AIR MONITORING NETWORK RESULTS FOR 2021

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EXECUTIVE SUMMARY

In February 2011, the California Department of Pesticide Regulation (DPR) implemented a multi-year statewide Air Monitoring Network (AMN) to measure pesticides in various agricultural communities. The AMN is the first long-term multi-year air monitoring study conducted by DPR. Its objectives are to collect data that assist in (1) assessing potential health risks, (2) evaluating the effectiveness of existing mitigation measures, (3) developing measures to mitigate risks, and (4) evaluating the effectiveness of regulatory requirements. Representative communities were selected using an exhaustive selection process detailed in the AMN's web page, which is updated periodically to account for trends or changes that affect California's communities. This annual report is the eleventh volume of this study and contains AMN results from January 1, 2021 to December 31, 2021.

In 2021, DPR, with the assistance of staff from the Santa Barbara and Ventura County Agricultural Commissioners' offices, monitored a total of 31 pesticides and 5 pesticide breakdown products across four communities throughout California: Oxnard, Shafter, Santa Maria, and Watsonville. Pesticides monitored in the AMN were selected primarily based on potential risk to human health. Higher-risk pesticides were prioritized and selected for inclusion in the AMN based on higher use, higher volatility, and higher toxicity. At each sampling site, one set of 24-hour air samples was collected on a weekly basis. A sample set is the collective term for all samples recovered from one site in one week and consists of three sorbent tubes and one canister. Sampling start dates were randomly selected each week to produce variation in the sampling day; sampling start times varied from 6:00 AM to 4:00 PM. While the air monitors are located in high-use areas, the results should only be considered representative of air concentrations in California, rather than absolute.

A total of 7,161 analyses (samples multiplied by the number of chemicals analyzed in each sample) were conducted on the air samples collected from all four AMN sites operating in 2021. Of these analyses, 474 (6.6%) were either quantifiable or trace detections. Quantifiable detections refer to concentrations above the limit of quantitation (LOQ) for the respective pesticide, while trace detections are measured concentrations above the method detection limit (MDL) but below the LOQ. Samples that resulted in a quantifiable detection accounted for 251 (3.5%) of all analyses conducted. Of the 31 pesticides and 5 breakdown products monitored, 10 were detected at quantifiable levels, 12 were detected at trace levels only, and 14 were not detected. The chemicals with the highest number of quantifiable detections were 1,3-dichloropropene (n=94, 47%), methyl bromide (n=91, 45%), and MITC (methyl Isothiocyanate) (n=34, 17%). The 13-week rolling average of 1,3-dichloropropene exceeded its sub-chronic screening level by 46% in Shafter, this was due to one high concentration detected in October 2020 that rolled over January 2021. The 13-week rolling average of chloropicrin exceeded its sub-chronic regulatory target by 24% in Oxnard, this was due to two high concentrations detected in July 2021.

No state or federal agency has established health standards for pesticides in ambient air. Therefore, DPR estimates the potential for adverse health effects by comparing the measured air concentration of a pesticide to developed health screening levels or regulatory targets for 1- or 3-day (depending on the pesticide), 4- or 13-week (depending on the pesticide), 1-year, and lifetime exposure periods. DPR developed health screening levels (SL) based on preliminary assessments of possible health effects, whereas regulatory targets (RT) are established based on complete assessments of possible health risks and supersede SLs. The SL or RT is used as a trigger to conduct a more detailed evaluation. DPR puts measures in place based on the RT to limit exposures, and

avoid adverse effects on human health. Exceeding a RT does not necessarily mean that an adverse health effect has occurred; however, it does indicate that the restrictions on the pesticide may need to be modified.

INTRODUCTION

Background

In February 2011, as part of the California Department of Pesticide Regulation's (DPR) mandate for continuous evaluation of currently registered pesticides, DPR implemented its first multi-year statewide Air Monitoring Network (AMN) to measure pesticide' concentrations in ambient air, hereafter referred to as air, in various California agricultural communities. The goal is to provide data that assist in assessing potential health risks, developing measures to mitigate risks, and evaluating the effectiveness of current regulatory requirements.

The AMN has the following scientific objectives:

- Identify pesticides in air and determine seasonal, annual, and multi-year concentrations
- Compare concentrations to acute, sub-chronic, chronic, and lifetime (when available) regulatory targets or health screening levels
- Track temporal variation in pesticide concentrations in the air
- Estimate cumulative exposure to multiple pesticides with common physiological modes of action in humans (e.g., cholinesterase inhibitors)

In 2020, DPR reevaluated reported California pesticide use data to identify four monitoring sites to continue with AMN monitoring operation in 2021 and beyond. DPR evaluated 1,228 communities and ranked them based on pesticide use (both local and regional), demographic data, and availability of other exposure and health data. Communities with similar pesticide-use rankings were prioritized based on the number of children, number of persons over 65, and number of persons living in close proximity to farms and agricultural areas with high pesticide use. Complete details on community selection can be found in DPR's Air Monitoring Network webpage at www.cdpr.ca.gov/docs/emon/airinit/air_network.htm.

Communities Monitored

In 2021, DPR monitored the air in the vicinities of four communities across California: Oxnard, Santa Maria, Shafter, and Watsonville.

1. Oxnard is in Ventura County. AMN's monitoring station is located at Rio Mesa High School and is operated by the Ventura County Commissioner's office (Table 1, Appendix A).

2. Santa Maria in Santa Barbara County. The monitoring station is located at Bonita Elementary School and is operated by the Santa Barbara County Commissioner's office (Table 1, Appendix B).

3. Shafter is in Kern County. The monitoring station is located adjacent to Sequoia Elementary School and is operated by DPR (Table 1, Appendix C).

4. Watsonville is on the southern edge of Santa Cruz County bordering with Monterey County. AMN's monitoring station is located at Ohlone Elementary School and is operated by DPR (Table 1, Appendix D).

Table 1. List of communities in the Air Monitoring Network in 2021.

Community	Latitude & Longitude	County	First Day of Sampling	Site Operation
Oxnard	34.255139, -119.144639	Ventura	10/24/2011	V-CAC†
Santa Maria	34.957718, -120.509308	Santa Barbara	08/11/2010	SB-CAC
Shafter	35.516472, -119.268785	Kern	02/09/2011	DPR
Watsonville	36.870118, -121.760891	Santa Cruz/ Monterey	11/05/2011	DPR

†Oxnard monitoring responsibilities transitioned from DPR to Ventura CAC in November 2021.

Pesticides Monitored

As part of the AMN, DPR monitored for 36 chemicals, 31 pesticides and 5 breakdown products (Table F-4). Chemicals were selected based primarily on potential health risk (CDPR 2013). At each monitoring station, one set of 24-hour air samples was collected on a weekly basis. A sample set is the collective term for all samples recovered from one site in one week and consists of four chemical analytical methods (details in Appendices E-F):

1. Volatile Organic Compounds (VOC) for 1,3-D and MeBr: samples taken using SUMMA air-canisters
2. Methyl Isothiocyanate (MITC): samples taken using coconut-charcoal glass sorbent tubes
3. Chloropicrin: samples taken using glass sorbent tubes with XAD-4 resin
4. Multi-Pesticide Residue for 32 Chemicals: samples taken using Teflon cartridges with XAD-4 resin

RESULTS

This report is the 11th volume of this study and contains 2021 AMN results from January 1 to December 31, 2021.

Tables 2-7 show the analytical results for the pesticides monitored by the AMN in 2021. The results for each individual community are available below in Appendices A-D.

Pesticide Detections

A total of 7,161 analyses (samples multiplied by the number of chemicals analyzed in each sample) were conducted on the air samples collected from the four AMN sites operating from January 1, 2021 to December 31, 2021. Of these, 474 (6.6 %) resulted in either quantifiable or trace detections. Quantifiable detections refer to concentrations above the limit of quantitation (LOQ) for the respective pesticide, while trace detections are measured concentrations above the method detection limit (MDL) but below the LOQ. Samples that resulted in a quantifiable detection accounted for 251 (3.5 %) of all analyses conducted.

Of the 36 pesticides and breakdown products monitored in 2021:

- 10 chemicals were detected at quantifiable levels: 1,3-dichloropropene, chloropicrin, dacthal, DDVP, EPTC, malathion, malathion oxygen analog (OA), methyl bromide, MITC, and trifluralin.
- 12 chemicals were detected only at trace levels: chlorothalonil, diazinon OA, diuron, methidathion, metolachlor, norflurazon, oryzalin, oxydemeton methyl, oxyfluorfen, permethrin, phosmet, and simazine.
- 14 chemicals were not detected: acephate, bensulide, chlorpyrifos, chlorpyrifos OA, cypermethrin, DEF, diazinon, dimethoate, dimethoate OA, endosulfan, endosulfan sulfate, iprodione, pp-dicofol, and propargite.

Table 2 lists the number of detections by type for each pesticide and pesticide breakdown product at all sites included in the AMN for 2021. The chemicals with the highest number of quantifiable detections were 1,3-D (n = 94, 47%), MeBr (n = 91, 46%), and MITC (n = 34, 17%).

Table 2. Number and percentage of positive samples per chemical in all AMN sites in 2021.

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	200	94	94	47 %	47 %
Acephate	199	0	0	0 %	0 %
Bensulide	199	0	0	0 %	0 %
Chloropicrin	196	51	19	26 %	9.7 %

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Chlorothalonil	199	13	0	6.5 %	0 %
Chlorpyrifos	199	0	0	0 %	0 %
Chlorpyrifos OA	199	0	0	0 %	0 %
Cypermethrin	199	0	0	0 %	0 %
Dacthal	199	49	1	24.6 %	0.5 %
DDVP	199	25	1	12.6 %	0.5 %
DEF	199	0	0	0 %	0 %
Diazinon	199	0	0	0 %	0 %
Diazinon OA	199	2	0	1 %	0 %
Dimethoate	199	0	0	0 %	0 %
Dimethoate OA	199	0	0	0 %	0 %
Diuron	199	1	0	0.5 %	0 %
Endosulfan	199	0	0	0 %	0 %
Endosulfan Sulfate	199	0	0	0 %	0 %
EPTC	199	3	1	1.5 %	0.5 %
Iprodione	199	0	0	0 %	0 %
Malathion	199	37	6	18.6 %	3 %
Malathion OA	199	10	1	5 %	0.5 %
Methidathion	199	1	0	0.5 %	0 %
Methyl Bromide	200	91	91	45.5 %	45.5 %
Metolachlor	199	1	0	0.5 %	0 %
MITC	197	62	34	31.5 %	17.3 %
Norflurazon	199	1	0	0.5 %	0 %
Oryzalin	199	1	0	0.5 %	0 %
Oxydemeton Methyl	199	1	0	0.5 %	0 %
Oxyfluorfen	199	10	0	5 %	0 %
Permethrin	199	1	0	0.5 %	0 %

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Phosmet	199	1	0	0.5 %	0 %
pp-dicofol	199	0	0	0 %	0 %
Propargite	199	0	0	0 %	0 %
Simazine	199	2	0	1 %	0 %
Trifluralin	199	17	3	8.5 %	1.5 %
Total	7,161	474	251	6.6 %	3.5 %

Table 3 summarizes the total number of detections of the monitored chemicals by community. The percentages of quantifiable and trace detections for monitored chemicals in each community ranged from 4% to 11%. Santa Maria had the highest percentage of detections at 11% followed by Shafter at 6%.

Table 3. Number and percentage of positive samples per location in 2021.

Community	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Oxnard	1,727	93	39	5.4 %	2.3 %
Santa Maria	1,761	197	82	11.2 %	4.7 %
Shafter	1,835	110	79	6 %	4.3 %
Watsonville	1,838	74	51	4 %	2.8 %
Total	7,161	474	251	6.6 %	3.5 %

Pesticide Concentrations

Acute Exposure: Highest 24-hour concentrations among all sites

Table 4 lists the highest 24-hour concentrations at any site for the pesticides detected at a quantifiable concentration in 2021. None of the pesticides or breakdown products exceeded their respective acute (24- or 72-hour) screening levels (SL) or regulatory targets (RT) in 2021. The pesticides with the highest percentage of 24-hour air concentration compared to its acute screening level were Chloropicrin (3.6%) and 1,3-D (2.1%). All other compounds were less than 1% of their acute screening levels or regulatory targets during monitoring in 2021.

Table 4. Highest 24-hour air concentrations, acute screening levels, and percent of screening level of any pesticide detected at a quantifiable concentration in 2021.

Community	Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Shafter	1,3-dichloropropene	2.3 ppb (10,421 ng/m^3)	110 ppb** (500,000 ng/m^3)	2.1 %
Oxnard	Chloropicrin	2.6 ppb (17,771 ng/m^3)	73 ppb*† (491,000 ng/m^3)	3.6 %
Oxnard	Dacthal	0.0001 ppb (1.8 ng/m^3)	1,732 ppb (23,500,000 ng/m^3)	0.00001 %
Shafter	DDVP	0.003 ppb (30.2 ng/m^3)	1.2 ppb (11,000 ng/m^3)	0.27 %
Shafter	EPTC	0.017 ppb (128 ng/m^3)	29.7 ppb (230,000 ng/m^3)	0.056 %
Oxnard	Malathion	0.009 ppb (121 ng/m^3)	8.3 ppb (112,500 ng/m^3)	0.11 %
Oxnard	Malathion OA	0.001 ppb (18.9 ng/m^3)	8.8 ppb (112,500 ng/m^3)	0.017 %
Watsonville	Methyl Bromide	0.95 ppb (3,693 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.45 %
Oxnard	MITC	0.18 ppb (527 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.08 %
Santa Maria	Trifluralin	0.008 ppb (112 ng/m^3)	87.5 ppb (1,200,000 ng/m^3)	0.0094 %

* This value is a regulatory target rather than a screening level.
† This value is an 8-hour time-weighted-average (TWA) used to compare against the 24-h concentration.
**This value is a 72-hour TWA used to compare against the 24-hour measured concentration.

Sub-chronic Exposure: Highest rolling 4- or 13-week average concentrations among all sites

Sub-chronic (seasonal) concentrations for 1,3-D and chloropicrin are averaged every 13 weeks (CDPR 2016b), while the sub-chronic concentrations of the remainder 34 active ingredients are averaged every 4 weeks. Table 5 lists the highest observed rolling 4- or 13-week average concentrations for any chemical detected at a quantifiable concentration among all sites in 2021. The pesticides with the highest rolling 13-week average concentrations were 1,3-D with a concentration of 4.5 ppb (146%) detected in Shafter, followed by chloropicrin with 0.42 ppb (124%) detected in Oxnard. These concentrations exceeded the given sub-chronic screening level for 1,3-D exposure. The pesticides with the highest 4-week average were MITC with a concentration of 1 ppb (5.7%) in Santa Maria and MeBr with 5 ppb (4.8%) in Watsonville.

Table 5. Highest rolling average concentrations, sub-chronic screening levels, and percent of screening levels of any pesticide detected at a quantifiable concentration in 2021.

Community	Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Shafter	1,3-dichloropropene	01/07/2021	4.5 ppb* (20,493 ng/m^3)	3 ppb (14,000 ng/m^3)	146 %
Oxnard	Chloropicrin	08/19/2021	0.42 ppb* (2,845 ng/m^3)	0.35 ppb (2,300 ng/m^3)	124 %
Oxnard	Dacthal	08/19/2021	0.00045 ppb (5.7 ng/m^3)	34.6 ppb (470,000 ng/m^3)	0.001 %
Santa Maria	DDVP	09/25/2021	0.0014 ppb (12.5 ng/m^3)	0.24 ppb (2,200 ng/m^3)	0.57 %
Shafter	EPTC	06/18/2021	0.0044 ppb (32.7 ng/m^3)	3.1 ppb (24,000 ng/m^3)	0.14 %
Oxnard	Malathion	06/19/2021	0.0025 ppb (34.4 ng/m^3)	6 ppb (80,600 ng/m^3)	0.043 %
Oxnard	Malathion OA	06/28/2021	0.00055 ppb (8.9 ng/m^3)	6.3 ppb (80,600 ng/m^3)	0.011 %
Watsonville	Methyl Bromide	05/19/2021	0.24 ppb (931 ng/m^3)	5 ppb† (19,400 ng/m^3)	4.8 %
Santa Maria	MITC	10/25/2021	0.057 ppb (171 ng/m^3)	1 ppb (3,000 ng/m^3)	5.7 %
Santa Maria	Trifluralin	02/17/2021	0.003 ppb (40.6 ng/m^3)	12.4 ppb (170,000 ng/m^3)	0.024 %

* This is a 13-week rolling average rather than the default 4-week rolling average.

