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Methyl Bromide, 1,3-Dichloropropene, and Chloropicrin Air Monitoring Results for 2010-2016

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INTRODUCTION

In September 2010, as part of the California Department of Pesticide Regulation's (DPR) Toxic Air Contaminant (TAC) Program, DPR submitted a request to the California Air Resources Board (ARB) for monitoring to be conducted pursuant to Food and Agricultural Code section 14022(c) for two fumigant pesticides in Oxnard¹ and Santa Maria. The two pesticides, methyl bromide (MBr) and 1,3-dichloropropene (1,3-D), were collected for periods of 24 hours every six days as part of an original 15-month study that started August 10, 2010 and was scheduled to end on October 30, 2011. At the request of DPR, weekly monitoring for MBr and 1,3-D will continue in Oxnard and Santa Maria until at least the end of 2018. Additionally, MBr and 1,3-D ambient monitoring in Watsonville was added starting January 2012 and will also continue until at least the end of 2018.

In February 2014, in addition to monitoring for MBr and 1,3-D, DPR requested that ARB include ambient air monitoring for the fumigant chloropicrin at the three sites during the high fumigant use period of August through November. This high fumigant use period monitoring for chloropicrin at all three sites was conducted by ARB in 2014 and 2015. Due to budgetary and staff constraints, ARB concluded this monitoring at the end of the 2015 high-use period. In 2016, DPR took over the high fumigant use monitoring for chloropicrin at two of the three sites: Santa Maria and Watsonville. No monitoring for chloropicrin was conducted in Oxnard during 2016.

Starting January 1, 2017, weekly ambient monitoring conducted by DPR at the Santa Maria and Watsonville sites expanded to include a total of 31 pesticides and 5 breakdown products, including all three fumigants, as part of the enhanced pesticide Air Monitoring Network (AMN). The monitoring site at Oxnard will be transitioned into an AMN site tended by ARB prior to the end of 2017. Actual monitoring start date for Oxnard is not yet available.

This report includes results for MBr and 1,3-D monitoring from all three sampling locations (Oxnard, Santa Maria, and Watsonville) for the 2010-2016 calendar years. Chloropicrin air

¹ Sampling site was moved from Camarillo to Oxnard on October 24, 2011.

monitoring results for 2014 (Aug 5th – Oct 29th), 2015 (Aug 10th – Dec 1st), and 2016² (Aug 30th – Dec 20th) are also included in this report.

MATERIALS AND METHODS

Methyl bromide, 1,3-D, and chloropicrin monitoring includes one site in each of three communities: Oxnard, Santa Maria, and Watsonville (Figure 1). ARB originally established a site at the animal shelter in Camarillo in August 2010, and continued sampling at this location until October 17, 2011. The air sampler was then moved to Rio Mesa High School in Oxnard (Ventura County) on October 24, 2011, and monitoring continued until the end of 2016 at this location. The air sampler in Watsonville is located at Ohlone Elementary School, while the air sampler in Santa Maria is located at an ARB Air Quality Monitoring Station.

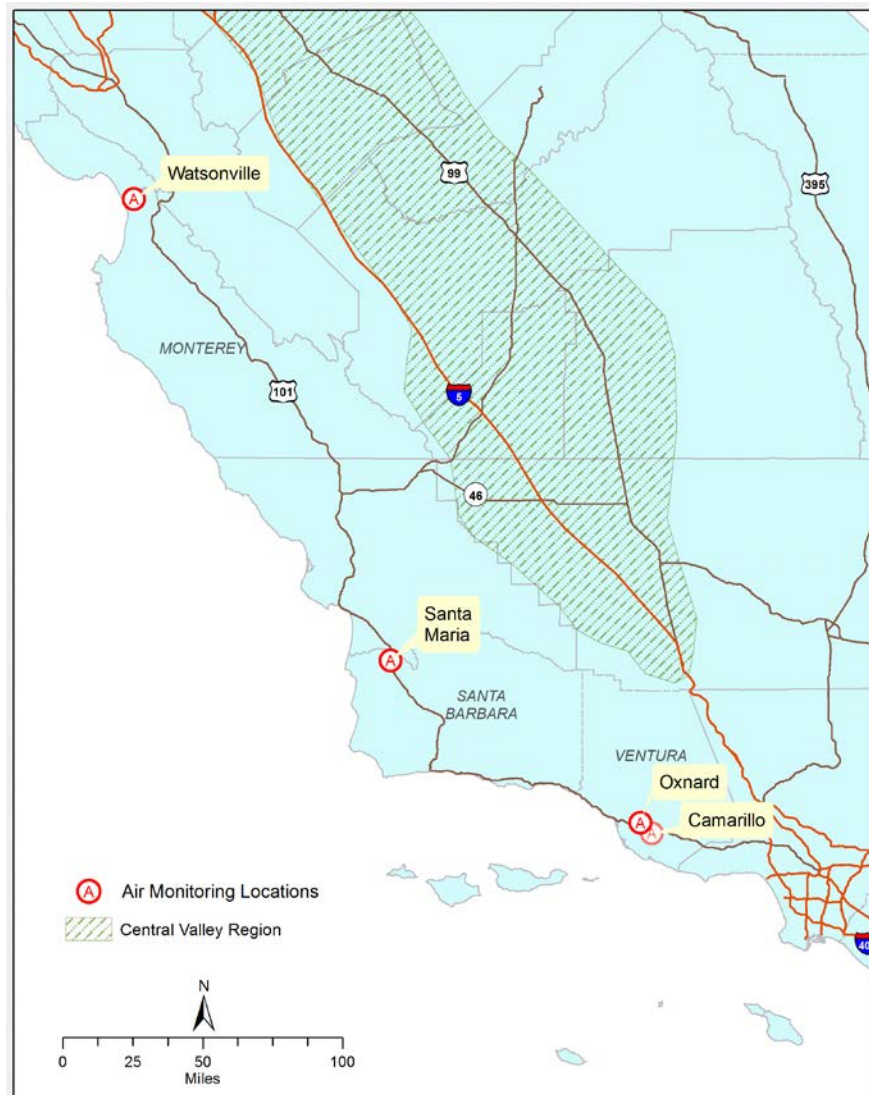


Figure 1. Map showing the three current sampling locations as well as the former site in Camarillo.

² Monitoring was conducted at Santa Maria and Watsonville sites only.

Sample Collection

As part of the MBr and 1,3-D sampling protocol, air samples were collected using a Tisch Environmental® 3-Channel Canister Sampler (TE-323). The sampler was automated to collect a 24-hour air sample into a SilcoCan® canister (Restek cat. no. 24142-65) once every six days. Sample collection would commence at 00:00 (midnight) and would automatically be terminated at 23:59 (11:59 pm) of the sampling day. A total of 1,217 air canister samples were collected from October 10, 2010 – December 31, 2016 and analyzed for 1,3-D and MBr. Canister samples (methyl bromide and 1,3-dichloropropene) were transported by vehicle to the ARB Organics Laboratory Section (OLS) of the Northern Laboratory Branch in Sacramento for analysis.

Chloropicrin samples were collected on XAD-4 sorbent resin sampling tubes. For 2014 and 2015 monitoring periods, sorbent tubes used were 8 mm × 140 mm, XAD-4, with 400 mg in the primary section, and 200 mg in the secondary section (SKC special order). Sample collection was conducted at a flow rate of 100 cubic centimeters per minute (ccm). For the 2016 monitoring period, sorbent tubes used were changed to 8 mm × 150 mm, XAD-4, with 400 mg in the primary section and 200 mg in the secondary section (SKC cat. # 226-175). Sample collection was conducted at a flow rate of 50 ccm (or 50 milliliters per minute³ (mL/min)). After each sampling collection, all tubes were capped, labeled, and transported in an insulated container with dry ice. A total of 204 XAD sorbent tubes were collected in 2014, 2015, and 2016 and analyzed for chloropicrin. Of the 204 XAD sorbent tubes collected, 83 were collected in 2014, 87 in 2015, and 34 in 2016.

Differences in chloropicrin sampling collection between 2014/2015 and 2016 periods are due to changes in sampling equipment and analytical methods used by the laboratories analyzing the samples. Briefly, monitoring for 2014 and 2015 was conducted by ARB while monitoring in 2016 was conducted by DPR. ARB and DPR use slightly different sampling equipment for sample collection as part of ambient monitoring. Additionally, the 2014/2015 collected air samples for the chloropicrin monitoring were analyzed by the ARB OLS laboratory, while the California Department of Food and Agriculture (CDFA) Center for Analytical Chemistry (CAC) laboratory analyzed the air samples collected by DPR in 2016. Although both laboratories quantify the amount of chloropicrin that was measured in the individual air samples collected, their analytical methods are slightly different. All of these differences led to the slight changes to the sample collection methods between the various years for the high chloropicrin use monitoring.

Analytical Methods

Air canisters were analyzed for MBr and 1,3-D using OLS Method MLD058 (CARB, 2000). Method MLD058 is a gas chromatographic method utilizing an Automated Sample Concentrator, capillary gas chromatography, and Ion Trap Mass Spectrometry.

During the 2014 and 2015 monitoring periods XAD-4 sorbent tubes were analyzed by the ARB OLS laboratory using the “Standard Operating Procedure for Sampling and Analysis of Trichloronitromethane (Chloropicrin) in Application and Ambient Air using Gas Chromatography/Mass Selective Detector” (CARB, 2001). During the 2016 monitoring period XAD-4 sorbent tubes were analyzed by CDFA CAC laboratory using the “Determination of Chloropicrin Desorbed from XAD-4 Resin Tubes” (CDFA, 1999).

³ 1 ccm = 1 mL/min

Reporting Limit, Method Detection Limit, and Limit of Quantitation

The reporting limit (RL) is the lowest concentration of a pesticide (analyte) that a chemical method can reliably detect. The laboratory determined the RL for each analyte by analyzing a standard at a concentration with a signal to noise ratio of 2.5 to 5. Table 1 lists the RL for MBr, 1,3-D, and chloropicrin.

The method detection limit (MDL) and limit of quantitation (LOQ) are used in reporting within the CDFA analyses performed on the chloropicrin samples taken in 2016. The MDL is functionally identical to the RL described above. The LOQ a separate value and is the level at which concentrations may be reliably measured which is set at a certain factor above the MDL. The level of interference determines the magnitude of this factor; the more interference, the higher the factor. The MDL and LOQ for chloropicrin as analyzed in 2016 are listed in Table 1. The use of these two values, rather than a single RL, produces a third category of detection level referred to as “trace.” This occurs when the analyte is detected in the sample, but is not at a level which can be reliably quantified (i.e., above the LOQ). For values reported as trace detections, an adjusted concentration equal to the average of the MDL and LOQ is used when calculating rolling 4-week averages.

Table 1. Analytical limits for each analyte.

Pesticide	Reporting Limit (ppb)	
Methyl Bromide	0.03	
1,3-Dichloropropene	0.10	
Chloropicrin (2014 & 2015)	0.003	
	MDL (ppb)	LOQ (ppb)
Chloropicrin (2016)	0.017	0.068

Health Evaluation Methods

No state or federal agency has established regulatory health standards for pesticides in ambient air (some agencies have developed occupational standards, or site-specific standards). Therefore, DPR, in consultation with the California Office of Environmental Health Hazard Assessment and others established advisory health standards, described below, compares the measured air concentrations to health screening levels or regulatory targets to place the results in a health-based context.

The health screening levels, devised by DPR, are based on a preliminary assessment of possible health effects, and are used as triggers for DPR to conduct a more detailed evaluation. A measured air concentration that is below the screening level for a given pesticide would generally not be considered to represent a significant health concern and would not generally undergo further evaluation. A measured concentration that is above the screening level would not necessarily indicate a significant health concern, but would indicate the need for a further and more refined evaluation. Exceedances of the screening levels could be of health concern and would indicate the need to explore mitigation measures. Health screening levels vary by pesticide and exposure period. For example, the screening level for a 1-day exposure is different than the screening level for a 1-year exposure.

DPR normally establishes a regulatory target after completing a comprehensive risk assessment of a chemical’s toxicity and potential exposures. DPR management determines a regulatory target based on the risk assessment, as well as risk assessments from other agencies, pesticide

use patterns, potential effects on use of alternative pesticides, and other factors. Regulatory target concentrations are established after a complete assessment of possible health risks and supersede the screening levels. DPR puts measures in place based on the regulatory target to limit exposures so that adverse effects can be avoided. Exceeding a regulatory target concentration does not necessarily mean an adverse health effect occurs, but it does indicate that the restrictions on the pesticide use may need to be modified. Regulatory targets vary by pesticide and exposure period. For example, the regulatory target for a 1-day exposure is different than the regulatory target for a 1-year exposure.

