates of oil. For Apple, Almond, Cherry, Nectarine, Peach, Pear, Plum, Prune, and Walnut: Use Vulcan as a dormant or delayed dormant spray at the rates indicated to control the pests listed in this table. While Vulcan can be used without oil, use oil to control additional pests such as European red mite and brown almond mite. Applications can be made on pears after harvest. See specific use directions in this table. Dormant or Delayed Dormant Spray: For control of additional pest such as European red mite, mix Vulcan with oil, although it can be used without oil. Using conventional, power-operated spray equipment, apply as a concentrate or dilute spray. For dilute sprays (greater than 200 gpa), use sufficient spray volume to saturate tree foliage, but not to point of runoff. For concentrate sprays (less than 200 gpa), evenly distribute an equivalent amount of product per acre. For dilute spray, tank mix the specified dosage with 1 to 2 gallons of a petroleum spray oil specified for dormant use in 100 gallons of water and spray the entire tree by application to run off using suitable ground spray equipment. For low volume (concentrate) sprays (less than 200 gallons of spray mixture per acre), use the same amount of Vulcan as for a dilute spray and apply in a manner that will ensure thorough coverage of the trees. Use the higher dosage of Vulcan for severe infestations. Use oil as specified by your State Agricultural Experiment Station or State Extension Service Specialist.
Almond, Cherry, Nectarine, Peach, Pear, Plum, Prune, Walnut	American plum borer, Brown almond mite, Climbing cutworms, European red mite, Greater peach tree borer Mealy plum aphid, Peach twig borer, Pear psylla adults, San Jose scale		

Use Restrictions:

- Do not apply more than 4 pints/A (1.88 lbs a.i./A) of Vulcan.
- Do not apply Vulcan until winter rains or irrigation has replenished soil moisture such that bark and twigs are not desiccated since cold or dry conditions can cause Vulcan plus oil sprays to infuse trees resulting in bud damage or drop.
- Make only one application during the dormant/delayed dormant season, applying no more than 4 pints/A (1.88 lbs a.i./A) per cropping season.
- Do not make more than one application of any chlorpyrifos-containing product per year.
- The application can either be a prebloom dormant/dormant delayed spray to the canopy or the trunk, OR a post-bloom application to the lower 4 feet of the trunk. For postbloom application instructions and restrictions for apple, See the Apple (Tree Trunk) section.
- Do not make a soil or foliar application within 10 days of a dormant/delayed dormant application of chlorpyrifos to the orchard.
- Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 days for tree fruits and 24 hours for almond and walnut unless PPE required for early entry is worn.
- Do not allow meat or dairy animals to graze in treated orchards.

Use Restrictions Specific to California:

- Use a minimum of 100 gallons of total spray volume per acre.
- Do not apply more than 4 gallons of spray oil per acre on almonds.
- Do not apply more than 6 gallons per acre on peaches and nectarines.
- Do not use any adjuvants or surfactants in addition to or as a substitute for a petroleum spray oil in a tank mix with Vulcan.
- Do not apply on almonds in the following counties in California: Butte, Colusa, Glenn, Solano, Sutter, Tehama, Yolo, and Yuba.
- Do not use more than 1% dormant oil in almond orchards less than 4 years old.

TREE NUTS
ALMONDS, FILBERTS, PECANS, WALNUTS

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Almonds	Leaf footed plant bug, Navel orangeworm, Peach twig borer, San Jose scale	4 pints	Foliar Spray: Use Vulcan at the dosage indicated by application as a foliar spray to control pests listed in the table. Mix the required dosage in sufficient water to ensure thorough and complete coverage of the foliage and crop, and apply as a concentrate or dilute spray using conventional, power-operated spray equipment. For dilute sprays applied to tree nut crops, mix the required dosage in sufficient water to allow for spray to runoff. For concentrate sprays, apply an equivalent amount of Vulcan per acre. Treat when pests appear or in accordance with local conditions. Insect control by aerial application may be less than control by ground application because of less coverage. Consult your state agricultural experiment station, certified pest control advisor, or extension service specialist for specific use information in your area. To avoid contamination of irrigation floodwaters, do not flood irrigate within 24 hours following an application of Vulcan.
Filberts	Eye-spotted bud moth, Filbert aphid, Filbert leafroller, Filbert worm, Obliquebanded leafroller, Omnivorous leaftier, Winter moth	3 - 4 pints	
Walnuts	Codling moth, Walnut scale, Walnut husk fly	4 pints	
Pecans	Pecan nut casebearer, Fall webworm	1.5 - 4 pints	
	Phylloxera spp., Black pecan aphid, Hickory shuckworm, Pecan leaf scorch mite (suppression) , Ant species (except fire ants, carpenter ants, harvester ants, and pharaoh ants)	2 - 4 pints For best *Phylloxera* spp. control, make 2 applications at 10 day interval using a minimum of 1.0 pint (0.94 lbs a.i.) of Vulcan per acre starting at bud swell. For Black pecan aphid and Hickory shuckworm make 2 applications, 10-14 days apart for best results To suppress pecan leaf scorch mite, use a preventative program. For ant control, apply as an orchard floor spray. Do not apply where weed growth or other obstructions prevent uniform coverage of the orchard floor.	
	Yellow pecan aphid, Black margined aphid[5], Spittlebugs	1 - 4 pints/acre For control of yellow pecan aphid and black margined aphid, apply in tank mix combination with the listed rate of a pyrethroid insecticide labeled for control or suppression of these aphids. For control of spittlebug, use a dosage of 2 to 4 pints (0.94–1.88 lbs a.i.) per acre for concentrate sprays.	

Use Restrictions:

- Cold or dry conditions can cause this product and oil mixtures to infuse into trees, resulting in bud damage or bud drop. Do not apply until winter rains or irrigation has replenished soil moisture so that bark and twigs are not desiccated. Do not flood irrigate within 24 hours of application of this product to avoid contamination of irrigation tail wate s.
- Vulcan is highly toxic to bees exposed to direct treatment. Do not apply when bees are actively foraging in the treated area.

- Make no more than 3 foliar applications of Vulcan or other product containing chlorpyrifos per season on almonds, filberts, and pecans and no more than 2 applications per season on walnuts.
- Make no more than one application of chlorpyrifos during the dormant season. Do not make a soil or foliar application of Vulcan or products containing chlorpyrifos within 10 days of a dormant/delayed dormant application.
- Do not apply within 14 days of harvest of almonds, filberts, and walnuts, or 28 days of harvest of pecans. Do not allow livestock to graze in treated orchards. Do not apply more than 8 pints (3.76 lbs a.i.) of Vulcan per acre per season as a foliar spray. Do not make a second application within 10 days of the first application. Do not apply more than 4 pints of Vulcan (1.88 lbs a.i.) per acre per season as a dormant/delayed dormant application.
- Do not use on almond, filbert or walnut in Mississippi.
- Do not aerially apply this product in Mississippi.

ALMOND, PECAN, WALNUT ORCHARD FLOORS
(Not For Use in Mississippi)

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Almond, Pecan, Walnut Orchard Floors	ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), pavement ants	4 to 8 pints (1.88 – 3.76 lbs a.i.)	Apply the specified dose with ground application equipment that will uniformly apply the spray to the orchard floor. Use when ant activity becomes evident within the orchard.Worker ants cease most of their foraging activity at temperatures above 90°F, best results will be achieved with applications made at temperatures below 90°F at the time of application. Sprinkler- or Drip-irrigated Orchards Apply in 25 or more gallons of water. Use the high rate for heavy infestations and the low rate for light infestations. In orchards where ant activity is concentrated around the irrigation emitters, apply the high rate to a 6- to 8-foot band along the drip-irrigation line and the low rate to the rest of the orchard. Flood-irrigated Orchards Apply in 25 or more gallons of water to the entire orchard floor using ground spray equipment. Apply the high rate to heavily infested areas and the low rate to lightly infested areas. Where ant colonies are abundant only in the berm areas, apply Vulcan at 8 pints (3.76 lbs a.i.) per treated acre in 50 or more gallons of water to a 6- to 10-foot band along the treeline (berm).