† This value is a regulatory target rather than a screening level.

‡ This is the week (week 4 or week 13) when the highest cumulative rolling average was detected.

Chronic Exposure: Highest 1-year average concentrations among all sites

Table 6 presents the highest observed annual average concentrations for each chemical detected at a quantifiable concentration in 2021 at any AMN site alongside its respective chronic SL. The highest annual average concentration relative to its chronic screening level was observed for Chloropicrin with a concentration of 0.27 ppb (47.8%), followed by MITC in Santa Maria with 0.1 ppb (11.7%), and 1,3-D with 2 ppb (8.3%) in Shafter.

Table 6. Highest annual average air concentrations, chronic screening levels, and percent of screening level of any pesticide detected at a quantifiable concentration in 2021.

Community	Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Shafter	1,3-dichloropropene	0.16 ppb (745 ng/m^3)	2 ppb (9,000 ng/m^3)	8.3 %
Oxnard	Chloropicrin	0.13 ppb (861 ng/m^3)	0.27 ppb (1,800 ng/m^3)	47.8 %
Santa Maria	Dacthal	0.00031 ppb (4 ng/m^3)	3.5 ppb (47,000 ng/m^3)	0.008 %
Santa Maria	DDVP	0.00049 ppb (4.3 ng/m^3)	0.085 ppb (770 ng/m^3)	0.56 %
Shafter	EPTC	0.00049 ppb (3.9 ng/m^3)	1.1 ppb (8,500 ng/m^3)	0.046 %
Santa Maria	Malathion	0.00032 ppb (4.4 ng/m^3)	0.6 ppb (8,100 ng/m^3)	0.054 %
Oxnard	Malathion OA	0.000093 ppb (1.6 ng/m^3)	0.63 ppb (8,100 ng/m^3)	0.02 %
Watsonville	Methyl Bromide	0.026 ppb (103 ng/m^3)	1 ppb (3,900 ng/m^3)	2.6 %
Santa Maria	MITC	0.012 ppb (35 ng/m^3)	0.1 ppb (300 ng/m^3)	11.7 %
Santa Maria	Trifluralin	0.0005 ppb (6.9 ng/m^3)	3 ppb (41,000 ng/m^3)	0.017 %

Lifetime Exposure: Cancer risk estimates

The AMN program monitors six pesticides that are designated as known or probable carcinogens by Proposition 65 or by US EPA's B2 list:

1. 1,3-dichloropropene
2. Chlorothalonil
3. DDVP
4. Diuron
5. Iprodione
6. Propargite

In 2021, 1,3-dichloropropene and DDVP had quantifiable concentrations, hence their annual average concentrations and cancer risk estimates were calculated (Table 7-8). These calculations use the average concentration based on all data available from the specified site (Table 1). It is important to note that these shorter timeframes are less suitable for comparison to a 70-year target and are for illustrative purposes only. These values differ from those presented in the calculated annual concentrations above because those are a simple mean (average) while a time-weighted-average is used for the cancer risk estimates. 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.). Risk in the range of 10^{-5} to 10^{-6} or less is generally considered to be at the limit of what is considered negligible. Cancer risk is estimated based on the following calculation:

$$\text{Cancer Risk} = \text{nBR} * \text{LAC} * \text{CPF}_H$$

where:

- Cancer Risk = probability of an additional case of cancer over a 70-year period
- nBR = normalized breathing rate of a human adult (m^3/kg/day)
- LAC = mean lifetime (70-year) air concentration (mg/m^3)
- CPF_H = estimated cancer potency factor in humans $(\text{mg/kg/day})^{-1}$

DPR uses the default respiratory rate (nBR) for an adult of 0.28 m^3kg/day (CDPR 2000), and LAC is the mean annual concentration of the pesticide for all available monitoring years. Moreover, DPR has estimated the following CPF_H values for two of the six monitored pesticides; two were detected in 2021:

- 1,3-D: $\text{CPF}_H = 0.014\ (\text{mg/kg/day})^{-1}$ (CDPR, 2015).
- DDVP: $\text{CPF}_H = 0.350\ (\text{mg/kg/day})^{-1}$ (CDPR, 1996).

Table 7 depicts the historic average concentrations and cancer risk estimates for 1,3-D and DDVP. DPR sets the lifetime regulatory target for 1,3-D at 0.56 ppb (CDPR 2016a).

Table 7. Cumulative average concentration, cancer risk (CR) estimate, CR target and percent of CR target for 1,3-D at each sampling location as of 2021.

Community	1,3-D Concentration	Cancer Risk Estimate	Cancer Risk Target	Percent of Target
Oxnard	0.120 ppb (533 ng/m^3)	2.09E-06	1.00E-05	21 %
Santa Maria	0.120 ppb (565 ng/m^3)	2.21E-06	1.00E-05	22 %
Shafter	0.490 ppb (2,221 ng/m^3)	8.70E-06	1.00E-05	87 %
Watsonville	0.0969 ppb (440 ng/m^3)	1.72E-06	1.00E-05	17 %

Table 8. Cumulative average concentration, cancer risk (CR) estimate, CR target and percent of CR target for DDVP at each sampling location as of 2021.

Community	DDVP Concentration	Cancer Risk Estimate	Cancer Risk Target	Percent of Target
Oxnard	0.0002 ppb (1.45 ng/m^3)	1.42E-07	1.00E-05	1.4 %
Santa Maria	0.0004 ppb (3.94 ng/m^3)	3.86E-07	1.00E-05	3.9 %
Shafter	0.0001 ppb (1.10 ng/m^3)	1.08E-07	1.00E-05	1.1 %
Watsonville	0.0002 ppb (1.81 ng/m^3)	1.77E-07	1.00E-05	1.8 %

Cumulative Exposure Estimates for Organophosphates

Cumulative exposures were calculated for pesticides classified as organophosphates, which are a class of chemical compounds that can cause adverse health effects on humans, such as the inhibition of cholinesterase, an enzyme in the nervous system. The 15 organophosphates included in the AMN monitoring are:

1. Acephate
2. Bensulide
3. Chlorpyrifos
4. Chlorpyrifos OA
5. DDVP
6. DEF
7. Diazinon
8. Diazinon OA
9. Dimethoate
10. Dimethoate OA
11. Malathion
12. Malathion OA
13. Methidathion
14. Oxydemeton methyl
15. Phosmet

The cumulative exposure was estimated using a 2-step procedure. First, we estimated a Hazard Quotient (HQ) for each organophosphate by dividing the detected air concentration by its screening level. Secondly, the organophosphate cumulative exposure is calculated using a

Hazard Index (HI) approach where all organophosphates' HQs are added (Appendix G). A HI of 1.0 suggests further evaluation.

Table 9 summarizes the highest calculated HI for each community and time period of 2021. Both the acute and sub-chronic HI values were calculated for each individual sample set, from which the maximum observed HI was reported. The hazard indices for all screening levels were less than 0.06 in all four communities in 2021. This indicates that even for the combined 15 organophosphate compounds, a summed screening level was not exceeded.

Table 9. Organophosphate cumulative exposure: acute, subchronic, and chronic hazard indices (HI) across all AMN sites in 2021.

Community	Acute HI	Subchronic HI	Chronic HI
Oxnard	0.021	0.024	0.029
Santa Maria	0.051	0.033	0.033
Shafter	0.051	0.028	0.029
Watsonville	0.020	0.026	0.029

SUMMARY

Ten pesticides were detected at quantifiable concentrations out of 36 chemicals monitored for by the AMN in 2021, including all four fumigants 1,3-D, chloropicrin, MeBr, and MITC. The organophosphates DDVP and malathion were also detected at quantifiable concentrations, along with dacthal (phthalate), EPTC (carbamate), and trifluralin (dinitroaniline).

Of the 10 pesticides detected at quantifiable concentrations, 1,3-D, MeBr, and MITC were the only pesticides detected across all four AMN locations.

The highest Hazard Index (HI) calculated for any site at any exposure period was 0.051, indicating a low risk from organophosphate cumulative exposure. 1,3-D cancer risk estimates ranged from 17% in Watsonville to 87% in Shafter, whereas the cancer risk estimates for DDVP ranged from 1% in Shafter to 4% in Santa Maria.

Of the 31 pesticides and 5 breakdown products monitored in 2021, 1,3-D exceeded its sub-chronic screening level by 46% in Shafter. This 13-week average concentration included the weeks from Oct/10/2020 to Jan/08/2021 and was largely driven by a single elevated air concentration of 37.5 ppb detected in October 2020. Moreover, chloropicrin exceeded its sub-chronic screening level by 24% in Oxnard. This 13-week average concentration was driven by two relatively elevated concentrations of 2.6 and 1.7 ppb detected in July 2021. As of August 2023, DPR proposed regulations to mitigate 1,3-D acute and lifetime exposures to non-occupational bystanders that will go into effect in 2024. DPR will propose additional regulations in 2024 to mitigate 1,3-D lifetime exposures to occupational bystanders in California.

APPENDIX A: OXNARD RESULTS

Oxnard is located in Ventura County and is 39.2 square miles in area. The average elevation is 52 feet and receives an average of 15.6 inches of precipitation annually. Daily average temperatures range from 56° to 76°F in the summer and 45° to 66°F in the winter. Based on the 2020 census, the population of Oxnard was 202,000 of which 27% were under 18 years of age and 10% were above 65 years of age. The monitoring site is located at Rio Mesa High School.

Pesticide Detections

Table A–1 lists the number and percentage of analyses resulting in detections at the Oxnard AMN sampling site in 2021. The active ingredient with the highest number of quantifiable detections was MeBr (n=17, 35%), followed by 1,3-D (n=9, 18%).

Table A–1. Number and percentage of positive samples per chemical in Oxnard in 2021.

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	49	9	9	18.4 %	18.4 %
Acephate	48	0	0	0 %	0 %
Bensulide	48	0	0	0 %	0 %
Chloropicrin	46	21	5	45.7 %	10.9 %
Chlorothalonil	48	0	0	0 %	0 %
Chlorpyrifos	48	0	0	0 %	0 %
Chlorpyrifos OA	48	0	0	0 %	0 %
Cypermethrin	48	0	0	0 %	0 %
Dacthal	48	15	1	31.2 %	2.1 %
DDVP	48	2	0	4.2 %	0 %
DEF	48	0	0	0 %	0 %
Diazinon	48	0	0	0 %	0 %
Diazinon OA	48	0	0	0 %	0 %
Dimethoate	48	0	0	0 %	0 %
Dimethoate OA	48	0	0	0 %	0 %
Diuron	48	0	0	0 %	0 %
Endosulfan	48	0	0	0 %	0 %

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Endosulfan Sulfate	48	0	0	0 %	0 %
EPTC	48	0	0	0 %	0 %
Iprodione	48	0	0	0 %	0 %
Malathion	48	8	1	16.7 %	2.1 %
Malathion OA	48	5	1	10.4 %	2.1 %
Methidathion	48	0	0	0 %	0 %
Methyl Bromide	49	17	17	34.7 %	34.7 %
Metolachlor	48	0	0	0 %	0 %
MITC	47	14	5	29.8 %	10.6 %
Norflurazon	48	0	0	0 %	0 %
Oryzalin	48	0	0	0 %	0 %
Oxydemeton Methyl	48	0	0	0 %	0 %
Oxyfluorfen	48	1	0	2.1 %	0 %
Permethrin	48	0	0	0 %	0 %
Phosmet	48	0	0	0 %	0 %
pp-dicofol	48	0	0	0 %	0 %
Propargite	48	0	0	0 %	0 %
Simazine	48	1	0	2.1 %	0 %
Trifluralin	48	0	0	0 %	0 %
Total	1,727	93	39	5.4 %	2.3 %

Pesticide Concentrations

Acute (24-hour) Concentrations

Table A–2 shows the highest 24-hour concentrations observed for all chemicals monitored at the Oxnard AMN sampling site in 2021. The highest concentration relative to its screening level was that of Chloropicrin at 3.6%. The remaining chemicals for which there were quantifiable detections at Oxnard in 2021 were detected at less than 1% of their screening levels.

Table A–2. Highest 24-hour air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored in Oxnard in 2021.

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	0.57 ppb (2,587 ng/m^3)	110 ppb** (500,000 ng/m^3)	0.52 %
Chloropicrin	2.6 ppb (17,771 ng/m^3)	73 ppb*† (491,000 ng/m^3)	3.6 %
Dacthal	0.0001 ppb (1.8 ng/m^3)	1,732 ppb (23,500,000 ng/m^3)	0.00001 %
Malathion	0.009 ppb (121 ng/m^3)	8.3 ppb (112,500 ng/m^3)	0.11 %
Malathion OA	0.001 ppb (18.9 ng/m^3)	8.8 ppb (112,500 ng/m^3)	0.017 %
Methyl Bromide	0.029 ppb (113 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.014 %
MITC	0.18 ppb (527 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.08 %
Acephate	ND	1.6 ppb (12,000 ng/m^3)	
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chlorothalonil	ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.084 ppb (1,200 ng/m^3)	
Chlorpyrifos OA	ND	0.088 ppb (1,200 ng/m^3)	
Cypermethrin	ND	6.6 ppb (113,000 ng/m^3)	
DDVP	Trace	1.2 ppb (11,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.011 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	ND	0.49 ppb (4,300 ng/m^3)	
Diuron	ND	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	ND	29.7 ppb (230,000 ng/m^3)	
Iprodione	ND	23.2 ppb (313,000 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Metolachlor	ND	7.3 ppb (85,000 ng/m^3)	
Norflurazon	ND	12.6 ppb (170,000 ng/m^3)	
Oryzalin	ND	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl	ND	3.7 ppb (39,200 ng/m^3)	
Oxyfluorfen	Trace	34.5 ppb (510,000 ng/m^3)	
Permethrin	ND	10.5 ppb (168,000 ng/m^3)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Phosmet	ND	5.9 ppb (77,000 ng/m^3)	
pp-dicofol	ND	4.5 ppb (68,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	Trace	13.3 ppb (110,000 ng/m^3)	
Trifluralin	ND	87.5 ppb (1,200,000 ng/m^3)	

* This value is a regulatory target rather than a screening level.

† This value is an 8-h time-weighted-average (TWA) used to compare the 24-h concentration.

** This value is a 72-hour TWA used to compare against the 24-hour measured concentration.

Sub-chronic (4- or 13-week) Concentrations

Table A–3 shows the highest rolling 4-week or 13-week average concentrations for all chemicals monitored at the Oxnard AMN sampling site in 2021. The highest concentration relative to its screening level was that of Chloropicrin at 124%, followed by MITC at 5%, and 1,3-D at 2%.

Table A–3. Highest rolling 4-week average air concentrations, sub-chronic screening levels, and percent of the sub-chronic screening level for chemicals monitored in Oxnard in 2021.