In December 2015, DPR released a risk assessment for inhalation exposure (DPR, 2015) to 1,3-D that updated the estimated inhalation exposure or reference concentrations that are likely to be without appreciable risk of deleterious effects. The concentrations were updated for the acute, subchronic and chronic screening levels in addition to the cancer potency value and are different than reported in previous result reports (Table 2). In October 2016, DPR issued a risk management directive for 1,3-D cancer risk that updated the regulatory target concentration from 0.14 ppb to 0.56 ppb as a 70-year average (DPR, 2016). Additionally, the 1,3-D risk management directive set 0.27 ppb as a 1-year average concentration that would trigger evaluation and consideration of more stringent mitigation measures if exceeded. The screening levels and regulatory targets for all three pesticides included in this monitoring are shown in Table 3.

Table 2. Previous and updated screening levels and regulatory targets for 1,3-dichloropropene.

Exposure scenario	Previous (ppb)	Current (ppb)
Acute screening level	35	110
Subchronic screening level	25	3
Chronic screening level	25	2
Cancer risk regulatory target	0.14	0.56

Table 3. Screening levels and regulatory targets for 1,3-dichloropropene, methyl bromide, and chloropicrin.

Pesticide	Monitoring period	Screening level (ppb) [†]	Regulatory target (ppb) [†]	Potential health effect
1,3-Dichloropropene	1 day	110 *	-	Body weight change
	4 weeks	3 *	-	Tissue damage in nose and lung
	1 year	2 *	-	
	Lifetime	-	0.56 ** (70-yr average)	Cancer
Methyl Bromide	1 day	-	210	Brain/nerve damage
	4 weeks	-	5	Brain/nerve damage
	1 year	1	-	Nose tissue damage
Chloropicrin	1 day	-	73	Eye irritation
	4 weeks	0.35	-	Nose tissue damage
	1 year	0.27	-	Lung damage

*Updated screening levels for 1,3-dichloropropene were established by DPR in December 2015

** New regulatory target for 1,3-dichloropropene was established by DPR in 2016

Invalid Samples

Of the 1,217 air canister samples collected since 2010, a total of 55 were invalid: 28 invalid samples were taken from Watsonville, 15 invalid samples were taken from Oxnard, and 12 invalid samples were taken from Santa Maria. All invalid samples were due to one of the following reasons: an ending pressure outside of the accepted criteria; power failure during sample extraction; sampler malfunction; or sample leakage during transit. The air samples lost were not replaced.

There were no chloropicrin samples reported by the laboratory as invalid from any site for any year.

RESULTS

Quality Control Samples

Laboratory matrix spikes and matrix blanks were included with every set of samples extracted and analyzed at the lab and are part of the laboratory quality control (QC) program. The matrix spikes are conducted to assess accuracy and precision; the blanks are to check for contamination at the laboratory.

For 1,3-D: none of the lab matrix blank samples showed any 1,3-D concentrations. Co-located duplicate air canister samples were collected as part of the QC process, with absolute percent differences ranging from 0.0% to 11.4% for all *cis*- isomer samples and 0.0% to 12.8% for all *trans*- isomer samples. For field spike samples, average 1,3-D recovery was 109.1% for *cis*- isomer samples and 113.3% on average for *trans*- isomer.

For MBr: none of the lab matrix blank samples showed any MBr concentrations. Co-located duplicate air canister samples were collected as part of the QC process, with absolute percent differences ranging from 0.0% to 63.7% for all MBr samples. For field spike samples, average MBr recovery was 96.5% for all samples.

For chloropicrin: none of the lab matrix blank samples showed any chloropicrin concentrations. Co-located duplicate XAD sorbent tube samples were collected as part of the QC process, with absolute percent differences ranging from 0.0% to 85.3% for all chloropicrin samples. For field spike samples, average chloropicrin recovery was 152.7% for 2014/2015 samples while for 2016 field spike samples, an average 100.0% recovery was measured for all samples.

Counts and comparison of detections

A total of 1,162 valid air canister samples were collected from all three sampling locations for the 2010-2016 calendar years. Each air canister sample was then analyzed for 1,3-D and MBr. Of these 1,162 air samples, 1,162 samples were analyzed for 1,3-D and 1,161 samples were analyzed for MBr. A total of 2,323 analyses were performed for all three sampling locations for the 2010- 2016 calendar years⁴.

⁴ 1,3-dichloropropene is analyzed by measuring the concentration of both its *cis*- and *trans*- isomers and then combining the results to obtain a complete 1,3-dichloropropene concentration. In this report, one analysis refers to the combination of the two individual *cis*- and *trans*- isomer concentration measurement for a particular air sample.

Of the 2,323 analyses for both MBr and 1,3-D, 1,797 (77.4%) contained no detectable amount and were below the RL (Reporting Limit; i.e., not quantifiable). Of the 2,323 analyses, 526 (22.6%) contained quantifiable detections (above the RL).

A total of 204 XAD sorbent tubes were collected over the combined 2014, 2015, and 2016 sampling periods, with each sample analyzed for chloropicrin. Of the 204 analyses for chloropicrin, 43 (21.1%) contained no detectable amount and were below the LOQ. Of the 204 analyses, 150 (73.5%) contained detections above the LOQ (quantifiable), while an additional 11 (5.4%) were at trace levels (detected, but not quantifiable).

Table 5 lists the number of detections for 1,3-D and MBr at each sampling location, while Table 6 lists the number of detections per sampling location for chloropicrin. The highest percentage of detections for 1,3-D across all 6 years of monitoring was in Santa Maria with 16.5% of samples resulting in a detection. This was followed by Watsonville with 16.1% of all samples resulting in a detection. Similarly, for MBr: Santa Maria has a percentage of quantifiable detections of 36.2%, followed by Watsonville with a percentage of quantifiable detections of 27.2%.

Table 4. Total number of methyl bromide and 1,3-dichloropropene detections for sampling years 2010 - 2016 by sampling location.

Location	Number of possible detections	Total number of quantifiable detections	Percent of quantifiable detections (%)
1,3-Dichloropropene			
Santa Maria ¹	423	70	16.5%
Camarillo ²	65	16	24.6%
Oxnard ³	346	30	8.7%
Watsonville ⁴	328	52	15.9%
Methyl Bromide			
Santa Maria ¹	423	153	36.2%
Camarillo ²	65	41	63.1%
Oxnard ³	346	76	22.0%
Watsonville ⁴	327	89	27.2%

1 – Sampling started on 8/11/10

2 – Sampling occurred between 8/11/10 and 10/17/11

3 – Sampling started on 10/24/11

4 – Sampling started on 11/05/11

For chloropicrin, Watsonville had the highest percentage of detections (74.6%), followed by Santa Maria with 69.7%. The values for chloropicrin detections, totaled across all monitoring periods, are presented in Table 6.

Table 5. Total number of chloropicrin detections for sampling years 2010 - 2016 by sampling location.

Location	Number of possible detections	Total number of detections	Percent of detections (%)	Total number of quantifiable detections	Percent of quantifiable detections (%)
Chloropicrin					
Santa Maria ^{1,3}	76	58	76.3%	53	69.7%
Oxnard ²	57	44	77.2%	44	77.2%
Watsonville ^{1,3}	71	59	83.1%	53	74.6%

1 - Sampling occurred 8/5/14-10/29/14, 8/10/15-12/1/15, and 8/30/16-12/20/16

2 - Sampling occurred 8/5/14-10/29/14 and 8/10/15-12/1/15

3 - The analysis method differs between monitoring conducted in 2016 and previous years

Table 7 contains comparisons of detections grouped by year for the three air sampling locations from 2010 – 2016 for 1,3-D and MBr, while Table 8 contains the same information for chloropicrin. Among the results from 2016, Watsonville contained the highest percentage of quantifiable detections for 1,3-D (14.5%) among all three sampling locations, while Santa Maria contained the highest percentage of quantifiable detections for MBr (27.6%) and chloropicrin (27.8%) out of all sampling locations.

Table 6. Comparison of 1,3-dichloropropene and methyl bromide detections by sampling location and sampling year.

	1,3-Dichloropropene				Methyl Bromide			
	Santa Maria ¹	Camarillo ²	Oxnard ³	Watsonville ⁴	Santa Maria ¹	Camarillo ²	Oxnard ³	Watsonville ⁴
2010								
Possible detections	21	19	-	-	21	19	-	-
Percentage of quantifiable detections	28.6%	31.6%	-	-	90.5%	47.4%	-	-
2011								
Possible detections	67	46	15	6	67	46	15	6
Percentage of quantifiable detections	11.9%	21.7%	0.0%	16.7%	46.3%	69.6%	40.0%	16.7%
2012								
Possible detections	73	-	71	69	73	-	71	69
Percentage of quantifiable detections	27.4%	-	9.9%	13.0%	34.2%	-	26.8%	37.7%
2013								
Possible detections	73	-	70	71	73	-	70	71
Percentage of quantifiable detections	19.2%	-	15.7%	21.1%	35.6%	-	14.3%	31.0%
2014								
Possible detections	70	-	69	68	70	-	69	68
Percentage of quantifiable detections	8.6%	-	5.8%	10.3%	24.3%	-	29.0%	19.1%
2015								
Possible detections	61	-	62	59	61	-	62	58
Percentage of quantifiable detections	13.1%	-	6.5%	20.3%	31.1%	-	21.0%	31.0%
2016								
Possible detections	58	-	59	55	58	-	59	55
Percentage of quantifiable detections	13.8%	-	6.8%	14.5%	27.6%	-	13.6%	16.4%

1 – Sampling started on 8/11/10

2 – Sampling occurred between 8/11/10 and 10/17/11

3 – Sampling started on 10/24/11

4 – Sampling started on 11/05/11

Table 7. Comparison of chloropicrin detections by sampling location and sampling year.

	Chloropicrin		
	Santa Maria ¹	Oxnard ²	Watsonville ¹
	2014		
Possible detections	29	28	26
Percentage of quantifiable detections	82.8%	85.7%	88.5%
	2015		
Possible detections	29	29	29
Percentage of quantifiable detections	82.8%	69.0%	93.1%
	2016		
Possible detections	18	-	16
Percentage of detections³	55.6%	-	56.3%
Percentage of quantifiable detections³	27.8%	-	18.8%

1 - Sampling occurred 8/5/14-10/29/14, 8/10/15-12/1/15, and 8/30/16-12/20/16

2 - Sampling occurred 8/5/14-10/29/14 and 8/10/15-12/1/15

3 - The analysis method differs between monitoring conducted in 2016 and previous years

Acute (1-day) exposure

Table 9 shows the highest one-day concentration detected at all three sampling locations for 1,3-D, MBr, and chloropicrin for all sampling years.

The highest 1-day concentration detected for 1,3-D for all sampling years was 8.7 ppb at Oxnard in August 2015. This concentration was approximately 12 times below the acute screening level of 110 ppb. Figure 2 shows the one-day 1,3-D concentration from all three sampling locations over time.

The highest 1-day concentration detected for MBr for all sampling years was 8.7 ppb at Oxnard in July 2014. This concentration was approximately 24 times below the acute regulatory target of 210 ppb. Figure 3 shows the one-day MBr concentration from all three sampling locations over time.

The highest 1-day concentration detected for chloropicrin for all sampling years was of 1.1 ppb at Santa Maria in October 2014. This concentration was approximately 68 times below the acute regulatory target of 73 ppb. Figure 4 shows the one-day chloropicrin concentration from all three sampling locations over time.

Table 8. Highest 1-day concentration for all sampling years by sampling location.