Use Restrictions:

- Do not make more than 2 applications of Vulcan or other product containing chlorpyrifos per season to the orchard floor. Do not apply more than 8 pints (3.76 lbs a.i.) per acre per season to the orchard floor. If the 8 pint rate is used, then a second application is not permitted.
- Do not apply the last treatment within 14 days of harvest.
- Do not allow livestock to graze in treated orchards. Do not allow spray to contact fruit or foliage.
- Do not make a second application within 10 days of the first application.
- Do not apply where weed growth or other obstructions would impede uniform coverage of the orchard floor. Mow or chemically control weeds before the application.

TURF GRASS GROWN FOR COMMERCIAL SOD

(Not for use in Mississippi)Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

For best results, turf should be moist at time of treatment.

PEST	PRODUCT RATE		REMARKS
	1000 sq ft	Acre	
Ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), armyworms (such as: beet, fall, yellowstriped), centipedes, chiggers, chinch bugs, crickets, cutworms, deer ticks, earwigs, European crane fly larvae, fiery skipper, fleas, gnats, grasshoppers, greenbug aphids, green June beetle grubs, leafhoppers, Lucerne moth, millipedes, mites (such as: clover, Bermudagrass stunt, winter grain), mosquitoes, pillbugs, springtails, sod webworms (lawn moths)[1], sowbugs, ticks	0.75 fl oz	1 qt	For sod webworms, watering or mowing of the treated area must be delayed for 12 to 24 hours after treatment.
Billbug adults (such as: bluegrass, Denver, hunting) [2]	0.75 – 1.5 fl oz	1 - 2 qt	For billbugs, spray early in the season just prior to or coinciding with first appearance of adults as specified by your local Agricultural Extension Service Specialist.

PEST	PRODUCT RATE		REMARKS
	1000 sq ft	Acre	
Annual bluegrass weevil (Hyperodes) [3] black turfgrass ataenius adults [4], mole crickets [5]	1.5 fl oz	2 qt	To control annual bluegrass weevil, spray suspected problem areas in mid-April and again in mid May, or as specified by your local Agricultural Extension Service Specialist. For black turfgrass ataenius adults, spray early in the season as specified by your local Agricultural Extension Service Specialist. A repeat application may be needed 1 to 2 weeks later. To control mole crickets in turfgrass, apply Vulcan through high-pressure injection or other suitable subsurface placement application equipment. Depending on the application equipment used, follow the manufacturer's specification for calibration and the volume of spray per acre needed to provide control or as specified by your local Agricultural Extension Service Specialist. For best results, apply when young nymphs are active.
White grubs (such as: black turfgrass ataenius, European chafer, Japanese beetle larvae, and northern and southern masked chafers) [6]	1.5 - 3 fl oz	2 - 4 qt	For white grubs, spray when grubs are young and actively feeding near the soil surface, usually during late July and August or as specified by your local Agricultural Extension Service Specialist. For best results, soil should be moist prior to treatment. For best results, immediately after spraying, irrigate the treated area with 0.5 to 1 inch or water to wash the insecticide into the thatch and underlying soil.

VEGETABLES - Brassica (Cole) Leafy Vegetables[1] and Radish, Rutabaga, and Turnip

(Not for use in Mississippi)Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 3 days for cauliflower and 24 hours for all other vegetables unless PPE required for early entry is worn.

[1]Brassica (cole) leafy vegetables include broccoli, broccoli raab, Brussels sprout, cabbage, cauliflower, cavalo broccoli, Chinese broccoli, Chinese cabbage, collards, kale, kohlrabi, mizuna, mustard greens, mustard spinach, rape greens.

Preplant Incorporation Application for Direct Seeded or Transplanted Crops

CROP	PEST	DOSAGE VULCAN	USE DIRECTIONS
Cauliflower	Billbugs, Cutworms, Grubs, Root Maggots, Symphylans, and Wireworms	4 pints (1.88 lbs a.i.) per acre	Use as a broadcast spray to the soil surface using power-operated ground spray equipment. Use a total spray volume of 10 gallons of water per acre or more. On the day of treatment, incorporate Vulcan into the top 2 to 4 inches of soil using a disc, field cultivator, or equivalent equipment. Insecticides may contribute to the stress of plants under certain environmental conditions. This stress may reduce plant stand or interfere with normal plant development. Herbicides used preplant incorporated may interact with insecticides and enhance this stress.
Broccoli, Brussels Sprouts, Cabbage, Chinese Cabbage, Collards, Kale, Kohlrabi, Rutabaga, Turnips		4.5 pints (2.12 lbs a.i.) per acre	
Radish		5.5 pints (2.6 lbs a.i.) per acre	

At-Plant, Post Plant Soil Application and Foliar Application

CROP	PEST	DOSAGE VULCAN	USE DIRECTIONS	RESTRICTIONS
Cauliflower-soil application	Root maggot	1.6-2.4 fl oz/1000 linear ft of row	For direct-seeded crops, apply the specified dosage in a water-based spray as a 4 inch wide band over the row at planting time. Shallow incorporation is necessary. Placement behind the planter shoe and in front of the press wheel is recommended. For transplanted crops, apply Vulcan as a water-based spray directed to the base of the plants immediately after setting. Use a minimum of 40 gallons of total spray per acre. Do not add any additional adjuvants, surfactants, or spreader stickers. Do not apply as a foliage application.	Do not apply more than 2 pints of Vulcan to cauliflower planted in 40 inch rows. Use proportional amounts for other row spacings not to exceed 4 pints of Vulcan per acre. Do not apply more than 2.6 pints (1.22 lbs a.i.) of Vulcan per acre to broccoli, Brussels sprouts, cabbage, Chinese cabbage, collards, kale, kohlrabi, and turnips planted in 40 inch rows. Do not apply more than 4.5 pints (2.12 lbs a.i.) of Vulcan per acre to these crops in 20 inch rows (or two rows per bed). Use proportional amounts for other row spacings not to exceed 4½ pints (2.12 lbs a.i.) of Vulcan per acre. Do not make more than one application per season within 30 days before harvest on broccoli, Brussels sprouts, cabbage, Chinese cabbage, collards, kale, kohlrabi, and turnips. Do not make more than one soil application per crop. Do not make a foliar application within 10 days of a soil application.
Broccoli, Brussels Sprouts, Cabbage, Chinese Cabbage, Collards, Kale, Kohlrabi, Turnips-soil application		1.6-2.75 fl oz/1000 linear ft of row		
Broccoli, Cabbage-soil application	Root aphid	1.2 fl. oz/1000 ft of row for single row plantings, and 2.4 fl oz/1000 linear ft of row for double row plantings	Apply Vulcan in a water emulsion or with liquid fertilizer injected as a side-dress on each side of the row after plants are established. Avoid mechanical damage to crop roots. Use a minimum of 15 gallons of total spray volume per acre. See **MIXDIRECTIONS** section of the label for mixing instructions with liquid fertilizers.	
Brussels sprouts-foliar application	Armyworms, Cabbage aphid, Cutworms. Imported cabbage worm, Striped flea beetle (adult)	1 - 2 pints/acre	Apply Vulcan with conventional power-operated equipment in 20 to 150 gallons of water per acre. Apply when insects appear on foliage and at 10 to 14 day intervals or thereafter as needed. Consult your state agricultural station, extension service specialist, or integrated pest control advisor for proper time to treat in your area.	Do not make more than 3 applications of Vulcan or other products containing chlorpyrifos per season. Do not apply within 21 days before harvest. Do not make a second application within 10 days of the first application. Do not make a foliar application within 10 days of a soil application. Do not aerially apply this product in Mississippi.
Radishes-soil application	Root maggot	1.0 fl oz/1000 linear ft of row	Apply the specified dosage as a water-based drench in the seed furrows with the seed at planting time. Use a minimum of 40 gallons of total drench per acre.	Do not apply more than 5.5 pints (2.6 lbs a.i.) of Vulcan per acre or make more than one soil application per season. Do not make a foliar application within 10 days of a soil application. Do not apply within 30 days of harvest.
Rutabagas-soil application	Root maggot	1.6-3.3 fl oz/1000 linear ft of row	Apply the specified dosage in a water-based spray as a 4 inch wide band over the row at planting time, behind the planter shoe and in front of the press wheel to achieve shallow incorporation. Use a minimum of 40 gallons of total spray volume per acre.	Do not apply more than 4.5 pints (2.12 lb a.i.) of Vulcan per acre or make more than one soil application per season. Do not use rutabaga tops for food or feed purposes. Do not make a foliar application within 10 days of a soil application. Do not apply within 30 days of harvest.

