



2015 Air Monitoring Results Update

Pesticide Registration and Evaluation Committee

November 18, 2016

Types of Air Monitoring

- **Air Monitoring Network:** year-round monitoring for **32 pesticides (list in next slide)** in three communities with high use of multiple pesticides to estimate cumulative, subchronic, and chronic exposures
 - Sample 24 hour intervals
 - Sample one per week (sampling day is randomly chosen)
- **Toxic Air Contaminant Monitoring:** year-round monitoring of **1,3-dichloropropene and methyl bromide** conducted by ARB at DPR's request as part of DPR's toxic air contaminant program
 - Sample 24 hour intervals
 - Sample every 6 days
- **Ambient Air Monitoring:** monitoring three communities in a high-use region during a high-use season for a single pesticide to estimate subchronic exposures (**Chloropicrin**)
 - Sample 24 hour intervals
 - Sample every 3 days

2015 Air Monitoring Network Results

- Number of detections of monitored chemicals by sampling location

Location	Number of possible detections	Percent of possible detections*	Percent of quantifiable detections
Salinas	1,976	8.2%	3.4%
Shafter	1,944	12.6%	6.6%
Ripon	1,972	10.1%	5.0%
Total	5,892	10.3%	5.2%

*Includes trace and quantifiable detections

- Of all AMN pesticides monitored in 2015:
 - 26 pesticides were detected in at least one sample.
 - 13 were detected at trace levels, and
 - 13 had quantifiable concentrations.
 - 11 were not detected.
- No monitored pesticide exceed any of their screening levels or regulatory target concentrations.
- Pesticides detected at quantifiable concentrations:

1. 1,3-Dichloropropene	6. Chlorpyrifos OA	11. Methyl bromide
2. Carbon disulfide	7. DDVP	12. MITC
3. Chloropicrin	8. EPTC	13. Oryzalin
4. Chlorothalonil	9. Iprodione	
5. Chlorpyrifos	10. Malathion	

AMN 2015 Acute Exposure

	Salinas	Shafter	Ripon	
Chemical	Highest 24-hr concentration	Highest 24-hr concentration	Highest 24-hr concentration	24-hour acute screening level
	Units of ng/m ³			
1,3-Dichloropropene	3,643	9,713	4,074	505,000*
Carbon Disulfide	3,125	813	2,842	1,550,000
Chloropicrin	3,023	--	Trace	491,000
Chlorothalonil	Trace	39	Trace	34,000
Chlorpyrifos	--	78	Trace	1,200
Chlorpyrifos OA	--	13	Trace	1,200
DDVP	Trace	Trace	26	11,000
EPTC	--	29	--	230,000
Iprodione	--	Trace	15	939,000
Malathion	11	--	--	112,500
Methyl Bromide	179	283	2,981	820,000
MITC	73	232	373	66,000
Oryzalin	--	62	45	420,000

-- = Not Detected Trace = Detection above MDL but below LOQ *Previous acute screening level = 160,000 ng/m³

AMN 2015 Subchronic Exposure

	Salinas	Shafter	Ripon	
Chemical	Highest 4-wk rolling concentration	Highest 4-wk rolling concentration	Highest 4-wk rolling concentration	Subchronic screening level
	Units of ng/m ³			
1,3-Dichloropropene	1,812	5,138	2,711	14,000*
Carbon Disulfide	945	410	1,565	800,000
Chloropicrin	1,551	---	Trace	2,300
Chlorothalonil	Trace	25	Trace	34,000
Chlorpyrifos	---	60	Trace	850
Chlorpyrifos OA	---	9	Trace	850
DDVP	Trace	Trace	10	2,200
EPTC	---	19	---	24,000
Iprodione	---	Trace	12	286,000
Malathion	6.9	---	---	80,600
Methyl Bromide	120	186	1,640	19,400
MITC	23	156	150	3,000
Oryzalin	---	16	12	230,000

-- = Not Detected Trace = Detection above MDL but below LOQ

*Previous subchronic screening level = 120,000 ng/m³

AMN 2015 Chronic Exposure

	Salinas	Shafter	Ripon	
Chemical	1-year average concentration	1-year average concentration	1-year average concentration	Chronic screening level
	Units of ng/m ³			
1,3-Dichloropropene	201	800	380	9,000*
Carbon Disulfide	273	217	352	800,000
Chloropicrin	249	---	Trace	1,800
Chlorothalonil	Trace	16	Trace	34,000
Chlorpyrifos	---	14	Trace	510
Chlorpyrifos OA	---	4	Trace	510
DDVP	Trace	Trace	3	770
EPTC	---	3	---	8,500
Iprodione	---	Trace	2	286,000
Malathion	2	---	---	8,100
Methyl Bromide	35	40	171	3,900
MITC	6	27	23	300
Oryzalin	---	2	2	232,000