Location	Highest 1-day concentration (ppb)	Acute Screening Level (ppb)	Acute Regulatory Target (ppb)
1,3-Dichloropropene			
Santa Maria ¹	5.0	110	-
Camarillo ²	3.1	110	-
Oxnard ³	8.7	110	-
Watsonville ⁴	2.8	110	-
Methyl Bromide			
Santa Maria ¹	3.8	-	210
Camarillo ²	1.4	-	210
Oxnard ³	8.7	-	210
Watsonville ⁴	1.8	-	210
Chloropicrin			
Santa Maria ⁵	1.1	-	73
Oxnard ⁶	0.8	-	73
Watsonville ⁵	1.0	-	73

1 – Sampling started on 8/11/10

2 – Sampling occurred between 8/11/10 and 10/17/11

3 – Sampling started on 10/24/11

4 – Sampling started on 11/05/11

5 – Data is for the sampling period of high use only (2014: 8/5-10/31; 2015: 8/10-12/1; 2016: 8/30-12/20)

6 – Data is for the sampling period of high use only (2014: 8/5 – 10/31; 2015: 8/10-12/1)

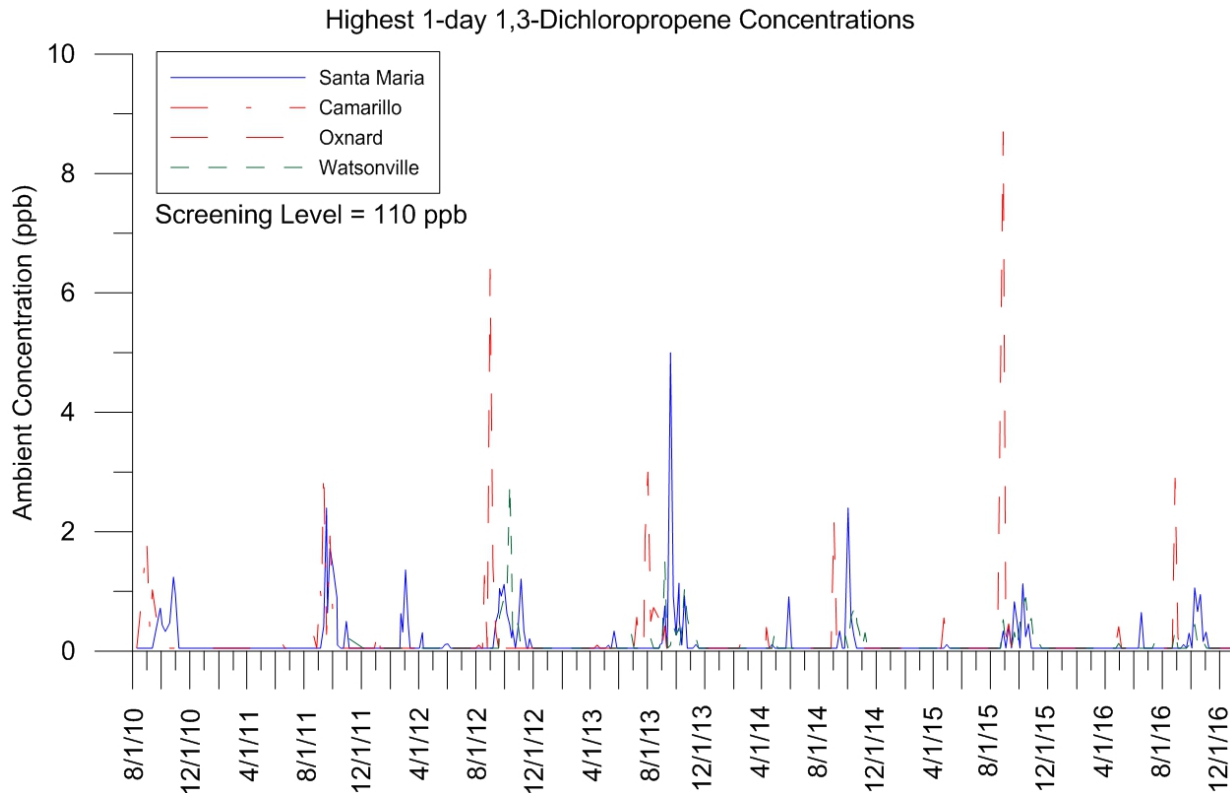


Figure 2. 1-day (acute) concentrations of 1,3-dichloropropene detected for the three monitoring locations for sampling years 2010 - 2016.

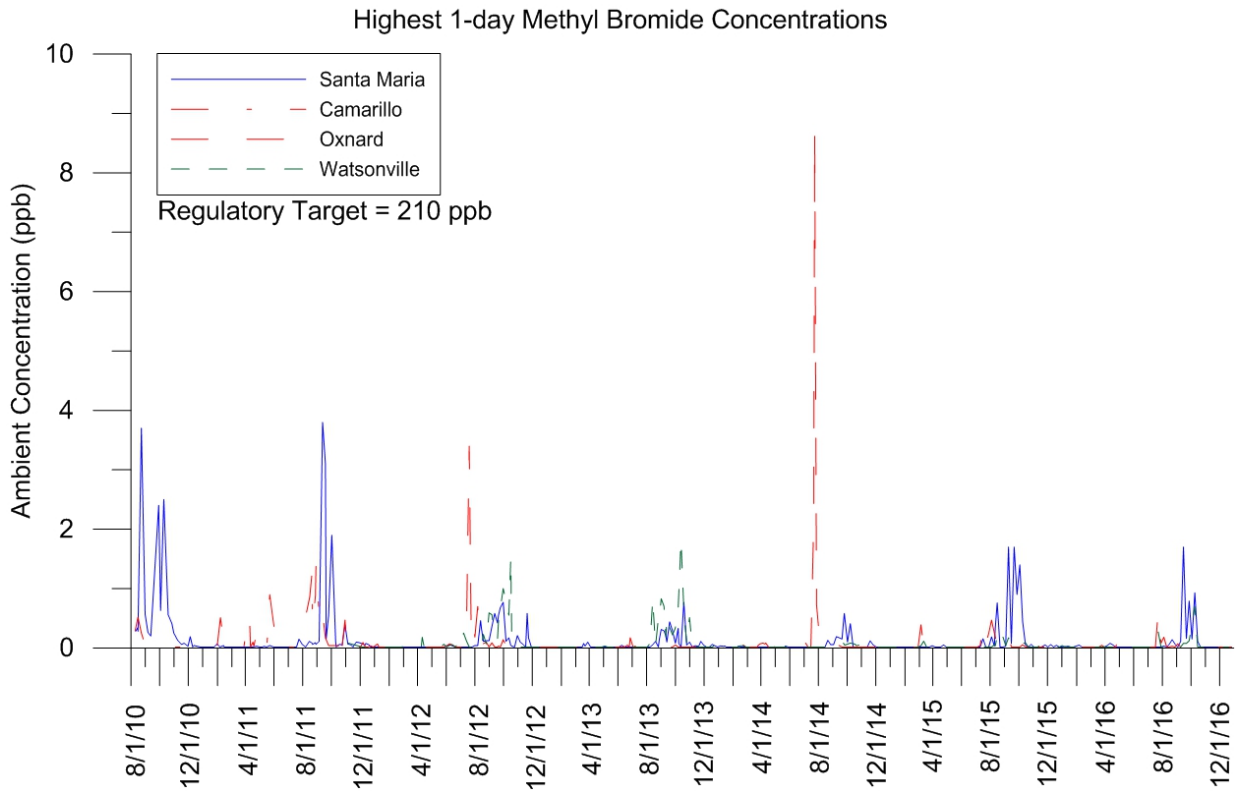


Figure 3. 1-day (acute) concentrations of methyl bromide detected for the three monitoring locations for sampling years 2010 - 2016.

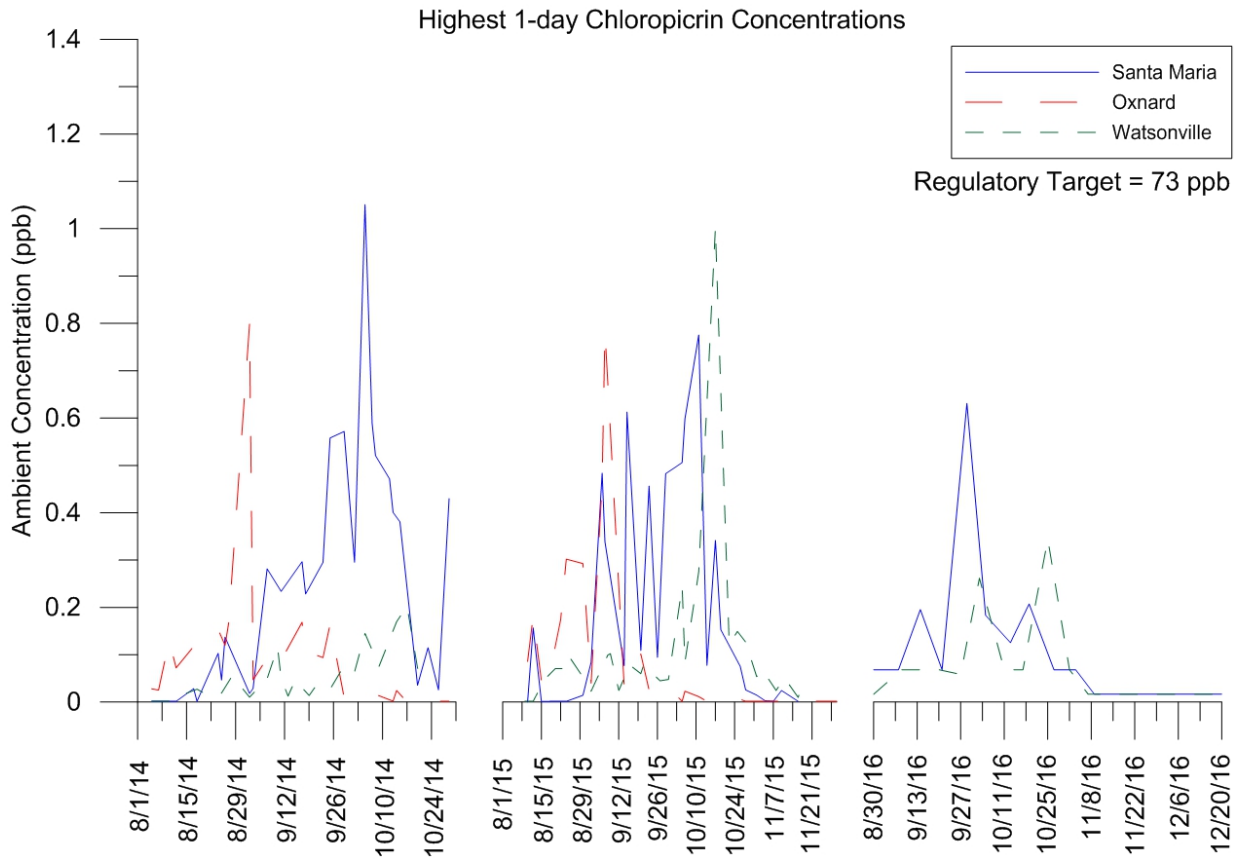


Figure 4. 1-day (acute) concentrations of chloropicrin detected for the three monitoring locations for sampling years 2010 - 2016.

Detailed yearly comparisons of highest 1-day concentrations for all three sampling locations are listed in Table 10. The highest 1-day concentration for 1,3-D and MBr were detected in Oxnard in 2015 and 2014 with values of 8.7 ppb and 8.7 ppb, respectively. The highest 1-day concentration for chloropicrin was detected in Santa Maria in 2014 with a value of 1.1 ppb.

Table 9. Comparisons of detections by sampling location.

Location	Highest 1-day concentration (ppb)						
	2010	2011	2012	2013	2014	2015	2016
1,3-Dichloropropene							
Santa Maria ¹	1.2	2.4	1.4	5.0	2.4	1.1	1.1
Camarillo ²	1.9	3.1	-	-	-	-	-
Oxnard ³	-	0.1	6.4	3.0	2.2	8.7	2.9
Watsonville ⁴	-	0.2	2.8	1.5	0.8	0.9	0.5
Methyl Bromide							
Santa Maria ¹	3.7	3.8	0.8	0.8	0.6	1.7	1.7
Camarillo ²	0.5	1.4	-	-	-	-	-
Oxnard ³	-	0.5	3.4	0.2	8.7	0.5	0.6
Watsonville ⁴	-	0.1	1.5	1.8	0.1	0.2	0.7
Chloropicrin							
Santa Maria ⁵	-	-	-	-	1.1	0.8	0.6
Oxnard ⁶	-	-	-	-	0.8	0.8	-
Watsonville ⁵	-	-	-	-	0.2	1.0	0.3

1 – Sampling started on 8/11/10

2 – Sampling occurred between 8/11/10 and 10/17/11

3 – Sampling started on 10/24/11

4 – Sampling started on 11/05/11

5 – Data is for the sampling period of high use only (2014: 8/5-10/31; 2015: 8/10-12/1; 2016: 8/30-12/20)

6 – Data is for the sampling period of high use only (2014: 8/5 – 10/31; 2015: 8/10-12/1)

Subchronic (4-week) exposure

Table 11 shows the highest 4-week rolling average concentrations for 1,3-D at all three sampling locations. Concentrations are presented as rolling or moving averages (i.e., average of weeks 1,2,3, and 4; average of weeks 2,3,4, and 5; etc.). The 4-week rolling average concentrations were calculated using one-half the Method Detection Limit (MDL) for samples with no detectable amount.

The highest 4-week rolling average 1,3-D concentration (2.4 ppb) was found in Oxnard in 2015. No 1,3-D 4-week rolling average concentration from any sampling location exceeded the screening level for the subchronic exposure (4-week) period. Figure 5 presents the highest 4-week rolling 1,3-D average concentrations measured in all three sampling locations compared with the subchronic screening level of 3 ppb.

The highest 4-week rolling average MBr concentration (2.0 ppb) was found in Oxnard in 2014. No MBr 4-week rolling average concentrations from any sampling location exceeded the regulatory target for the subchronic exposure period of 5 ppb. Figure 6 presents the highest 4-week rolling MBr average concentrations measured in all three sampling locations compared with the subchronic regulatory target of 5 ppb.