Use Restrictions:

- If a preplant incorporation application for direct seeded or transplanted crops is made, do not apply this product as an at-plant or post plant soil application. If an at-plant or post plant soil application is made, do not apply this product as a preplant incorporation applications for direct seeded or transplanted crops.
- For At-Plant, Post Plant Soil Application and Foliar Applications, to avoid phytotoxicity in vegetables (except Brussels sprouts) do not mix with other pesticide products or treat plants that are under extreme heat and drought stress.

WHEAT

Worker Restricted Entry Interval: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

For use only in Arizona, California, Colorado, Idaho, Kansas, Minnesota, Montana, Nebraska, New Mexico, Nevada, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming.

CROP	PEST	PRODUCT RATE PER ACRE	REMARKS
Wheat	Aphids (including Russian wheat aphid, Greenbug, English grain aphid), Brown wheat mite, Grasshoppers, brown marmorated stink bug	0.5 to 1 pint	From emergence to flowering, treat when 15-20% of tillers are infested. From flowering to early milk stage, treat when 20% or more of tillers are infested.
	Wheat midge (orange wheat blossom midge)	1 pint/acre	Make treatment when 75% of the wheat heads have emerged from the boot and when midge adults are found in the crop (1 midge per 4-5 heads). Application timing is critical to ensure good control. If possible, apply in the late afternoon or early evening when temperatures exceed 50° F and wind speed is less than 7 mph.
Wheat	Army cutworms, other cutworm species (suppression only)	1 pint/acre	Control may be reduced under high temperature conditions (greater than 80°F), under dry soil conditions, or if larvae are more than 0.5 inch long. Treat when field counts or crop injury indicates that damaging pest populations are developing or present. A second application of 1 pint/acre can be made for additional control.

Use Restrictions:

- Do not make more than 2 applications of Vulcan or other products containing chlorpyrifos per season.
- Do not apply within 14 days of harvest for forage and hay and within 28 days of harvest for grain and straw. Do not allow livestock to graze or otherwise feed on treated forage within 14 days of application.
- Do not feed straw from treated wheat within 28 days of application.

Mix the required dosage with water and apply in a minimum of 2 gallons per acre finished spray volume. Apply using aerial (fixed wing or helicopter) or power-operated ground spray equipment.

NONRESIDENTIAL TURF AND OTHER NONRESIDENTIAL OUTDOOR USES

Vulcan is an emulsifiable concentrate for control of pests located around industrial buildings (turf and ornamental), road medians (turf and ornamentals), and golf course turf only. Pests controlled by Vulcan are listed in the following tables. Vulcan is compatible with fungicides, insecticides, and miticides commonly specified except for alkaline materials such as Bordeaux mixtures and lime. Always conduct a small jar compatibility test using proper proportions of chemicals and water to check for physical compatibility prior to tank mixing.

Restrictions: Use on residential turf is prohibited. Keep out of fish pools and other bodies of water. Do not treat vegetable gardens. Do not allow livestock to graze in treated areas. Do not feed treated grass cuttings (hay) or seed screenings to livestock or use hay for livestock bedding. Do not use Vulcan in poultry houses.

ORNAMENTALS AROUND INDUSTRIAL BUILDINGS AND ROAD MEDIANS

Vulcan can be used to treat evergreens, vines, flowers, shrubs, shade and flowering trees, non-bearing fruit, nut and citrus trees found around industrials buildings and road medians infested with pests listed in the following table. Dilute Vulcan with water according to the directions given in the table and apply using suitable hand- or power-operated spray equipment. Ensure complete and uniform coverage. Uniform coverage is critical for effective insect and mite control. Apply a coarse spray to thoroughly wet both upper and lower leaf surfaces and infested limb and trunk areas. Attempt to penetrate dense foliage but avoid over-spraying to the point of excessive runoff. Treat when pests appear and repeat at 7 to 10 day intervals, if needed. For application timing and other specific use information, consult your State Agricultural Experiment Station or Extension Service Specialist.

Note: Environmental factors have significant effects on phytotoxic expression. Vulcan has been tested on numerous ornamental plants without causing serious phytotoxicity at listed use rates. Some varieties of azaleas, camellias, poinsettias, rose bushes, or variegated ivy have shown varying degrees of phytotoxicity following treatment with Vulcan. Before treating large numbers of plants (especially those previously listed), treat a small block of plants and observe for 7 to 10 days to determine phytotoxic potential.

Note: The user assumes responsibility for determining if Vulcan is safe to treated plants under commercial growing conditions.

PEST*	AMOUNT OF VULCAN IN WATER TO MAKE		REMARKS
	Per Acre	100 Gallons	
Adelgids: (Cooley, Eastern spruce galls, Pine bark), Ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), Aphids: (Apple, Chrysanthemum, Cottonwood, Elm leaf, Peach, Rose, Spirea, Woolly), Armyworms: (Fall, Yellowstriped), Bagworms[1], Boxelder bugs, Cankerworms, Catalpa sphinx, Chiggers (for control of chiggers in golf courses, road medians, and industrial sites only), mealy bugs, Elm spanworms, Fall webworms[2], Grasshoppers, Green fruitworms, Hornworms, Jackpine budworms, Juniper webworms, Katydids, Lace bugs, Leafhoppers, Leafrollers[3], Maple leafcutters[4], Mites[5]: (Clover, Red spider, Southern red, Spruce spider, Twospotted spider), Oleander caterpillars, Orange tortrix, Periodical cicada, Plant bugs, Poplar tentmaker, Psyllids, Puss caterpillars, Rose chafers, Sawflies, exposed: (Pin oak, Pine, Redheaded), Sowbugs, Spittlebugs, Spring elm caterpillars, Springtails, Spruce budworms: (Eastern, Western), Tent caterpillars: (Eastern, Western, Forest), Thornbug, Walnut caterpillars, Whiteflies, Yellownecked caterpillars, brown marmorated stink bug	1 pt –1 qt	8-16 fl oz	[1] Treat when bagworm larvae are small and actively feeding. [2] Direct spray into web and immediately adjacent foliage for control of fall webworms. [3] For effective control of leafrollers, spray before leaves are tightly rolled. [4] Apply spray to maple leafcutter larvae as cases are being formed for effective control. Do not treat sugar maple trees intended for maple syrup production. [5] For effective control of spider mites when large numbers of eggs are present, apply a 2nd spray 3-5 days in the South or 7-10 days in the North after initial treatment to control newly hatched nymphs.
Armyworms: (Beet), Beetles: (Fuller rose, Native elm bark[1]), Browntail moth, Cutworms, Leafhoppers, Mahogany webworms, Mealbugs, Mimosa webworms, Moths: (Browntail, Cypress tip, Douglas fir tussock, European pine shoot, Gypsy[2], Holly bud, Nantucket pine tip, Pandora, Pitch pine tip, Subtropical pine tip, Tussock, Oakworms: (California, Orangestriped, Redhumped), Redhumped caterpilla s, Thrips: (Exposed), Weevils: (Blackvine[3], Pine production, Yellow poplar)	1 qt	1 pt	[1] Make applications in the spring or early summer to reduce twig and branch feeding by bark beetles. [2] To kill migrating and invading gypsy moth larvae, treat trunks and foliage. [3] Blackvine weevils are night feeders. Late afternoon spraying will maximize control.
Foliar feeding beetles: (Blister leaf, Cottonwood leaf[1], Elm leaf, Flea, Fuller rose, Japanese, June, Willow leaf)	1 qt	1 pt	[1] Use Vulcan in water to control cottonwood leaf beetle larvae and adults infesting cottonwoods. Make the treatment when field counts indicate damaging beetle populations are developing or present.
Borers[1], Clearwing moths: (Ash, Dogwood, Lesser peachtree, Lilac, Oak, Rhododendron), Metallic wood: (Bronze birch, Flathead appletree, Twolined chestnut), Longhomed beetles: (Locust, Red oak), Cranberry girdler larvae[2], Leafminers, Needleminers: (Jeffrey pine, Lodgepole pine, Spruce), Scale insects[3]: (Cottonycushion, Cottony maple, Euonymus, Fletcher, Florida wax, Golden oak, Hemispherical, Lecanium, Magnolia, Oak kermes, Oak lacanium, Oystershell, Pine needle, San Jose, Tea, White birch, White peach)	1 qt	1 qt	[1] For borers, apply Vulcan to the trunks and lower limbs of trees and shrubs when the adults begin to emerge. Consult your State Agricultural Experiment Station or Extension Service Specialist for proper time to treat. Apply uniformly a coarse low-pressure spray. Pheromone traps can aid in detection of adult clearwing moths. [2] Apply 1 qt of Vulcan for cranberry girdler larvae. Direct spray at the base of tree using 50 gallons of water per acre. Irrigate immediately after applications for soil penetration of 1-2 inches. Treat after egg laying during the summer. [3] Time applications for control of scale insects when crawlers or first two stages of settled nymphs are present.
Borers: (Cottonwood, Peactree[1])	1 qt	3 qts **	[1] For peachtree borers, apply Vulcan in water to flowering trees and shrubs of the genus *Prunus* as a trunk spray before newly-hatched larvae enter the trees. Apply as a coarse, low-pressure spray. Thoroughly wet all bark areas from ground level to scaffold limbs. ** When using the 3 qt per 100 gallon dilution, do not exceed 1 qt of Vulcan per acre.

