Toxic Air Contaminant Program Monitoring Results for Methyl Bromide, 1,3-Dichloropropene, and Chloropicrin 2010-2017

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By

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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 Oxnard[1] and Santa Maria. The two volatile organic compound (VOC) pesticides, methyl bromide (MeBr) and 1,3-dichloropropene (1,3-D), were collected for periods of 24 hours (h) once per week 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 MeBr and 1,3-D continues in Oxnard and Santa Maria until at least the end of 2018. Additionally, MeBr and 1,3-D ambient air monitoring in Watsonville was added to DPR's TAC program starting January 2012 and will continue until at least the end of 2018.

In February 2014, in addition to monitoring for MeBr 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-use fumigant monitoring for chloropicrin at two of the three sites: Santa Maria and Watsonville. Additionally, starting January 1, 2017, DPR expanded the monitoring at these two sites to include a total of 31 pesticides and 5 breakdown products (including the original three fumigants) as part of the enhanced pesticide Air Monitoring Network (AMN). Monitoring for chloropicrin at the Oxnard sampling site was not conducted in 2016 or 2017 but was conducted in 2018 as the site transitioned to an AMN sampling location.

This report includes results for MeBr and 1,3-D monitoring from all three sampling locations (Oxnard[2], Santa Maria, and Watsonville) for the 2010-2017 calendar years. Chloropicrin TAC air monitoring results from three sampling locations during the following periods are also included in this report:

- 2014: August 5 – October 29
- 2015: August 10 – December 1
- August 30, 2016 – December 31, 2017[3]

MATERIALS AND METHODS

MeBr, 1,3-D, and chloropicrin monitoring include one site in each of three communities: Oxnard, Santa Maria, and Watsonville (Figure 1). The 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 has continued uninterrupted at this location since that date. 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.

[1] Sampling site was moved from Camarillo to Oxnard on October 24, 2011.
[2] Samples from December 10, 2017 to December 31, 2017 were not collected in Oxnard due the Thomas Fire prompting closure of Rio Mesa High School (Oxnard sampling site location).
[3] Chloropicrin monitoring at the Oxnard sampling site was not conducted in 2016 or 2017.

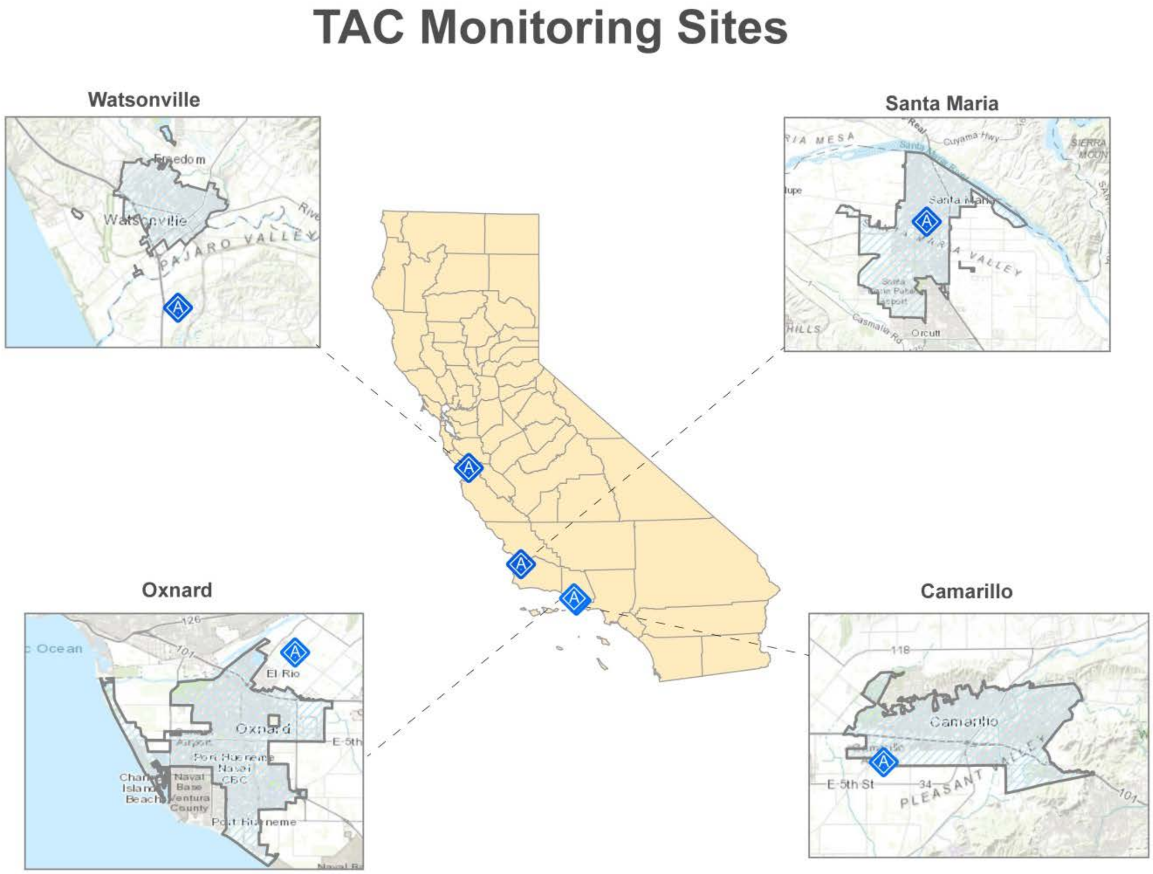

Figure 1. Map showing the three current sampling locations as well as the former site in Camarillo.

Air Sampling Equipment

Original VOC Equipment

As part of MeBr and 1,3-D sampling, air samples were collected using a Tisch Environmental® 3–Channel Canister Sampler (TE-323). The sampler was automated to collect a 24-h air sample into a SilcoCan® 6-liter (6-L) canister (Restek cat. # 24142) pre-evacuated to a pressure of -30”Hg. Air sample collection occurred once per week. Sample collection would automatically commence at 00:00 (midnight) and would automatically be terminated at 23:59 of the sampling day. Bios Defender 530® or DC-Lite® flow standards were used to check the flow rate at the start of the sampling period.

The original TAC sampling equipment was used to collect 24-h canister air samples at Oxnard (2010-2017), Santa Maria (2010-2016), and Watsonville (2010-2016). A total of 1,217 air canister samples from October 10, 2010 to December 31, 2016 were collected with the original VOC equipment. Canister air samples were analyzed for 1,3-D and MeBr. Canister samples were transported by vehicle to the ARB Organics Laboratory Section (OLS) laboratory in Sacramento for analysis.

New VOC Equipment

Beginning on January 1, 2017, sampling collection equipment at Santa Maria and Watsonville was upgraded when DPR took over the monitoring at these two sampling locations. As part of the new sampling procedures at these two sites, ambient air was drawn into a 6-L SilcoCan canister (Restek cat. # 24142) pre-evacuated to a pressure of -30”Hg. A Xonteck Model 901 ambient air sampler was attached to the canister inlet to achieve a flow rate of 7.5 mL/min (± 10%) for a continuous 24-h period. The

Xonteck Model 901 sampler included an automatically initiated 60-second purge period to clear the sampling lines immediately prior to sample collection. Bios Defender 530® or DC-Lite® flow standards were used to check the flow rate at the start of the sampling period.

The new VOC equipment collected a total of 164 air canister samples from January 1, 2017 to December 31, 2017, which were analyzed for 1,3-D and MeBr. Canister samples were transported by vehicle to the ARB OLS laboratory in Sacramento for analysis.

Chloropicrin

Chloropicrin samples were collected onto 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). Starting in 2016, DPR took over the monitoring for chloropicrin at the TAC sites. Additionally, the analytical laboratory changed from the ARB OLS laboratory to the California Department of Food and Agriculture (CDFA) Center for Analytical Chemistry (CAC) laboratory. Although both OLS and CAC laboratories quantify the amount of chloropicrin that was measured in the individual air samples collected, their analytical methods are slightly different and the changing from one laboratory to another required a slight alteration to collection procedures. Therefore, during the 2016 monitoring period, the 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. After each sampling collection, all tubes were capped, labeled, and transported in an insulated container under dry ice (-78.5° C).

A total of 307 XAD sorbent tubes were collected from 2014-2017 and analyzed for chloropicrin. Of the 307 XAD sorbent tubes collected, 83 were collected in 2014, 87 in 2015, 34 in 2016, and 103 in 2017.

Analytical Methods

1,3-Dichloropropene and Methyl Bromide

Air canisters were analyzed for MeBr and 1,3-D using the method described by ARB (2000). This gas chromatographic method utilizes an automated sample concentrator, capillary gas chromatography, and ion trap mass spectrometry. While transitioning from a TAC to an AMN monitoring configuration, air canisters from Santa Maria and Watsonville were analyzed by CDFA's CAC laboratory. The primary difference between the laboratory analytical methods is that the reporting limits established by the CAC laboratory for 1,3-D and MeBr are lower than those established by the ARB OLS laboratory (Table 1).

Chloropicrin

During the 2014 and 2015 monitoring periods, XAD-4 sorbent tubes were analyzed by the ARB OLS laboratory using the method described by ARB (2001). During the 2016 and 2017 monitoring periods XAD-4 sorbent tubes were analyzed by the CDFA CAC laboratory using the method described by CDFA (1999).

Laboratory Analytical Limits

ARB's OLS laboratory reports measured air concentrations in relation to an established analytical reporting limit (RL), which 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 analytical limits for each analyte.

For chloropicrin, CDFA CAC laboratory reports analytical results in relation to a method detection limit (MDL) and limit of quantitation (LOQ) for samples taken in 2016 and 2017. The LOQ, a separate value, is the level at which concentrations may be reliably measured and is set at a certain factor above the MDL. The level of interference determines the magnitude of this factor; the greater the interference, the higher the factor. Trace concentrations of chloropicrin refer to measured air concentrations at a level above the MDL but below the LOQ. For values reported as trace detections, an adjusted concentration equal to the average of the MDL and LOQ is used when calculating 90-day rolling average concentrations.

Table 1. Analytical limits for each analyte based on analytical laboratory.

<table>
<tr><th colspan="3">CDFA CAC Laboratory Analytical Limits</th><th colspan="2">ARB OLS Laboratory Analytical Limits</th></tr>
<tr><th>Pesticide</th><th>MDL (ppb)</th><th>LOQ (ppb)</th><th>Pesticide</th><th>RL (ppb)</th></tr>
<tr><td>Chloropicrin (2016 & 2017)</td><td>0.017</td><td>0.068</td><td>Chloropicrin (2014 & 2015)</td><td>0.003</td></tr>
<tr><td>MeBr</td><td colspan="2">0.01</td><td>MeBr</td><td>0.03</td></tr>
<tr><td>1,3-D</td><td colspan="2">0.01</td><td>1,3-D</td><td>0.10</td></tr>
</table>

Health Evaluation Methods

No state or federal agency has established regulatory human 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, so that measured air concentrations can be compared to health screening levels or regulatory targets to place the results in a health-based context.

These health screening levels, 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. Health screening levels vary by pesticide and exposure period. For example, the screening level for a 24-h 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 its risk assessment, as well as risk assessments from other agencies, pesticide use patterns, potential effects on use of alternative pesticides, and other factors. Regulatory targets 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 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 24-h exposure is different than the regulatory target for a 1-year exposure. Table 2 lists the monitoring period, screening level, regulatory target and potential health effects for 1,3-D, MeBr, and chloropicrin.