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	08/12/2021	0.073 ppb* (330 ng/m^3)	3 ppb (14,000 ng/m^3)	2.4 %
Chloropicrin	08/19/2021	0.42 ppb* (2,845 ng/m^3)	0.35 ppb (2,300 ng/m^3)	124 %
Dacthal	08/19/2021	0.00045 ppb (5.7 ng/m^3)	34.6 ppb (470,000 ng/m^3)	0.001 %
Malathion	06/19/2021	0.0025 ppb (34.4 ng/m^3)	6 ppb (80,600 ng/m^3)	0.043 %
Malathion OA	06/28/2021	0.00055 ppb (8.9 ng/m^3)	6.3 ppb (80,600 ng/m^3)	0.011 %

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Methyl Bromide	12/08/2021	0.024 ppb (95.1 ng/m^3)	5 ppb† (19,400 ng/m^3)	0.49 %
MITC	07/08/2021	0.046 ppb (139 ng/m^3)	1 ppb (3,000 ng/m^3)	4.6 %
Acephate		ND	1.1 ppb (8,500 ng/m^3)	
Bensulide		ND	1.5 ppb (24,000 ng/m^3)	
Chlorothalonil		ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.059 ppb (850 ng/m^3)	
Chlorpyrifos OA		ND	0.062 ppb (850 ng/m^3)	
Cypermethrin		ND	4.8 ppb (81,000 ng/m^3)	
DDVP		Trace	0.24 ppb (2,200 ng/m^3)	
DEF		ND	0.68 ppb (8,800 ng/m^3)	
Diazinon		ND	0.01 ppb (130 ng/m^3)	
Diazinon OA		ND	0.011 ppb (130 ng/m^3)	
Dimethoate		ND	0.32 ppb (3,000 ng/m^3)	
Dimethoate OA		ND	0.34 ppb (3,000 ng/m^3)	
Diuron		ND	1.8 ppb (17,000 ng/m^3)	
Endosulfan		ND	0.2 ppb (3,300 ng/m^3)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Endosulfan Sulfate		ND	0.19 ppb (3,300 ng/m^3)	
EPTC		ND	3.1 ppb (24,000 ng/m^3)	
Iprodione		ND	7.1 ppb (95,600 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Metolachlor		ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon		ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin		ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl		ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen		Trace	12.2 ppb (180,000 ng/m^3)	
Permethrin		ND	5.6 ppb (90,000 ng/m^3)	
Phosmet		ND	2 ppb (26,000 ng/m^3)	
pp-dicofol		ND	3.2 ppb (49,000 ng/m^3)	
Propargite		ND	0.98 ppb (14,000 ng/m^3)	
Simazine		Trace	3.8 ppb (31,000 ng/m^3)	
Trifluralin		ND	12.4 ppb (170,000 ng/m^3)	

* Represents a 13-week rolling average rather than the default 4-week rolling average.
† This value is a regulatory target rather than a screening level.
‡ This is the week (week 4 or week 13) when the highest cumulative rolling average was detected.

Chronic (annual) Concentrations

Table A–4 shows the annual average concentration for all chemicals monitored at the Oxnard sampling site in 2021. The pesticide with highest concentration relative to its screening level was Chloropicrin at 48%, followed by MITC at 7%, and 1,3-D at 1.3%. All other monitored chemicals were less than 1% of their chronic screening level or regulatory target.

Table A–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Oxnard in 2021.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.026 ppb (119 ng/m^3)	2 ppb (9,000 ng/m^3)	1.3 %
Chloropicrin	0.13 ppb (861 ng/m^3)	0.27 ppb (1,800 ng/m^3)	47.8 %
Dacthal	0.00019 ppb (2.4 ng/m^3)	3.5 ppb (47,000 ng/m^3)	0.005 %
Malathion	0.00029 ppb (4 ng/m^3)	0.6 ppb (8,100 ng/m^3)	0.05 %
Malathion OA	0.000093 ppb (1.6 ng/m^3)	0.63 ppb (8,100 ng/m^3)	0.02 %
Methyl Bromide	0.0077 ppb (30 ng/m^3)	1 ppb (3,900 ng/m^3)	0.77 %
MITC	0.0068 ppb (20.3 ng/m^3)	0.1 ppb (300 ng/m^3)	6.8 %
DDVP	Trace	0.085 ppb (770 ng/m^3)	
Oxyfluorfen	Trace	3.4 ppb (51,000 ng/m^3)	
Simazine	Trace	3.8 ppb (31,000 ng/m^3)	
Acephate	ND	1.1 ppb (8,500 ng/m^3)	
Bensulide	ND	1.5 ppb (24,000 ng/m^3)	
Chlorothalonil	ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.036 ppb (510 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Chlorpyrifos OA	ND	0.037 ppb (510 ng/m^3)	
Cypermethrin	ND	1.6 ppb (27,000 ng/m^3)	
DEF	ND	NA ppb (NA ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.011 ppb (130 ng/m^3)	
Dimethoate	ND	0.032 ppb (300 ng/m^3)	
Dimethoate OA	ND	0.034 ppb (300 ng/m^3)	
Diuron	ND	0.6 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.019 ppb (330 ng/m^3)	
EPTC	ND	1.1 ppb (8,500 ng/m^3)	
Iprodione	ND	7.1 ppb (95,600 ng/m^3)	
Methidathion	ND	0.2 ppb (2,500 ng/m^3)	
Metolachlor	ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.058 ppb (610 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Permethrin	ND	5.6 ppb (90,000 ng/m^3)	
Phosmet	ND	1.4 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.3 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Trifluralin	ND	3 ppb (41,000 ng/m^3)	

Temporal Trends in Detected Concentrations

The following figures depict the concentrations over time for any chemical detected at a quantifiable concentration in Oxnard in 2021. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

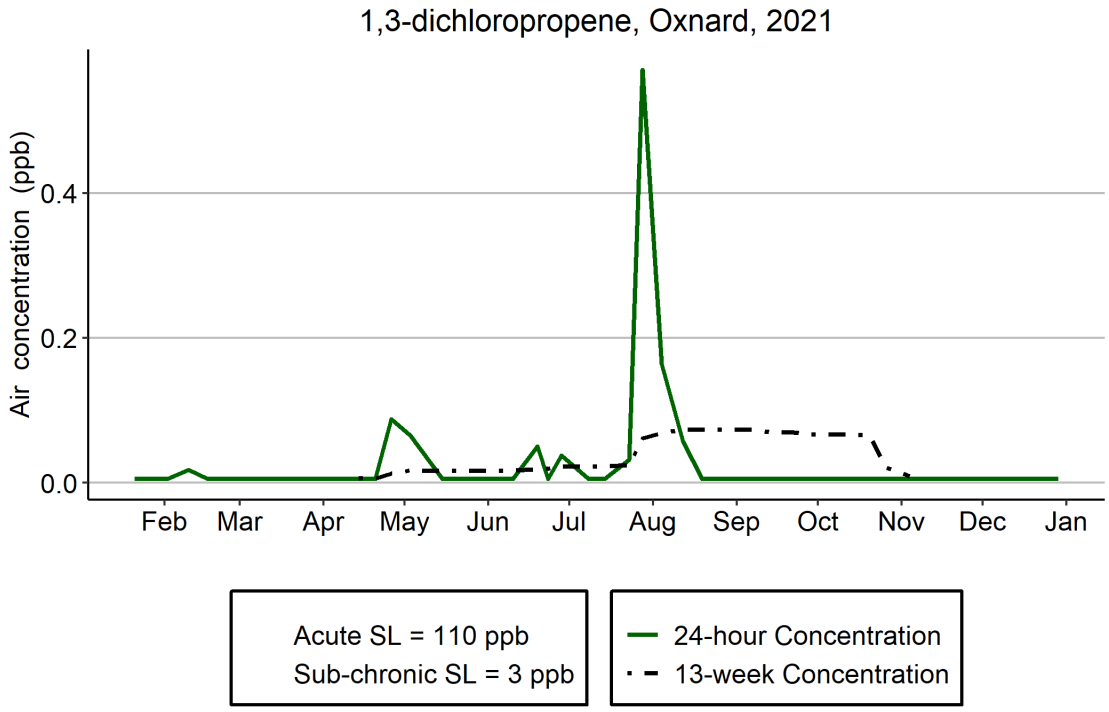

Figure A-1. Temporal trend in 1,3-dichloropropene concentrations in Oxnard in 2021.

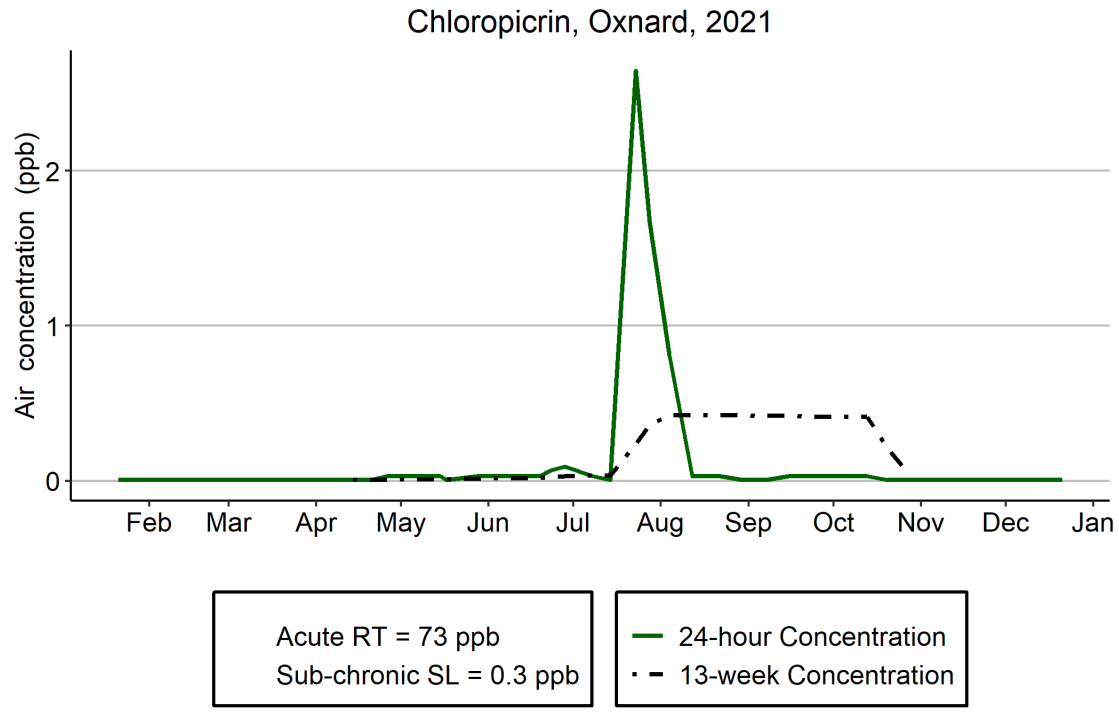

Figure A-2. Temporal trend in Chloropicrin concentrations in Oxnard in 2021.

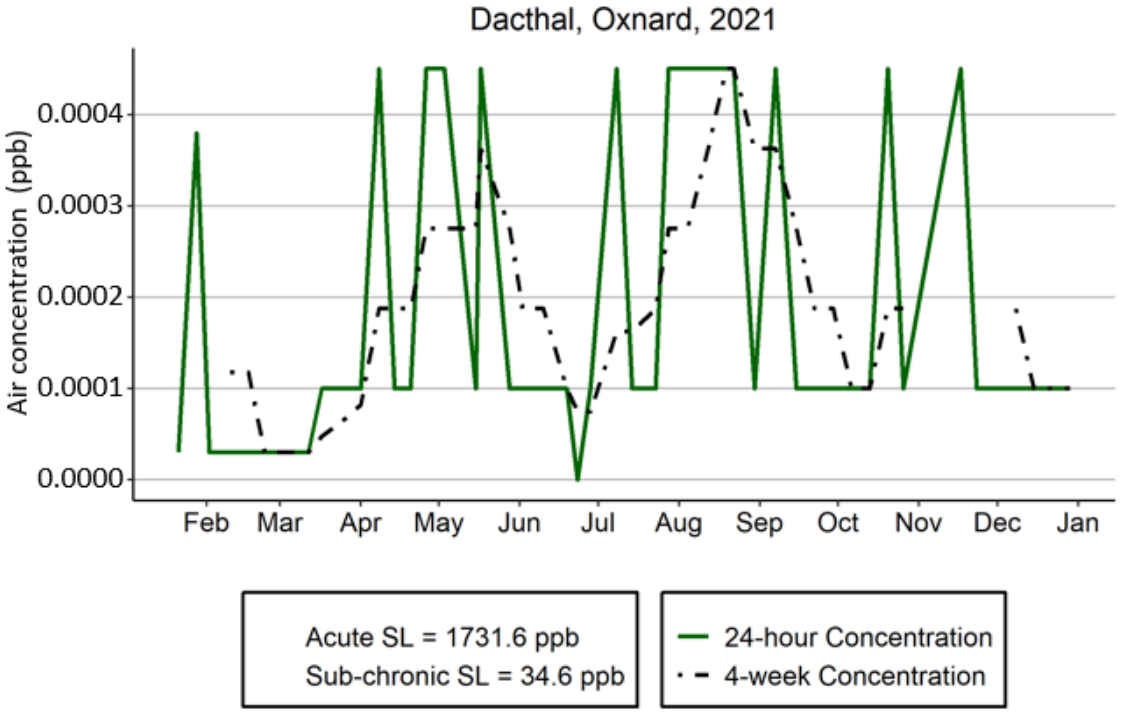

Figure A-3. Temporal trend in Dacthal concentrations in Oxnard in 2021.

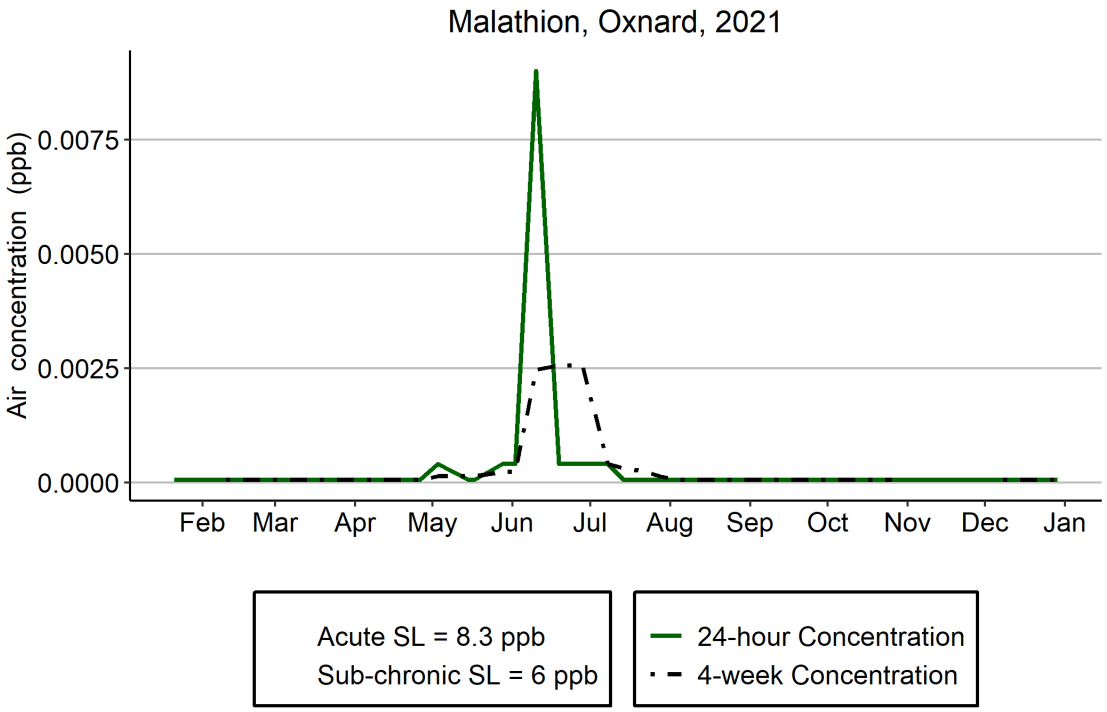

Figure A-4. Temporal trend in Malathion concentrations in Oxnard in 2021.