PEST*	AMOUNT OF VULCAN IN WATER TO MAKE		REMARKS
	Per Acre	100 Gallons	
Beetles[1]: (Includes wood infesting, Ambrosia, Anobiidae, Black turpentine, Cottonwood leaf, Elm leaf, European elm bark, Flea, Fuller rose, Japanese, June, Native elm bark[2], Southern pine, Willow leaf)	1 qt	2 gals***	[1] For preventative treatment, apply the spray to the main trunk of trees in the early spring or when threat of attack exists from nearby infested trees. For remedial treatment, apply the spray to the main trunk of infested trees when damage occurs but before adult beetles begin to emerge. [2] To prevent native elm bark beetles from overwintering in uninfested trees, apply Vulcan in water to the bottom 9 ft of the trunk. Wet the trunk thoroughly but do not spray to runoff. Take care to apply the spray right to the base of the root flare. Application can be made with either a backpack mistblower or a hydraulic pressure sprayer from spring through early fall. *** When using the 2-gallon per 100-gallon dilution, do not exceed 1 qt of Vulcan per acre.

*Superscrips refer to specific directions

FOR COMMERCIAL ORNAMENTALS IN NURSERIES AND GREENHOUSES FOR USDA QUARANTINE USE ONLY AND FOR DIRECT MOUND AND/OR DRENCH APPLICATION ONLY

Vulcan can be used for USDA quarantine use only to treat containerized, potted, or balled and burlapped nursery stock to control the insects in the soil attached to the roots of these plants. Completely submerge the container with drain holes or root ball stabilized by burlap in a tank containing diluted Vulcan. Do not remove burlap wrap or plastic containers with drain holes prior to submerging. Keep the container or root ball submerged until complete soil saturation has occurred, normally about 30 seconds.

Note: During all operations (submerging, drenching, injecting), wear a chemical-resistant apron in addition to other PPE listed for applicators and other handlers. Make applications in a well-ventilated area.

Note: Environmental factors have significant effects on phytotoxic expression. Vulcan has been tested on numerous ornamental plants without causing serious phytotoxicity at listed use rates. However, because of the numerous varieties grown, treat a small group of plants at the listed rate under the anticipated growing conditions and observe for at least 7 days to determine phytotoxic potential before treating a larger number of plants.

Note: The professional user assumes responsibility for determining if Vulcan is safe to treated plants under commercial growing conditions.

PEST*	AMOUNT OF VULCAN IN WATER TO MAKE		REMARKS
	1 Gallon	100 Gallons	
Fire Ants[1]	1/25 fl oz	4 fl oz	[1] As an alternative to submerging potted plants, dilute 4 oz. of Vulcan in 100 gallons of water. Apply this dilution to the point of runoff twice daily for 3 consecutive days. Do not remove burlap wrap or container from plants prior to treatment.
White Grubs[2] Weevils[3] (such as Blackvine)	2/3 fl oz	2 qts**	[2] An alternative treatment to submerging containerized plants is to drench the container with the diluted insecticide solution applying approximately 10 to 12 fl oz of diluted insecticide solution per gallon of container size (4-5 fl oz/100 cubic inches of container). Pre-moisten the container media by irrigation or rainfall before drenching. Do not remove container from plants prior to treatment. [3] An alternate treatment to submerging balled and burlapped plants is to inject Vulcan into the root ball. Equally distribute 1 to 3 quarts of the dilute Vulcan solution per cubic foot of soil volume through an injection rod inserted into the soil ball surrounding the plant roots. Uniform distribution of the insecticide throughout the soil of the root ball is critical for effective control. Insert the injection rod in at least 4 equally spaced locations around the stem of the plant at a 30-45 degree angle from the plant between the stem and the upper, outer perimeter of the ball. This technique has been shown to be most effective with small root balls (up to 1.5 ft in diameter). Larger root balls may require more injection points to ensure thorough soil distribution of the insecticide. Couple the injection rod to a flow meter to monitor the correct volume applied per root ball using an injection pressure of at least 30 psi. The application must be made such that splash-back and runoff are minimized. **Do not exceed more than 1 quart (0.94 lbs a.i.) of Vulcan per acre.
Coffee root mealybug[2]	1/6 fl oz	1 pt	

*Superscripts refer to specific directions.

ORNAMENTALS IN INDUSTRIAL PLANT SITES AND ROAD MEDIANS
(DORMANT SPRAY OF TREE PESTS)

Vulcan can be used as a dormant or delayed dormant spray at the rates indicated to control the listed insects. Vulcan can be used without oil; however, use oil to control additional pests such as the European red mite.

For high volume (dilute) sprays (200 to 600 gallons of spray mixture per acre), tank mix the specified dosage with 1 to 2 gallons of a petroleum spray oil specified for dormant use in 100 gallons of water. Spray the entire tree to runoff using suitable ground spray equipment.

For low volume (concentrate) sprays (less than 200 gallons of spray mixture per acre), use the same amount of Vulcan as for a dilute spray and apply in a manner that will ensure thorough coverage of the trees. Use oil as specified by your State Agricultural Experiment Station or Extension Service Specialist.

PEST	AMOUNT OF VULCAN IN WATER TO MAKE			REMARKS
	1 Gallon	3 Gallons	100 Gallons	
Aphids: (Mealy plum, Rosy Apple, Woolly apple), Borers: (Peach twig), Cutworms: (Climbing), Leafrollers: (Pandemis), Pear psylla adults, Plant bugs, Scale: (San Jose)	1/12 – 1/6 fl oz	¼ - ½ fl oz	½ - 1 pt	Tank mix with 1-2 gallons of a petroleum spray oil specified for dormant use in 100 gallons of water.
Apple ermine moth	1/12 fl oz	¼ fl oz	½ pt	For control on *Malus* species make 2 applications at a 7 to 14 day interval in combination with a petroleum spray oil at the rate of 2 to 4% (v/v) in a spray to wet application to ensure thorough coverage of all stems and branches. When using tank mixtures, follow all label directions for the mixing partner (oil). Use appropriate application equipment and spray volumes to ensure complete coverage of the plant(s) or control will be compromised.