Table 2. 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
	90 days	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
	90 days	0.35	-	Nose tissue damage
	1 year	0.27	-	Lung damage

Invalid Samples

Of the 1,380 air canister samples collected since 2010, a total of 68 were invalid: 31 invalid samples were taken from Watsonville, 17 invalid samples were taken from Oxnard, and 20 invalid samples were taken from Santa Maria. Invalid samples were due to one of the following reasons: an ending pressure outside the accepted criteria; power failure during sample extraction; sampler malfunction; or sample leakage during transit. The invalid air samples were not replaced.

There were no chloropicrin samples reported by the laboratory as invalid from any site for any year. However, one chloropicrin sample was lost due to a power outage resulting from a storm at Watsonville and DPR was unable to take a make-up sample.

RESULTS

Quality Control Samples

Laboratory matrix spikes and matrix blanks were included with every set of samples extracted and analyzed at the laboratory 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.

1,3-Dichloropropene

None of the laboratory matrix blank samples showed any 1,3-D concentrations (Table 3). Co-located duplicate air canister samples were collected as part of the QC process, with absolute percent differences ranging from 0.0% to 0.2% for all *cis*-isomer samples and 0.0% to 8.7% for all *trans*-isomer samples (data not shown). For field spike samples, average 1,3-D recovery was 130.8% for cis-isomer samples and 129.3% on average for trans-isomer.

Methyl Bromide

Recovery of MeBr from laboratory spikes was within the tolerance set by the ARB OLS laboratory as none of the laboratory matrix blank samples showed any MeBr concentrations (Table 3). Co-located duplicate air canister samples were collected as part of the QC process, with all samples resulting in nondetections. However, the percent recovery for the field MeBr spike samples was outside acceptable control limits set by the ARB OLS laboratory (Tables 3 and 4). As shown in Table 4, MeBr field spike samples from 2017 had an average recovery of only 8.6% (n = 21). The low recovery percent of these field spike samples can indicate possible issues affecting MeBr field spike samples. These issues may include: spiking procedure problems, laboratory extraction problems, storage instability, transportation issues, and field handling among others. Therefore, DPR requested ARB OLS laboratory to conduct an extensive investigation into the cause of the low spike recoveries. Their preliminary analysis indicates that the spiking procedure and the laboratory water management system for the analytical detector affected the field spike samples and may not necessarily impact the field samples. The ARB OLS laboratory will provide DPR with a complete evaluation in a later report.

<u>Chloropicrin:</u>

None of the laboratory matrix blank samples showed any chloropicrin concentrations. Co-located duplicate XAD sorbent tube samples were collected as part of the QC process, with the single quantifiable detection resulting in an absolute percent difference of 0.0%. For field spike samples, average chloropicrin recovery was 108% (Table 3).

Table 3. Average percent recovery of field spike samples collected in 2017.

Chemical	Average Field Spike Recovery Percent
cis-1,3-dichloropropene	131%
trans-1,3-dichloropropene	129%
Methyl bromide	8.6%
Chloropicrin	108%

Table 4. Average percent recovery of field spike samples collected per year.

Year	*cis*-1,3-dichloropropene	*trans*-1,3-dichloropropene	Methyl bromide	Chloropicrin
2010	93% (n = 5)	95% (n = 5)	(n = 0)	NA
2011	112% (n = 15)	116% (n = 15)	102% (n = 4)	
2012	110% (n = 36)	118% (n = 36)	99% (n = 36)	
2013	104% (n = 30)	104% (n = 30)	95% (n = 30)	
2014	104% (n = 26)	106% (n = 26)	98% (n = 26)	138% (n = 9)
2015	113% (n = 33)	122% (n = 33)	104% (n = 33)	159% (n = 9)
2016	114% (n = 33)	118% (n = 33)	91% (n = 33)	98% (n = 5)
2017	131% (n = 21)	129% (n = 21)	8.6% (n = 21)	108% (n = 7)
All Years	**111% (n = 199)**	**115% (n = 199)**	**89% (n = 183)**	**130% (n = 30)**

Counts and comparison of detections

A total of 1,312 valid air canister samples were collected from all three sampling locations for the 2010-2017 calendar years. Each air canister sample was then analyzed for MeBr and 1,3-D[4]. A total of 2,623 analyses were performed for all three sampling locations for the 2010-2017 calendar years. Of the 2,623 analyses, 2,039 (77.7%) contained no detectable amount, while 584 (22.3%) contained concentrations above the RL.

A total of 307 XAD sorbent tubes were collected over the combined 2014, 2015, 2016, and 2017 sampling periods, with each sample analyzed for chloropicrin. Of the 307 analyses for chloropicrin, 122 (39.7%) contained no detectable amount and were below the MDL. Of the 307 analyses, 185 (60.3%) contained detections above the LOQ (quantifiable), while an additional 24 (7.8%) were at trace levels (detected, but not quantifiable).

Table 5 lists the number of detections for 1,3-D and MeBr at each sampling location, while Table 6 lists the number of detections per sampling location for chloropicrin. Because monitoring at Camarillo was for a very limited duration, the focus here is on the three sites with continuous monitoring. The highest percentage of quantifiable detections for 1,3-D was in Watsonville with 16.4 % of samples resulting in a detection. This was followed by Santa Maria with 16.2% of all samples resulting in a detection. Similarly, for MeBr, Santa Maria had the highest percentage of quantifiable detections (32.7%), followed by Watsonville with 23.7% quantifiable detections.

Table 5. Total number of 1,3-dichloropropene and methyl bromide detections for sampling years 2010-2017 by location.

Location	Number of possible detections	Total number of quantifiable detections	Percent of quantifiable detections (%)
1,3-Dichloropropene			
Santa Maria[1]	468	76	16.2%
Camarillo[2]	65	16	24.6%
Oxnard[3]	402	35	8.7%
Watsonville[4]	377	62	16.4%
Methyl Bromide			
Santa Maria[1]	468	153	32.7%
Camarillo[2]	65	41	63.1%
Oxnard[3]	402	76	18.9%
Watsonville[4]	376	89	23.7%

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, Oxnard had the highest percentage of total detections (77.2%) and quantifiable detections (77.2%), followed by Watsonville with 59.0% total and 48.4% quantifiable detections. The values for chloropicrin detections, totaled across all monitoring periods, are presented in Table 6.

[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.

Table 6. Total number of chloropicrin detections for sampling years 2010 - 2017 by 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]	128	69	53.9%	58	45.3%
Oxnard[2]	57	44	77.2%	44	77.2%
Watsonville[1]	122	72	59.0%	59	48.4%

1 - Sampling occurred 8/5/14-10/29/14, 8/10/15-12/1/15, and 8/30/16-12/31/17

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

Table 7 compares detections grouped by year for the three air sampling locations from 2014 – 2017 for chloropicrin, while Table 8 compares detections grouped by year for the three air sampling locations from 2010 – 2017 for MeBr and 1,3-D. The highest percentage of chloropicrin total detections (93.1%) in 2015 occurred in Watsonville. Watsonville also contained the highest percentage of quantifiable detections for 1,3-D (20.4%) among all sampling locations (Table 8). MeBr was not detected at any TAC site in 2017 (Table 8).

Table 7. Comparison of chloropicrin detections by 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 detections	55.6%	-	56.3%
Percentage of quantifiable detections	27.8%	-	18.8%
	2017		
Possible detections	52	-	51
Percentage of detections	21.6%	-	25.5%
Percentage of quantifiable detections	9.6%	-	11.8%

1 - Sampling occurred 8/5/14-10/29/14, 8/10/15-12/1/15, and 8/30/16-12/31/17

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

Table 8. Comparison of 1,3-dichloropropene and methyl bromide detection by 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%
2017								
Possible detections	45	-	56	49	45	-	56	49
Percentage of quantifiable detections	13.3%	-	8.8%	20.4%	0%	-	0%	0%

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

Acute Concentrations

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

Figures 2 - 4 show the 24-h 1,3-D concentration from all three sampling locations over time. The highest 24-h concentration detected for 1,3-D for all sampling years was 8.7 ppb at Oxnard in August 2015.

Figures 5 - 7 show the 24-h MeBr concentration from all three sampling locations over time. The highest 24-h concentration detected for MeBr for all sampling years was 8.7 ppb at Oxnard in July 2014.

Figures 8 - 10 show the 24-h chloropicrin concentration from all three sampling locations over time. The highest 24-h concentration detected for chloropicrin for all sampling years was of 1.1 ppb at Santa Maria in October 2014.

Table 7. Highest 24-h concentration for all sampling years by location.

Location	Highest 24-h 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 – Sampling occurred 8/5/14-10/29/14, 8/10/15-12/1/15, and 8/30/16-12/31/17
6 – Data is for the sampling period of high use only (2014: 8/5 – 10/31; 2015: 8/10-12/1)

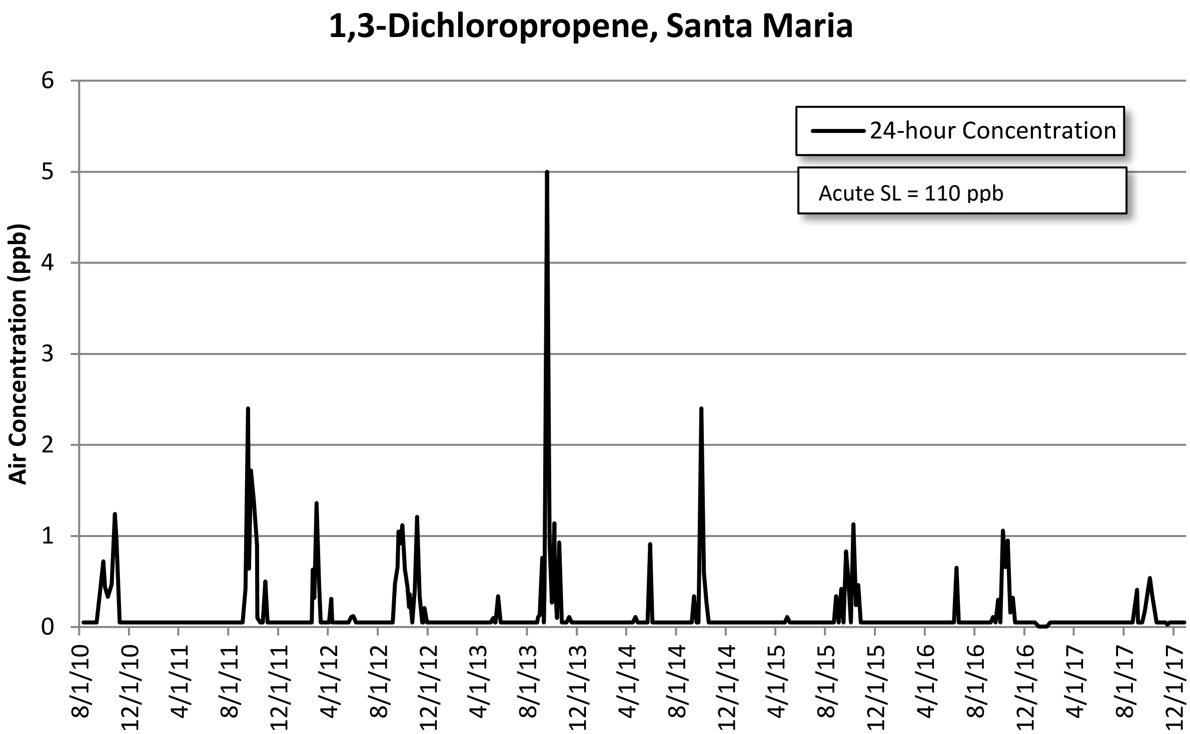

Figure 2. 24-hour concentrations of 1,3-dichloropropene in Santa Maria.