-- = Not Detected Trace = Detection above MDL but below LOQ

*Previous chronic screening level = 120,000 ng/m³

2015 AMN Exposure Summary

Pesticide	% of acute screening level	% of subchronic screening level	% of chronic screening level
1,3-Dichloropropene	1.92%	36.70%	5.12%
Carbon Disulfide	0.20%	0.20%	0.04%
Chloropicrin	0.62%	67.45%	8.84%
Chlorothalonil	0.11%	0.07%	0.04%
Chlorpyrifos	6.49%	7.01%	1.43%
Chlorpyrifos OA	1.12%	1.07%	0.53%
DDVP	0.24%	0.47%	0.39%
EPTC	0.01%	0.08%	0.02%
Iprodione	0.00%	0.00%	0.00%
Malathion	0.01%	0.01%	0.02%
Methyl Bromide	0.36%	8.45%	2.10%
MITC	0.57%	5.21%	6.19%
Oryzalin	0.02%	0.01%	0.00%

2015 Methyl Bromide Monitoring (TAC & AMN)

Sampling Location	Highest 24-hr concentration ppb (ng/m ³)	Highest 4-wk rolling concentration ppb (ng/m ³)	1-year average concentration ppb (ng/m ³)
Santa Maria (ARB)	1.70 (6,598)	1.15 (4,464)	0.14 (543)
Oxnard (ARB)	0.47 (1,824)	0.27 (1,048)	0.05 (194)
Watsonville (ARB)	0.20 (776)	0.13 (505)	0.04 (155)
Salinas (DPR)	0.05 (179)	0.03 (120)	0.01 (35)
Shafer (DPR)	0.07 (283)	0.05 (186)	0.01 (40)
Ripon (DPR)	0.77 (2,981)	0.42 (1,640)	0.04 (171)
Regulatory Target	210 (820,000)	5 (19,400)	1* (3,900)

*Screening Level

Reference: For methyl bromide → 1 ppb = 3,881 ng/m³

2015 1,3-Dichloropropene Monitoring (TAC & AMN)

Sampling Location	Highest 24-hr concentration ppb (ng/m ³)	Highest 4-wk rolling concentration ppb (ng/m ³)	1-year average concentration ppb (ng/m ³)
Santa Maria (ARB)	1.13 (5,127)	0.55 (2,495)	0.11 (499)
Oxnard (ARB)	8.70 (39,474)	2.36 (10,708)	0.21 (953)
Watsonville (ARB)	0.90 (4,083)	0.63 (2,858)	0.12 (544)
Salinas (DPR)	0.80 (3,643)	0.40 (1,812)	0.04 (201)
Shafer (DPR)	2.14 (9,713)	1.13 (5,138)	0.18 (800)
Ripon (DPR)	0.90 (4,074)	0.60 (2,711)	0.08 (380)
Screening Level	110 (505,000)	3 (14,000)	2 (9,000)

Reference: For 1,3-dichloropropene, 1 ppb = 4,537 ng/m³

2015 Chloropicrin Monitoring (ARB & DPR)

Sampling Location	Highest 24-hr concentration ppb (ng/m ³)	Highest 4-wk rolling concentration ppb (ng/m ³)	1-year average concentration ppb (ng/m ³)
Santa Maria (ARB) †	0.78 (5,242)	0.41‡ (2,755)	*
Oxnard (ARB) †	0.78 (5,242)	0.27 (1,814)	*
Watsonville (ARB) †	1.00 (6,720)	0.26 (1,747)	*
Salinas (DPR)	0.45 (3,023)	0.23 (1,551)	0.04 (249)
Shafer (DPR)	--	--	--
Ripon (DPR)	Trace	Trace	Trace
Screening Level	73** (491,000)	0.35 (2,300)	0.27 (1,800)

† Data is for the **high use** sampling period of 8/10/2015 - 12/1/2015.

* 1-year average concentrations for chloropicrin were not computed as samples were only taken for a ~3.5 month period and extrapolating that data to obtain a 1-year average concentration is not possible.