The highest 4-week rolling average chloropicrin concentration (0.49 ppb) was found in Santa Maria in 2014. Chloropicrin's highest 4-week rolling average concentrations for Santa Maria slightly exceeded the screening level for the subchronic exposure (4-week) period of 0.35 ppb. Figure 7 presents the highest 4-week rolling chloropicrin average concentrations measured in all three sampling locations compared with the subchronic screening level of 0.35 ppb.

Because the preliminary analysis indicated the subchronic screening levels for chloropicrin were exceeded in Santa Maria in 2014 and 2015, DPR conducted a more thorough evaluation of the risk associated with the measured concentration for the subchronic or seasonal exposure scenario (DPR 2016b). The more detailed evaluation concluded that a 5-month average concentration is the more appropriate time period to assess seasonal exposure to chloropicrin, rather than the default 4-week period. The default 4-week period is health-conservative, and using the more appropriate 5-month period indicates lower seasonal exposure. Although the seasonal screening level was based on a 5-month period, a seasonal exposure was calculated based on the 3-month study results for the high use period as a conservative estimate. The estimated 3-month average concentrations of 0.247 ppb in 2014 and 0.190 ppb in 2015 were both below the seasonal screening level of 0.35 ppb. The concentrations were 71 and 55 percent of the screening level in 2014 and 2015, respectively, indicating a need to closely follow future concentrations. The highest rolling 4-week average concentration of chloropicrin calculated in 2016 was 0.25 ppb, 71.4% of the 0.35 ppb screening level.

Table 10. The highest rolling 4-week average concentrations detected for all sampling years by sampling location.

Location	Highest 4-week rolling concentration (ppb)	Subchronic Screening Level (ppb)	Subchronic Regulatory Target (ppb)
1,3-Dichloropropene			
Santa Maria ¹	1.3	3	-
Camarillo ²	1.3	3	-
Oxnard ³	2.4	3	-
Watsonville ⁴	1.2	3	-
Methyl Bromide			
Santa Maria ¹	1.6	-	5
Camarillo ²	0.9	-	5
Oxnard ³	2.0	-	5
Watsonville ⁴	0.8	-	5
Chloropicrin			
Santa Maria ⁵	0.49 (0.25*)	0.35	-
Oxnard ⁶	0.27	0.35	-
Watsonville ⁵	0.26	0.35	-

1 – Sampling started on 8/11/10

2 – Sampling occurred between 8/11/10 and 10/17/11

3 – Sampling started on 10/24/11

4 – Sampling started on 11/05/11

5 – Data is for the sampling period of high use only (2014: 8/5-10/31; 2015: 8/10-12/1; 2016: 8/30-12/20)

6 – Data is for the sampling period of high use only (2014: 8/5 – 10/31; 2015: 8/10-12/1)

* Estimated 3-month seasonal concentration

Yearly comparisons of the highest 4-week rolling average concentrations for all sampling locations are listed on Table 12. This report contains some small discrepancies with previously reported 4-week rolling average concentrations due to a refined calculation methodology employed. Previously, 4-week rolling average concentrations were determined manually by cross referencing sampling date with a monthly calendar and calculating rolling 28-day periods which were used to determine an average concentration. This methodology, due to the vast number of samples and to potential user error, can and did lead to some small errors in the determination of accurate 4-week periods for the sampling data. Since the 2015 report, we have employed an automated process to automatically calculate an accurate 28-day timeframe from the sampling date and to include only those concentrations within these periods in the rolling 4-week average concentration calculations.

In 2015, Oxnard had the highest 4-week rolling average concentration of 1,3-D compared to any of the other sampling locations for any sampling year included in this report. In 2014, Oxnard had the highest 4-week rolling concentration for MBr compared to any of the other sampling locations or sampling years. Santa Maria was the only location with a highest 4-week rolling concentration that exceeded the subchronic regulatory target of 0.35 ppb for chloropicrin for any sampling year during the 2014 and 2015 monitoring periods, requiring closer evaluation.

Table 11. Comparisons of highest 4-week rolling average concentrations by sampling location.

Location	Highest 4-wk rolling concentration (ppb)						
	2010	2011	2012	2013	2014	2015	2016
1,3-Dichloropropene							
Santa Maria ¹	0.69	1.25	0.81	1.32	0.67	0.55	0.63
Camarillo ²	1.00	1.28	-	-	-	-	-
Oxnard ³	-	0.13	1.65	1.19	0.49	2.36	0.66
Watsonville ⁴	-	0.05	1.17	0.52	0.44	0.63	0.23
Methyl Bromide							
Santa Maria ¹	1.52	1.60	0.56	0.26	0.30	1.15	0.75
Camarillo ²	0.28	0.87	-	-	-	-	-
Oxnard ³	-	0.15	0.90	0.05	1.97	0.27	0.18
Watsonville ⁴	-	0.02	0.75	0.77	0.07	0.13	0.25
Chloropicrin							
Santa Maria ⁵	-	-	-	-	0.49 (0.25*)	0.41 (0.19*)	0.25
Oxnard ⁶	-	-	-	-	0.21	0.27	-
Watsonville ⁵	-	-	-	-	0.10	0.26	0.16

1 – Sampling started on 8/11/10

2 – Sampling occurred between 8/11/10 and 10/17/11

3 – Sampling started on 10/24/11

4 – Sampling started on 11/05/11

5 – Data is for the sampling period of high use only (2014: 8/5-10/31; 2015: 8/10-12/1; 2016: 8/30-12/20)

6 – Data is for the sampling period of high use only (2014: 8/5 – 10/31; 2015: 8/10-12/1)

* Estimated 3-month seasonal concentration

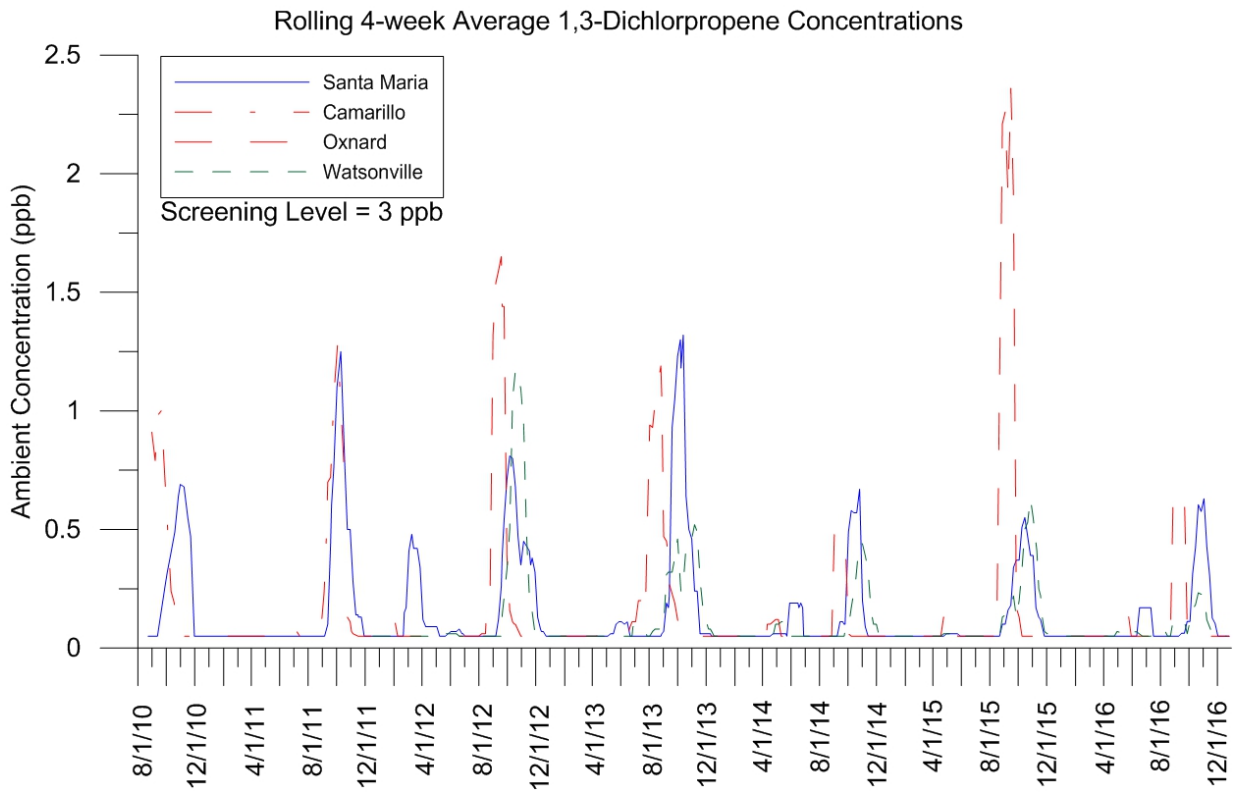


Figure 5. Rolling 4-week average (subchronic) concentrations of 1,3-dichloropropene detected for the three monitoring locations.

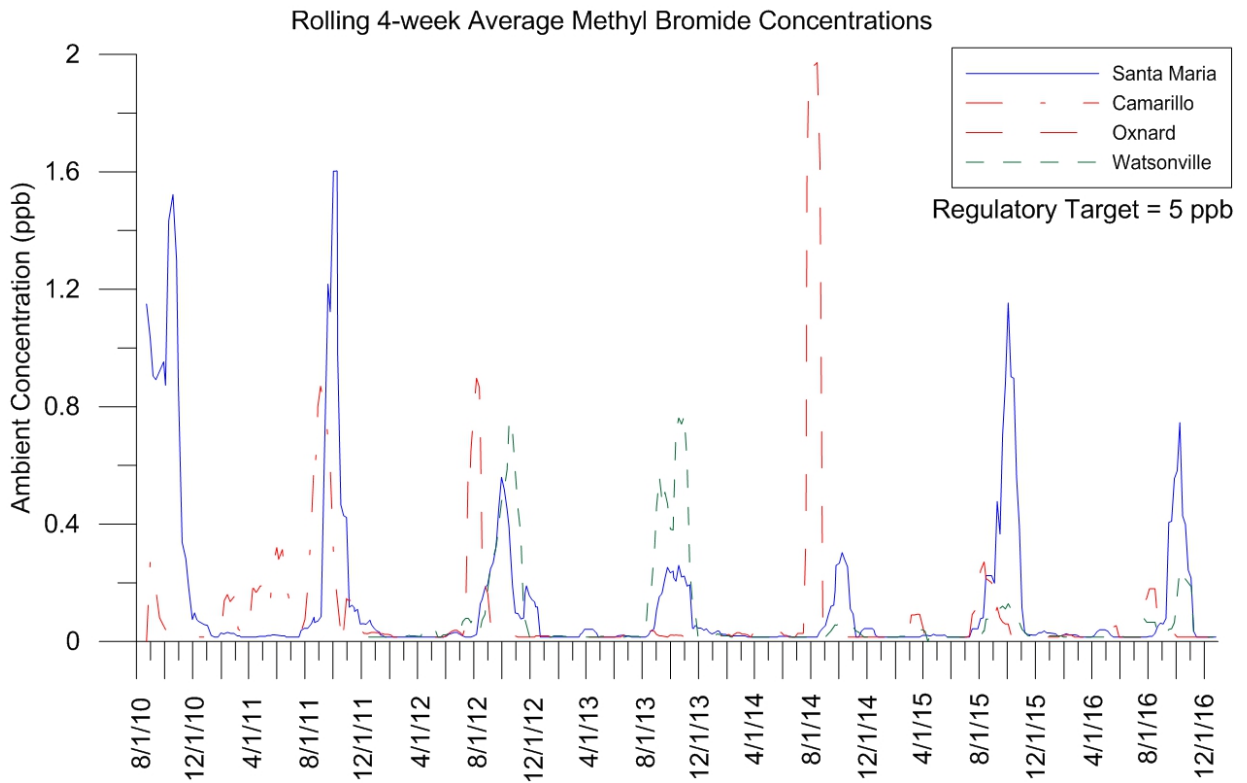


Figure 6. Rolling 4-week average (subchronic) concentration of methyl bromide detected for the three monitoring locations.