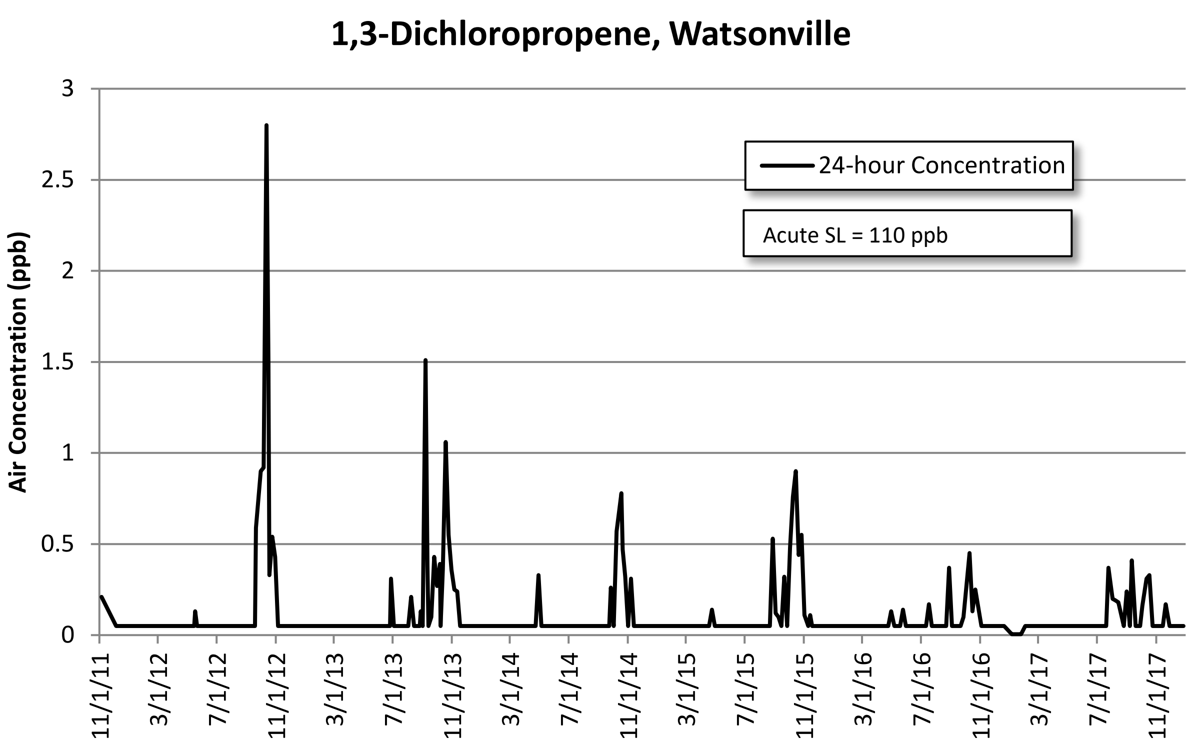

Figure 3. 24-hour concentrations of 1,3-dichloropropene in Watsonville.

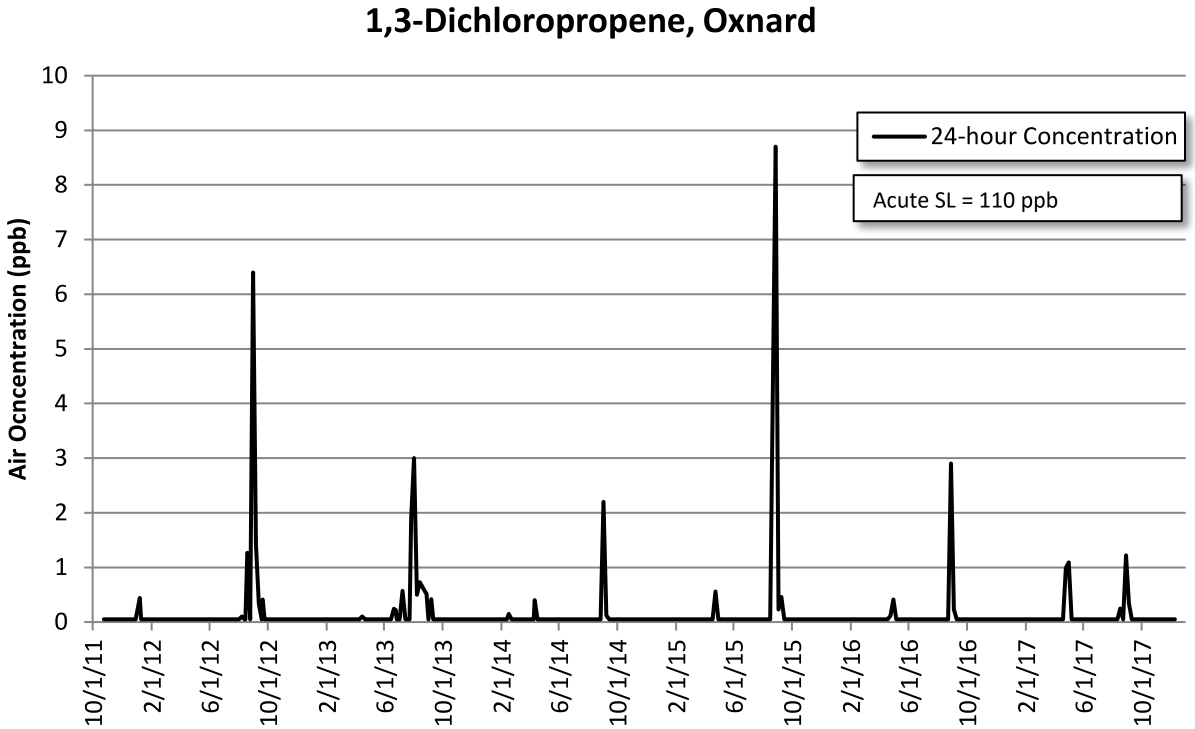

Figure 4. 24-hour concentrations of 1,3-dichloropropene in Oxnard.

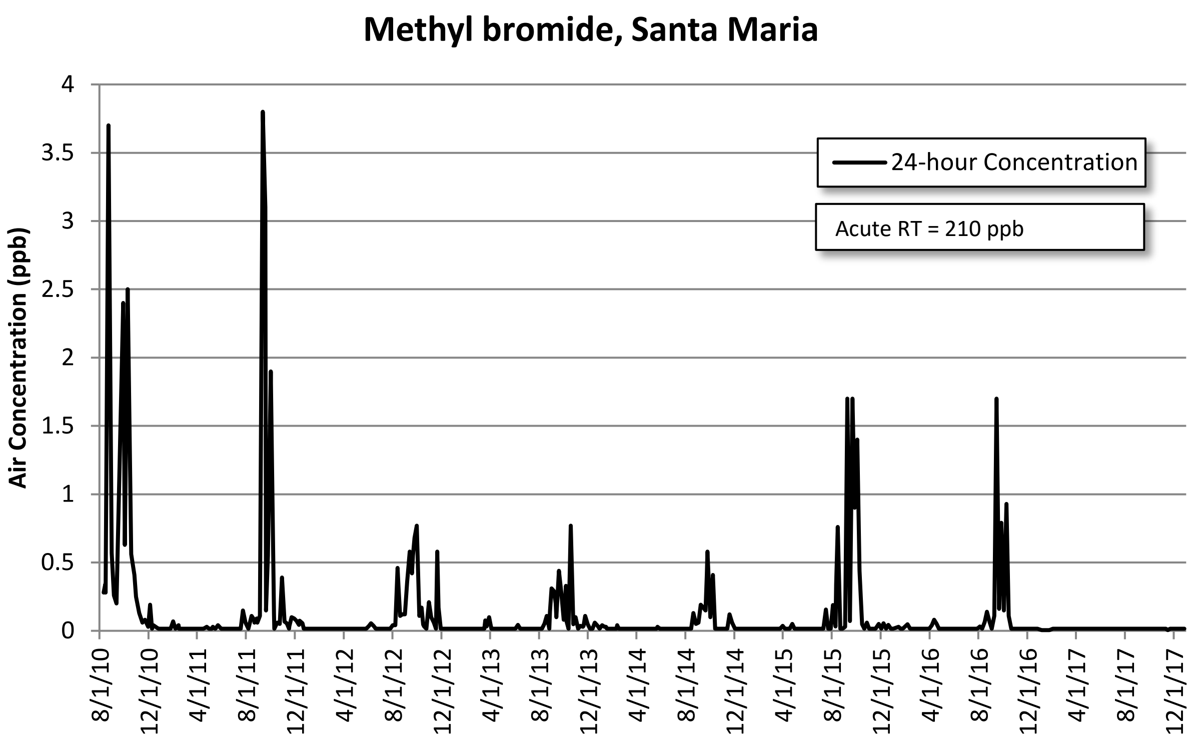

Figure 5. 24-hour concentrations of methyl bromide in Santa Maria.

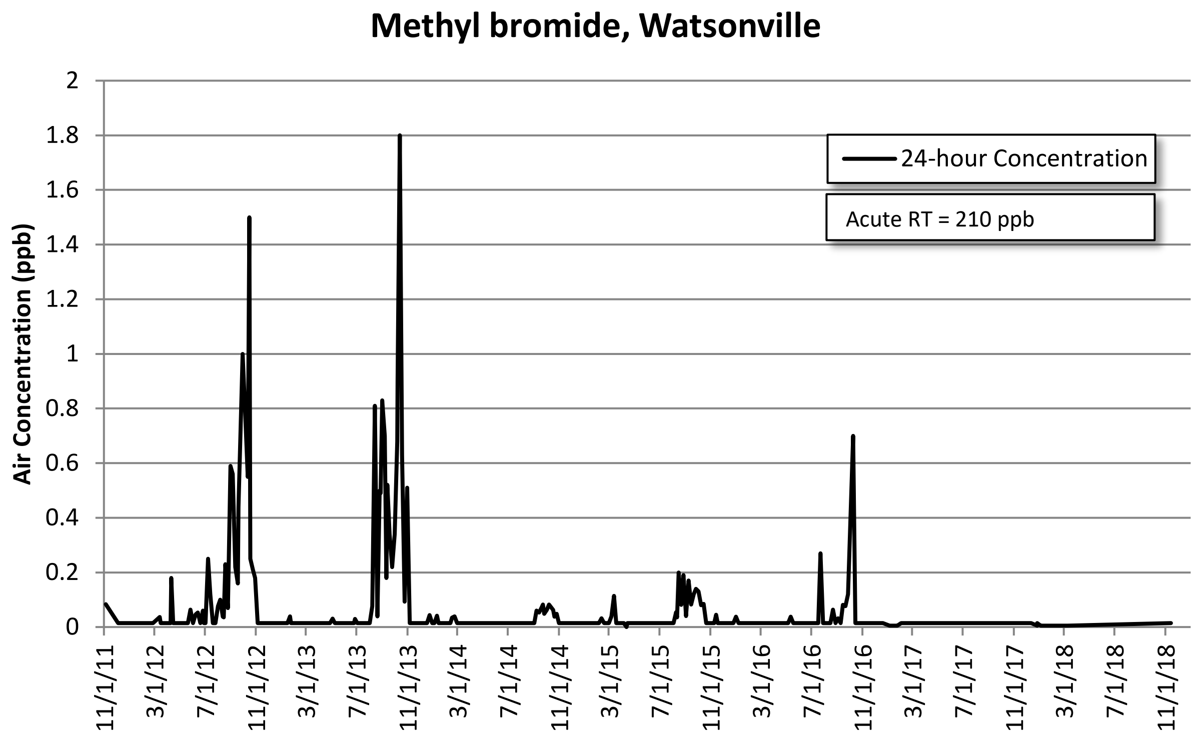

Figure 6. 24-hour concentrations of methyl bromide in Watsonville.