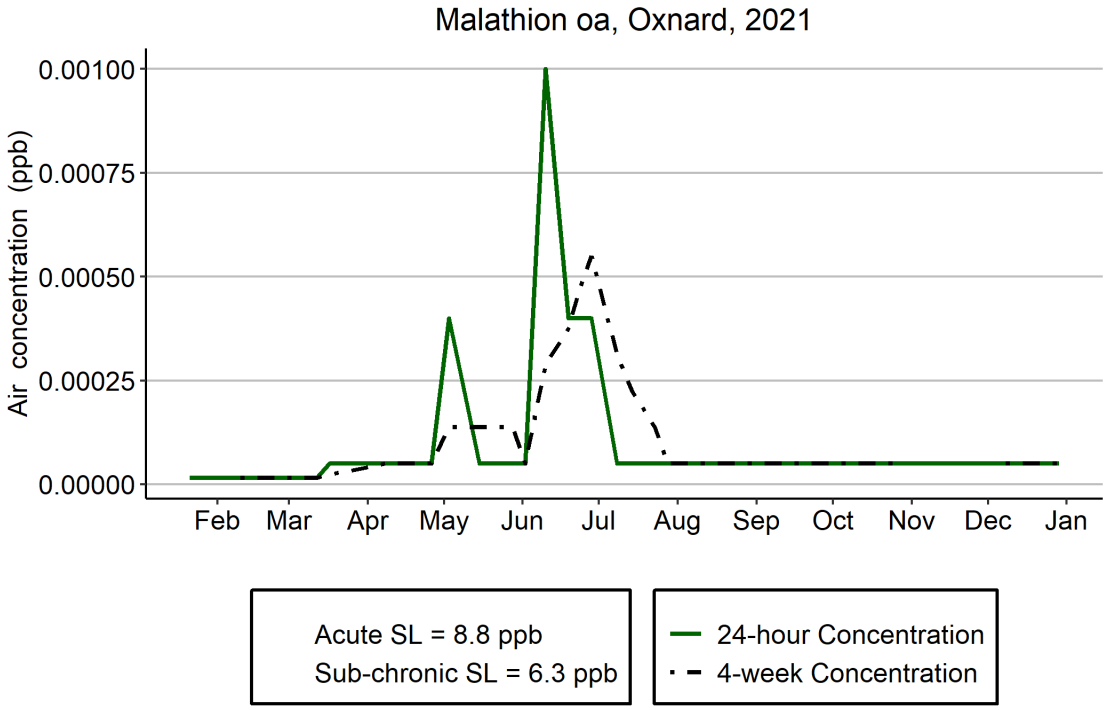

Figure A-5. Temporal trend in Malathion OA concentrations in Oxnard in 2021.

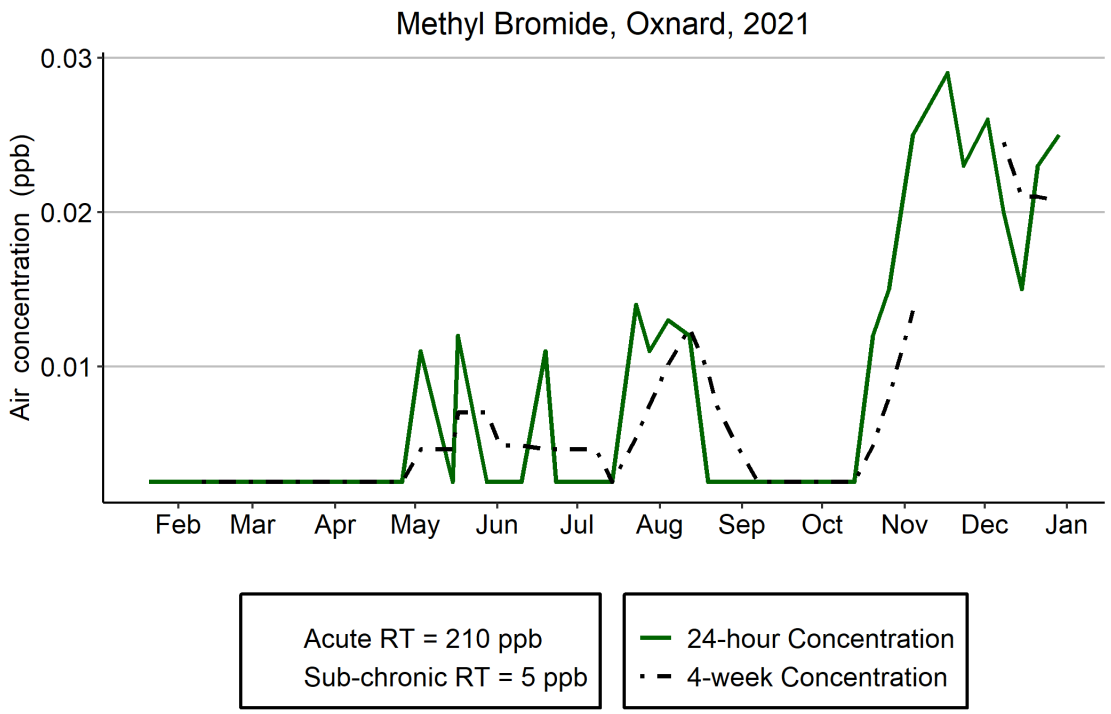

Figure A-6. Temporal trend in Methyl Bromide concentrations in Oxnard in 2021.

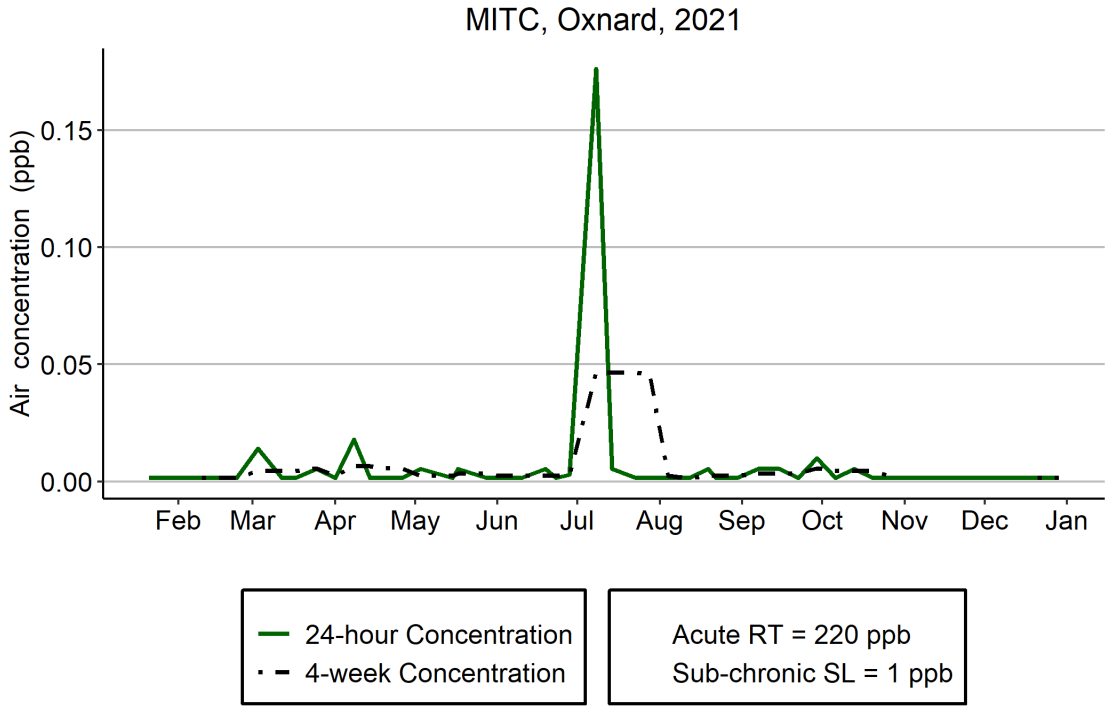

Figure A-7. Temporal trend in MITC concentrations in Oxnard in 2021.

APPENDIX B: SANTA MARIA RESULTS

Santa Maria is located in Santa Barbara County and is 23.4 square miles in area. The average elevation is 217 feet; it receives an average of 14 inches of precipitation annually. Daily average temperatures range from 47° to 73°F in the summer and 39° to 64°F in winter. Santa Maria is the most populous city in Santa Barbara County, with a population of 110,000 based on the 2020 census. Of this population, 31% were below 18 years of age and 10% were above 65 years of age. The monitoring site was relocated from a CARB monitoring location to the southwest corner of Bonita Elementary School where sampling began on November 12, 2019. Monitoring is conducted through a California Department of Pesticide Regulation (DPR) contract with the Santa Barbara County Agricultural Commissioner's (SB CAC) office. SB CAC staff follow standard operating procedures established by DPR's Air Program, ensuring that samples are collected, handled, and transported appropriately to maintain consistency and integrity of the samples. DPR Air Program staff provides annual training and continuous support to SB CAC for operation and monitoring at this sampling location.

Pesticide Detections

Table B–1 lists the number and percentage of analyses resulting in detections at the Santa Maria AMN sampling site in 2021. The active ingredient with the highest number of quantifiable detections was MeBr (n=31, 63%), followed by 1,3-D (n=26, 53%), and MITC (n=13, 27%).

Table B–1. Number and percentage of positive samples per chemical in Santa Maria in 2021.

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	49	26	26	53.1 %	53.1 %
Acephate	49	0	0	0 %	0 %
Bensulide	49	0	0	0 %	0 %
Chloropicrin	47	13	5	27.7 %	10.6 %
Chlorothalonil	49	1	0	2 %	0 %
Chlorpyrifos	49	0	0	0 %	0 %
Chlorpyrifos OA	49	0	0	0 %	0 %
Cypermethrin	49	0	0	0 %	0 %
Dacthal	49	31	0	63.3 %	0 %
DDVP	49	15	0	30.6 %	0 %
DEF	49	0	0	0 %	0 %
Diazinon	49	0	0	0 %	0 %

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Diazinon OA	49	1	0	2 %	0 %
Dimethoate	49	0	0	0 %	0 %
Dimethoate OA	49	0	0	0 %	0 %
Diuron	49	0	0	0 %	0 %
Endosulfan	49	0	0	0 %	0 %
Endosulfan Sulfate	49	0	0	0 %	0 %
EPTC	49	0	0	0 %	0 %
Iprodione	49	0	0	0 %	0 %
Malathion	49	29	5	59.2 %	10.2 %
Malathion OA	49	4	0	8.2 %	0 %
Methidathion	49	1	0	2 %	0 %
Methyl Bromide	49	31	31	63.3 %	63.3 %
Metolachlor	49	1	0	2 %	0 %
MITC	48	18	13	37.5 %	27.1 %
Norflurazon	49	1	0	2 %	0 %
Oryzalin	49	1	0	2 %	0 %
Oxydemeton Methyl	49	1	0	2 %	0 %
Oxyfluorfen	49	5	0	10.2 %	0 %
Permethrin	49	1	0	2 %	0 %
Phosmet	49	1	0	2 %	0 %
pp-dicofol	49	0	0	0 %	0 %
Propargite	49	0	0	0 %	0 %
Simazine	49	1	0	2 %	0 %
Trifluralin	49	15	2	30.6 %	4.1 %
Total	1,761	197	82	11.2 %	4.7 %

Pesticide Concentrations

Acute (24-hour) Concentrations

Table B–2 shows the highest 24-hour concentrations observed for all chemicals monitored at the Santa Maria AMN sampling site in 2021. The highest concentration relative to its screening level was that of Chloropicrin at 0.85%. All chemicals were detected at less than 1% of their acute screening levels in Santa Maria in 2021.

Table B–2. Highest 24-hour air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored in Santa Maria in 2021.

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	0.8 ppb (3,617 ng/m^3)	110 ppb** (500,000 ng/m^3)	0.72 %
Chloropicrin	0.62 ppb (4,191 ng/m^3)	73 ppb*† (491,000 ng/m^3)	0.85 %
Malathion	0.001 ppb (19.4 ng/m^3)	8.3 ppb (112,500 ng/m^3)	0.017 %
Methyl Bromide	0.079 ppb (307 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.037 %
MITC	0.13 ppb (400 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.061 %
Trifluralin	0.008 ppb (112 ng/m^3)	87.5 ppb (1,200,000 ng/m^3)	0.0094 %
Acephate	ND	1.6 ppb (12,000 ng/m^3)	
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chlorothalonil	Trace	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.084 ppb (1,200 ng/m^3)	
Chlorpyrifos OA	ND	0.088 ppb (1,200 ng/m^3)	
Cypermethrin	ND	6.6 ppb (113,000 ng/m^3)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Dacthal	Trace	1,732 ppb (23,500,000 ng/m^3)	
DDVP	Trace	1.2 ppb (11,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	Trace	0.011 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	ND	0.49 ppb (4,300 ng/m^3)	
Diuron	ND	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	ND	29.7 ppb (230,000 ng/m^3)	
Iprodione	ND	23.2 ppb (313,000 ng/m^3)	
Malathion OA	Trace	8.8 ppb (112,500 ng/m^3)	
Methidathion	Trace	0.25 ppb (3,100 ng/m^3)	
Metolachlor	Trace	7.3 ppb (85,000 ng/m^3)	
Norflurazon	Trace	12.6 ppb (170,000 ng/m^3)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Oryzalin	Trace	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl	Trace	3.7 ppb (39,200 ng/m^3)	
Oxyfluorfen	Trace	34.5 ppb (510,000 ng/m^3)	
Permethrin	Trace	10.5 ppb (168,000 ng/m^3)	
Phosmet	Trace	5.9 ppb (77,000 ng/m^3)	
pp-dicofol	ND	4.5 ppb (68,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	Trace	13.3 ppb (110,000 ng/m^3)	

* This value is a regulatory target rather than a screening level.
† This value is an 8-h time-weighted-average (TWA) used to compare the 24-h concentration.
** This value is a 72-hour TWA used to compare against the 24-hour measured concentration.

Sub-chronic (4- or 13-week) Concentrations

Table B–3 shows the highest rolling 4-week or 13-week average concentrations for all chemicals monitored at the Santa Maria AMN sampling site in 2021. The highest concentration relative to its screening level was that of Chloropicrin at 27%, followed by 1,3-D at 7%, and MITC at 3%. The remaining chemicals were detected at less than 1% of their screening levels.

Table B–3. Highest rolling average air concentrations, sub-chronic screening levels, and percent of the sub- chronic screening level for chemicals monitored in Santa Maria in 2021.

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	01/06/2021	0.23 ppb* (1,022 ng/m^3)	3 ppb (14,000 ng/m^3)	7.3 %
Chloropicrin	12/18/2021	0.094 ppb* (631 ng/m^3)	0.35 ppb (2,300 ng/m^3)	27.4 %

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Malathion	03/31/2021	0.0007 ppb (10.5 ng/m^3)	6 ppb (80,600 ng/m^3)	0.013 %
Methyl Bromide	12/06/2021	0.048 ppb (184 ng/m^3)	5 ppb† (19,400 ng/m^3)	0.95 %
MITC	09/25/2021	0.025 ppb (73.8 ng/m^3)	1 ppb (3,000 ng/m^3)	2.5 %
Trifluralin	02/17/2021	0.003 ppb (40.6 ng/m^3)	12.4 ppb (170,000 ng/m^3)	0.024 %
Acephate		ND	1.1 ppb (8,500 ng/m^3)	
Bensulide		ND	1.5 ppb (24,000 ng/m^3)	
Chlorothalonil		Trace	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.059 ppb (850 ng/m^3)	
Chlorpyrifos OA		ND	0.062 ppb (850 ng/m^3)	
Cypermethrin		ND	4.8 ppb (81,000 ng/m^3)	
Dacthal		Trace	34.6 ppb (470,000 ng/m^3)	
DDVP		Trace	0.24 ppb (2,200 ng/m^3)	
DEF		ND	0.68 ppb (8,800 ng/m^3)	
Diazinon		ND	0.01 ppb (130 ng/m^3)	
Diazinon OA		Trace	0.011 ppb (130 ng/m^3)	
Dimethoate		ND	0.32 ppb (3,000 ng/m^3)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Dimethoate OA		ND	0.34 ppb (3,000 ng/m^3)	
Diuron		ND	1.8 ppb (17,000 ng/m^3)	
Endosulfan		ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate		ND	0.19 ppb (3,300 ng/m^3)	
EPTC		ND	3.1 ppb (24,000 ng/m^3)	
Iprodione		ND	7.1 ppb (95,600 ng/m^3)	
Malathion OA		Trace	6.3 ppb (80,600 ng/m^3)	
Methidathion		Trace	0.25 ppb (3,100 ng/m^3)	
Metolachlor		Trace	1.3 ppb (15,000 ng/m^3)	
Norflurazon		Trace	1.9 ppb (26,000 ng/m^3)	
Oryzalin		Trace	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl		Trace	0.058 ppb (610 ng/m^3)	
Oxyfluorfen		Trace	12.2 ppb (180,000 ng/m^3)	
Permethrin		Trace	5.6 ppb (90,000 ng/m^3)	
Phosmet		Trace	2 ppb (26,000 ng/m^3)	
pp-dicofol		ND	3.2 ppb (49,000 ng/m^3)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Propargite		ND	0.98 ppb (14,000 ng/m^3)	
Simazine		Trace	3.8 ppb (31,000 ng/m^3)	

* Represents a 13-week rolling average rather than the default 4-week rolling average.
† This value is a regulatory target rather than a screening level.
‡This is the week (week 4 or week 13) when the highest cumulative rolling average was detected.