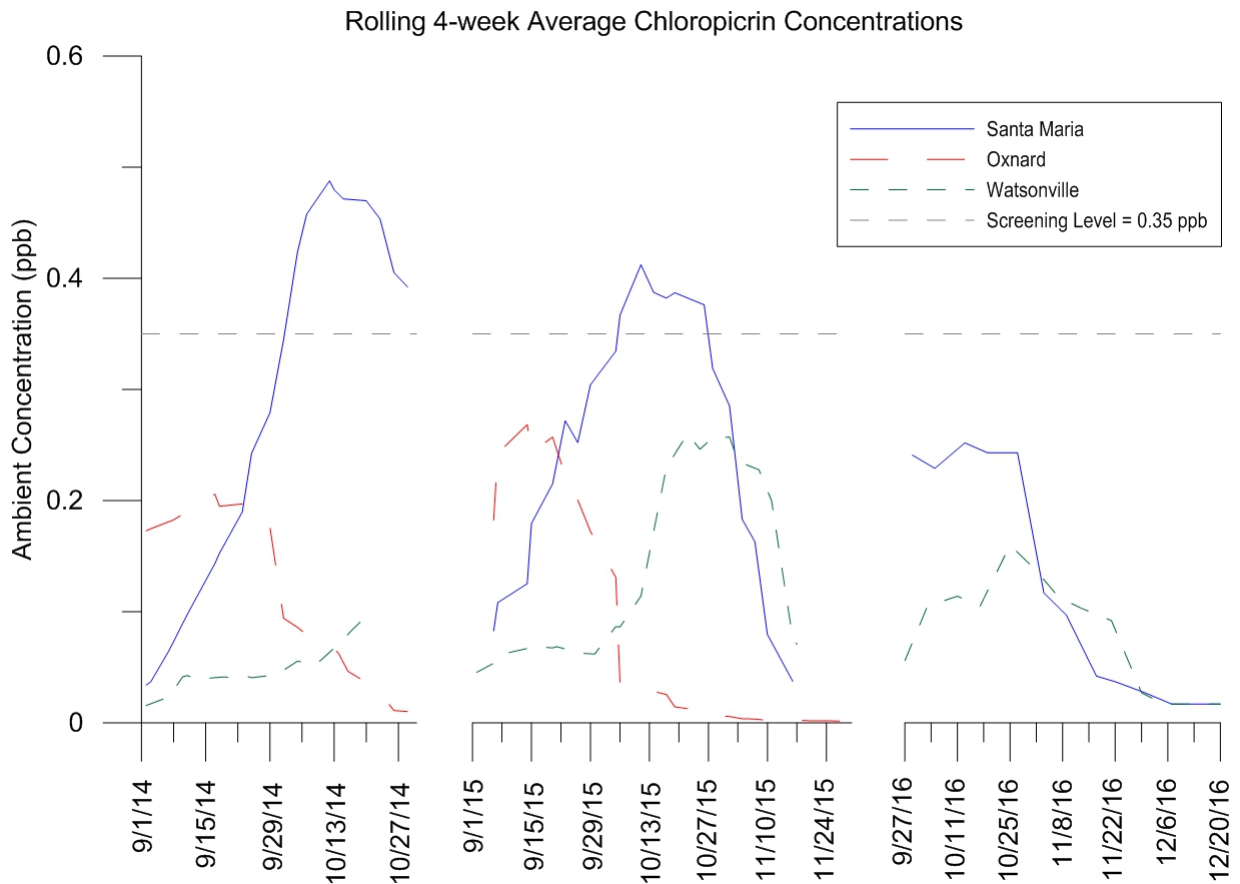


Figure 7. Rolling 4-week average (subchronic) concentrations of chloropicrin detected for the three monitoring locations.

Chronic (1-year) exposure

Table 13 shows the 1-year average concentrations for all sampling locations for 1,3-D and MBr in 2016. In 2016, the highest 1-year average 1,3-D concentration measured was 0.12 ppb at Santa Maria. In 2016 the highest 1-year average MBr concentration measured was 0.09 ppb at Santa Maria. One-year average concentrations for chloropicrin were not computed as XAD sorption samples were collected during a 13-week period in 2014, a 17-week period in 2015, and a 16-week period in 2016; therefore, extrapolating that data to obtain a 1-year average concentration was not possible.

Table 12. 1-year average air concentrations by location for sampling year 2016.

Location	1-year average concentration (ppb)	Chronic Screening Level (ppb) *
1,3-Dichloropropene		
Santa Maria	0.12	2.0
Oxnard	0.11	2.0
Watsonville	0.07	2.0
Methyl Bromide		
Santa Maria	0.09	1.0
Oxnard	0.03	1.0
Watsonville	0.04	1.0

* Screening level for possible long-term health effects other than cancer

As shown on Table 14, both Oxnard and Santa Maria had the highest 2010-2016 average concentration for 1,3-D (0.15 ppb), while Santa Maria had the highest 2010-2016 average concentration for MBr (0.13 ppb). For individual years, Oxnard had the highest 1-year average concentrations for both 1,3-D (0.21 ppb) and MBr (0.19 ppb) in 2015 and 2014, respectively.

Table 13. Comparison of 1-year average concentrations by sampling location.

Location	1-year average concentration (ppb)							Avg. Conc. (ppb)
	2010	2011	2012	2013	2014	2015	2016	2010-2016
1,3-Dichloropropene								
Santa Maria ¹	-	0.16	0.19	0.19	0.11	0.11	0.12	0.15
Camarillo ²	*	*	-	-	-	-	-	-
Oxnard ³	-	*	0.19	0.17	0.09	0.21	0.11	0.15
Watsonville ⁴	-	-	0.16	0.13	0.09	0.12	0.07	0.12
Methyl Bromide								
Santa Maria ¹	-	0.18	0.09	0.06	0.05	0.14	0.09	0.13
Camarillo ²	*	*	-	-	-	-	-	-
Oxnard ³	-	*	0.10	0.02	0.19	0.05	0.03	0.08
Watsonville ⁴	-	-	0.12	0.15	0.02	0.04	0.04	0.08

1 – Sampling started on 8/11/10

2 – Sampling occurred between 8/11/10 and 10/17/11

3 – Sampling started on 10/24/11

4 – Sampling started on 11/05/11

Cancer Risk Estimates

1,3-dichloropropene is the only pesticide monitored at these sites that is classified as a human carcinogen by both The United States Environmental Protection Agency and by the designated “State’s Qualified Experts” for evaluation of chemicals under Proposition 65⁵. The risk of cancer from exposure to a chemical is determined from the cancer potency of the chemical and the human exposure to the chemical. Cancer potency is expressed in the units of (mg/kg-day)⁻¹. Cancer risk is expressed as a probability for the occurrence of cancer (e.g., 1 in 1,000,000 or 10⁻⁶, 1 in 100,000 or 10⁻⁵, etc). It is a standard default assumption that exposure to a carcinogen takes place over a lifetime, so the default respiratory rate for an adult is used (0.28 m³/kg/day) over 70 years. DPR has calculated a cancer potency of 0.014 (mg/kg-day)⁻¹. The risk is then calculated as (cancer potency) × (chronic air concentration) × (respiratory rate). The concentration is calculated as an average of the monthly averages of the measured concentrations over all of the years of sampling. Cancer risk estimates for 1,3-D were calculated by treating samples with no detectable concentrations as having concentrations equal to half of the Reporting Limit (RL). Alternatively, the cancer risk can be expressed relative to DPR’s regulatory target of 0.56 ppb (cancer potency × respiratory rate, and converting units).

Table 15 shows 1,3-D cancer risk estimate comparisons for all sampling locations for sampling years 2010 - 2016. DPR has set a cancer risk regulatory goal of 1 excess cancer per 100,000 people (10⁻⁵) for 1,3-D. Overall, the Camarillo, Oxnard, and Santa Maria 2010-2016 average air

⁵ California’s Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986, requires the state to maintain a list of chemicals known to the state to cause reproductive toxicity or cancer.

concentrations were detected at levels that, if continued for a lifetime of 70 years would be below DPR’s regulatory goal for cancer risk.

Table 14. 1,3-dichloropropene cancer risk estimate comparisons for all sampling locations for sampling years 2010 - 2016.

Location	2010-2016 Average Concentration (ppb)	Lifetime (70-year) Regulatory Target (ppb)	Average Cancer Risk Estimate†
Santa Maria ¹	0.15	0.56 *	2.7×10^{-6}
Oxnard ²	0.15	0.56 *	2.8×10^{-6}
Watsonville ³	0.12	0.56 *	2.0×10^{-6}

1 – Sampling started on 8/11/10

2 – Sampling started on 10/24/11

3 – Sampling started on 11/05/11

† Cancer risk estimates were calculated using a value equal to one-half of the MDL for samples with no detectable

* Regulatory target for 1,3-dichloropropene was revised in December of 2015

DISCUSSION AND CONCLUSIONS

Since monitoring began in 2010, none of the detected concentrations for all three fumigants exceeded DPR’s screening levels or regulatory targets for acute exposure (1-day), subchronic exposure (4-week), or chronic exposure (1-year). The 1,3-D concentrations were generally the same or decreasing for some sampling locations throughout the 2010 – 2016 sample years. The time periods and communities with higher concentrations are consistent with historical use patterns.

Overall, observed MBr concentrations decreased in Watsonville. An increase in the detected concentration in Santa Maria in 2015 which continued into 2016 ended what was previously a general trend of decrease in that sampling location, although, it remained below half of 2010 and 2011 levels. Aside from two spikes in detections at Oxnard, observed MBr concentrations remained fairly consistent across all years.

For all sampled years, Santa Maria had the highest overall 24-hour chloropicrin concentration followed by Oxnard. However, a general decreasing trend can be observed in Santa Maria as the highest 24-hour concentrations measured at this site has decreased every year starting with 2014. Out of the two sites monitoring in 2016, Santa Maria had the highest 4-week rolling average concentration, while Watsonville’s 2016 measured maximum 4-week average concentration decreased by 38.5% compared to the maximum 4-week average concentration measured at the site in 2015.

In previous reports, DPR’s goal for 1,3-D was not to exceed the regulatory target of 0.14 ppb as an average for a 70-year lifetime exposure to address cancer risk. DPR’s updated risk management directive (DPR, 2016) has updated the regulatory target to 0.56 ppb as a 70-year average. None of the 2011-2016 average 1,3-D concentrations at the three sites exceeded the updated regulatory target concentration. Moreover, none of the three sites exceeded 0.27 ppb, DPR’s trigger for additional evaluation and consideration of additional mitigation measures for 1,3-D cancer risk (DPR, 2016).

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APPENDIX A

RESULTS OF INDIVIDUAL 1,3-DICHLOROPROPENE & METHYL BROMIDE SAMPLES FOR 2010 – 2016

Santa Maria			Camarillo/Oxnard			Ohlone		
Date	Concentration (ppb)		Date	Concentration (ppb)		Date	Concentration (ppb)	
	Methyl Bromide	1,3-Dichloro propene		Methyl Bromide	1,3-Dichloro propene		Methyl Bromide	1,3-Dichloro propene
8/11/10	0.28	ND	8/10/10	0.29	ND	11/5/11	0.08	0.21
8/15/10	0.34	ND	8/16/10	0.52	0.52	12/5/11	ND	ND
8/16/10	0.28	ND	8/23/10	0.25	1.15	12/11/11	ND	ND
8/23/10	3.70	ND	8/31/10	0.05	1.90	12/17/11	ND	ND
8/31/10	0.57	ND	9/7/10	ND	0.32	12/23/11	ND	ND
9/6/10	0.26	ND	9/12/10	0.05	1.03	12/29/11	ND	ND
9/12/10	0.20	ND	9/20/10	0.04	0.61	1/4/12	ND	ND
9/29/10	2.40	0.72	10/4/10	0.05	ND	1/10/12	ND	ND
10/3/10	0.63	0.44	10/11/10	0.05	ND	1/12/12	ND	ND
10/10/10	2.50	0.33	10/18/10	0.06	ND	1/16/12	ND	ND
10/19/10	0.56	0.47	10/25/10	ND	ND	1/22/12	ND	ND
10/27/10	0.41	1.24	11/9/10	ND	ND	1/28/12	ND	ND
10/31/10	0.25	0.96	11/10/10	ND	ND	2/9/12	ND	ND
11/8/10	0.13	ND	11/15/10	ND	ND	2/21/12	ND	ND
11/16/10	0.06	ND	11/22/10	ND	ND	2/23/12	ND	ND
11/22/10	0.08	ND	11/29/10	ND	ND	2/27/12	ND	ND
11/30/10	0.03	ND	12/6/10	ND	ND	3/14/12	0.04	ND
12/5/10	0.19	ND	12/13/10	ND	ND	3/16/12	ND	ND
12/10/10	ND	ND	12/27/10	ND	ND	3/20/12	ND	ND
12/13/10	0.04	ND	1/3/11	ND	ND	3/22/12	ND	ND
12/26/10	ND	ND	1/10/11	ND	ND	3/23/12	ND	ND
1/2/11	ND	ND	1/25/11	ND	ND	3/28/12	ND	ND
1/10/11	ND	ND	1/31/11	ND	ND	4/3/12	ND	ND
1/17/11	ND	ND	2/7/11	0.51	ND	4/9/12	ND	ND
1/25/11	ND	ND	2/14/11	0.10	ND	4/11/12	0.18	ND
1/31/11	0.07	ND	2/20/11	0.04	ND	4/15/12	ND	ND
2/6/11	ND	ND	3/7/11	ND	ND	4/21/12	ND	ND
2/14/11	0.04	ND	3/9/11	ND	ND	4/27/12	ND	ND
2/15/11	ND	ND	3/14/11	ND	ND	5/3/12	ND	ND
2/21/11	ND	ND	3/21/11	ND	ND	5/9/12	ND	ND
2/28/11	ND	ND	3/29/11	ND	ND	5/15/12	ND	ND
3/7/11	ND	ND	4/3/11	0.30	ND	5/17/12	ND	0.13
3/13/11	ND	ND	4/10/11	0.56	ND	5/21/12	ND	ND
3/15/11	ND	ND	4/12/11	ND	ND	5/27/12	0.06	ND
3/20/11	ND	ND	4/17/11	0.10	ND	6/2/12	ND	ND
3/28/11	ND	ND	4/19/11	0.03	ND	6/8/12	0.05	ND
4/3/11	ND	ND	4/26/11	0.30	ND	6/14/12	0.05	ND
4/10/11	ND	ND	5/2/11	0.14	ND	6/20/12	ND	ND
4/12/11	ND	ND	5/3/11	0.16	ND	6/26/12	0.06	ND
4/17/11	ND	ND	5/8/11	ND	ND	6/28/12	ND	ND
4/25/11	0.03	ND	5/17/11	ND	ND	7/2/12	ND	ND
5/1/11	ND	ND	5/23/11	0.90	ND	7/8/12	0.25	ND
5/8/11	ND	ND	6/1/11	0.35	ND	7/14/12	0.12	ND
5/10/11	0.03	ND	6/5/11	0.12	ND	7/20/12	ND	ND
5/16/11	ND	ND	6/13/11	0.18	0.16	7/24/12	ND	ND