Use Restrictions:

- Do not apply until rain or irrigation have replenished soil moisture such that bark and twigs are not desiccated since cold dry conditions can cause Vulcan plus oil to infuse trees resulting in bud damage or drop.
- Make only one application during the dormant season except for the control of the apple ermine moth. Do not allow meat or dairy animals to graze in treated areas.

TREE PESTS IN GREENHOUSES AND PLANTATIONS

Vulcan can be used to treat shade and flowering trees, and evergreens infested with pests listed in the following table. Dilute Vulcan with water according to the directions given in the table and apply using suitable hand-or power operated spray equipment in a manner to provide complete and uniform coverage. Apply a coarse spray to thoroughly wet both the upper and lower leaf surfaces and to infested limb and trunk areas. Attempt to penetrate dense foliage, but avoid overspraying to the point of excessive runoff. Treat when pests appear and repeat application at 7 to 10 day intervals, if needed. Consult your State Agricultural Experiment Station or Extension Service Specialist for application timing and other specific use information applicable to your area.

PEST*	AMOUNT OF VULCAN IN WATER TO MAKE			REMARKS
	1 Gallon	3 Gallons	100 Gallons	
Adelgids: (Cooley, Eastern spruce gall, Pine bark), Aphids: (Apple, Chrysanthemum, Cottonwood, Elm leaf, Peach, Rose, Spirea, Woolly), Bagworms[1], Boxelder bugs, Cankerworms, Catalpa sphinx, Citrus mealybugs, Elm spanworms, Fall webworms[2], Greenstriped mapleworms, Jackpine budworms, Juniper webworms, Katydids, Lace bugs, Leafhoppers, Leafrollers[3], Maple leafcutters[4], Mites[5]: (Clover, Red spider, Southern red), Oak skeletonizers, Poplar Tentmakers, Puss caterpillars, Sawflies, exposed: (Pin oak, Pine), Spring elm caterpillars, Spruce budworms, Tent caterpillars: (Eastern, Forest, Western), Walnut caterpillars, Western spruce budworms, Yellownecked caterpillars	1/12 fl oz.	¼ fl oz	8 fl oz	[1] Treat when bagworm larvae are small and actively feeding. [2] For effective control of fall webworms, direct spray into web and immediately surrounding foliage. [3] For control of leafrollers, apply spray before leaves are tightly rolled. [4] Apply spray to maple leafcutter larvae as cases are being formed. Do not treat sugar maple trees intended for maple syrup production.
Beetles: (Fuller rose, Native elm bark[1]), Leafhoppers, Mahogony webworms, Mealybugs, Mimosa webworms, Moths: (Browntail, Cypress tip, Douglar fir tussock, European pine shoot, Gypsy[2], Holly bud, Nantucket pine tip, Pandora, Pitch pine tip, Subtropical pine tip, Tussock), Oakworms: (California, Orangestriped, Redhumped), Redhumped caterpillars, Thrips-exposed, Weevils: (Blackvine[3], Pine reproduction, Yellow poplar)	1/6 fl oz	½ fl.oz.	1 pt	[1] To reduce foliar feeding on twigs and branches by beetles, apply in the spring or early summer. [2] To kill migrating and invading gypsy moth larvae, treat trunk and foliage. [3] Blackvine weevils are night feeders. Late afternoon spraying will maximize control.
Beetles: (Cottonwood leaf[1], Elm leaf, Flea, Willow leaf)	1/6-1/3 fl oz	½ - 1 fl oz	1 pt–1 qt	[1] For cottonwood leaf beetles, use Vulcan in water to control larvae and adults infesting cottonwoods. Apply when field counts indicate damaging beetle populations are developing or are present. For seedlings, use 8-20 gallons of spray volume per acre.
Bore s[1], Clearwing moths: (Ash, Dogwood, Lesser peachtree, Lilac, Oak, Rhododendron), Metallic wood: (Bronze birch, Flatheaded appletree, Twolined chestnut,), Longhorned beetles: (Locust, Red oak), Cranberry girdler larvae[2], Leafminers, Needleminers: (Jeffery pine, Lodgepole pine, Spruce), Scale insects[3]: (Cottonycushion, Cottony maple, Euonymus, Fletcher, Florida wax, Golden oak, Hemispherical, Lecanium, Magnolia, Oak kermes, Oystershell, Pine needle, San Jose, Tea, White birch)	1/3 fl oz	1 fl oz	1 qt	[1] For borers, apply Vulcan to the trunks and lower limbs of trees and shrubs when the adults begin to emerge. Consult your State Agricultural Experiment Station or Extension Service Specialist for proper time to treat in your area. Apply uniformly as a coarse low-pressure spray. Pheromone traps can aid in detection of adult clearwing moths. [2] Apply 1 quart (0.94 lbs a.i.) of Vulcan per acre to cranberry girdler larvae infesting Douglas fir seedlings. Direct spray at the lower crown and stems using 50 gals of water per acre. Irrigate immediately after application for soil penetration of 1-2 inches. Treat after egg laying during the summer. [3] Time applications for control of scale insects when crawlers or first two stages of settled nymphs are present.

PEST*	AMOUNT OF VULCAN IN WATER TO MAKE			REMARKS
	1 Gallon	3 Gallons	100 Gallons	
Northern pine weevil, Pales weevil	1 fl oz	3 fl oz	3 qts**	Apply as a cut stump spray or drench in winter or early spring. ** Do not exceed 1 quart (0.94 lbs a.i.) of Vulcan per acre.
Borers: (Cottonwood, Peachtree)[1]	1 fl oz	3 fl oz	3 qts**	[1]For peachtree borers, apply Vulcan in water to flowering trees and shrubs of the genus *Prunus* as a trunk spray before newly hatched larvae enter the trees. Apply as a coarse low-pressure spray. Thoroughly wet all bark areas from ground level to scaffold limbs. ** Do not exceed more than 1 quart (0.94 lbs a.i.) of Vulcan per acre.
Beetles[1]: (Cottonwood leaf, Elm leaf, Flea, Fuller rose, Native elm bark[2], Willow leaf)	1 1/3 fl oz	4 fl oz	1 gal **	[1]For preventative treatment, apply spray to the main trunk of trees in the early spring or when threat of attack exists from nearby infested trees. For remedial treatment, apply the spray to the main trunk of infested trees or logs when damage occurs but before adult beetles begin to emerge. [2] To prevent native elm bark beetles from overwintering in uninfested trees, apply a dilution of 1 gallon per 100 gals of water (1 1/3 fl oz per gallon) as a spray to the bottom 9 ft. of the trunk. Wet the trunk thoroughly but do not spray to runoff. Take care to apply the spray to the base of the root flare. Applications can be made from spring to early fall. To reduce twig and branch feeding on trees deemed to be of high value, apply as spray to the tree crown using a dilution of 1 gallon per 100 gals of water (1 1/3 fl oz per gallon). Make applications in the spring or early summer using a sprayer that will give thorough coverage to the tree crown. ** Do not exceed more than 1 quart (0.94 lbs a.i.) of Vulcan per acre.
Weevils: (such as Northern pine, Pitch eating, Twig)	5 1/3 fl oz	16 fl oz	—	Treat pine seedlings immediately after transplanting. Treat each seedling with enough spray to thoroughly wet the foliage and stem to the point of runoff.

*Superscripts refer to specific directions.

NON-RESIDENTIAL TURF ON GOLF COURSES, AROUND INDUSTRIAL PLANTS AND ON ROAD MEDIANS

Apply Vulcan to control the pests listed in the following table at the listed dosages and in accordance with the directions given below or as specified by your local Agricultural Extension Service specialist. Dilute Vulcan in water and apply as a coarse, low-pressure spray using suitable application equipment. Except as noted, thoroughly water immediately after treatment to wash the insecticide into the turf. The area to be treated should be moist at the time of treatment. Spray when pests first appear.