Chronic (annual) Concentrations

Table B–4 shows the annual average concentration for all chemicals monitored at the Santa Maria sampling site in 2021. The pesticide with highest concentration relative to its screening level was Chloropicrin at 14%, followed by MITC at 12%, and 1,3-D at 4%. All other monitored chemicals were less than 1% of their chronic screening level in Santa Maria in 2021.

Table B–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Santa Maria in 2021.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.077 ppb (348 ng/m^3)	2 ppb (9,000 ng/m^3)	3.9 %
Chloropicrin	0.038 ppb (252 ng/m^3)	0.27 ppb (1,800 ng/m^3)	14 %
Malathion	0.00032 ppb (4.4 ng/m^3)	0.6 ppb (8,100 ng/m^3)	0.054 %
Methyl Bromide	0.017 ppb (66.7 ng/m^3)	1 ppb (3,900 ng/m^3)	1.7 %
MITC	0.012 ppb (35 ng/m^3)	0.1 ppb (300 ng/m^3)	11.7 %
Trifluralin	0.0005 ppb (6.9 ng/m^3)	3 ppb (41,000 ng/m^3)	0.017 %
Chlorothalonil	Trace	3.1 ppb (34,000 ng/m^3)	
Dacthal	Trace	3.5 ppb (47,000 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
DDVP	Trace	0.085 ppb (770 ng/m^3)	
Diazinon OA	Trace	0.011 ppb (130 ng/m^3)	
Malathion OA	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	Trace	0.2 ppb (2,500 ng/m^3)	
Metolachlor	Trace	1.3 ppb (15,000 ng/m^3)	
Norflurazon	Trace	1.9 ppb (26,000 ng/m^3)	
Oryzalin	Trace	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	Trace	0.058 ppb (610 ng/m^3)	
Oxyfluorfen	Trace	3.4 ppb (51,000 ng/m^3)	
Permethrin	Trace	5.6 ppb (90,000 ng/m^3)	
Phosmet	Trace	1.4 ppb (18,000 ng/m^3)	
Simazine	Trace	3.8 ppb (31,000 ng/m^3)	
Acephate	ND	1.1 ppb (8,500 ng/m^3)	
Bensulide	ND	1.5 ppb (24,000 ng/m^3)	
Chlorpyrifos	ND	0.036 ppb (510 ng/m^3)	
Chlorpyrifos OA	ND	0.037 ppb (510 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Cypermethrin	ND	1.6 ppb (27,000 ng/m^3)	
DEF	ND	NA ppb (NA ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.032 ppb (300 ng/m^3)	
Dimethoate OA	ND	0.034 ppb (300 ng/m^3)	
Diuron	ND	0.6 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.019 ppb (330 ng/m^3)	
EPTC	ND	1.1 ppb (8,500 ng/m^3)	
Iprodione	ND	7.1 ppb (95,600 ng/m^3)	
pp-dicofol	ND	1.3 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	

Temporal Trends in Detected Concentrations

The following figures depict the concentrations over time for any chemical detected at a quantifiable concentration in Santa Maria in 2021. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

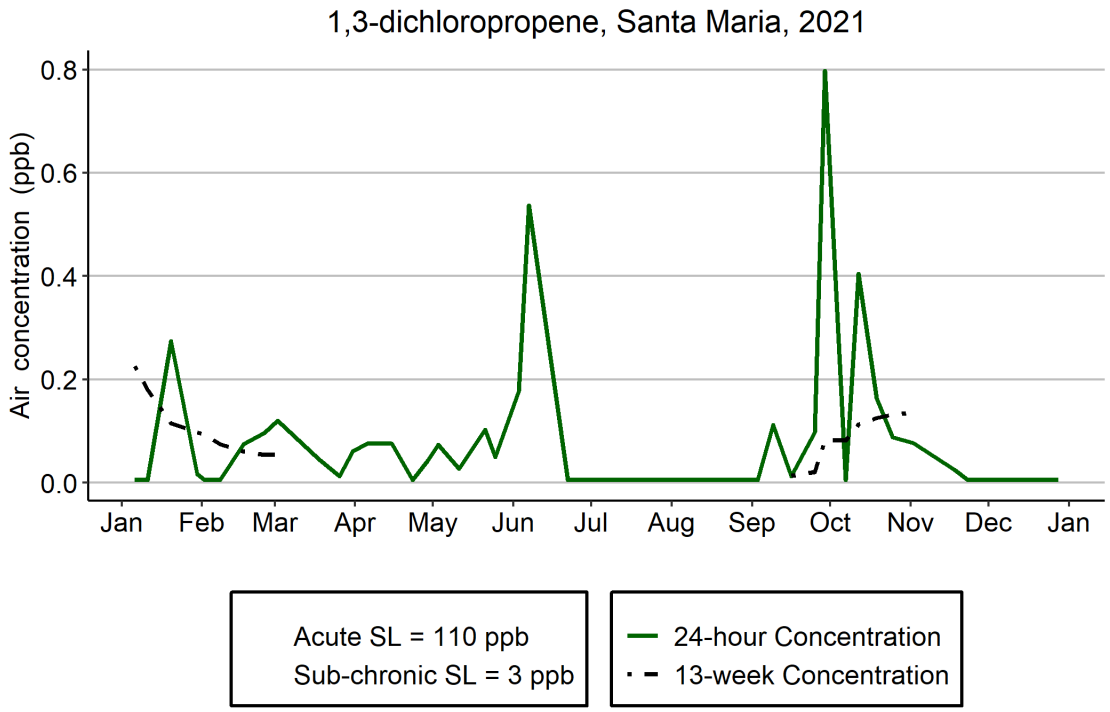

Figure B-1. Temporal trend in 1,3-dichloropropene concentrations in Santa Maria in 2021.

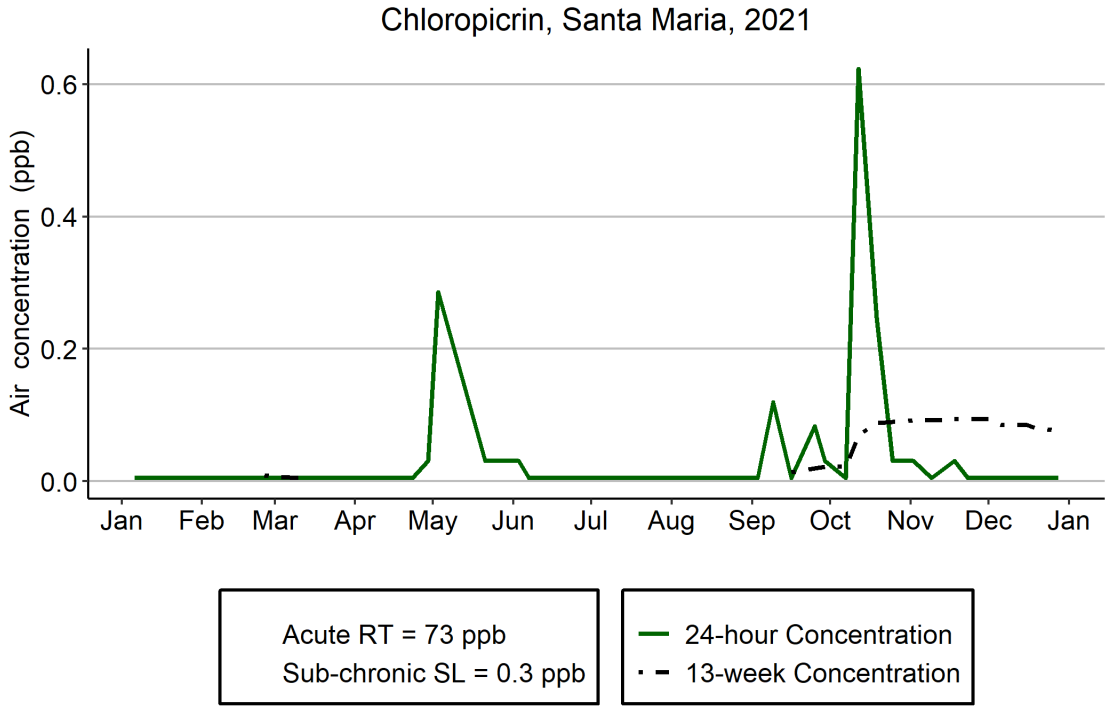

Figure B-2. Temporal trend in Chloropicrin concentrations in Santa Maria in 2021.

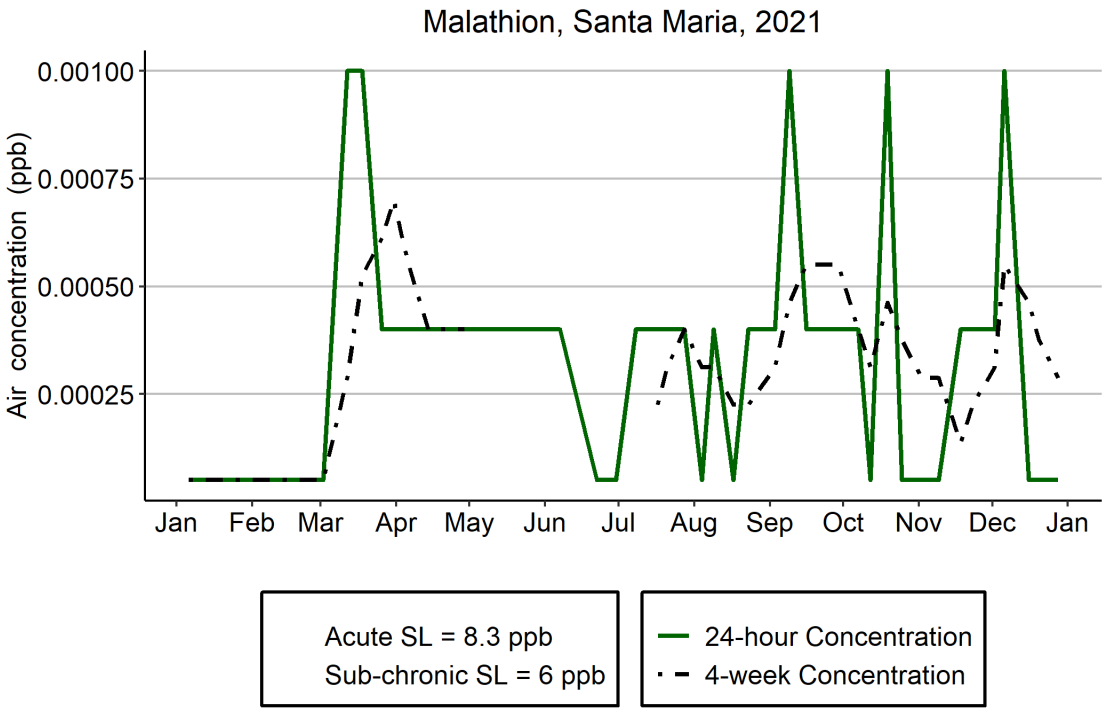

Figure B-3. Temporal trend in Malathion concentrations in Santa Maria in 2021.

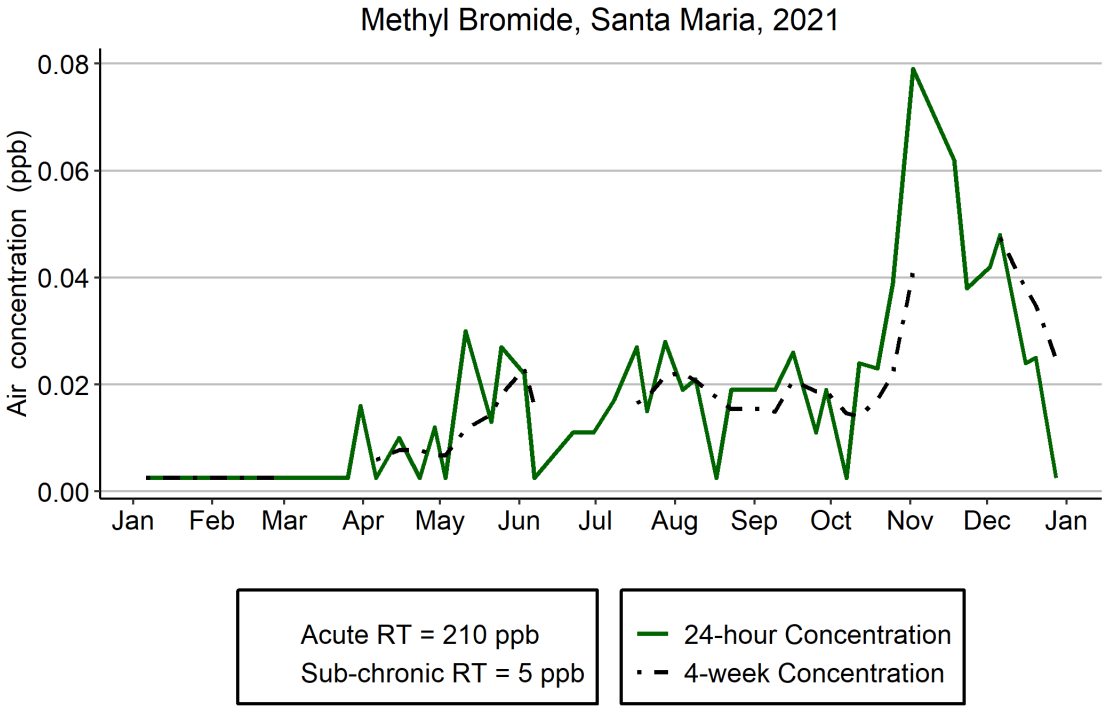

Figure B-4. Temporal trend in Methyl Bromide concentrations in Santa Maria in 2021.