5/17/11	ND	ND	6/21/11	0.04	ND	7/26/12	ND	ND
5/23/11	0.04	ND	6/26/11	0.10	ND	8/1/12	0.08	ND
5/31/11	ND	ND	7/4/11	ND	ND	8/7/12	0.10	ND
6/5/11	ND	ND	7/14/11	ND	ND	8/13/12	0.04	ND
6/13/11	ND	ND	7/25/11	0.09	ND	8/15/12	0.04	ND
6/19/11	ND	ND	7/25/11	0.09	ND	8/19/12	0.23	ND
6/21/11	ND	ND	8/1/11	0.18	ND	8/25/12	0.07	ND
6/26/11	ND	ND	8/9/11	0.60	ND	8/31/12	0.59	ND
7/4/11	ND	ND	8/16/11	0.86	ND	9/6/12	0.56	ND
7/13/11	ND	ND	8/21/11	1.30	ND	9/12/12	0.22	ND
7/18/11	ND	ND	8/22/11	0.38	0.25	9/18/12	0.16	ND
7/19/11	ND	ND	8/28/11	0.88	ND	9/20/12	0.44	0.59
7/24/11	0.15	ND	8/29/11	1.40	0.14	9/30/12	1.00	0.90
7/31/11	0.06	ND	9/4/11	0.67	1.05	10/6/12	0.78	0.92
8/7/11	ND	ND	9/7/11	0.41	0.87	10/12/12	0.55	2.80
8/15/11	0.11	ND	9/12/11	0.59	3.10	10/16/12	1.50	1.49
8/21/11	0.08	ND	9/18/11	0.17	0.28	10/18/12	0.25	0.33
8/22/11	0.06	ND	9/25/11	0.04	1.93	10/24/12	0.21	0.54
8/28/11	0.09	ND	10/3/11	0.04	0.21	10/30/12	0.18	0.43
8/29/11	0.06	ND	10/17/11	0.04	0.12	11/5/12	ND	ND
9/5/11	0.11	ND	Site Changed to Oxnard			11/11/12	ND	ND
9/12/11	3.80	0.42	10/24/11	0.04	ND	11/17/12	ND	ND
9/18/11	3.10	2.40	10/30/11	0.47	ND	11/20/12	ND	ND
9/20/11	0.15	0.64	11/2/11	ND	ND	11/30/12	ND	ND
9/25/11	0.55	1.72	11/5/11	0.14	ND	12/5/12	ND	ND
10/2/11	1.90	1.39	11/16/11	ND	ND	12/11/12	ND	ND
10/10/11	0.12	0.90	11/17/11	ND	ND	12/13/12	ND	ND
10/11/11	ND	0.10	11/23/11	ND	ND	12/17/12	ND	ND
10/18/11	0.06	ND	11/29/11	ND	ND	12/23/12	ND	ND
10/24/11	0.05	ND	12/2/11	ND	ND	12/29/12	ND	ND
10/30/11	0.39	0.50	12/7/11	0.09	ND	1/4/13	ND	ND
11/5/11	0.07	ND	12/11/11	0.03	ND	1/10/13	ND	ND
11/11/11	0.05	ND	12/13/11	ND	ND	1/16/13	ND	ND
11/16/11	ND	ND	12/17/11	ND	ND	1/22/13	0.04	ND
11/17/11	0.03	ND	12/23/11	0.03	ND	1/24/13	ND	ND
11/23/11	0.10	ND	12/29/11	ND	ND	1/28/13	ND	ND
11/29/11	0.09	ND	1/7/12	0.07	0.44	2/3/13	ND	ND
12/5/11	0.07	ND	1/10/12	ND	ND	2/9/13	ND	ND
12/11/11	0.04	ND	1/12/12	ND	ND	2/12/13	ND	ND
12/13/11	0.08	ND	1/16/12	ND	ND	2/15/13	ND	ND
12/20/11	0.05	ND	1/22/12	ND	ND	2/21/13	ND	ND
12/23/11	ND	ND	1/28/12	ND	ND	3/11/13	ND	ND
12/29/11	ND	ND	2/3/12	ND	ND	3/17/13	ND	ND
1/4/12	ND	ND	2/9/12	ND	ND	3/20/13	ND	ND
1/10/12	ND	ND	2/21/12	ND	ND	3/23/13	ND	ND
1/12/12	ND	ND	2/23/12	ND	ND	3/24/13	ND	ND
1/16/12	ND	ND	2/27/12	ND	ND	3/29/13	ND	ND
1/22/12	ND	ND	3/4/12	ND	ND	4/4/13	ND	ND
1/31/12	ND	ND	3/10/12	ND	ND	4/10/13	ND	ND
2/3/12	ND	ND	3/14/12	ND	ND	4/16/13	ND	ND
2/9/12	ND	ND	3/16/12	ND	ND	4/22/13	ND	ND
2/15/12	ND	ND	3/22/12	ND	ND	4/24/13	ND	ND

2/21/12	ND	ND	3/28/12	ND	ND	4/28/13	ND	ND
2/23/12	ND	0.63	4/3/12	ND	ND	5/4/13	0.03	ND
2/27/12	ND	0.32	4/9/12	ND	ND	5/10/13	ND	ND
3/4/12	ND	1.36	4/11/12	ND	ND	5/14/13	ND	ND
3/10/12	ND	0.46	4/15/12	ND	ND	5/16/13	ND	ND
3/14/12	ND	ND	4/21/12	ND	ND	5/22/13	ND	ND
3/16/12	ND	ND	4/27/12	ND	ND	5/30/13	ND	ND
3/22/12	ND	ND	5/3/12	ND	ND	6/3/13	ND	ND
3/28/12	ND	ND	5/9/12	ND	ND	6/9/13	ND	ND
4/3/12	ND	ND	5/15/12	ND	ND	6/15/13	ND	ND
4/9/12	ND	0.31	5/17/12	ND	ND	6/21/13	ND	ND
4/11/12	ND	ND	5/21/12	ND	ND	6/25/13	ND	ND
4/15/12	ND	ND	5/27/12	ND	ND	6/27/13	0.03	0.31
4/21/12	ND	ND	6/2/12	0.04	ND	7/3/13	ND	ND
4/27/12	ND	ND	6/8/12	0.07	ND	7/11/13	ND	ND
5/3/12	ND	ND	6/14/12	0.05	ND	7/15/13	ND	ND
5/9/12	ND	ND	6/20/12	ND	ND	7/21/13	ND	ND
5/15/12	ND	ND	6/26/12	ND	ND	7/24/13	ND	ND
5/17/12	ND	ND	6/28/12	ND	ND	7/27/13	ND	ND
5/21/12	ND	ND	7/2/12	ND	ND	8/2/13	ND	ND
5/27/12	ND	0.11	7/8/12	ND	ND	8/8/13	0.08	0.21
6/2/12	0.04	0.12	7/14/12	0.24	ND	8/14/13	0.81	ND
6/8/12	0.05	ND	7/20/12	3.40	ND	8/20/13	0.04	ND
6/14/12	0.04	ND	7/24/12	0.33	ND	8/26/13	0.50	ND
6/20/12	ND	ND	7/26/12	0.53	ND	8/28/13	0.49	0.13
6/26/12	ND	ND	8/1/12	0.18	ND	9/1/13	0.83	ND
6/28/12	ND	ND	8/7/12	0.70	0.10	9/7/13	0.70	1.51
7/2/12	ND	ND	8/13/12	0.05	ND	9/11/13	0.18	0.38
7/8/12	ND	ND	8/15/12	0.04	ND	9/13/13	0.52	ND
7/14/12	ND	ND	8/19/12	0.07	1.27	9/19/13	0.34	0.10
7/20/12	ND	ND	8/25/12	0.10	ND	9/25/13	0.22	0.43
7/24/12	ND	ND	8/31/12	ND	6.40	10/1/13	0.34	0.27
7/26/12	ND	ND	9/6/12	0.09	1.42	10/7/13	0.68	0.39
8/1/12	0.04	ND	9/12/12	ND	0.33	10/8/13	0.90	ND
8/7/12	0.04	ND	9/18/12	ND	ND	10/13/13	1.80	0.36
8/13/12	0.46	ND	9/20/12	0.03	0.41	10/19/13	0.63	1.06
8/15/12	0.32	ND	9/24/12	ND	ND	10/25/13	0.09	0.55
8/19/12	0.11	ND	9/30/12	0.14	ND	10/31/13	0.51	0.36
8/25/12	0.12	ND	10/6/12	0.03	ND	11/6/13	ND	0.25
8/31/12	0.12	ND	10/12/12	ND	ND	11/12/13	ND	0.24
9/6/12	0.36	ND	10/16/12	ND	ND	11/18/13	ND	ND
9/12/12	0.58	0.48	10/18/12	ND	ND	11/20/13	ND	ND
9/18/12	0.42	0.66	10/30/12	ND	ND	11/24/13	ND	ND
9/20/12	0.55	1.05	11/5/12	ND	ND	11/30/13	ND	ND
9/24/12	0.68	0.92	11/11/12	ND	ND	12/6/13	ND	ND
9/30/12	0.77	1.12	11/17/12	ND	ND	12/10/13	ND	ND
10/6/12	0.11	0.63	11/20/12	ND	ND	12/18/13	ND	ND
10/12/12	0.17	0.44	11/23/12	ND	ND	12/24/13	0.04	ND
10/16/12	0.05	0.22	11/29/12	ND	ND	12/30/13	ND	ND
10/18/12	0.03	0.36	12/5/12	ND	ND	1/5/14	ND	ND
10/24/12	ND	ND	12/11/12	ND	ND	1/11/14	0.04	ND
10/30/12	0.21	0.42	12/13/12	0.04	ND	1/15/14	ND	ND