PEST*	AMOUNT OF VULCAN PER		REMARKS
	1,000 Sq Ft	Acre	
Ticks[1]: (American dog, Cattle fever, Gulf coast, Lone star) (for control of ticks in golf courses, road medians, and industrial plant sites only)	¼ fl oz	1 ½ pts	[1]For control of ticks, treat soil and other areas likely to serve as harborage sites for ticks that have removed themselves from their host. Spray surfaces to be treated until wet but do not create excessive runoff. Note: This application is intended as a premise spray only. Do not use as a direct spray on livestock or any sites that may come in contact with livestock.
Ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), Armyworms: (Beet, Fall, Yellowstriped), Chiggers[1] (for control of chiggers in golf courses, road medians and industrial plant sites only), Chinch bugs, Clover mites, Cutworms, Crickets, Deer ticks[2] (for control of ticks in golf courses, road medians, and industrial sites only), Earwigs, Fiery skipper, Gnats, Grasshoppers, Greenbug aphids, June beetles, Leafhoppers, Lucerne moths, Millipedes, Mites: (Clover, Bermudagrass stunt, Formula grass, Winter grain), Pillbugs, Sod webworms[3]: (Lawn moths), Sowbugs, Ticks[1] (for control of ticks in golf courses, road medians and industrial plant sites only), brown marmorated stink bug	¾ fl oz	1 qt	[1]Apply Vulcan for area control of ticks and chigge s infesting golf course turf, turf in road medians, and industrial plant sites where these pests are present and create a nuisance or a possible public health problem. Do not allow public use of treated areas during application or until spray has dried. Apply Vulcan in water at the rate of ½ pint/acre (equivalent to 1/6 fl oz per 1,000 sq. ft) using a hydraulic sprayer, mist applicator, knap sack sprayer, or other suitable hand or power-operated spray equipment. Treat low underbrush, grassy areas, weeds, and ground surface and debris using enough spray volume to obtain thorough coverage, usually 40-100 gals/acre. [2] Apply Vulcan in water at the rate of 1 quart per acre or ¾ fl oz per 1,000 sq ft for control of deer ticks. Treat low underbrush, turf, grassy areas, weeds, and ground surface and debris, using enough spray volume to obtain thorough coverage. [3]For sod webworms, delay watering or mowing of the treated area for 24 hours after treatment.
European crane fly	1 fl oz	1 qt	
Turfgrass weevil (*Hyperodes*)[1]	1 ½ fl oz	1 qt	[1]Make application to problem areas in mid-April and again in mid-May or as specified by your local Agricultural Extension Service specialist.
White grubs[1]: (Black turfgrass ataenius, European chafer, Japanese beetle larvae, Southern and Northernmasked chafer)	1 ½ - 3 fl oz	1 qt	[1]Spray when white grubs are young and actively feeding near the soil surface, usually during late July and August or as specified by your local Agricultural Extension Service specialist. Immediately after spraying, irrigate the treated area with ½ to 1 inch of water to wash the insecticide deep into the thatch or into the underlying soil.
Billbug adults, such as: (Bluegrass, Denver, Hunting)	¾ - 3 fl oz	1 qt	Spray early in the season when adult billbugs first appear.
Mole Crickets	1 ½ fl oz	1 qt	For mole crickets in golf course turf, turf in road medians, and industrial plant site turfgrass, apply through high-pressure injection or other suitable subsurface placement application equipment. Depending on the application equipment used, follow the manufacturer's specification for calibration and the volume of spray per acre needed to provide control or as specified by your local Agricultural Extension Service specialist. Apply when young nymphs are active.

*Superscripts refer to Specific Directions.

OUTSIDE SURFACES AND AROUND INDUSTRIAL PLANT SITES (SUCH AS AROUND WAREHOUSES, FOOD PROCESSING AND FOOD MANUFACTURING SITES)

Vulcan can be applied as a residual spray to and around outside surfaces of nonresidential buildings and structures. Permitted areas of use include fences, pre-construction foundations, refuse dumps, outside of walls, and other areas where pests congregate or have been seen. Do not allow adults, children, or pets to contact treated surfaces until sprays have dried. Keep out of fish pools and other bodies of water. Do not feed treated grass cuttings (hay) or seed screenings to livestock, or use treated hay for livestock bedding. Do not treat vegetable gardens. Repeat treatment as needed to maintain effectiveness. Unless prohibited by a products' label, users, at their own discretion, can tank mix pesticides currently labeled for similar use patterns. Always perform a small jar compatibility test using proper proportions to check for physical compatibility prior to tank mixing. Do not tank mix this product with products containing dichlorvos (DDVP).

PEST*	AMOUNT OF VULCAN IN WATER TO MAKE			REMARKS
	1 Gallon	10 Gallons	50 Gallons	
	For Band Treatment[1]			
Ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), Beetles, Boxelder bugs (for other true bugs), Clover mites, Crickets, Earwigs, Elf leaf beetles (adults), Firebrats, Millipedes, Pillbugs, Silverfish, Sowbugs, Spiders (excluding black widow and brown recluse spiders), Springtails, Ticks (for control of ticks in golf courses, road medians and industrial plant sites only, brown marmorated stink bug	¼ tsp	¾ fl oz	4 fl oz	[1] To help prevent infestation of non-residential buildings, treat a band of soil 6-10 ft. wide around and adjacent to buildings including the building foundation to a height of 2-3 ft. where pests are active and may find entrance. Use 4 fl oz of Vulcan per 50 gals of water and apply as a coarse spray at the rate of about 10 gals of spray mixture per 1,000 sq. ft. to thoroughly and uniformly wet the band area.
	For Outside Surfaces			
	1 1/3 fl oz	13 1/3 fl oz	2 qts**	**Do not exceed 1 qt (0.94 lbs a.i.) of Vulcan per acre.

*Superscripts refer to Specific Directions.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

PESTICIDE STORAGE:

Store in a cool, dry place and in such a manner as to prevent cross contamination with other pesticides, fertilizers, food and feed. Store in original container and out of reach of children, preferably in a locked storage area.

Do not store above 100°F for extended periods of time. Storage below 20°F can result in formation of crystals. If product crystallizes, store at 50°F to 70°F and agitate to redissolve crystals. If container is damaged or spill occurs, use product immediately or dispose of product and damaged container as indicated below.

PESTICIDE DISPOSAL:

Open dumping is prohibited. Pesticide wastes are toxic. Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the hazardous waste representative at the nearest EPA Regional Office for guidance.

CONTAINER HANDLING:

NONREFILLABLE CONTAINERS:

Rigid, Nonrefillable containers small enough to shake (i.e. with capacities equal to less than five gallons).

Nonrefillable container. Do not reuse or refill this container. Triple rinse or pressure rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling or reconditioning if available, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Pressure rinse as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or a mix tank or collect rinsate at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip. Once container is rinsed, offer for recycling if available, or puncture and dispose of in a sanitary landfill.

STORAGE AND DISPOSAL (cont.)

REFILLABLE CONTAINERS:
Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller.
REFILLING OR RETURNING CONTAINERS:
If refilling or returning container is planned, end users are not authorized to remove tamper evident cables, one way values or clean container.
RECYCLE OR DISPOSAL OF CONTAINERS:
End users are authorized to remove tamper evident cable as required to remove the product from the container unless the container is equipped with one way valves and refilling or returning is planned.

LIMITATION OF WARRANTY AND LIABILITY

Read the entire directions for use, conditions of warranties and limitations of liability before using this product. If terms are not acceptable, return the unopened product container at once.
By using this product, user or buyer accepts the following **CONDITIONS**, **DISCLAIMER OF WARRANTIES,** and **LIMITATIONS OF LIABILITY**.
CONDITIONS: The directions for use of this product are believed to be adequate and must be followed carefully. However, it is impossible to eliminate all risks associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the manner of use or application, all of which are beyond the control of ADAMA. All such risks shall be assumed by the user or buyer.
DISCLAIMER OF WARRANTIES: To the extent consistent with applicable law, ADAMA makes no other warranties, express or implied, of merchantability or of fitness for a particular purpose or otherwise, that extend beyond the statements made on this label. No agent of ADAMA is authorized to make any warranties beyond those contained herein or to modify the warranties contained herein. To the extent consistent with applicable law, ADAMA disclaims any liability whatsoever for special, incidental or consequential damages resulting from the use or handling of this product.
LIMITATIONS OF LIABILITY: To the extent consistent with applicable law, the exclusive remedy of the user or buyer for any and all losses, injuries or damages resulting from the use or handling of this product, whether in contract, warranty, tort, negligence, strict liability or otherwise, shall not exceed the purchase price paid or at ADAMA's election, the replacement of product.