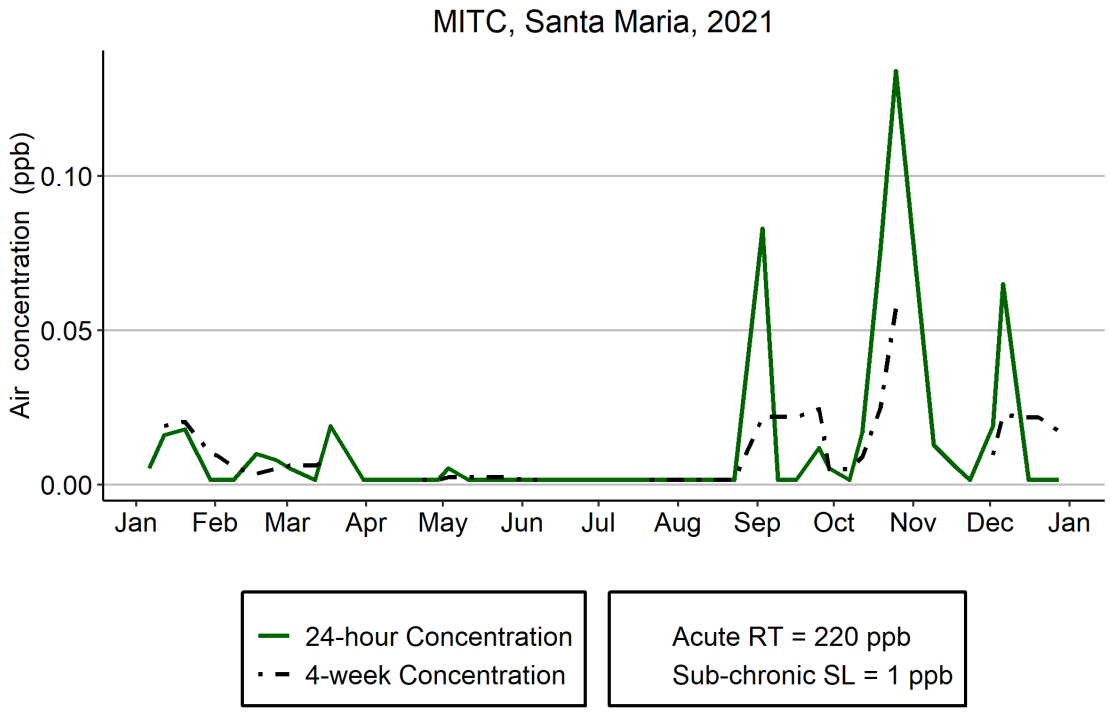

Figure B-5. Temporal trend in MITC concentrations in Santa Maria in 2021.

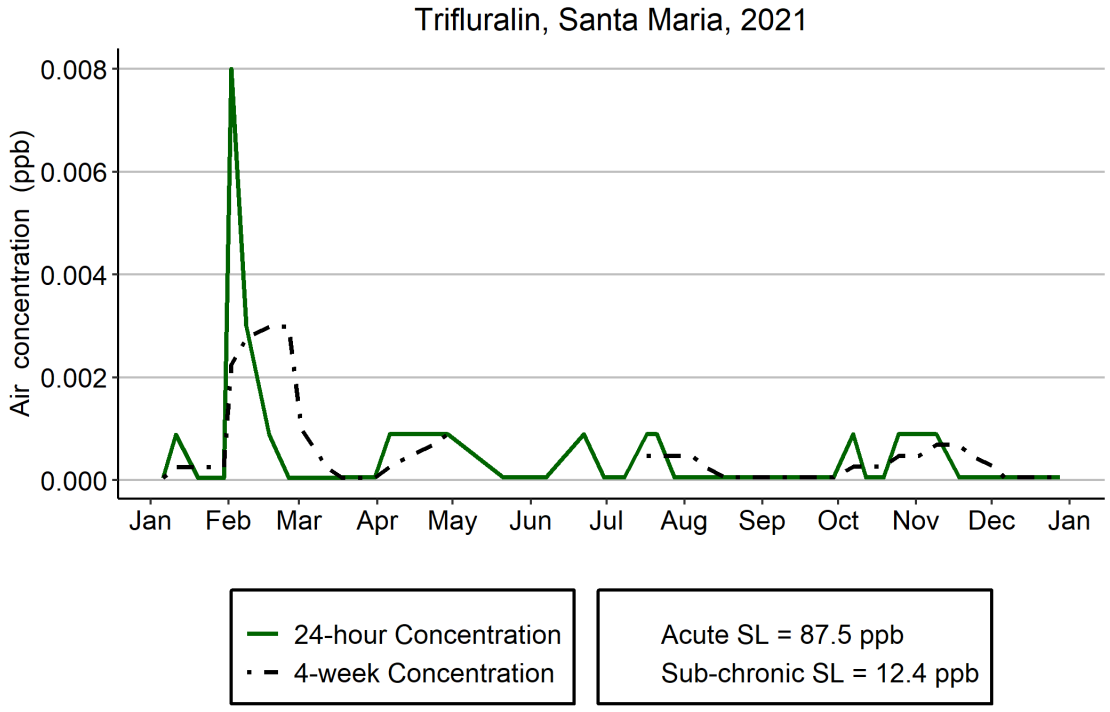

Figure B-6. Temporal trend in Trifluralin concentrations in Santa Maria in 2021.

APPENDIX C: SHAFTER RESULTS

The Shafter sampling site has been monitored since 2011. Shafter is 18 square miles in area located 18 miles west-northwest of Bakersfield in Kern County. The elevation is 351 feet and receives an average of 7 inches of precipitation annually. Average temperatures range from 59° to 99°F in the summer and 35° to 64°F in winter. Based on the 2020 census, the population of Shafter was 20,000 of which 35% were below 18 years of age and 8% were above 65 years of age. The monitoring site was originally situated at a city well located adjacent to Shafter High School at the northeastern edge of the city. On February 22, 2019, the monitoring site was relocated to the north-west corner of Sequoia Elementary School, a half mile north-northwest from the original sampling location.

Pesticide Detections

Table C–1 lists the number and percentage of analyses resulting in detections at the Shafter AMN sampling site in 2021. The active ingredient with the highest number of quantifiable detections was 1,3-D (n=35, 69%), followed by MeBr (n=28, 55%), and MITC (n=13, 26%).

Table C–1 Number and percentage of positive samples per chemical in Shafter in 2021.

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	51	35	35	68.6 %	68.6 %
Acephate	51	0	0	0 %	0 %
Bensulide	51	0	0	0 %	0 %
Chloropicrin	51	2	0	3.9 %	0 %
Chlorothalonil	51	12	0	23.5 %	0 %
Chlorpyrifos	51	0	0	0 %	0 %
Chlorpyrifos OA	51	0	0	0 %	0 %
Cypermethrin	51	0	0	0 %	0 %
Dacthal	51	0	0	0 %	0 %
DDVP	51	2	1	3.9 %	2 %
DEF	51	0	0	0 %	0 %
Diazinon	51	0	0	0 %	0 %
Diazinon OA	51	1	0	2 %	0 %
Dimethoate	51	0	0	0 %	0 %

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Dimethoate OA	51	0	0	0 %	0 %
Diuron	51	1	0	2 %	0 %
Endosulfan	51	0	0	0 %	0 %
Endosulfan Sulfate	51	0	0	0 %	0 %
EPTC	51	3	1	5.9 %	2 %
Iprodione	51	0	0	0 %	0 %
Malathion	51	0	0	0 %	0 %
Malathion OA	51	1	0	2 %	0 %
Methidathion	51	0	0	0 %	0 %
Methyl Bromide	51	28	28	54.9 %	54.9 %
Metolachlor	51	0	0	0 %	0 %
MITC	50	20	13	40 %	26 %
Norflurazon	51	0	0	0 %	0 %
Oryzalin	51	0	0	0 %	0 %
Oxydemeton Methyl	51	0	0	0 %	0 %
Oxyfluorfen	51	3	0	5.9 %	0 %
Permethrin	51	0	0	0 %	0 %
Phosmet	51	0	0	0 %	0 %
pp-dicofol	51	0	0	0 %	0 %
Propargite	51	0	0	0 %	0 %
Simazine	51	0	0	0 %	0 %
Trifluralin	51	2	1	3.9 %	2 %
Total	1,835	110	79	6 %	4.3 %

Pesticide Concentrations

Acute (24-hour) Concentrations

Table C–2 shows the highest 24-hour concentrations observed for all chemicals monitored at the Shafter AMN sampling site in 2021. The highest concentration relative to its screening level was that of 1,3-D at 2%. The remaining chemicals' concentrations were less than 1% of their acute screening levels.

Table C–2. Highest 24-hour air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored in Shafter in 2021.

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	2.3 ppb (10,421 ng/m^3)	110 ppb** (500,000 ng/m^3)	2.1 %
DDVP	0.003 ppb (30.2 ng/m^3)	1.2 ppb (11,000 ng/m^3)	0.27 %
EPTC	0.017 ppb (128 ng/m^3)	29.7 ppb (230,000 ng/m^3)	0.056 %
Methyl Bromide	0.047 ppb (182 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.022 %
MITC	0.13 ppb (388 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.059 %
Trifluralin	0 ppb (3.8 ng/m^3)	87.5 ppb (1,200,000 ng/m^3)	0.0003 %
Acephate	ND	1.6 ppb (12,000 ng/m^3)	
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chloropicrin	Trace	73 ppb*† (491,000 ng/m^3)	
Chlorothalonil	Trace	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.084 ppb (1,200 ng/m^3)	
Chlorpyrifos OA	ND	0.088 ppb (1,200 ng/m^3)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Cypermethrin	ND	6.6 ppb (113,000 ng/m^3)	
Dacthal	ND	1,732 ppb (23,500,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	Trace	0.011 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	ND	0.49 ppb (4,300 ng/m^3)	
Diuron	Trace	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
Iprodione	ND	23.2 ppb (313,000 ng/m^3)	
Malathion	ND	8.3 ppb (112,500 ng/m^3)	
Malathion OA	Trace	8.8 ppb (112,500 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Metolachlor	ND	7.3 ppb (85,000 ng/m^3)	
Norflurazon	ND	12.6 ppb (170,000 ng/m^3)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Oryzalin	ND	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl	ND	3.7 ppb (39,200 ng/m^3)	
Oxyfluorfen	Trace	34.5 ppb (510,000 ng/m^3)	
Permethrin	ND	10.5 ppb (168,000 ng/m^3)	
Phosmet	ND	5.9 ppb (77,000 ng/m^3)	
pp-dicofol	ND	4.5 ppb (68,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	13.3 ppb (110,000 ng/m^3)	

* This value is a regulatory target rather than a screening level.
† This value is an 8-h time-weighted-average (TWA) used to compare the 24-h concentration.
** This value is a 72-hour TWA used to compare against the 24-hour measured concentration.

Sub-chronic (4- or 13-week) Concentrations

Table C–3 shows the highest rolling 4-week or 13-week average concentrations for all chemicals monitored at the Shafter AMN sampling site in 2021. The highest rolling average concentration relative to its screening level was that of 1,3-D (146%) followed by MITC (3%). 1,3-D high detection was due to one high detection from Oct/16/2020 (week 1) that rolled over the week of Jan/07/2021 (week 13).

Table C–3. Highest rolling average air concentrations, sub-chronic screening levels, and percent of the sub- chronic screening level for chemicals monitored in Shafter in 2021.

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	01/07/2021	4.5 ppb* (20,493 ng/m^3)	3 ppb (14,000 ng/m^3)	146 %

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
DDVP	06/11/2021	0.00082 ppb (8.2 ng/m^3)	0.24 ppb (2,200 ng/m^3)	0.37 %
EPTC	06/18/2021	0.0044 ppb (32.7 ng/m^3)	3.1 ppb (24,000 ng/m^3)	0.14 %
Methyl Bromide	06/21/2021	0.033 ppb (128 ng/m^3)	5 ppb† (19,400 ng/m^3)	0.66 %
MITC	08/02/2021	0.034 ppb (100 ng/m^3)	1 ppb (3,000 ng/m^3)	3.3 %
Trifluralin	05/10/2021	0.00026 ppb (3.7 ng/m^3)	12.4 ppb (170,000 ng/m^3)	0.0022 %
Acephate		ND	1.1 ppb (8,500 ng/m^3)	
Bensulide		ND	1.5 ppb (24,000 ng/m^3)	
Chloropicrin		Trace	0.35 ppb (2,300 ng/m^3)	
Chlorothalonil		Trace	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.059 ppb (850 ng/m^3)	
Chlorpyrifos OA		ND	0.062 ppb (850 ng/m^3)	
Cypermethrin		ND	4.8 ppb (81,000 ng/m^3)	
Dacthal		ND	34.6 ppb (470,000 ng/m^3)	
DEF		ND	0.68 ppb (8,800 ng/m^3)	
Diazinon		ND	0.01 ppb (130 ng/m^3)	
Diazinon OA		Trace	0.011 ppb (130 ng/m^3)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Dimethoate		ND	0.32 ppb (3,000 ng/m^3)	
Dimethoate OA		ND	0.34 ppb (3,000 ng/m^3)	
Diuron		Trace	1.8 ppb (17,000 ng/m^3)	
Endosulfan		ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate		ND	0.19 ppb (3,300 ng/m^3)	
Iprodione		ND	7.1 ppb (95,600 ng/m^3)	
Malathion		ND	6 ppb (80,600 ng/m^3)	
Malathion OA		Trace	6.3 ppb (80,600 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Metolachlor		ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon		ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin		ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl		ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen		Trace	12.2 ppb (180,000 ng/m^3)	
Permethrin		ND	5.6 ppb (90,000 ng/m^3)	
Phosmet		ND	2 ppb (26,000 ng/m^3)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
pp-dicofol		ND	3.2 ppb (49,000 ng/m^3)	
Propargite		ND	0.98 ppb (14,000 ng/m^3)	
Simazine		ND	3.8 ppb (31,000 ng/m^3)	

* Represents a 13-week rolling average rather than the default 4-week rolling average.
† This value is a regulatory target rather than a screening level.
‡ This is the week (week 4 or week 13) when the highest cumulative rolling average was detected.

Chronic (annual) Concentrations

Table C–4 shows the annual average concentration for all chemicals monitored at the Shafter sampling site in 2021. The pesticide with highest concentration relative to its screening level was that of MITC at 11%, followed by 1,3-D at 8%. All other monitored chemicals were less than 1% of their chronic screening level.

Table C–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Shafter in 2021.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.16 ppb (745 ng/m^3)	2 ppb (9,000 ng/m^3)	8.3 %
DDVP	0.00017 ppb (1.6 ng/m^3)	0.085 ppb (770 ng/m^3)	0.21 %
EPTC	0.00049 ppb (3.9 ng/m^3)	1.1 ppb (8,500 ng/m^3)	0.046 %
Methyl Bromide	0.012 ppb (46.6 ng/m^3)	1 ppb (3,900 ng/m^3)	1.2 %
MITC	0.011 ppb (33.8 ng/m^3)	0.1 ppb (300 ng/m^3)	11.3 %
Trifluralin	0.000064 ppb (1.1 ng/m^3)	3 ppb (41,000 ng/m^3)	0.003 %
Chloropicrin	Trace	0.27 ppb (1,800 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Chlorothalonil	Trace	3.1 ppb (34,000 ng/m^3)	
Diazinon OA	Trace	0.011 ppb (130 ng/m^3)	
Diuron	Trace	0.6 ppb (5,700 ng/m^3)	
Malathion OA	Trace	0.63 ppb (8,100 ng/m^3)	
Oxyfluorfen	Trace	3.4 ppb (51,000 ng/m^3)	
Acephate	ND	1.1 ppb (8,500 ng/m^3)	
Bensulide	ND	1.5 ppb (24,000 ng/m^3)	
Chlorpyrifos	ND	0.036 ppb (510 ng/m^3)	
Chlorpyrifos OA	ND	0.037 ppb (510 ng/m^3)	
Cypermethrin	ND	1.6 ppb (27,000 ng/m^3)	
Dacthal	ND	3.5 ppb (47,000 ng/m^3)	
DEF	ND	NA ppb (NA ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.032 ppb (300 ng/m^3)	
Dimethoate OA	ND	0.034 ppb (300 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Endosulfan Sulfate	ND	0.019 ppb (330 ng/m^3)	
Iprodione	ND	7.1 ppb (95,600 ng/m^3)	
Malathion	ND	0.6 ppb (8,100 ng/m^3)	
Methidathion	ND	0.2 ppb (2,500 ng/m^3)	
Metolachlor	ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.058 ppb (610 ng/m^3)	
Permethrin	ND	5.6 ppb (90,000 ng/m^3)	
Phosmet	ND	1.4 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.3 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.8 ppb (31,000 ng/m^3)	

Temporal Trends in Detected Concentrations

The following figures depict the concentrations over time for any chemical detected at a quantifiable concentration in Shafter in 2021. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