11/5/12	0.10	1.21	12/17/12	ND	ND	1/17/14	ND	ND
11/11/12	0.06	0.34	12/23/12	ND	ND	1/23/14	ND	ND
11/17/12	ND	ND	12/29/12	ND	ND	1/29/14	ND	ND
11/20/12	0.58	ND	1/4/13	ND	ND	2/4/14	ND	ND
11/23/12	0.17	0.21	1/10/13	ND	ND	2/10/14	ND	ND
11/29/12	ND	ND	1/16/13	ND	ND	2/12/14	ND	ND
12/5/12	ND	ND	1/22/13	ND	ND	2/16/14	0.03	ND
12/11/12	ND	ND	1/24/13	ND	ND	2/22/14	0.04	ND
12/13/12	ND	ND	1/28/13	ND	ND	2/28/14	ND	ND
12/17/12	ND	ND	2/3/13	ND	ND	3/6/14	ND	ND
12/23/12	ND	ND	2/9/13	ND	ND	3/12/14	ND	ND
12/29/12	ND	ND	2/12/13	ND	ND	3/18/14	ND	ND
1/4/13	ND	ND	2/15/13	ND	ND	3/24/14	ND	ND
1/10/13	ND	ND	2/21/13	ND	ND	3/26/14	ND	ND
1/16/13	ND	ND	2/27/13	ND	ND	3/30/14	ND	ND
1/22/13	ND	ND	3/5/13	ND	ND	4/5/14	ND	ND
1/24/13	ND	ND	3/11/13	ND	ND	4/9/14	ND	ND
1/28/13	ND	ND	3/17/13	ND	ND	4/11/14	ND	ND
2/3/13	ND	ND	3/20/13	ND	ND	4/17/14	ND	ND
2/9/13	ND	ND	3/23/13	ND	ND	4/23/14	ND	ND
2/12/13	ND	ND	3/29/13	ND	ND	4/29/14	ND	0.33
2/15/13	ND	ND	4/4/13	ND	ND	5/5/14	ND	ND
2/21/13	ND	ND	4/10/13	ND	ND	5/11/14	ND	ND
2/27/13	ND	ND	4/16/13	ND	0.10	5/17/14	ND	ND
3/5/13	ND	ND	4/22/13	ND	ND	5/21/14	ND	ND
3/11/13	ND	ND	4/22/13	ND	ND	5/23/14	ND	ND
3/17/13	ND	ND	4/28/13	ND	ND	5/29/14	ND	ND
3/20/13	0.08	ND	5/4/13	ND	ND	6/4/14	ND	ND
3/23/13	0.03	ND	5/10/13	ND	ND	6/10/14	ND	ND
3/29/13	0.10	ND	5/14/13	ND	ND	6/16/14	ND	ND
4/4/13	ND	ND	5/16/13	ND	ND	6/22/14	ND	ND
4/10/13	ND	ND	5/22/13	ND	ND	6/26/14	ND	ND
4/16/13	ND	ND	5/28/13	ND	ND	6/28/14	ND	ND
4/22/13	ND	ND	6/3/13	ND	ND	7/4/14	ND	ND
4/24/13	ND	ND	6/9/13	ND	ND	7/10/14	ND	ND
4/28/13	ND	ND	6/15/13	ND	ND	7/16/14	ND	ND
5/4/13	ND	ND	6/21/13	0.05	0.24	7/22/14	ND	ND
5/10/13	ND	0.10	6/25/13	ND	0.22	7/24/14	ND	ND
5/14/13	ND	ND	6/27/13	0.17	ND	7/28/14	ND	ND
5/16/13	ND	ND	7/3/13	ND	ND	8/3/14	ND	ND
5/22/13	ND	0.34	7/9/13	0.04	0.57	8/9/14	ND	ND
5/28/13	ND	ND	7/15/13	0.04	ND	8/15/14	ND	ND
6/3/13	ND	ND	7/21/13	0.04	ND	8/21/14	ND	ND
6/9/13	0.04	ND	7/24/13	ND	ND	9/2/14	ND	ND
6/15/13	ND	ND	7/27/13	0.05	1.90	9/8/14	0.06	ND
6/21/13	ND	ND	8/2/13	0.06	3.00	9/14/14	0.05	ND
6/25/13	ND	ND	8/8/13	0.03	0.50	9/20/14	0.07	ND
6/27/13	ND	ND	8/14/13	ND	0.73	9/23/14	0.08	ND
7/3/13	ND	ND	8/26/13	0.04	0.54	9/26/14	0.05	0.26
7/9/13	ND	ND	8/28/13	ND	0.52	10/2/14	0.06	ND
7/15/13	ND	ND	9/1/13	ND	ND	10/8/14	0.08	0.57
7/21/13	ND	ND	9/7/13	ND	0.42	10/18/14	0.06	0.78

7/24/13	ND	ND	9/11/13	ND	ND	10/21/14	0.04	0.47
7/27/13	ND	ND	9/13/13	ND	ND	10/26/14	0.05	0.32
8/2/13	ND	ND	9/25/13	ND	ND	11/1/14	ND	ND
8/8/13	ND	ND	10/1/13	0.05	ND	11/7/14	ND	0.31
8/14/13	0.05	ND	10/7/13	ND	ND	11/13/14	ND	ND
8/20/13	0.11	ND	10/8/13	ND	ND	11/19/14	ND	ND
8/26/13	ND	ND	10/13/13	ND	ND	11/25/14	ND	ND
8/28/13	0.14	0.11	10/19/13	ND	ND	12/1/14	ND	ND
9/1/13	0.31	0.13	10/25/13	ND	ND	12/7/14	ND	ND
9/7/13	0.29	0.76	10/31/13	ND	ND	12/13/14	ND	ND
9/11/13	0.20	ND	11/12/13	ND	ND	12/16/14	ND	ND
9/13/13	0.10	0.41	11/13/13	ND	ND	12/25/14	ND	ND
9/19/13	0.44	5.00	11/18/13	ND	ND	12/31/14	ND	ND
9/25/13	0.29	0.91	11/20/13	ND	ND	1/6/15	ND	ND
10/1/13	0.08	0.27	11/24/13	ND	ND	1/12/15	ND	ND
10/7/13	0.33	1.14	11/30/13	ND	ND	1/14/15	ND	ND
10/8/13	0.08	0.50	12/6/13	ND	ND	1/18/15	ND	ND
10/13/13	ND	0.10	12/10/13	ND	ND	1/24/15	ND	ND
10/19/13	0.77	0.93	12/18/13	ND	ND	1/30/15	ND	ND
10/25/13	0.05	ND	12/24/13	ND	ND	2/5/15	ND	ND
10/31/13	0.10	ND	12/30/13	ND	ND	2/11/15	0.03	ND
11/6/13	ND	ND	1/5/14	ND	ND	2/17/15	ND	ND
11/12/13	0.04	0.11	1/11/14	0.04	ND	2/23/15	ND	ND
11/18/13	0.03	ND	1/15/14	ND	ND	3/1/15	ND	ND
11/20/13	0.04	ND	1/17/14	ND	ND	3/7/15	0.04	ND
11/24/13	0.11	ND	1/23/14	ND	ND	3/13/15	0.11	ND
11/30/13	0.05	ND	1/29/14	ND	ND	3/19/15	ND	ND
12/6/13	ND	ND	2/4/14	0.04	ND	3/25/15	ND	ND
12/10/13	ND	ND	2/10/14	ND	ND	3/31/15	ND	ND
12/12/13	ND	ND	2/12/14	ND	ND	4/6/15	ND	ND
12/18/13	0.06	ND	2/16/14	0.04	0.15	4/12/15	--	ND
12/24/13	0.04	ND	2/22/14	0.05	ND	4/15/15	ND	ND
12/30/13	ND	ND	2/28/14	ND	ND	4/18/15	ND	ND
1/5/14	0.04	ND	3/6/14	ND	ND	4/24/15	ND	0.14
1/11/14	0.03	ND	3/12/14	ND	ND	4/30/15	ND	ND
1/15/14	0.03	ND	3/18/14	ND	ND	5/6/15	ND	ND
1/17/14	ND	ND	3/24/14	ND	ND	5/12/15	ND	ND
1/23/14	ND	ND	3/26/14	0.04	ND	5/20/15	ND	ND
1/29/14	ND	ND	3/30/14	0.07	ND	5/24/15	ND	ND
2/4/14	ND	ND	4/5/14	0.08	ND	5/30/15	ND	ND
2/10/14	ND	ND	4/9/14	0.07	ND	6/6/15	ND	ND
2/12/14	0.04	ND	4/11/14	0.08	0.40	6/11/15	ND	ND
2/16/14	ND	ND	4/17/14	ND	ND	6/17/15	ND	ND
2/22/14	ND	ND	4/29/14	ND	ND	6/23/15	ND	ND
2/28/14	ND	ND	5/5/14	0.08	ND	7/5/15	ND	ND
3/6/14	ND	ND	5/11/14	ND	ND	8/4/15	ND	ND
3/12/14	ND	ND	5/17/14	0.05	ND	8/10/15	0.05	ND
3/18/14	ND	ND	5/21/14	ND	ND	8/12/15	0.04	ND
3/24/14	ND	ND	5/23/14	ND	ND	8/16/15	0.20	ND
3/26/14	ND	ND	5/29/14	ND	ND	8/22/15	0.08	ND
3/30/14	ND	ND	6/4/14	ND	ND	8/28/15	0.19	0.53
4/9/14	ND	ND	6/10/14	ND	ND	9/3/15	0.04	0.12

4/11/14	ND	ND	6/16/14	ND	ND	9/9/15	0.17	0.10
4/17/14	ND	ND	6/22/14	ND	ND	9/15/15	0.08	ND
4/23/14	ND	0.11	6/26/14	ND	ND	9/21/15	0.12	0.32
4/29/14	ND	ND	6/28/14	ND	ND	9/27/15	0.14	ND
5/5/14	ND	ND	7/4/14	0.09	ND	10/3/15	0.13	0.48
5/11/14	ND	ND	7/10/14	ND	ND	10/9/15	0.08	0.76
5/17/14	ND	ND	7/16/14	ND	ND	10/15/15	0.09	0.90
5/21/14	ND	ND	7/22/14	2.10	ND	10/21/15	ND	0.44
5/23/14	0.03	ND	7/24/14	8.70	ND	10/27/15	ND	0.55
5/29/14	ND	0.91	7/28/14	0.73	ND	11/2/15	ND	0.11
6/4/14	ND	ND	8/3/14	0.19	ND	11/10/15	ND	ND
6/10/14	ND	ND	8/9/14	0.04	ND	11/14/15	0.05	0.11
6/16/14	ND	ND	8/15/14	0.07	ND	11/18/15	ND	ND
6/18/14	ND	ND	8/21/14	0.04	ND	11/20/15	ND	ND
6/22/14	ND	ND	8/27/14	ND	ND	11/26/15	ND	ND
6/26/14	ND	ND	9/2/14	ND	2.20	12/2/15	ND	ND
6/28/14	ND	ND	9/8/14	ND	0.12	12/8/15	ND	ND
7/4/14	ND	ND	9/14/14	0.04	ND	12/14/15	ND	ND
7/10/14	ND	ND	9/20/14	ND	ND	12/20/15	ND	ND
7/16/14	ND	ND	9/23/14	ND	ND	12/26/15	ND	ND
7/22/14	ND	ND	9/26/14	ND	ND	1/1/16	0.04	ND
7/24/14	ND	ND	10/2/14	ND	ND	1/7/16	ND	ND
7/28/14	ND	ND	10/8/14	ND	ND	1/13/16	ND	ND
8/3/14	ND	ND	10/14/14	ND	ND	1/18/16	ND	ND
8/9/14	ND	ND	10/20/14	ND	ND	1/25/16	ND	ND
8/15/14	ND	ND	10/26/14	ND	ND	1/31/16	ND	ND
8/21/14	0.13	ND	11/1/14	ND	ND	2/6/16	ND	ND
8/27/14	0.05	ND	11/7/14	ND	ND	2/12/16	ND	ND
9/2/14	0.06	ND	11/13/14	ND	ND	2/18/16	ND	ND
9/8/14	0.19	ND	11/19/14	ND	ND	2/23/16	ND	ND
9/14/14	0.17	0.34	11/25/14	ND	ND	3/1/16	ND	ND
9/20/14	0.15	ND	12/1/14	ND	ND	3/7/16	ND	ND
9/23/14	0.41	ND	12/7/14	ND	ND	3/13/16	ND	ND
9/25/14	0.58	ND	12/13/14	ND	ND	3/19/16	ND	ND
10/2/14	0.10	2.40	12/16/14	ND	ND	3/25/16	ND	ND
10/8/14	0.41	0.59	12/19/14	ND	ND	3/31/16	ND	ND
10/14/14	ND	0.27	12/25/14	ND	ND	4/12/16	ND	ND
10/20/14	ND	ND	12/31/14	ND	ND	4/18/16	ND	ND
10/26/14	ND	ND	1/6/15	ND	ND	4/24/16	ND	ND
11/1/14	ND	ND	1/12/15	ND	ND	4/30/16	ND	0.13
11/7/14	ND	ND	1/14/15	ND	ND	5/6/16	ND	ND
11/13/14	ND	ND	1/18/15	ND	ND	5/12/16	0.04	ND
11/19/14	0.12	ND	1/24/15	ND	ND	5/18/16	ND	ND
11/25/14	0.06	ND	1/30/15	ND	ND	5/24/16	ND	0.14
12/2/14	ND	ND	2/5/15	ND	ND	5/30/16	ND	ND
12/7/14	ND	ND	2/11/15	ND	ND	6/5/16	ND	ND
12/13/14	ND	ND	2/17/15	ND	ND	6/11/16	ND	ND
12/16/14	ND	ND	2/23/15	ND	ND	6/23/16	ND	ND
12/19/14	ND	ND	3/1/15	ND	ND	6/24/16	ND	ND
12/25/14	ND	ND	3/7/15	0.39	ND	7/5/16	ND	ND
12/31/14	ND	ND	3/13/15	ND	ND	7/11/16	ND	ND
1/12/15	ND	ND	3/19/15	0.03	ND	7/17/16	ND	0.17