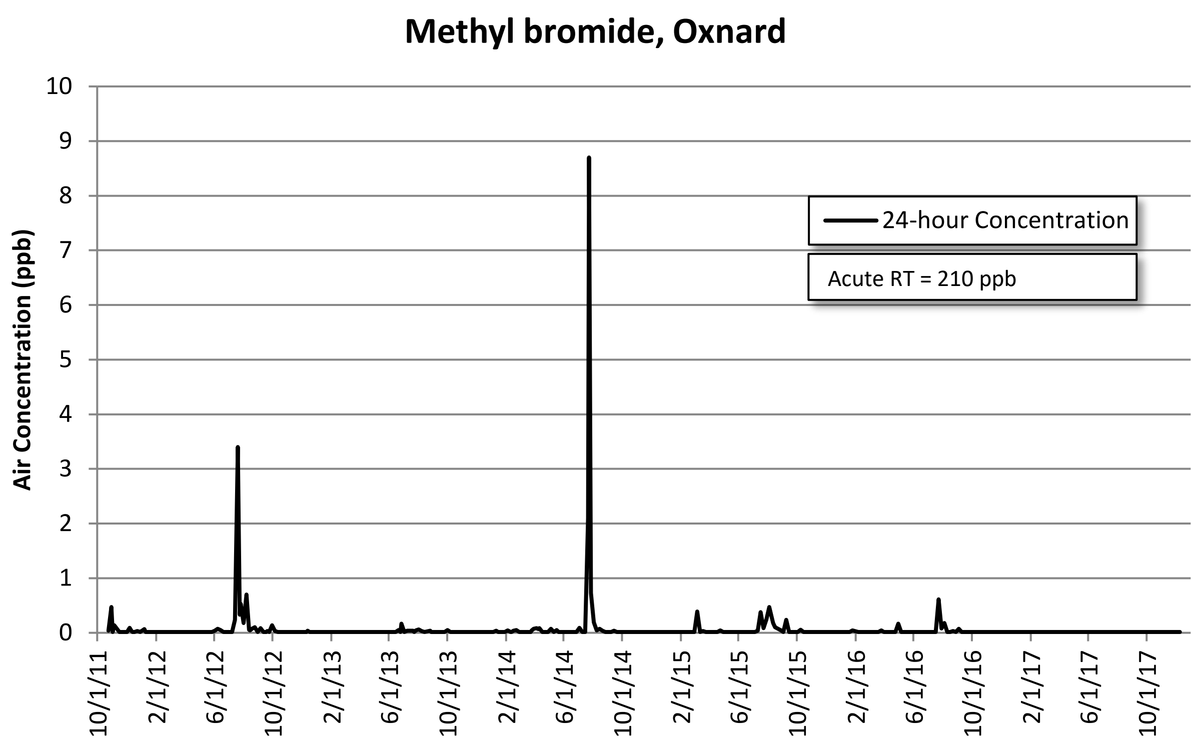

Figure 7. 24-hour concentrations of methyl bromide in Oxnard.

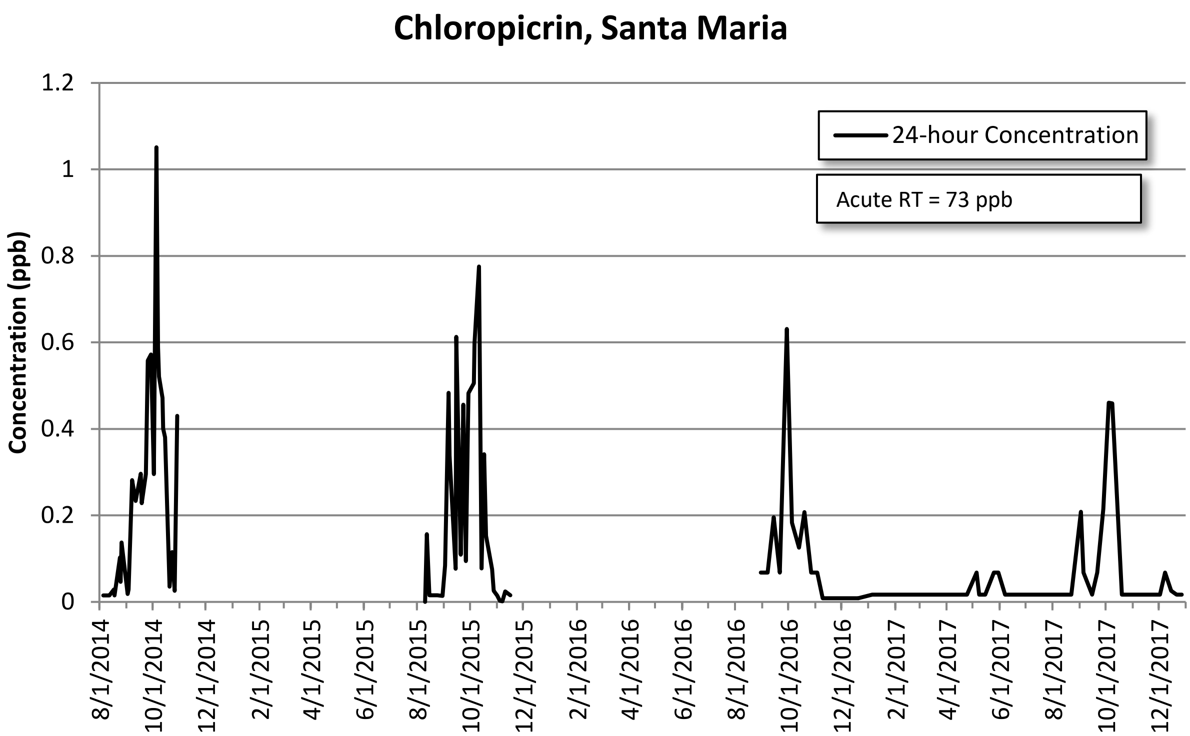

Figure 8. 24-hour concentrations of chloropicrin in Santa Maria.

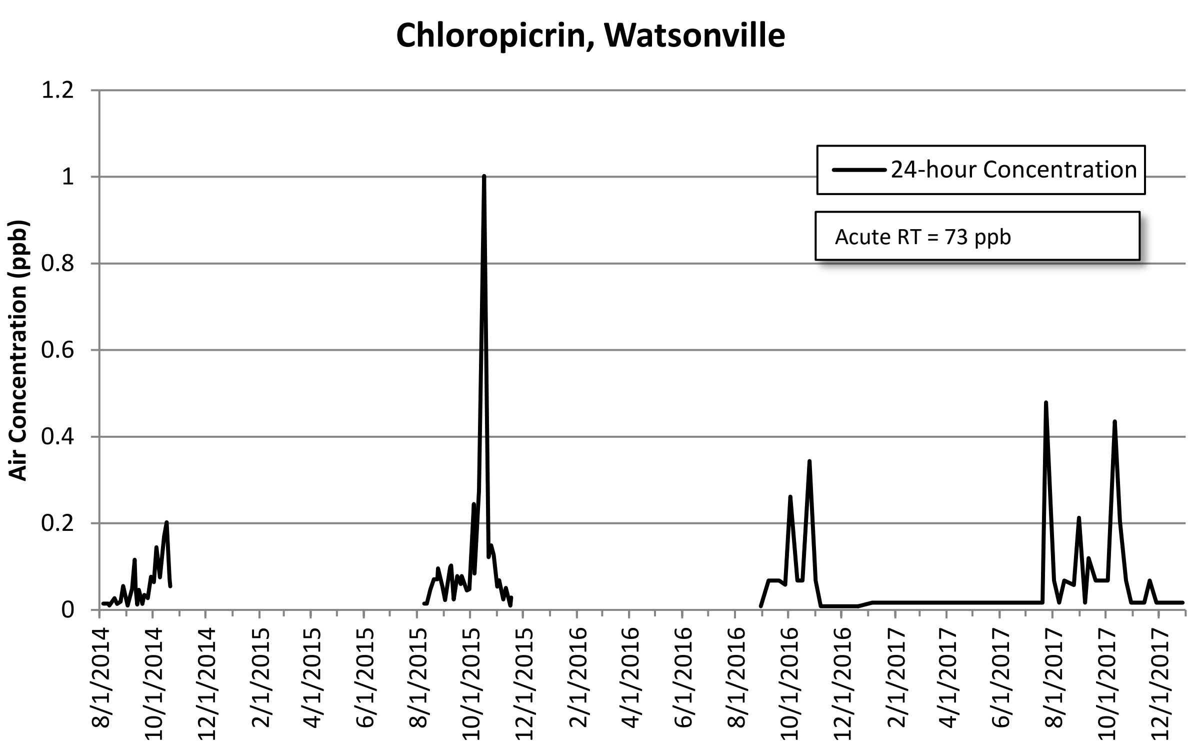

Figure 9. 24-hour concentrations of chloropicrin in Watsonville.

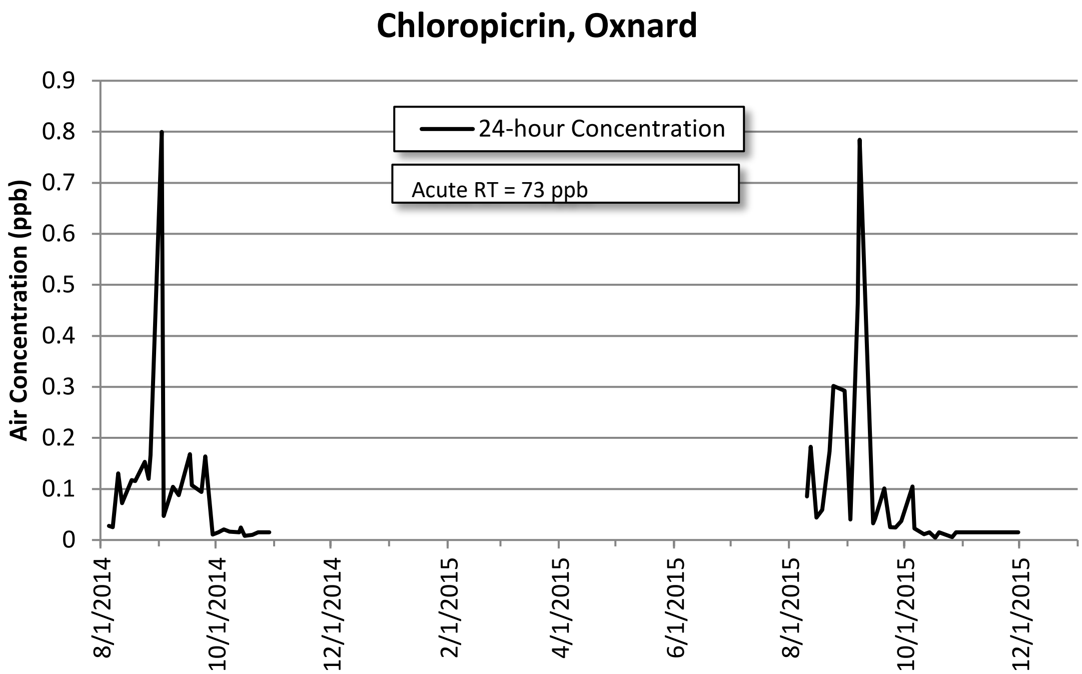

Figure 10. 24-hour concentrations of chloropicrin in Oxnard.