** Regulatory Target

‡ A detailed evaluation was conducted to determine if residential seasonal exposure to these pesticides was of concern (**ahead in presentation**)

Reference: For Chloropicrin, 1 ppb = 6,720 ng/m³

Trend Analysis – Highest 1-day

Location	Highest 1-day concentration (ppb)					
	2010	2011	2012	2013	2014	2015
1,3-Dichloropropene (Screening level = 110 ppb)						
Santa Maria (ARB)	1.24	2.40	1.36	5.00	2.40	1.13
Oxnard (ARB)		0.05	6.40	3.00	2.20	8.70
Watsonville (ARB)		0.21	2.80	1.51	0.78	0.90
Salinas (DPR)		2.22	0.76	0.95	0.10	0.80
Shafter (DPR)		--	0.80	8.81	2.04	2.14
Ripon (DPR)		2.70	--	3.25	0.77	0.90
Methyl Bromide (Regulatory Target = 210 ppb)						
Santa Maria (ARB)	3.70	3.80	0.77	0.77	0.58	1.70
Oxnard (ARB)		0.47	3.40	0.17	8.70	0.47
Watsonville (ARB)		0.08	1.50	1.80	0.08	0.20
Salinas (DPR)		1.56	0.65	1.14	0.79	0.05
Shafter (DPR)		0.76	0.55	0.05	0.25	0.07
Ripon (DPR)		0.76	0.69	0.30	0.75	0.77
Chloropicrin (Regulatory Target = 73 ppb)						
Santa Maria (ARB)					1.05	0.78
Oxnard (ARB)					0.80	0.78
Watsonville (ARB)					0.20	1.00
Salinas (DPR)		0.58	--	0.95	0.72	0.45
Shafter (DPR)		--	--	--	--	--
Ripon (DPR)		--	--	0.19	0.17	Trace

-- = Not Detected

Trend Analysis – Highest 4-wk

Location	Highest 4-week concentration (ppb)					
	2010	2011	2012	2013	2014	2015
1,3-Dichloropropene (Screening level = 3 ppb)						
Santa Maria (ARB)	0.69	1.25	0.81	1.32	0.67	0.55
Oxnard (ARB)		0.13	1.65	1.19	0.49	2.36
Watsonville (ARB)		0.05	1.17	0.52	0.44	0.63
Salinas (DPR)		0.60	0.24	0.58	0.03	0.40
Shafter (DPR)		--	0.25	2.23 (3.97*)	0.90	1.13
Ripon (DPR)		0.89	--	1.76	0.38	0.60
Methyl Bromide (Regulatory target = 5 ppb)						
Santa Maria (ARB)	1.52	1.60	0.56	0.26	0.30	1.15
Oxnard (ARB)		0.15	0.90	0.05	1.97	0.27
Watsonville (ARB)		0.02	0.75	0.77	0.07	0.13
Salinas (DPR)		1.06	0.28	0.48	0.33	0.03
Shafter (DPR)		0.36	0.18	0.05	0.10	0.05
Ripon (DPR)		0.43	0.29	0.11	0.22	0.42
Chloropicrin (Screening level = 0.35 ppb)						
Santa Maria (ARB)					0.25 (0.49*)	0.19 (0.41*)
Oxnard (ARB)					0.21	0.27
Watsonville (ARB)					0.1	0.26
Salinas (DPR)		0.27	--	0.12 (0.48*)	0.32	0.23
Shafter (DPR)		--	--	--	--	--
Ripon (DPR)		--	--	0.15	0.09	Trace

-- = Not Detected

*A detailed evaluation was conducted to determine if residential seasonal exposure to these pesticides was of concern (next two slides)

Calculation of subchronic chloropicrin and 1,3-D residential exposures

- A detailed evaluation was conducted to determine if residential seasonal exposure of these pesticides was of concern
- **Chloropicrin:**
 - The seasonal reference concentration (RfC) is 0.35 ppb (2,300 ng/m³) for children
 - The RfC is derived from rhinitis in rats after a 90-day inhalation exposure (6 hrs/day, 5 days/week), adjusting for difference in breathing and exposure duration between rats and children, and applying a default uncertainty factor of 100 (assuming humans are more sensitive than rats and there is a 10-fold variation in the sensitivity of humans)
 - Use information was utilized to determine chloropicrin peak application season (August through October)
 - 90-day concentrations were determined and compared to the seasonal RfC value for children. The concentrations were below the seasonal RfC value. Based on this data, it was determined that seasonal exposures to chloropicrin in Santa Maria and Salinas were not of health concern for the determined time period.

Calculation of subchronic chloropicrin and 1,3-D residential exposures

- **1,3-Dichloropropene:**

- The seasonal reference concentration (RfC) is 3 ppb (14,000 ng/m³) for children
 - The RfC is based on the development of nasal histopathology in rats during a 13-week inhalation study (6 hrs/day, 5 days/week) at doses ranging from 0 to 150 ppm, and calculating a lower-bound benchmark dose concentration at the 10% response level (BMCL₁₀) of 16 ppm.
 - This value was then adjusted to a human equivalent concentration of 0.3 ppm by applying a rat-to-human Regional Gas Dose Ratio scalar of 0.115 and taking into account the differences in exposure duration between the experimentally exposed rats and humans exposed under ambient conditions. Finally, an uncertainty factor of 100 was applied.
- Use information was utilized to determine 1,3-D peak application season (November through January)
- 90-day concentrations were determined and compared to the seasonal RfC value for children. The concentrations were below the seasonal RfC value. Based on this data, it was determined that seasonal exposure to 1,3-D in Shafter was not of health concern for the determined time period.