1/14/15	ND	ND	3/25/15	ND	ND	7/23/16	0.27	ND
1/18/15	ND	ND	4/6/15	ND	ND	7/29/16	ND	ND
1/24/15	ND	ND	4/7/15	ND	ND	8/4/16	ND	ND
1/30/15	ND	ND	4/12/15	ND	ND	8/10/16	ND	ND
2/5/15	ND	ND	4/15/15	ND	ND	8/16/16	ND	ND
2/11/15	ND	ND	4/18/15	ND	ND	8/22/16	0.06	ND
2/17/15	ND	ND	4/24/15	0.04	0.56	8/28/16	ND	0.37
3/1/15	ND	ND	4/30/15	ND	ND	9/3/16	0.03	ND
3/7/15	ND	ND	5/6/15	ND	ND	9/9/16	ND	ND
3/13/15	ND	ND	5/12/15	ND	ND	9/15/16	0.08	ND
3/25/15	ND	ND	5/18/15	ND	ND	9/21/16	0.08	ND
3/31/15	0.04	ND	5/20/15	ND	ND	9/27/16	0.12	0.10
4/6/15	ND	ND	5/24/15	ND	ND	10/9/16	0.70	0.45
4/12/15	ND	ND	5/30/15	ND	ND	10/15/16	ND	0.13
4/15/15	ND	ND	6/5/15	ND	ND	10/21/16	ND	0.25
4/18/15	ND	ND	6/11/15	ND	ND	11/3/16	ND	ND
4/24/15	0.05	ND	6/17/15	ND	ND	11/8/16	ND	ND
4/30/15	ND	0.11	6/23/15	ND	ND	11/22/16	ND	ND
5/6/15	ND	ND	6/29/15	ND	ND	11/26/16	ND	ND
5/12/15	ND	ND	7/5/15	ND	ND	12/2/16	ND	ND
5/18/15	ND	ND	7/11/15	0.04	ND	12/8/16	ND	ND
5/20/15	ND	ND	7/17/15	0.38	ND	12/17/16	ND	ND
5/24/15	ND	ND	7/23/15	0.08	ND	12/20/16	ND	ND
5/30/15	ND	ND	7/29/15	0.24	ND			
6/5/15	ND	ND	8/4/15	0.47	ND			
6/11/15	ND	ND	8/12/15	0.18	ND			
6/17/15	ND	ND	8/16/15	0.10	ND			
6/23/15	ND	ND	8/28/15	0.05	8.70			
6/29/15	ND	ND	9/3/15	ND	0.23			
7/5/15	ND	ND	9/9/15	0.24	0.46			
7/11/15	ND	ND	9/15/15	ND	ND			
7/17/15	0.16	ND	9/21/15	ND	ND			
7/23/15	ND	ND	9/27/15	ND	ND			
7/29/15	ND	ND	10/3/15	ND	ND			
8/4/15	0.19	ND	10/9/15	0.05	ND			
8/10/15	0.03	ND	10/15/15	ND	ND			
8/12/15	0.34	ND	10/21/15	ND	ND			
8/16/15	0.76	ND	10/27/15	ND	ND			
8/22/15	ND	ND	11/2/15	ND	ND			
8/28/15	ND	0.34	11/8/15	ND	ND			
9/3/15	0.03	ND	11/14/15	ND	ND			
9/9/15	1.70	0.42	11/18/15	ND	ND			
9/15/15	0.07	ND	11/20/15	ND	ND			
9/21/15	1.70	0.83	11/26/15	ND	ND			
9/27/15	0.90	0.48	12/2/15	ND	ND			
10/3/15	1.40	ND	12/14/15	ND	ND			
10/9/15	0.44	1.13	12/20/15	ND	ND			
10/15/15	0.05	0.24	12/26/15	ND	ND			
10/21/15	ND	0.46	1/1/16	ND	ND			
10/27/15	0.06	ND	1/7/16	ND	ND			
11/2/15	ND	ND	1/13/16	ND	ND			
11/8/15	ND	ND	1/19/16	ND	ND			

11/14/15	ND	ND	1/25/16	0.04	ND
11/18/15	ND	ND	1/25/16	0.04	ND
11/26/15	0.05	ND	2/6/16	ND	ND
12/2/15	ND	ND	2/12/16	ND	ND
12/8/15	0.06	ND	2/18/16	ND	ND
12/14/15	ND	ND	2/19/16	ND	ND
12/20/15	0.04	ND	2/24/16	ND	ND
12/26/15	ND	ND	3/1/16	ND	ND
1/1/16	ND	ND	3/7/16	ND	ND
1/14/16	0.03	ND	3/13/16	ND	ND
1/19/16	ND	ND	3/19/16	ND	ND
1/25/16	ND	ND	3/25/16	0.04	ND
2/6/16	0.05	ND	3/31/16	ND	ND
2/12/16	ND	ND	4/6/16	ND	ND
2/18/16	ND	ND	4/12/16	ND	ND
2/24/16	ND	ND	4/18/16	ND	ND
3/1/16	ND	ND	4/24/16	ND	0.12
3/7/16	ND	ND	4/30/16	0.17	0.41
3/13/16	ND	ND	5/6/16	ND	ND
3/19/16	ND	ND	5/12/16	ND	ND
3/25/16	ND	ND	5/24/16	ND	ND
3/31/16	ND	ND	5/30/16	ND	ND
4/6/16	0.04	ND	6/5/16	ND	ND
4/12/16	0.08	ND	6/11/16	ND	ND
4/18/16	0.05	ND	6/23/16	ND	ND
4/24/16	ND	ND	6/29/16	ND	ND
4/30/16	ND	ND	7/5/16	ND	ND
5/6/16	ND	ND	7/11/16	ND	ND
5/12/16	ND	ND	7/11/16	ND	ND
5/18/16	ND	ND	7/17/16	ND	ND
5/24/16	ND	ND	7/23/16	0.61	ND
5/30/16	ND	ND	7/29/16	0.08	ND
6/5/16	ND	ND	8/4/16	0.18	ND
6/11/16	ND	ND	8/10/16	ND	ND
6/17/16	ND	0.65	8/16/16	ND	ND
6/23/16	ND	ND	8/22/16	0.03	ND
6/29/16	ND	ND	8/28/16	ND	2.90
7/5/16	ND	ND	9/3/16	0.07	0.23
7/11/16	ND	ND	9/9/16	ND	ND
7/17/16	ND	ND	9/15/16	ND	ND
7/23/16	ND	ND	9/21/16	ND	ND
7/29/16	ND	ND	9/27/16	ND	ND
8/4/16	0.03	ND	10/3/16	ND	ND
8/10/16	ND	ND	10/9/16	ND	ND
8/16/16	0.06	ND	10/15/16	ND	ND
8/22/16	0.14	ND	10/21/16	ND	ND
8/28/16	0.07	ND	10/27/16	ND	ND
9/3/16	ND	ND	11/8/16	ND	ND
9/9/16	0.11	ND	11/14/16	ND	ND
9/15/16	1.70	0.11	11/20/16	ND	ND
9/21/16	0.16	ND	11/26/16	ND	ND
9/27/16	0.79	0.30	12/2/16	ND	ND

10/3/16	0.15	ND	12/8/16	ND	ND
10/9/16	0.93	1.06	12/14/16	ND	ND
10/15/16	0.11	0.66	12/20/16	ND	ND
10/21/16	ND	0.95	12/26/16	ND	ND
10/27/16	ND	0.16			
11/2/16	ND	0.32			
11/8/16	ND	ND			
11/14/16	ND	ND			
11/20/16	ND	ND			
11/26/16	ND	ND			
12/2/16	ND	ND			
12/8/16	ND	ND			
12/20/16	ND	ND			
12/26/16	ND	ND			

APPENDIX B
RESULTS OF INDIVIDUAL CHLOROPICRIN SAMPLES FOR 2010 - 2016

Santa Maria		Camarillo/Oxnard		Ohlone	
Date	Chloropicrin Concentration (ppb)	Date	Chloropicrin Concentration (ppb)	Date	Chloropicrin Concentration (ppb)
8/5/14	ND	8/5/14	0.03	8/5/14	ND
8/6/14	ND	8/6/14	0.03	8/6/14	ND
8/10/14	ND	8/10/14	0.13	8/11/14	ND
8/12/14	ND	8/12/14	0.07	8/12/14	0.01
8/17/14	0.03	8/17/14	0.12	8/18/14	0.03
8/18/14	ND	8/18/14	0.12	8/21/14	0.01
8/24/14	0.10	8/24/14	0.15	8/25/14	0.02
8/25/14	0.05	8/25/14	0.12	8/28/14	0.06
8/26/14	0.14	8/26/14	0.17	9/2/14	0.01
9/2/14	0.02	9/2/14	0.80	9/7/14	0.05
9/3/14	0.03	9/3/14	0.05	9/10/14	0.12
9/7/14	0.28	9/7/14	0.10	9/11/14	0.05
9/11/14	0.23	9/11/14	0.09	9/13/14	0.01
9/17/14	0.30	9/17/14	0.17	9/15/14	0.05
9/18/14	0.23	9/18/14	0.11	9/19/14	0.01
9/23/14	0.30	9/23/14	0.09	9/21/14	0.03
9/25/14	0.56	9/25/14	0.16	9/24/14	0.03
9/29/14	0.57	9/29/14	0.01	9/25/14	0.03
10/2/14	0.30	10/2/14	0.02	9/29/14	0.08
10/5/14	1.05	10/5/14	0.02	10/2/14	0.06
10/7/14	0.59	10/8/14	0.02	10/5/14	0.14
10/8/14	0.52	10/12/14	ND	10/9/14	0.08
10/12/14	0.47	10/13/14	0.02	10/14/14	0.17
10/13/14	0.40	10/16/14	0.01	10/17/14	0.20
10/15/14	0.38	10/20/14	0.01	10/20/14	0.07
10/20/14	0.04	10/23/14	ND	10/21/14	0.05
10/23/14	0.11	10/26/14	ND	8/9/15	ND
10/26/14	0.03	10/29/14	ND	8/12/15	ND
10/29/14	0.43	8/10/15	0.09	8/16/15	0.05
8/10/15	0.00	8/12/15	0.18	8/20/15	0.07
8/12/15	0.16	8/15/15	0.04	8/24/15	0.07
8/15/15	ND	8/18/15	0.06	8/25/15	0.10
8/18/15	ND	8/22/15	0.17	8/30/15	0.05
8/22/15	ND	8/24/15	0.30	9/2/15	0.02
8/24/15	ND	8/30/15	0.29	9/8/15	0.10
8/30/15	0.01	9/2/15	0.04	9/9/15	0.10
9/2/15	0.08	9/6/15	0.46	9/12/15	0.02
9/6/15	0.48	9/7/15	0.78	9/16/15	0.08

9/7/15	0.34	9/14/15	0.03	9/20/15	0.06
9/14/15	0.08	9/15/15	0.04	9/21/15	0.08
9/15/15	0.61	9/20/15	0.10	9/27/15	0.05
9/20/15	0.11	9/23/15	0.03	9/30/15	0.05
9/23/15	0.46	9/26/15	0.02	10/5/15	0.24
9/26/15	0.09	9/29/15	0.04	10/6/15	0.08
9/29/15	0.48	10/5/15	ND	10/11/15	0.28
10/5/15	0.51	10/6/15	0.02	10/17/15	1.00
10/6/15	0.60	10/11/15	0.01	10/22/15	0.12
10/11/15	0.78	10/14/15	ND	10/25/15	0.15
10/14/15	0.08	10/17/15	0.00	10/28/15	0.13
10/17/15	0.34	10/19/15	ND	11/1/15	0.05
10/19/15	0.15	10/26/15	0.01	11/3/15	0.07
10/26/15	0.08	10/28/15	ND	11/8/15	0.02
10/28/15	0.03	11/1/15	ND	11/11/15	0.05
11/1/15	0.01	11/4/15	ND	11/16/15	0.01
11/4/15	0.00	11/7/15	ND	11/17/15	0.03
11/7/15	0.00	11/10/15	ND	8/30/16	ND
11/10/15	0.02	11/30/15	ND	9/8/16	0.07
11/16/15	ND			9/12/16	0.07
8/30/16	0.07			9/20/16	0.07
9/7/16	0.07			9/27/16	0.06
9/14/16	0.20			10/3/16	0.26
9/21/16	0.07			10/11/16	0.07
9/29/16	0.63			10/17/16	0.07
10/5/16	0.18			10/25/16	0.34
10/13/16	0.13			11/1/16	0.07
10/19/16	0.21			11/7/16	ND
10/27/16	0.07			11/13/16	ND
11/3/16	0.07			11/21/16	ND
11/9/16	ND			11/29/16	ND
11/17/16	ND			12/5/16	ND
11/22/16	ND			12/20/16	ND
11/30/16	ND				
12/7/16	ND				
12/14/16	ND				
12/17/16	ND				
12/20/16	ND				