Detailed yearly comparisons of highest 24-h concentrations for all three sampling locations are listed in Table 10. The highest 24-h concentrations for 1,3-D and MeBr were detected in Oxnard in 2015 and 2014 with values of 8.7 ppb and 8.7 ppb, respectively. The highest 24-h concentration for chloropicrin was detected in Santa Maria in 2014 (1.1 ppb).

Table 8. Comparison of highest 24-h concentrations of 1,3-dichloropropene, methyl bromide, and chloropicrin per year by location.

Location	Highest 24-h concentration (ppb)							
	2010	2011	2012	2013	2014	2015	2016	2017
1,3-Dichloropropene								
Santa Maria	1.2	2.4	1.4	5.0	2.4	1.1	1.1	0.5
Camarillo	1.9	3.1	-	-	-	-	-	-
Oxnard	-	0.1	6.4	3.0	2.2	**8.7**	2.9	1.2
Watsonville	-	0.2	2.8	1.5	0.8	0.9	0.5	0.4
Methyl Bromide								
Santa Maria	3.7	3.8	0.8	0.8	0.6	1.7	1.7	ND
Camarillo	0.5	1.4	-	-	-	-	-	-
Oxnard	-	0.5	3.4	0.2	**8.7**	0.5	0.6	ND
Watsonville	-	0.1	1.5	1.8	0.1	0.2	0.7	ND
Chloropicrin								
Santa Maria	-	-	-	-	**1.1**	0.8	0.6	0.5
Oxnard	-	-	-	-	0.8	0.8	-	-
Watsonville	-	-	-	-	0.2	1.0	0.3	0.5

Subchronic Concentrations

Table 11 shows the highest 90-day rolling average concentrations for 1,3-D at all three sampling locations. Concentrations are presented as rolling averages. The 90-day rolling average concentrations were calculated using one-half the RL for samples with no detectable amount. The highest 90-day rolling average 1,3-D concentration (0.7 ppb) was found in Oxnard in 2015. No 1,3-D 90-day rolling average concentration from any sampling location exceeded the subchronic screening level for 1,3-D. Figures 11 - 13 present the highest 90-day rolling 1,3-D average concentrations measured at all three sampling locations.

The highest 28-day rolling average MeBr concentration (2.0 ppb) was found in Oxnard in 2014 (Table 11). No MeBr 28-day rolling average concentrations from any sampling location exceeded the subchronic regulatory target for MeBr (Table 11). Figures 12 – 16 present the highest 28-day rolling MeBr average concentrations measured at all three sampling locations.

The highest 90-day rolling average chloropicrin concentration (0.25 ppb) was found in Santa Maria in 2014. No chloropicrin 90-day rolling average concentration from any sampling location exceeded the subchronic screening level for chloropicrin. Figures 17 – 18 present the highest 90-day rolling chloropicrin average concentrations measured at Santa Maria and Watsonville.

Table 9. The highest rolling 28-day or 90-day average concentrations detected for all sampling years by location.

Location	Highest Rolling Average Concentration (ppb)	Subchronic Screening Level (ppb)	Subchronic Regulatory Target (ppb)
1,3-Dichloropropene (90-day rolling average)			
Santa Maria[1]	0.6	3	-
Camarillo[2]	0.5	3	-
Oxnard[3]	0.7	3	-
Watsonville[4]	0.5	3	-
Methyl Bromide (28-day rolling average)			
Santa Maria[1]	1.6	-	5
Camarillo[2]	0.9	-	5
Oxnard[3]	2.0	-	5
Watsonville[4]	0.8	-	5
Chloropicrin (90-day rolling average)			
Santa Maria[5]	0.25	0.35	-
Oxnard[6]	0.10	0.35	-
Watsonville[5]	0.14	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 – Sampling occurred 8/5/14-10/29/14, 8/10/15-12/1/15, and 8/30/16-12/31/17
6 – Data is for the sampling period of high use only (2014: 8/5 – 10/31; 2015: 8/10-12/1)

Table 12 lists yearly comparisons of the highest rolling average concentrations for all sampling locations. In 2015, Oxnard had the highest 90-day rolling average concentration of 1,3-D (0.71 ppb) compared to any of the other sampling locations for any sampling year included in this report. In 2014, Oxnard had the highest 28-day rolling average concentration for MeBr (1.97 ppb) compared to any of the other sampling locations or sampling years. In 2014, Santa Maria had the highest 90-day rolling average for chloropicrin (0.25 ppb) compared to any of the other sampling locations or sampling years

Table 10. Comparisons of highest 28-day or 90-day rolling average concentrations by sampling location.

Location	Highest observed rolling average concentrations (ppb)							
	2010	2011	2012	2013	2014	2015	2016	2017
1,3-Dichloropropene (90-day rolling average)								
Santa Maria[1]	0.37	0.50	0.48	0.60	0.26	0.29	0.28	0.25
Camarillo[2]	0.45	0.52	-	-	-	-	-	-
Oxnard[3]	-	-	0.62	0.54	0.19	**0.71**	0.27	0.18
Watsonville[4]	-	-	0.53	0.36	0.21	0.31	0.21	0.19
Methyl Bromide (28-day rolling average)								
Santa Maria[1]	1.52	1.60	0.56	0.26	0.30	1.15	0.75	ND (0.02)
Camarillo[2]	0.28	0.87	-	-	-	-	-	-
Oxnard[3]	-	0.15	0.90	0.05	**1.97**	0.27	0.18	ND (0.02)
Watsonville[4]	-	0.02	0.75	0.77	0.07	0.13	0.25	ND (0.02)
Chloropicrin (90-day rolling average)								
Santa Maria[5]	-	-	-	-	**0.25**	0.21	0.12	0.13
Oxnard[6]	-	-	-	-	0.10	0.10	-	-
Watsonville[5]	-	-	-	-	0.05	0.12	0.09	0.14

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 – Sampling occurred 8/5/14-10/29/14, 8/10/15-12/1/15, and 8/30/16-12/31/17
6 – Data is for the sampling period of high use only (2014: 8/5 – 10/31; 2015: 8/10-12/1)

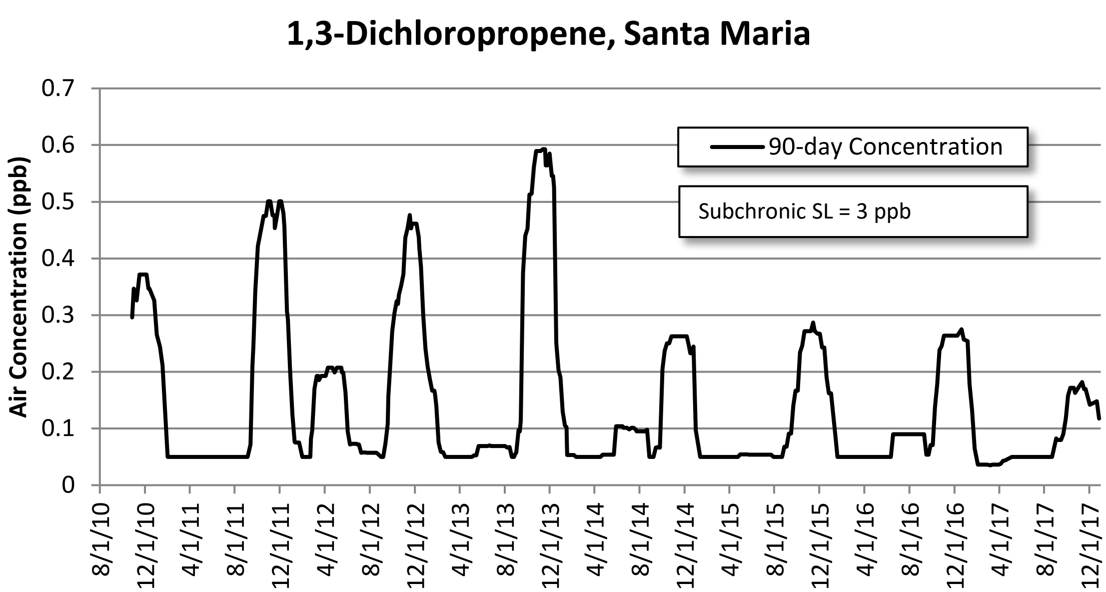

Figure 11. 90-day rolling average concentrations of 1,3-dichloropropene in Santa Maria.

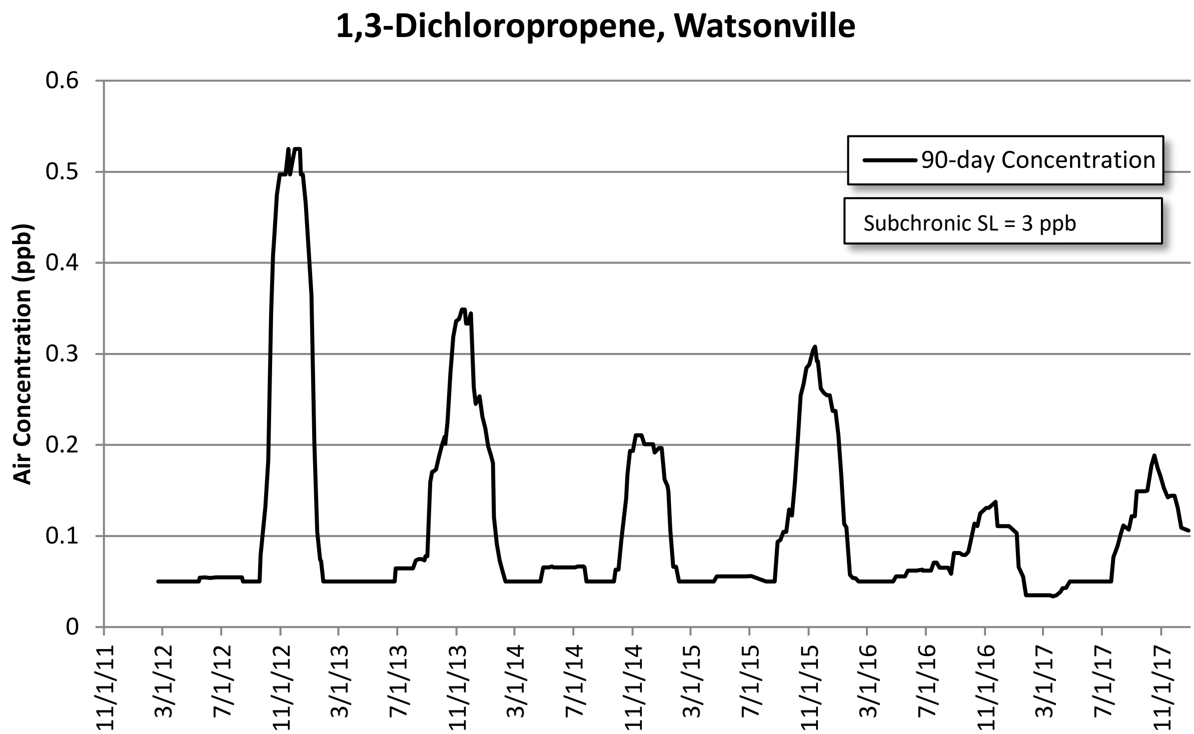

Figure 12. 90-day rolling average concentrations of 1,3-dichloropropene in Watsonville.