Manufactured for:
Makhteshim Agan of North America, Inc.
d/b/a ADAMA
3120 Highwoods Blvd., Suite 100
Raleigh, NC 27604

Specimen Label for: NU FILM P

NU FLIM P®

SPREADER AND STICKER

*PRINCIPAL FUNCTIONING AGENTS:
Pinene (polyterpenes) Polymers, a-(p-Dodecylphenyl)-Omega-hydroxypoly (oxyethylene)…… 100%

*The amount of principal functioning agent in the formulation does not determine the activity. Activity is governed by the type of film which is formed. [The main principal functioning agent in this product is Pinolene®, a Terpenic polymer].

Proprietary Protected Technology
Calif. Reg. No. 72- 50022-AA

KEEP OUT OF REACH OF CHILDREN

CAUTION

Manufactured By
MILLER CHEMICAL & FERTILIZER CORPORATION
P.O. Box 333
Hanover, Pennsylvania 17331

Net Contents: 2.5 Gallon Liquid

GENERAL INFORMATION

MILLER NU FILM P is a superior SPREADER STICKER adjuvant with non-ionic properties designed to improve the contact, wetting and adhesion of pesticides onto the plant surface. **MILLER NU FILM P** forms a soft film, which polymerizes. This film reduces the effects of rainfall erosion, volatility and ultraviolet (UV) degradation on pesticide spray deposits. Under most conditions, apply sprays containing **MILLER NU FILM P** at least one hour, during daylight, before an anticipated rain. Sunlight, direct or indirect, for this time period is needed for the film to set.
MILLER NU FILM P forms a soft, elastic film which tenaciously holds the pesticide on the crop foliage and greatly reduces rainfall and overhead irrigation erosion of the spray residue. The **MILLER NU FILM P** film will withstand about 1 inch of rain for seven to ten days, thus insuring that pesticide sprays are not lost shortly after application. **MILLER NU FILM P** will not foam, freeze or clog nozzles. It has been proven effective when applied by any aircraft or ground sprayer. It improves the initial pesticide deposit and allows excellent re-distribution of aircraft and concentrate sprayer deposits, to give complete coverage. Miller Chemical certifies that this product is a Synthetic substance allowed for use in organic crop production in compliance with 7 CFR Part 205, Subpart A, 205.601(m)(1). **MILLER NU FILM P** is Approved under Washington State's Department of Agriculture Organic Food Program.

DIRECTIONS FOR USE

MILLER NU FILM P may be used with products registered for: Agricultural, Forestry, Ornamental, Industrial Vegetation, Turf and Non-Cropland uses.

MILLER NU FILM P may be applied by ground, aerial spray equipment in concentrate or dilute sprays. In most applications, use enough **MILLER NU FILM P** to allow for uniform wetting and deposition of the spray onto leaf surfaces without excess runoff.

GROUND: Dosage per acre

Fungicides, Insecticides, Plant Growth Regulators ..... 4 oz. to 1 pt.
Foliar Nutrients ..... 4 oz. to 1 pt.
Herbicides ..... 4 oz. to 1 pt.

Dilute Sprays: Greater than 100 gallons of spray solution per acre. Use 4 oz. to 1 pint per 100 gallons.

AIR: Use 4 oz. to 1 pt. per acre.

SPRINKLER or PIVOT IRRIGATION: Use 8 oz. to 1 pint per acre.

MIXING

Prior to any pesticide application all spray mixing and application equipment must be cleaned.

Fill spray tank half full of water and begin agitation. Add pesticides as directed by label or in the following sequence:

1. Dry flowables, water dispersible granules or soluble fertilizers
2. Wettable Powders
3. Flowables
4. Emulsifiable Concentrates
5. Add **MILLER NU FILM P** last and continue agitation.

Rinse tank, lines and nozzles immediately after spraying, with water. After rinsing, there may still be a small amount of sticky residue in the tank. This will help to prevent rusting and corrosion. It will not clog nozzles when sprayer is next used. If spray happens to land on undesired surfaces, such as windows, cars, application equipment or others, it can be removed with soap and water, before the spray deposit is dry or with premium grade or white kerosene after the film has dried or set. To remove dried deposits from painted car surfaces, use standard tar remover products designed for use on painted car finishes.

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
CAUTION

PHYTOTOXICITY PRECAUTION: Under some environmental conditions, some pesticides or pesticide combinations may cause phytotoxicity on growing plants. Adjuvant products such as this product may increase the chance or the intensity of phytotoxicity. Use this product in a manner consistent with individual pesticide product recommendations.

ENVIRONMENTAL HAZARDS: This product is not for aquatic use. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

STORAGE AND DISPOSAL: Do not contaminate water, food, or feed by storage and disposal. **Pesticide Storage:** Keep in original container. Triple rinse (or equivalent) during mixing and loading. **Pesticide Disposal:** Waste resulting from the use of this product must be disposed of on site or at an approved waste disposal facility. **Container Disposal:** Recycling decontaminated containers is the best option of container disposal. The Agricultural Container Recycling Council (ACRC) operates the national recycling program. To contact your state and local ACRC recycler visit the ACRC web page at www.acrecycle.org. Decontaminated containers may also be disposed of in a sanitary landfill.

Use this product in accordance with good agronomic practices, which include utilizing proven spray equipment set for proper coverage. Do not make applications when temperatures are too hot. Applications should be made at temperature levels and when other environmental conditions in your area are such that your experience indicates the application will be compatible and will accomplish the desired result.

LIMITED WARRANTY: The use of this material being beyond our control and involving elements of risk to human beings, animals, and vegetation, we do not make any warranty, express or implied, as to the effects of such use, when this product is not used in accordance with the directions as stated on this label.

PA Right-To-Know: This product contains proprietary ingredient(s). This product is intellectual property of Miller Chemical & Fertilizer Corporation.

January -2011

BU-pH-ER

A Buffer Activator for Agricultural Sprays

PRINCIPAL FUNCTIONING AGENTS
Phosphoric Acid, Propylene glycol, Caustic soda.....21.84%
CONSTITUENTS INEFFECTIVE AS SPRAY ADJUVANT.....78.16%
100%

Contains 0.1 pounds sodium per gallon.

CA Reg. No. 1051181-50002

KEEP OUT OF REACH OF CHILDREN

CAUTION

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Caution: Avoid contact with eyes or skin. In case of contact, immediately flush eyes or skin with plenty of water. Get medical attention if irritation persists.

FIRST AID Have the product container or label with you when calling a poison control center or doctor, or going for treatment.	
If in eyes:	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
If on skin or clothing:	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 Minutes. • Call a poison control center or doctor for treatment advice.
If swallowed:	• Call a poison control center or doctor immediately for treatment advice. • Have person sip a glass of water if able to swallow. • Do not induce vomiting unless told to do so by a poison control center or doctor. • Do not give anything by mouth to an unconscious person.
If Inhaled:	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. • Call a poison control center or doctor for further treatment advice.

GENERAL INFORMATION

RNA BUpHER is a spray adjuvant designed to improve the effectiveness of certain agricultural chemicals by reducing the pH of higher alkaline water. May be used with suitable wetting agents.

Manufactured by:
RNA
PO Box 210, San Joaquin, CA 93660

Plant: 22312 Railroad Avenue
San Joaquin, CA 93660

NET CONTENTS: ___ GALLONS

DIRECTIONS FOR USE

Use the rate of one (1) to four (4) pints per 100 gallons of spray solution. Maximum amount to be used will depend on the pH of the water supply.