Trend Analysis – 1-year average

Location	1-year average concentration (ppb)					
	2011	2012	2013	2014	2015	Average
1,3-Dichloropropene (Screening level = 2 ppb)						
Santa Maria (ARB)	0.16	0.19	0.19	0.11	0.11	0.16
Oxnard (ARB)	-	0.19	0.17	0.09	0.21	0.16
Watsonville (ARB)	-	0.16	0.13	0.09	0.12	0.12
Salinas (DPR)	0.15	0.06	0.09	0.01	0.04	0.06
Shafter (DPR)	0.05	0.10	0.57	0.20	0.18	0.23
Ripon (DPR)	0.17	0.05	0.19	0.07	0.08	0.11
Methyl Bromide (Screening level = 1 ppb)						
Santa Maria (ARB)	0.18	0.09	0.06	0.05	0.14	0.13
Oxnard (ARB)	-	0.10	0.02	0.20	0.05	0.09
Watsonville (ARB)	-	0.12	0.15	0.02	0.04	0.08
Salinas (DPR)	0.22	0.08	0.07	0.04	0.01	0.06
Shafter (DPR)	0.09	0.05	0.04	0.02	0.01	0.04
Ripon (DPR)	0.14	0.07	0.04	0.04	0.04	0.06
Chloropicrin (Screening level = 0.27 ppb)						
Santa Maria (ARB)	-	-	-	-	-	-
Oxnard (ARB)	-	-	-	-	-	-
Watsonville (ARB)	-	-	-	-	-	-
Salinas (DPR)	0.05	--	0.06	0.03	0.04	0.04
Shafter (DPR)	--	--	--	--	--	--
Ripon (DPR)	--	--	0.03	0.02	0.02	0.02

-- = Not Detected

- = 1-year average concentration was not possible since sampling did not span complete 12 months in that sampling year.

Cancer Risk Estimates

- 1,3-dichloropropene was detected at quantifiable concentrations and classified as a human carcinogen.
- 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.
 - 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.
 - Cancer Risk = (cancer potency) X (chronic air concentration) X (respiratory rate).
- Alternatively, the cancer risk can be expressed relative to DPR's regulatory target of 0.56 ppb (cancer potency X respiratory rate, and converting units)

Location	2011-2015 Average Concentration (ppb)	Lifetime (70-year) Regulatory Target (ppb)	Average Cancer Risk Estimate [†]
Santa Maria ¹	0.16	0.56*	2.8E-06
Oxnard ²	0.16	0.56	3.0E-06
Watsonville ³	0.12	0.56	2.2E-06
Salinas ⁴	0.06	0.56	1.4E-06
Shafter ⁵	0.23	0.56	3.7E-06
Ripon ⁶	0.11	0.56	2.1E-06

1 – Sampling started on 8/11/10; 2 – Sampling started on 10/24/11; 3 – Sampling started on 11/05/11; 4 – Sampling started on 2/1/11; 5 – Sampling started on 2/9/11; 6 – Sampling started on 2/3/11

[†]Cancer risk estimates were calculated using ½ MDL for samples with no detectable concentrations

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

2015 Air Monitoring Summary

- Of the 32 pesticides and 5 breakdown products monitored, 26 pesticides were detected in at least one sample (13 with at least one quantifiable concentration and 13 at only trace levels) and none exceeded any of their screening levels or regulatory target concentrations.
- Nine of the 14 pesticides (including three breakdown products) detected at quantifiable concentrations in the AMN were either fumigants (1,3-dichloropropene, carbon disulfide, methyl bromide, chloropicrin, and MITC) or organophosphate insecticides (chlorpyrifos + and its oxygen analog, DDVP, malathion).
- Maximum 4-week rolling concentrations exceeded their sub-chronic screening levels in Salinas and Santa Maria (Chloropicrin) and Shafter (1,3-dichloropropene). These results, in part, led DPR to conduct a detailed evaluation of possible human exposure to these pesticides. Based on seasonal reference concentrations (RfC) for children, seasonal residential exposures to 1,3-D and chloropicrin did not indicate a health concern in any of the sampling communities.
- Calculated 1,3-D cancer risk estimates for all six monitoring locations show levels below DPR's regulatory target of 0.56 ppb for a 70-year lifetime exposure period.
- Overall, AMN results document low air concentrations for the pesticides and communities monitored.