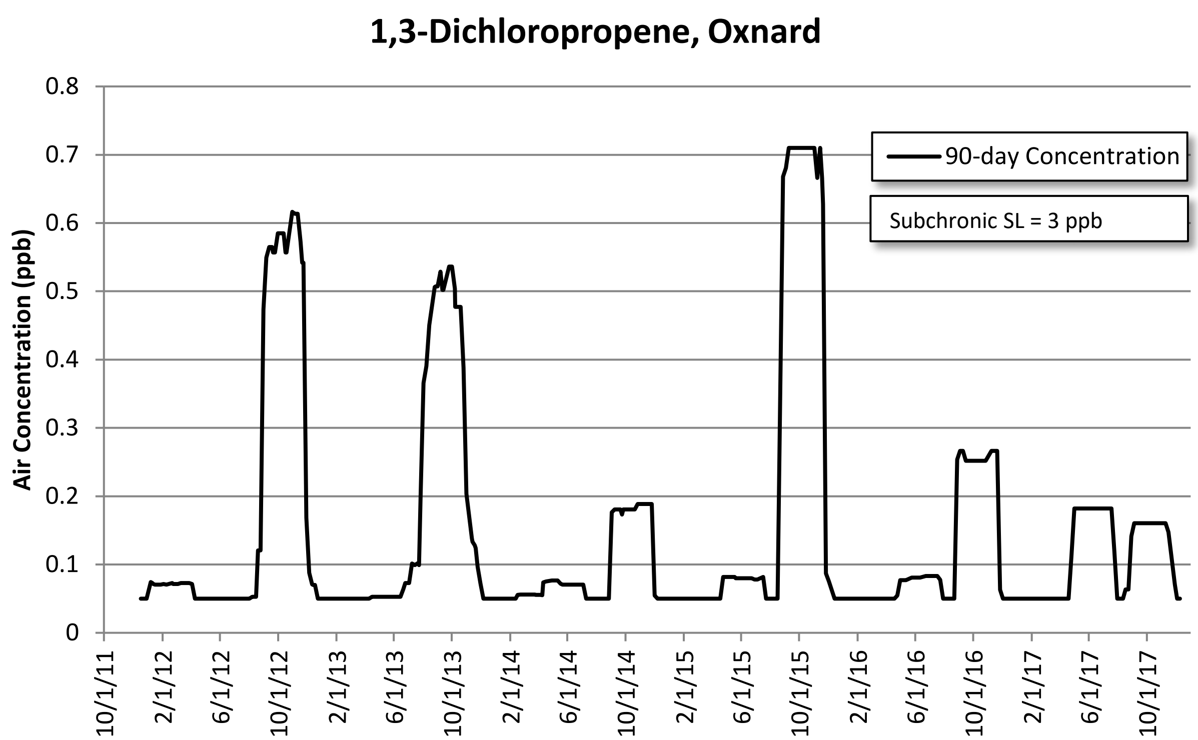

Figure 13. 90-day rolling average concentrations of 1,3-dichloropropene in Oxnard.

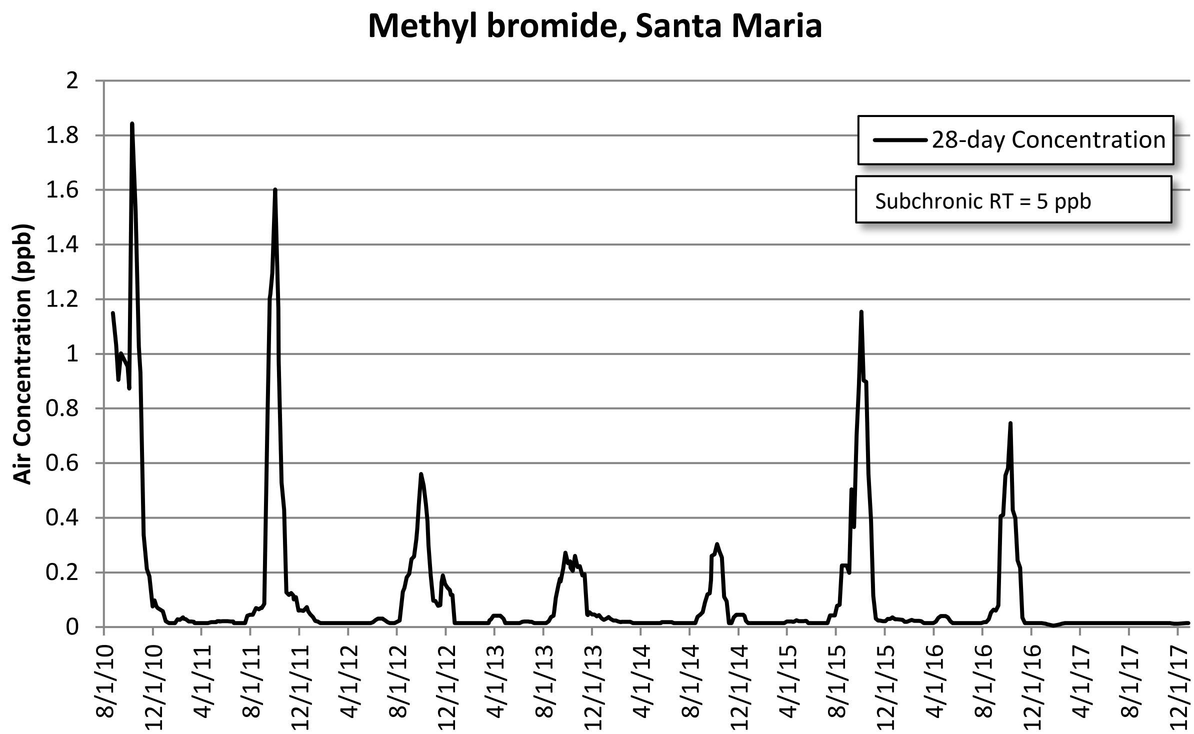

Figure 14. 28-day rolling average concentrations of methyl bromide in Santa Maria.

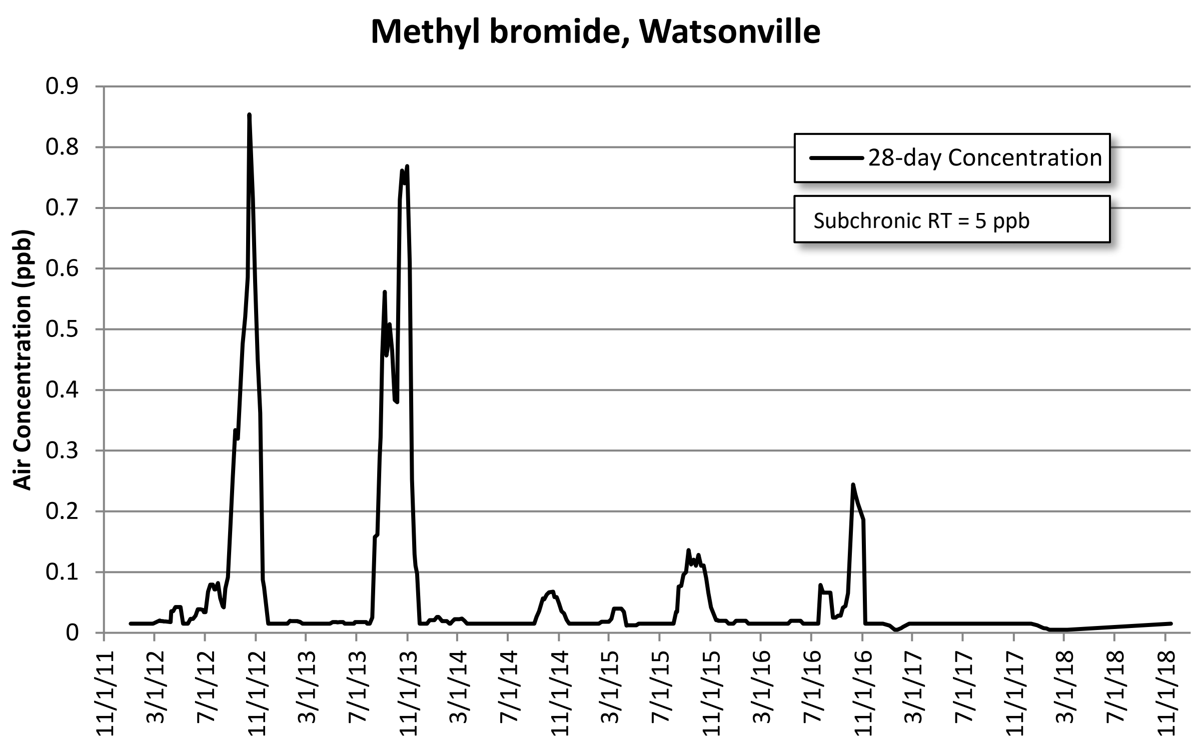

Figure 15. 28-day rolling average concentrations of methyl bromide in Watsonville.

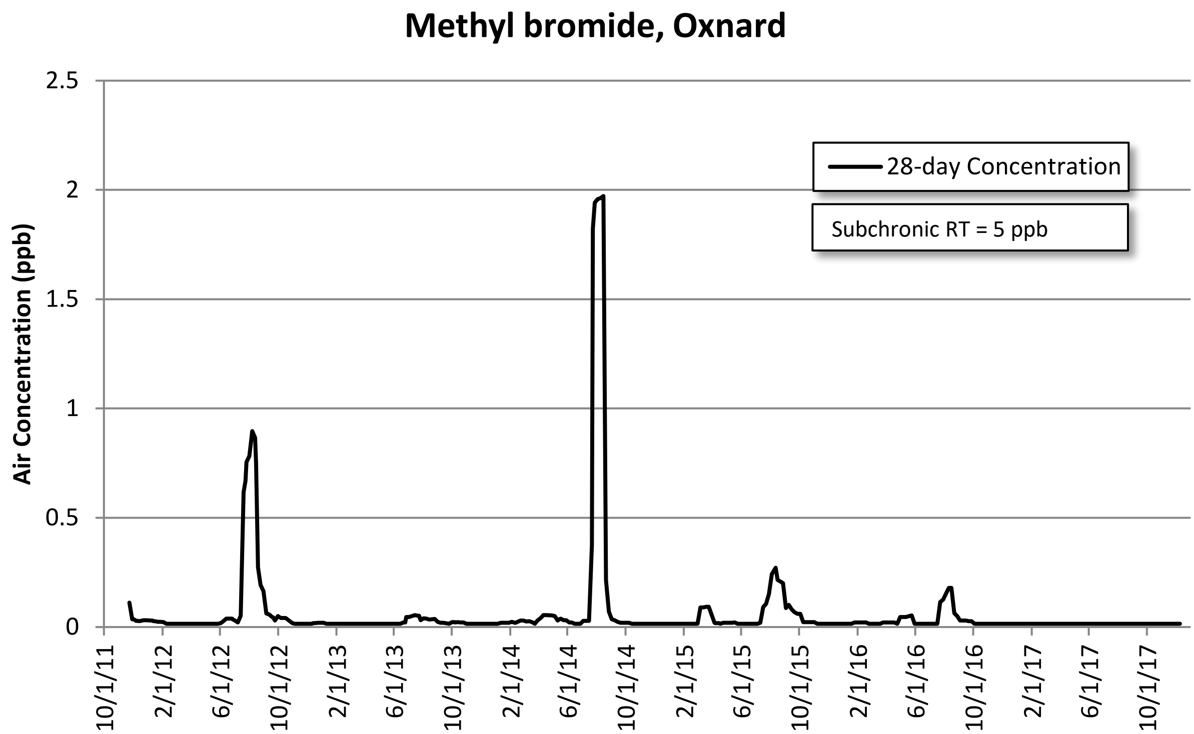

Figure 16. 28-day rolling average concentrations of methyl bromide in Oxnard.