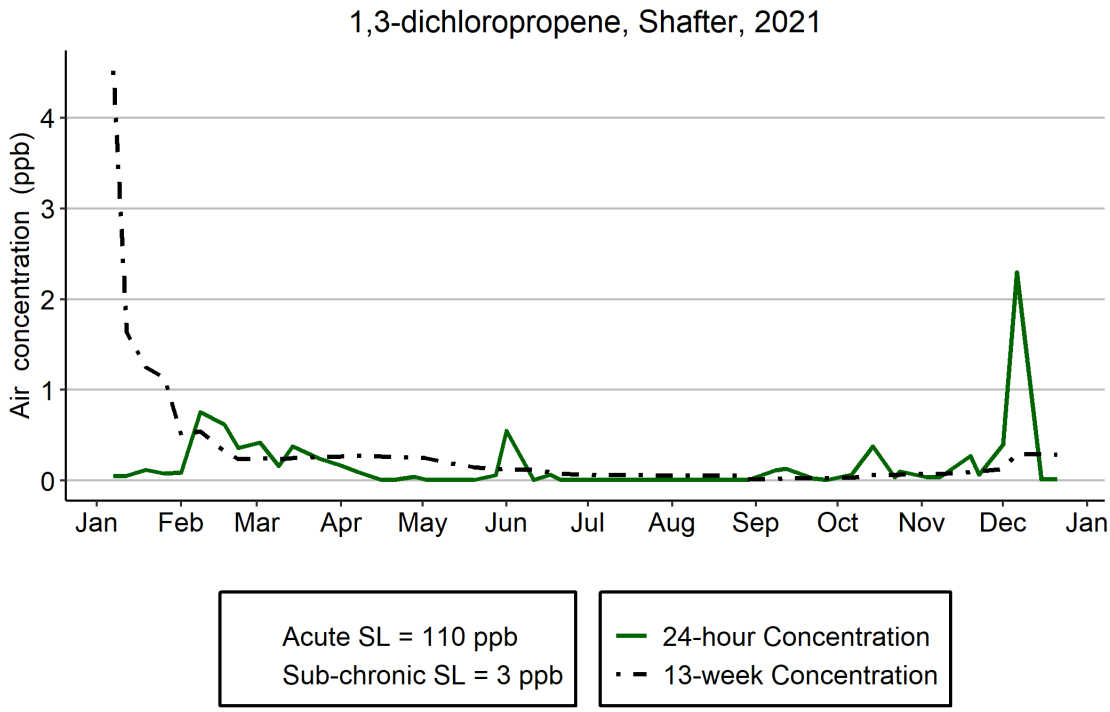

Figure C-1. Temporal trend in 1,3-dichloropropene concentrations in Shafter in 2021.

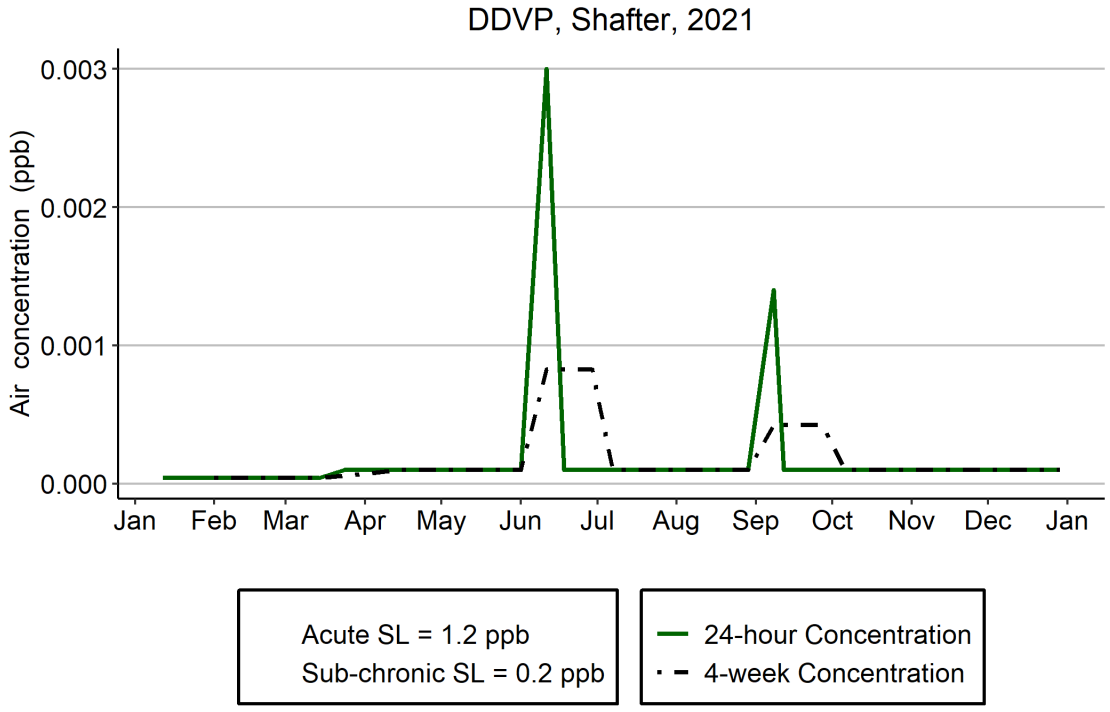

Figure C-2. Temporal trend in DDVP concentrations in Shafter in 2021.

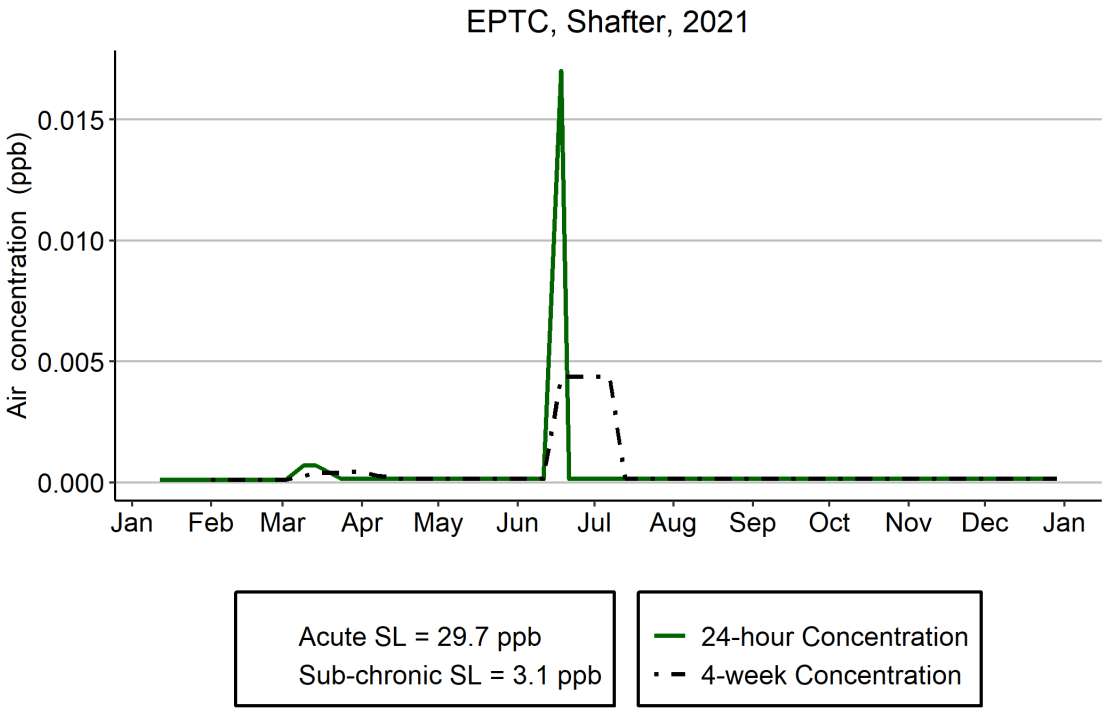

Figure C-3. Temporal trend in EPTC concentrations in Shafter in 2021.

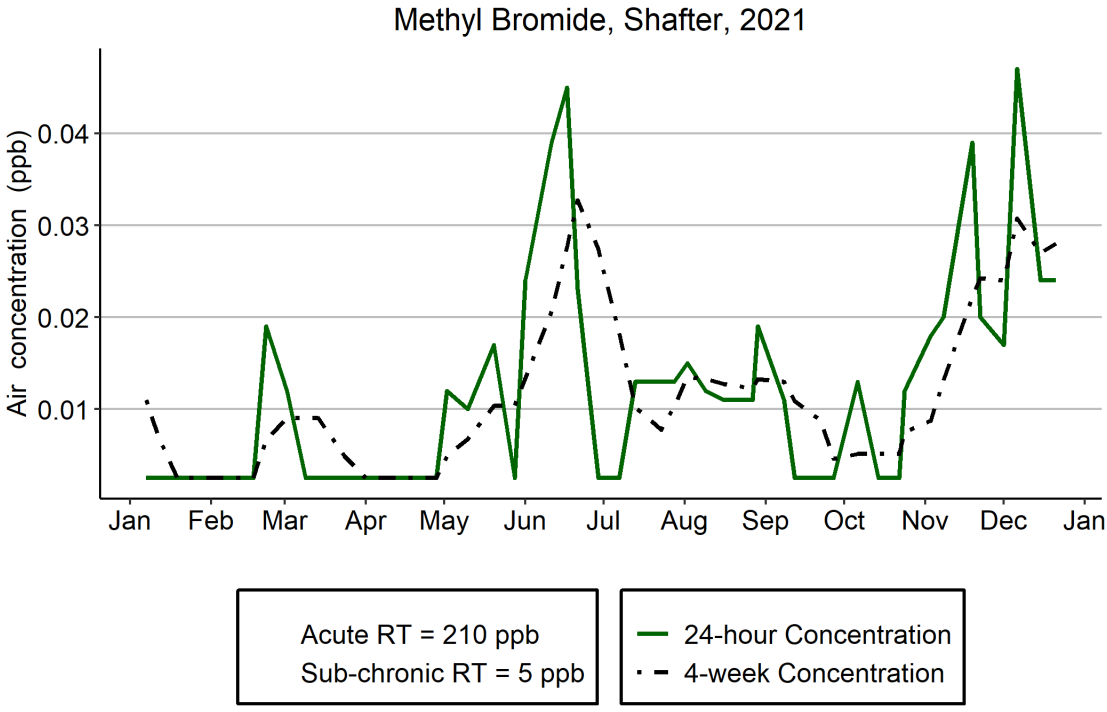

Figure C-4. Temporal trend in Methyl Bromide concentrations in Shafter in 2021.

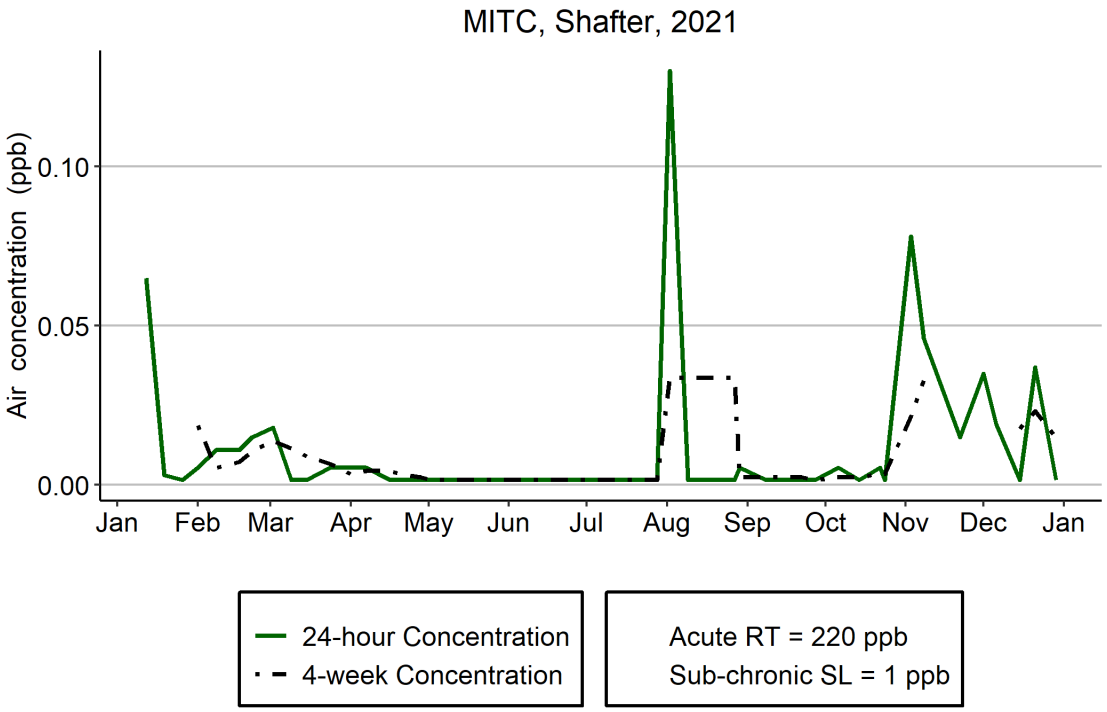

Figure C-5. Temporal trend in MITC concentrations in Shafter in 2021.

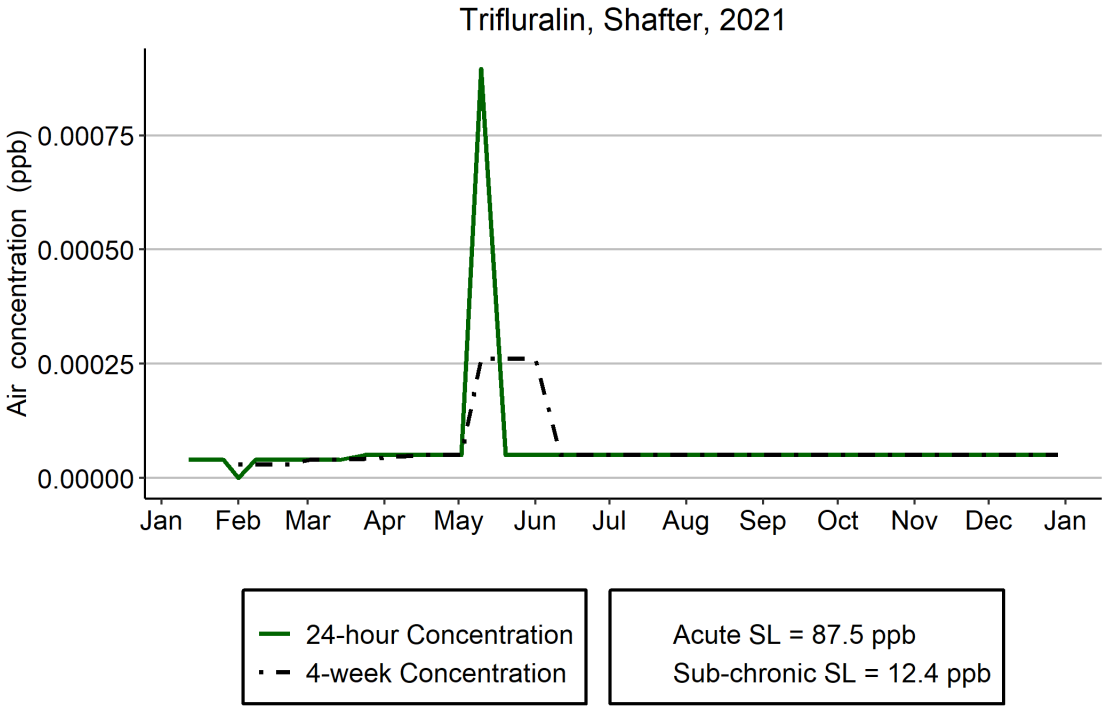

Figure C-6. Temporal trend in Trifluralin concentrations in Shafter in 2021.