USE PRECAUTIONS

RNA BUpHER may not be compatible with certain materials. Excessive buffering of certain nutritional and crop protection materials may cause phytotoxicity.

NON COMPATIBILITY: RNA BUpHER is not compatible with high pH products such as non-reacted lime, lime sulfur, or phenoxy herbicides buffered to a pH lower than 4.5.

PHYTOTOXICITY: Excessive buffering of a spray solution that contains a combination of wettable powders or liquids may cause phytotoxicity to certain fruits and vegetables. Excessive buffering of sulfur, metal oxides, metal sulfates, metal oxychlorides, metal hydroxides, metal carbonates, lime reacted metals, or neutral based metals such as basic copper or zinc may cause phytotoxicity to the buds, leaves or fruit. Please contact the manufacturer of the plant protection material for their recommended spray solution pH.

STORAGE AND DISPOSAL

PESTICIDE STORAGE: Keep out of reach of children and animals. Store in original containers only. Store in a cool, dry place and avoid excess heat. Carefully open containers. After partial use, replace lid and close tightly. Do not put concentrate or diluted material into food or drink containers. Do not contaminate other pesticides, fertilizers, water, food or feed by storage or disposal. In case of spill, avoid contact, isolate areas and keep out animals and unprotected persons. Confine spill. **Call** CHEMTREC (800) 424-9300.

To Confine Spill: Dike surrounding area or absorb with sand, cat litter or commercial clay. Place damaged package in a holding container. Indentify contents.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL: Metal: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities. Do not cut or weld metal containers. **Plastic:** Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or if allowed by state and local authorities, by burning. If burned, stay out of smoke.

FOR MINI-BULK REFILLABLE CONTAINERS: Return the empty container to the original place of purchase. Refill this container with pesticide only. Cleaning before refilling is the responsibility of the refiller. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container.

Do not reuse empty container. Triple rinse (or equivalent) during mixing and loading. Recycling decontaminated containers is the best option of container disposal. The Agricultural Container Recycling Council (ACRC) operates the national recycling program. To contact your state and local ACRC recycler visit the ACRC web page at www.acrecycle.org. Decontaminated containers may also be disposed of in a sanitary landfill.

Conditions of Sale and Limitation of Warranty and Liability:

NOTICE: Read the entire Directions for Use and Conditions of Sale and Limitation of Warranty and Liability before buying or using the product. If the terms are not acceptable, return the product at once, unopened, and the purchase price will be refunded.

ALL STATEMENTS MADE HEREIN ARE SUBJECT TO APPLICABLE LAW, AND TO THE EXTENT THERE IS ANY INCONSISTENCY OR CONTENTION, APPLICABLE LAW SHALL GOVERN.

The Directions for Use of the product must be followed carefully. It is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness, or other unintended consequences may result because of many different factors including, without limitation, manner of use or application, weather, combination with other products, or crop conditions. All such risks shall be assumed by Buyer and User, and Buyer and User agree to hold Manufacturer and Seller harmless from any claims relating to such factors.

Seller warrants that this product conforms to the chemical description on the label. EXCEPT FOR THIS WARRANTY, THE PRODUCT IS FURNISHED "AS-IS", AND NEITHER SELLER NOR MANUFACTURER MAKES ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THE SELECTION, PURCHASE OR USE OF THIS PRODUCT; SELLER AND MANUFACTURER SPECIFICALLY DISCLAIM ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE BEYOND WHAT IS STATED ON THE LABEL. Buyer and User accept all risks arising from any use of this product, including without limitation, uses contrary to label instructions, or under conditions not reasonably foreseeable to (or beyond the control of) Seller or Manufacturer.

Neither Manufacturer nor Seller shall be liable for any incidental, consequential or special damages resulting from the use or handling of this product. THE EXCLUSIVE REMEDY OF THE BUYER OR USER, AND THE EXCLUSIVE LIABILITY OF MANUFACTURER AND SELLER, FOR ANY AND ALL CLAIMS, LOSSES, INJURIES OR DAMAGES (INCLUDING CLAIMS BASED ON BREACH OF WARRANTY, CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, SHALL BE THE RETURN OF THE PURCHASE PRICE OF THIS PRODUCT, OR, AT THE ELECTION OF MANUFACTURER OR SELLER, THE REPLACEMENT OF THE PRODUCT.

These Conditions of Sale and Limitation of Warranty and Liability shall be interpreted, unless otherwise required by the law of the state of purchase, in accordance with the laws of the State of California, excluding its conflicts of laws rules, and may not be amended by any oral or written agreement.

APPENDIX H

Sampler Photos

East Side – Facing North

East Side – Facing East

East Side – Facing South

East Side – Facing West

South East Corner – Facing North

South East Corner – Facing East

South East Corner – Facing South

South East Corner – Facing West

South Side – Facing North

South Side – Facing East

South Side – Facing South

South Side – Facing West

South West Corner – Facing North

South West Corner – Facing East

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North Side – Facing South

North Side – Facing West

North East Corner – Facing North

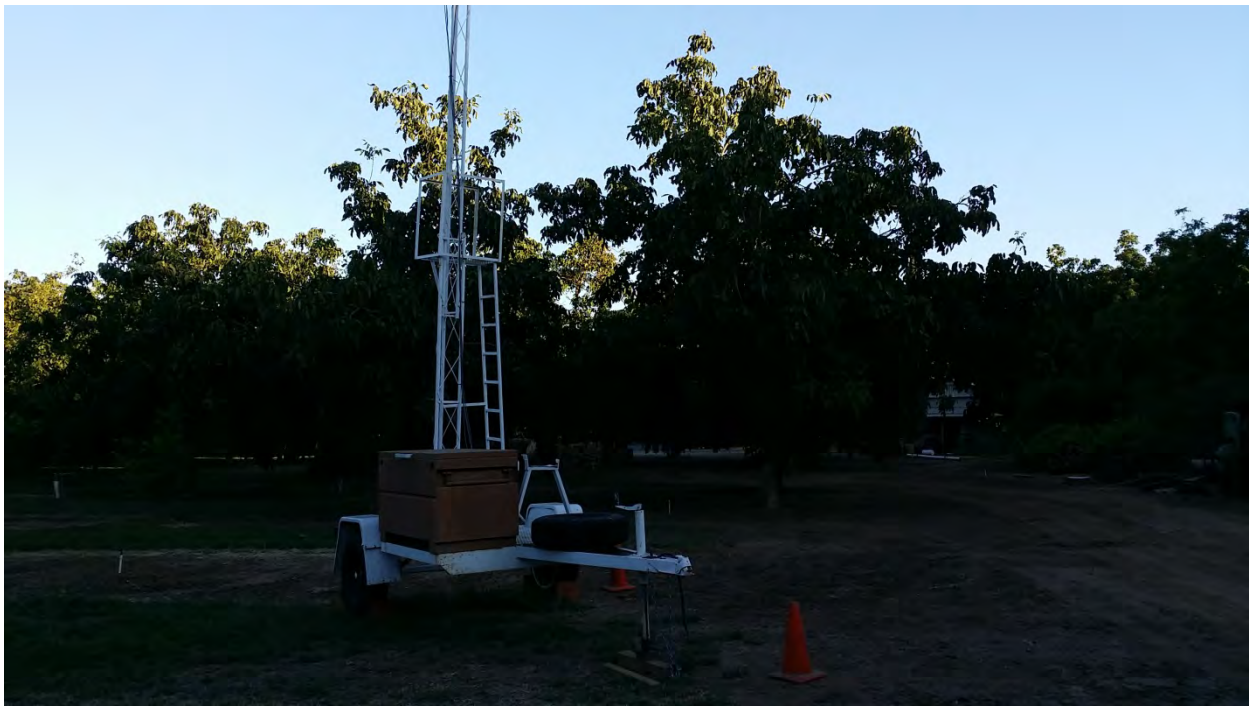
North East Corner – Facing East

North East Corner – Facing South

North East Corner – Facing West

Met Tower – Facing North

Met Tower – Facing East



Met Tower – Facing South

Met Tower – Facing West

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