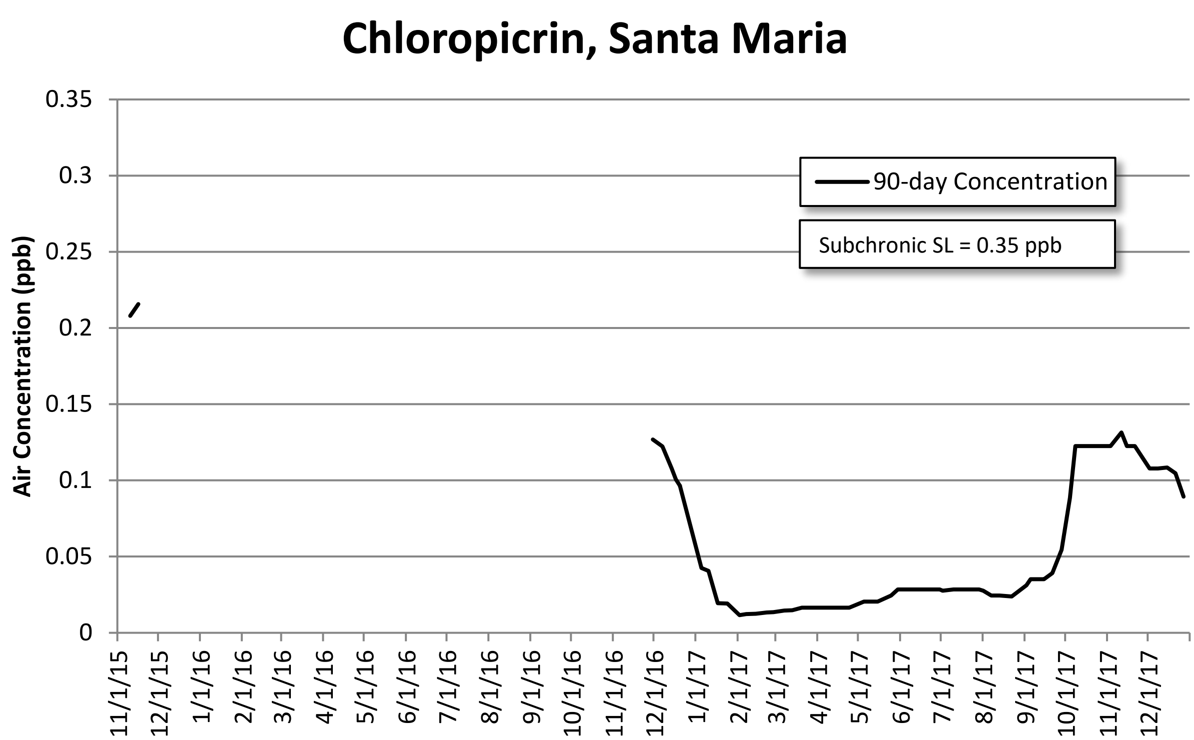

Figure 17. 90-day rolling average concentrations of chloropicrin in Santa Maria.

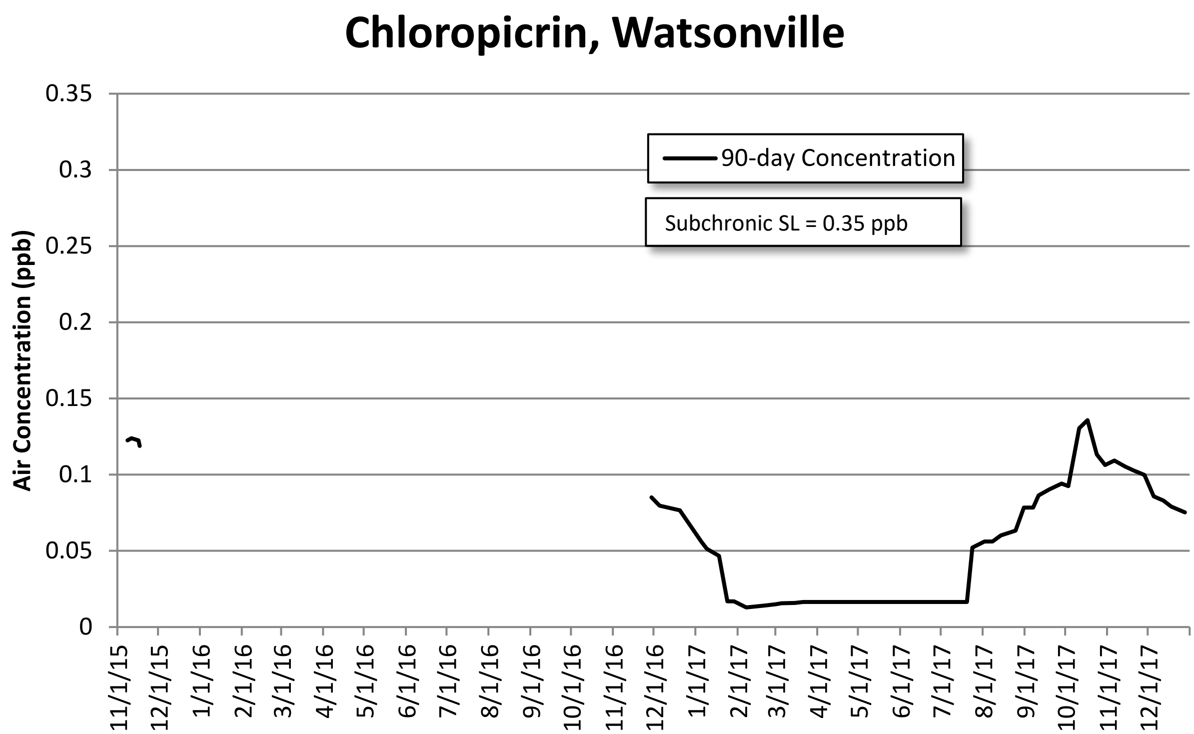

Figure 18. 90-day rolling average concentrations of chloropicrin in Watsonville.

Chronic Concentrations

Table 13 shows the 1-year average concentrations for all sampling locations for 1,3-D and MeBr in 2017. In 2017, the highest 1-year average 1,3-D concentration measured was 0.11 ppb at Oxnard. In 2017, MeBr was not detected at any TAC monitoring location. Year-round monitoring for chloropicrin occurred for the first time at the Santa Maria and Watsonville sampling locations; both sampling sites had a 1-year average concentration of 0.05 ppb.

Table 11. 1-year average air concentrations by location for sampling year 2017.

Location	1-Year Average Concentration (ppb)	Chronic Screening Level (ppb)
	1,3-Dichloropropene	
Santa Maria	0.08	2.0
Oxnard	0.11	2.0
Watsonville	0.09	2.0
	Methyl Bromide	
Santa Maria	ND (0.02)	1.0
Oxnard	ND (0.02)	1.0
Watsonville	ND (0.02)	1.0
	Chloropicrin	
Santa Maria	0.05	0.27
Watsonville	0.05	0.27

ND = Not Detected

As shown on Table 14, Santa Maria had the highest 2010-2017 average concentration for 1,3-D (0.15 ppb). Santa Maria also had the highest 2010-2017 average concentration for MeBr (0.12 ppb), although

MeBr was not detected at any site in 2017. For individual years, Oxnard had the highest 1-year average concentrations for both 1,3-D (0.21 ppb) and MeBr (0.19 ppb) in 2015 and 2014, respectively. Since 2017 marked the first instance of year-round chloropicrin monitoring at any of these sites, it is not compared to previous monitoring here.

Table 12. 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	2017	2010-2016
1,3-Dichloropropene									
Santa Maria[1]	-	0.16	0.19	0.19	0.11	0.11	0.12	0.08	0.15
Camarillo[2]	*	*	-	-	-	-	-	-	-
Oxnard[3]	-	*	0.19	0.17	0.09	0.21	0.11	0.11	0.14
Watsonville[4]	-	-	0.16	0.13	0.09	0.12	0.07	0.09	0.11
Methyl Bromide									
Santa Maria[1]	-	0.18	0.09	0.06	0.05	0.14	0.09	0.01	0.12
Camarillo[2]	*	*	-	-	-	-	-	-	-
Oxnard[3]	-	*	0.10	0.02	0.19	0.05	0.03	0.01	0.07
Watsonville[4]	-	-	0.12	0.15	0.02	0.04	0.04	0.02	0.07

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

* Sampling timeframe was for less than 12 months. Therefore, a 1-year average concentration was determined.

Cancer Risk Estimates

1,3-D is classified as a human carcinogen by both the United States Environmental Protection Agency and Proposition 65. Cancer risk is typically expressed as the estimated probability of developing cancer over a 70-year lifetime (e.g., 1 in 100,000 or 1 in 1,000,000, also expressed as 1×10^{-5} or 1×10^{-6}, respectively).

DPR set a regulatory cancer risk goal for 1,3-D of 1 in 100,000 (1×10^{-5}) in the 2016 Risk Management Directive (DPR 2016). Cancer risk can be estimated using air monitoring results and evaluated against the cancer risk goal using the following equation:

$$\text{Cancer Risk} = CPF_H * LAC * nBR$$

where:

Risk = probability of an additional case of cancer over a 70-year period.

CPF_H = estimated cancer potency factor in humans $(mg/kg/day)^{-1}$.

LAC = mean lifetime (70-year) air concentration ($mg\ m^{-3}$).

nBR = normalized breathing rate of a human adult ($m^3\ kg^{-1}\ day^{-1}$).

The DPR-estimated value of CPF_H based on a portal-of-entry effect, is 0.014 $(mg/kg/day)^{-1}$ (DPR 2015).

DPR assumes nBR to be 0.28 m^3 kg^{-1} day^{-1} (DPR 2015). For this study and based on the available monitoring data, LAC is taken as the mean annual concentration of total 1,3-D at a monitoring location for all available years, with non-detection samples assigned a value of ½ RL. Alternatively, the cancer risk can be expressed relative to DPR's regulatory target of 0.56 ppb (CPF_H × nBR, and converting units). Table 15 shows the estimated cancer risk from 1,3-D exposures for all sampling locations based on 2010-2017 air monitoring data.

Table 13. 1,3-dichloropropene cancer risk estimate comparisons for all sampling locations for sampling years 2010-2017.

Location	2010-2017 Average Concentration (ppb)	Lifetime (70-year) Regulatory Target (ppb)	Average Cancer Risk Estimate
Santa Maria[1]	0.15	0.56	2.5×10^{-6}
Oxnard[2]	0.14	0.56	2.7×10^{-6}
Watsonville[3]	0.11	0.56	1.9×10^{-6}

1 – Sampling started on 8/11/10   2 – Sampling started on 10/24/11   3 – Sampling started on 11/05/11

DISCUSSION

Since monitoring began in 2010, none of the detected concentrations for the three fumigants exceeded DPR's human health screening levels or regulatory targets for acute exposure (24-h), subchronic exposure (4-week or 90-day), or chronic exposure (1-year). A general decreasing trend for 1,3-D concentrations for some sampling locations can be observed throughout the 2010 – 2017 sample years. The time periods and communities with higher concentrations are consistent with historical use patterns.

Overall, MeBr concentrations have generally decreased over time at all three sampling locations. On December 31, 2016, most uses of MeBr were discontinued and this was reflected in monitoring results as no detections occurred at any TAC monitoring location in 2017.

For all sampled years, Santa Maria had the highest overall 24-h chloropicrin concentration followed by Watsonville. However, a general decreasing trend can be observed in Santa Maria as the highest 24-h concentrations measured at this site have decreased every year starting with 2014. Out of the two sites monitoring in 2017, Santa Maria had the highest 4-week rolling average concentration.

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CDFA, 1999. Determination of Chloropicrin Desorbed from LAD-4 Resin Tubes. California Department of Food and Agriculture. Sacramento, CA. http://www.cdpr.ca.gov/docs/specproj/lompoc/99append/append_m.pdf

Appendix A:

RESULTS OF INDIVIDUAL 1,3-DICHLOROPROPENE & METHYL BROMIDE SAMPLES FOR 2010-2017

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	1/5/17	ND	ND
6/5/15	ND	ND	8/4/15	0.47	ND	1/9/17	ND	ND
6/11/15	ND	ND	8/12/15	0.18	ND	1/18/17	ND	ND
6/17/15	ND	ND	8/16/15	0.10	ND	1/24/17	ND	ND
6/23/15	ND	ND	8/28/15	0.05	8.70	2/2/17	ND	ND
6/29/15	ND	ND	9/3/15	ND	0.23	2/7/17	ND	ND
7/5/15	ND	ND	9/9/15	0.24	0.46	2/21/17	ND	ND
7/11/15	ND	ND	9/15/15	ND	ND	3/1/17	ND	ND

7/17/15	0.16	ND	9/21/15	ND	ND	3/5/17	ND	ND
7/23/15	ND	ND	9/27/15	ND	ND	3/15/17	ND	ND
7/29/15	ND	ND	10/3/15	ND	ND	3/21/17	ND	ND
8/4/15	0.19	ND	10/9/15	0.05	ND	3/28/17	ND	ND
8/10/15	0.03	ND	10/15/15	ND	ND	4/6/17	ND	ND
8/12/15	0.34	ND	10/21/15	ND	ND	4/10/17	ND	ND
8/16/15	0.76	ND	10/27/15	ND	ND	4/17/17	ND	ND
8/22/15	ND	ND	11/2/15	ND	ND	4/25/17	ND	ND
8/28/15	ND	0.34	11/8/15	ND	ND	5/2/17	ND	ND
9/3/15	0.03	ND	11/14/15	ND	ND	5/9/17	ND	ND
9/9/15	1.70	0.42	11/18/15	ND	ND	5/16/17	ND	ND
9/15/15	0.07	ND	11/20/15	ND	ND	5/30/17	ND	ND
9/21/15	1.70	0.83	11/26/15	ND	ND	6/8/17	ND	ND
9/27/15	0.90	0.48	12/2/15	ND	ND	6/11/17	ND	ND
10/3/15	1.40	ND	12/14/15	ND	ND	6/21/17	ND	ND
10/9/15	0.44	1.13	12/20/15	ND	ND	6/28/17	ND	ND
10/15/15	0.05	0.24	12/26/15	ND	ND	7/7/17	ND	ND
10/21/15	ND	0.46	1/1/16	ND	ND	7/13/17	ND	ND
10/27/15	0.06	ND	1/7/16	ND	ND	7/20/17	ND	ND
11/2/15	ND	ND	1/13/16	ND	ND	7/24/17	ND	0.37
11/8/15	ND	ND	1/19/16	ND	ND	8/2/17	ND	0.20
11/14/15	ND	ND	1/25/16	0.04	ND	8/8/17	ND	0.19
11/18/15	ND	ND	1/25/16	0.04	ND	8/14/17	ND	0.18
11/26/15	0.05	ND	2/6/16	ND	ND	8/25/17	ND	ND
12/2/15	ND	ND	2/12/16	ND	ND	8/31/17	ND	0.24
12/8/15	0.06	ND	2/18/16	ND	ND	9/7/17	ND	ND
12/14/15	ND	ND	2/19/16	ND	ND	9/11/17	ND	0.41
12/20/15	0.04	ND	2/24/16	ND	ND	9/19/17	ND	ND
12/26/15	ND	ND	3/1/16	ND	ND	9/28/17	ND	ND
1/1/16	ND	ND	3/7/16	ND	ND	10/3/17	ND	0.16
1/14/16	0.03	ND	3/13/16	ND	ND	10/11/17	ND	0.31
1/19/16	ND	ND	3/19/16	ND	ND	10/17/17	ND	0.33
1/25/16	ND	ND	3/25/16	0.04	ND	10/24/17	ND	ND
2/6/16	0.05	ND	3/31/16	ND	ND	10/30/17	ND	ND
2/12/16	ND	ND	4/6/16	ND	ND	11/6/17	ND	ND
2/18/16	ND	ND	4/12/16	ND	ND	11/14/17	ND	ND
2/24/16	ND	ND	4/18/16	ND	ND	11/20/17	ND	0.17
3/1/16	ND	ND	4/24/16	ND	0.12	11/28/17	ND	ND
3/7/16	ND	ND	4/30/16	0.17	0.41	12/5/17	ND	ND
3/13/16	ND	ND	5/6/16	ND	ND	12/12/17	ND	ND
3/19/16	ND	ND	5/12/16	ND	ND	12/27/17	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	1/1/17	ND	ND
11/2/16	ND	0.32	1/7/17	ND	ND
11/8/16	ND	ND	1/13/17	ND	ND
11/14/16	ND	ND	1/19/17	ND	ND
11/20/16	ND	ND	1/25/17	ND	ND
11/26/16	ND	ND	1/31/17	ND	ND
12/2/16	ND	ND	2/6/17	ND	ND
12/8/16	ND	ND	2/12/17	ND	ND
12/20/16	ND	ND	2/18/17	ND	ND

12/26/16	ND	ND	2/24/17	ND	ND
1/5/17	ND	ND	3/2/17	ND	ND
1/10/17	ND	ND	3/8/17	ND	ND
1/17/17	ND	ND	3/14/17	ND	ND
1/24/17	ND	ND	3/20/17	ND	ND
2/2/17	ND	ND	3/26/17	ND	ND
2/9/17	ND	ND	4/1/17	ND	ND
2/14/17	ND	ND	4/7/17	ND	ND
2/22/17	ND	ND	4/13/17	ND	ND
2/27/17	ND	ND	4/19/17	ND	ND
3/8/17	ND	ND	4/25/17	ND	0.99
3/13/17	ND	ND	5/1/17	ND	1.09
3/20/17	ND	ND	5/7/17	ND	ND
3/30/17	ND	ND	5/13/17	ND	ND
4/4/17	ND	ND	5/19/17	ND	ND
4/11/17	ND	ND	5/31/17	ND	ND
4/16/17	ND	ND	6/6/17	ND	ND
5/5/17	ND	ND	6/12/17	ND	ND
5/8/17	ND	ND	6/18/17	ND	ND
5/15/17	ND	ND	6/24/17	ND	ND
6/13/17	ND	ND	6/30/17	ND	ND
6/18/17	ND	ND	7/6/17	ND	ND
6/30/17	ND	ND	7/12/17	ND	ND
7/2/17	ND	ND	7/18/17	ND	ND
7/19/17	ND	ND	7/24/17	ND	ND
7/29/17	ND	ND	7/30/17	ND	ND
8/1/17	ND	ND	8/5/17	ND	ND
8/7/17	ND	ND	8/11/17	ND	ND
8/13/17	ND	ND	8/17/17	ND	0.25
8/22/17	ND	ND	8/23/17	ND	ND
9/2/17	ND	0.41	8/29/17	ND	1.22
9/5/17	ND	ND	9/4/17	ND	0.34
9/15/17	ND	ND	9/10/17	ND	ND
9/21/17	ND	0.17	9/16/17	ND	ND
9/28/17	ND	0.38	9/22/17	ND	ND
10/4/17	ND	0.54	9/28/17	ND	ND
10/10/17	ND	0.33	10/4/17	ND	ND
10/20/17	ND	ND	10/10/17	ND	ND
10/23/17	ND	ND	10/16/17	ND	ND
11/1/17	ND	ND	10/22/17	ND	ND
11/11/17	ND	ND	10/28/17	ND	ND
11/16/17	ND	0.03	11/3/17	ND	ND
11/21/17	ND	ND	11/9/17	ND	ND

12/2/17	ND	ND	11/15/17	ND	ND
12/21/17	ND	ND	11/28/17	ND	ND
12/27/17	ND	ND	12/3/17	ND	ND
			12/9/17	ND	ND

APPENDIX B

RESULTS OF INDIVIDUAL CHLOROPICRIN SAMPLES FOR 2010-2017

Santa Maria		Camarillo/Oxnard		Watsonville	
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			1/5/17	ND
12/7/16	ND			1/9/17	ND
12/14/16	ND			1/18/17	ND
12/17/16	ND			1/24/17	ND
12/20/16	ND			1/29/17	ND

1/5/17	ND		2/7/17	ND
1/10/17	ND		2/21/17	ND
1/17/17	ND		3/1/17	ND
1/24/17	ND		3/5/17	ND
2/2/17	ND		3/15/17	ND
2/7/17	ND		3/21/17	ND
2/14/17	ND		3/28/17	ND
2/22/17	ND		4/6/17	ND
2/27/17	ND		4/10/17	ND
3/7/17	ND		4/17/17	ND
3/13/17	ND		4/25/17	ND
3/20/17	ND		5/3/17	ND
3/29/17	ND		5/9/17	ND
4/4/17	ND		5/16/17	ND
4/11/17	ND		5/24/17	ND
4/16/17	ND		5/30/17	ND
4/24/17	ND		6/8/17	ND
5/5/17	Trace		6/11/17	ND
5/8/17	ND		6/21/17	ND
5/15/17	ND		6/28/17	ND
5/25/17	Trace		7/7/17	ND
5/30/17	Trace		7/13/17	ND
6/7/17	ND		7/20/17	ND
6/13/17	ND		7/24/17	0.48
6/18/17	ND		8/2/17	Trace
6/30/17	ND		8/8/17	ND
7/2/17	ND		8/14/17	Trace
7/10/17	ND		8/25/17	0.06
7/19/17	ND		8/31/17	0.21
7/29/17	ND		9/7/17	ND
8/1/17	ND		9/11/17	0.12
8/7/17	ND		9/19/17	Trace
8/13/17	ND		9/28/17	Trace
8/22/17	ND		10/3/17	Trace
9/2/17	0.21		10/11/17	0.44
9/5/17	Trace		10/17/17	0.20
9/15/17	ND		10/24/17	Trace
9/21/17	Trace		10/30/17	ND
9/28/17	0.21		11/6/17	ND
10/4/17	0.46		11/14/17	ND
10/8/17	0.46		11/20/17	Trace
10/19/17	ND		11/28/17	ND
10/27/17	ND		12/5/17	ND

11/3/17	ND
11/11/17	ND
11/15/17	ND
11/21/17	ND
12/2/17	ND
12/8/17	Trace
12/15/17	0.03
12/21/17	ND
12/27/17	ND

12/12/17	ND
12/18/17	ND
12/28/17	ND