APPENDIX D: WATSONVILLE RESULTS

Watsonville is a small city of 7 square miles in area located on the southern edge of Santa Cruz County. The elevation is 29 feet, and it receives on average 22 inches of precipitation annually. Daily average temperatures range from 50° to 72°F in the summer to 38° to 63°F in winter. Based on the 2020 census, the population of Watsonville was 53,000 of which 31% were below 18 years of age and 11% were above 65 years of age. The monitoring site is located approximately 2 miles south of Watsonville at Ohlone Elementary School.

Pesticide Detections

Table D–1 lists the number and percentage of analyses resulting in detections at the Watsonville in 2021. The active ingredient with the highest number of quantifiable detections was 1,3-D (n=24, 47%), followed by MeBr (n=15, 29%), and Chloropicrin (n=9, 17%).

Table D–1 Number and percentage of positive samples per chemical in Watsonville in 2021.

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	51	24	24	47.1 %	47.1 %
Acephate	51	0	0	0 %	0 %
Bensulide	51	0	0	0 %	0 %
Chloropicrin	52	15	9	28.8 %	17.3 %
Chlorothalonil	51	0	0	0 %	0 %
Chlorpyrifos	51	0	0	0 %	0 %
Chlorpyrifos OA	51	0	0	0 %	0 %
Cypermethrin	51	0	0	0 %	0 %
Dacthal	51	3	0	5.9 %	0 %
DDVP	51	6	0	11.8 %	0 %
DEF	51	0	0	0 %	0 %
Diazinon	51	0	0	0 %	0 %
Diazinon OA	51	0	0	0 %	0 %
Dimethoate	51	0	0	0 %	0 %
Dimethoate OA	51	0	0	0 %	0 %

Chemical	Number of Valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Diuron	51	0	0	0 %	0 %
Endosulfan	51	0	0	0 %	0 %
Endosulfan Sulfate	51	0	0	0 %	0 %
EPTC	51	0	0	0 %	0 %
Iprodione	51	0	0	0 %	0 %
Malathion	51	0	0	0 %	0 %
Malathion OA	51	0	0	0 %	0 %
Methidathion	51	0	0	0 %	0 %
Methyl Bromide	51	15	15	29.4 %	29.4 %
Metolachlor	51	0	0	0 %	0 %
MITC	52	10	3	19.2 %	5.8 %
Norflurazon	51	0	0	0 %	0 %
Oryzalin	51	0	0	0 %	0 %
Oxydemeton Methyl	51	0	0	0 %	0 %
Oxyfluorfen	51	1	0	2 %	0 %
Permethrin	51	0	0	0 %	0 %
Phosmet	51	0	0	0 %	0 %
pp-dicofol	51	0	0	0 %	0 %
Propargite	51	0	0	0 %	0 %
Simazine	51	0	0	0 %	0 %
Trifluralin	51	0	0	0 %	0 %
Total	1,838	74	51	4 %	2.8 %

Pesticide Concentrations

Acute (24-hour) Concentrations

Table D–2 shows the highest 24-hour concentrations observed for all chemicals monitored at the Watsonville AMN sampling site in 2021. All chemicals with quantifiable concentrations were less than 1% of their acute screening level or regulatory target in Watsonville in 2021.

Table D–2. Highest 24-hour air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored in Watsonville in 2021.

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	0.4 ppb (1,811 ng/m^3)	110 ppb** (500,000 ng/m^3)	0.36 %
Chloropicrin	0.31 ppb (2,074 ng/m^3)	73 ppb*† (491,000 ng/m^3)	0.42 %
Methyl Bromide	0.95 ppb (3,693 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.45 %
MITC	0.063 ppb (188 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.028 %
Acephate	ND	1.6 ppb (12,000 ng/m^3)	
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chlorothalonil	ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.084 ppb (1,200 ng/m^3)	
Chlorpyrifos OA	ND	0.088 ppb (1,200 ng/m^3)	
Cypermethrin	ND	6.6 ppb (113,000 ng/m^3)	
Dacthal	Trace	1,732 ppb (23,500,000 ng/m^3)	
DDVP	Trace	1.2 ppb (11,000 ng/m^3)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.011 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	ND	0.49 ppb (4,300 ng/m^3)	
Diuron	ND	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	ND	29.7 ppb (230,000 ng/m^3)	
Iprodione	ND	23.2 ppb (313,000 ng/m^3)	
Malathion	ND	8.3 ppb (112,500 ng/m^3)	
Malathion OA	ND	8.8 ppb (112,500 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Metolachlor	ND	7.3 ppb (85,000 ng/m^3)	
Norflurazon	ND	12.6 ppb (170,000 ng/m^3)	
Oryzalin	ND	29.7 ppb (420,000 ng/m^3)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Oxydemeton Methyl	ND	3.7 ppb (39,200 ng/m^3)	
Oxyfluorfen	Trace	34.5 ppb (510,000 ng/m^3)	
Permethrin	ND	10.5 ppb (168,000 ng/m^3)	
Phosmet	ND	5.9 ppb (77,000 ng/m^3)	
pp-dicofol	ND	4.5 ppb (68,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	13.3 ppb (110,000 ng/m^3)	
Trifluralin	ND	87.5 ppb (1,200,000 ng/m^3)	

* This value is a regulatory target rather than a screening level.
† This value is an 8-h time-weighted-average (TWA) used to compare the 24-h concentration.
** This value is a 72-hour TWA used to compare against the 24-hour measured concentration.

Sub-chronic (4- or 13-week) Concentrations

Table D–3 shows the highest rolling 4-week or 13-week average concentrations for all chemicals monitored at the Watsonville AMN sampling site in 2021. The highest concentration relative to its screening level was that of Chloropicrin at 28%, followed by 1,3-D at 6%, MeBr at 5%, and MITC at 2%.

Table D–3. Highest rolling average air concentrations, sub-chronic screening levels, and percent of the sub- chronic screening level for chemicals monitored in Watsonville in 2021.

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	01/07/2021	0.19 ppb* (875 ng/m^3)	3 ppb (14,000 ng/m^3)	6.2 %
Chloropicrin	11/28/2021	0.097 ppb* (652 ng/m^3)	0.35 ppb (2,300 ng/m^3)	28.3 %

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Methyl Bromide	05/19/2021	0.24 ppb (931 ng/m^3)	5 ppb† (19,400 ng/m^3)	4.8 %
MITC	10/28/2021	0.02 ppb (58.6 ng/m^3)	1 ppb (3,000 ng/m^3)	2 %
Acephate		ND	1.1 ppb (8,500 ng/m^3)	
Bensulide		ND	1.5 ppb (24,000 ng/m^3)	
Chlorothalonil		ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.059 ppb (850 ng/m^3)	
Chlorpyrifos OA		ND	0.062 ppb (850 ng/m^3)	
Cypermethrin		ND	4.8 ppb (81,000 ng/m^3)	
Dacthal		Trace	34.6 ppb (470,000 ng/m^3)	
DDVP		Trace	0.24 ppb (2,200 ng/m^3)	
DEF		ND	0.68 ppb (8,800 ng/m^3)	
Diazinon		ND	0.01 ppb (130 ng/m^3)	
Diazinon OA		ND	0.011 ppb (130 ng/m^3)	
Dimethoate		ND	0.32 ppb (3,000 ng/m^3)	
Dimethoate OA		ND	0.34 ppb (3,000 ng/m^3)	
Diuron		ND	1.8 ppb (17,000 ng/m^3)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Endosulfan		ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate		ND	0.19 ppb (3,300 ng/m^3)	
EPTC		ND	3.1 ppb (24,000 ng/m^3)	
Iprodione		ND	7.1 ppb (95,600 ng/m^3)	
Malathion		ND	6 ppb (80,600 ng/m^3)	
Malathion OA		ND	6.3 ppb (80,600 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Metolachlor		ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon		ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin		ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl		ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen		Trace	12.2 ppb (180,000 ng/m^3)	
Permethrin		ND	5.6 ppb (90,000 ng/m^3)	
Phosmet		ND	2 ppb (26,000 ng/m^3)	
pp-dicofol		ND	3.2 ppb (49,000 ng/m^3)	
Propargite		ND	0.98 ppb (14,000 ng/m^3)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Simazine		ND	3.8 ppb (31,000 ng/m^3)	
Trifluralin		ND	12.4 ppb (170,000 ng/m^3)	

* Represents a 13-week rolling average rather than the default 4-week rolling average.
† This value is a regulatory target rather than a screening level.
‡ This is the week (week 4 or week 13) when the highest cumulative rolling average was detected.

Chronic (annual) Concentrations

Table D–4 shows the annual average concentration for all chemicals monitored at the Watsonville sampling site in 2021. The pesticide with highest concentration relative to its screening level was Chloropicrin at 11%, followed by MITC at 4%.

Table D–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Watsonville in 2021.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.059 ppb (267 ng/m^3)	2 ppb (9,000 ng/m^3)	3 %
Chloropicrin	0.029 ppb (197 ng/m^3)	0.27 ppb (1,800 ng/m^3)	10.9 %
Methyl Bromide	0.026 ppb (103 ng/m^3)	1 ppb (3,900 ng/m^3)	2.6 %
MITC	0.0038 ppb (11.4 ng/m^3)	0.1 ppb (300 ng/m^3)	3.8 %
Dacthal	Trace	3.5 ppb (47,000 ng/m^3)	
DDVP	Trace	0.085 ppb (770 ng/m^3)	
Oxyfluorfen	Trace	3.4 ppb (51,000 ng/m^3)	
Acephate	ND	1.1 ppb (8,500 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Bensulide	ND	1.5 ppb (24,000 ng/m^3)	
Chlorothalonil	ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.036 ppb (510 ng/m^3)	
Chlorpyrifos OA	ND	0.037 ppb (510 ng/m^3)	
Cypermethrin	ND	1.6 ppb (27,000 ng/m^3)	
DEF	ND	NA ppb (NA ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.011 ppb (130 ng/m^3)	
Dimethoate	ND	0.032 ppb (300 ng/m^3)	
Dimethoate OA	ND	0.034 ppb (300 ng/m^3)	
Diuron	ND	0.6 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.019 ppb (330 ng/m^3)	
EPTC	ND	1.1 ppb (8,500 ng/m^3)	
Iprodione	ND	7.1 ppb (95,600 ng/m^3)	
Malathion	ND	0.6 ppb (8,100 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Malathion OA	ND	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.2 ppb (2,500 ng/m^3)	
Metolachlor	ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.058 ppb (610 ng/m^3)	
Permethrin	ND	5.6 ppb (90,000 ng/m^3)	
Phosmet	ND	1.4 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.3 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.8 ppb (31,000 ng/m^3)	
Trifluralin	ND	3 ppb (41,000 ng/m^3)	

Temporal Trends in Detected Concentrations

The following figures depict the concentrations over time for any chemical detected at a quantifiable concentration in Watsonville in 2021. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

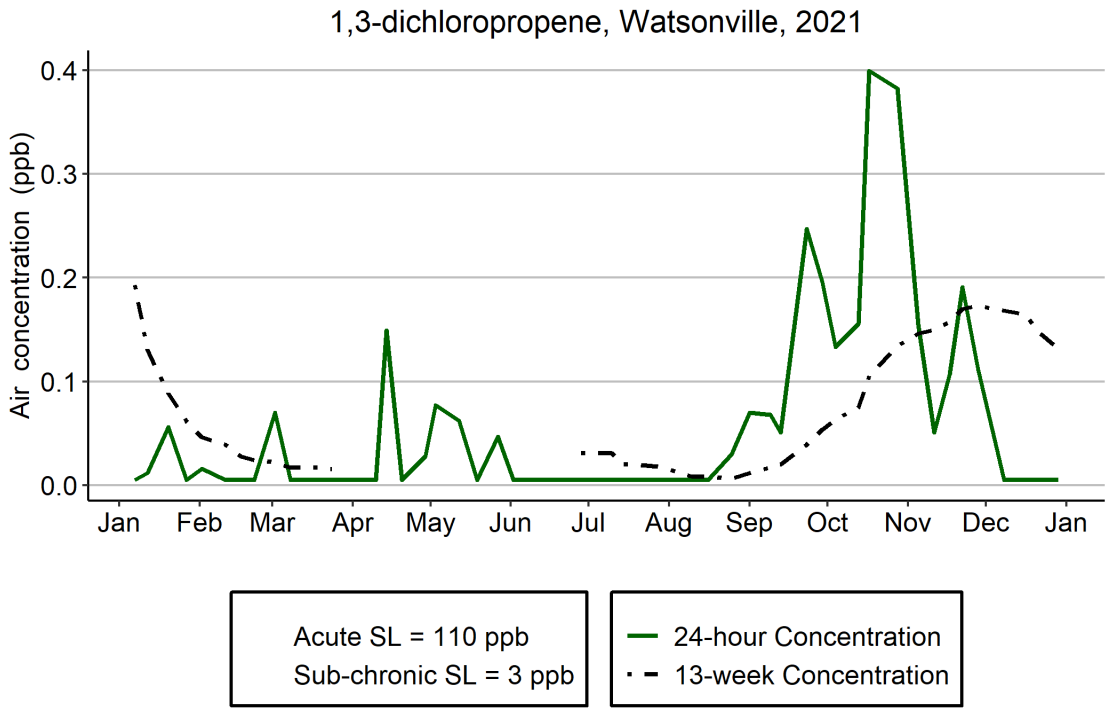

Figure D-1. Temporal trend in 1,3-dichloropropene concentrations in Watsonville in 2021.

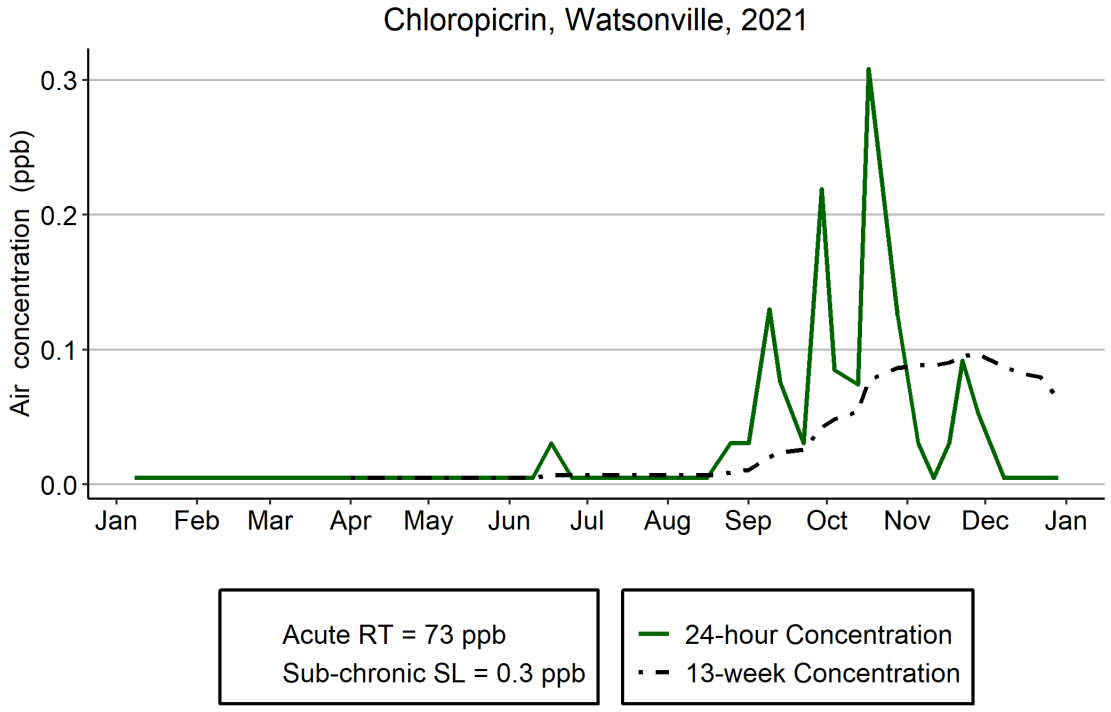

Figure D-2. Temporal trend in Chloropicrin concentrations in Watsonville in 2021.

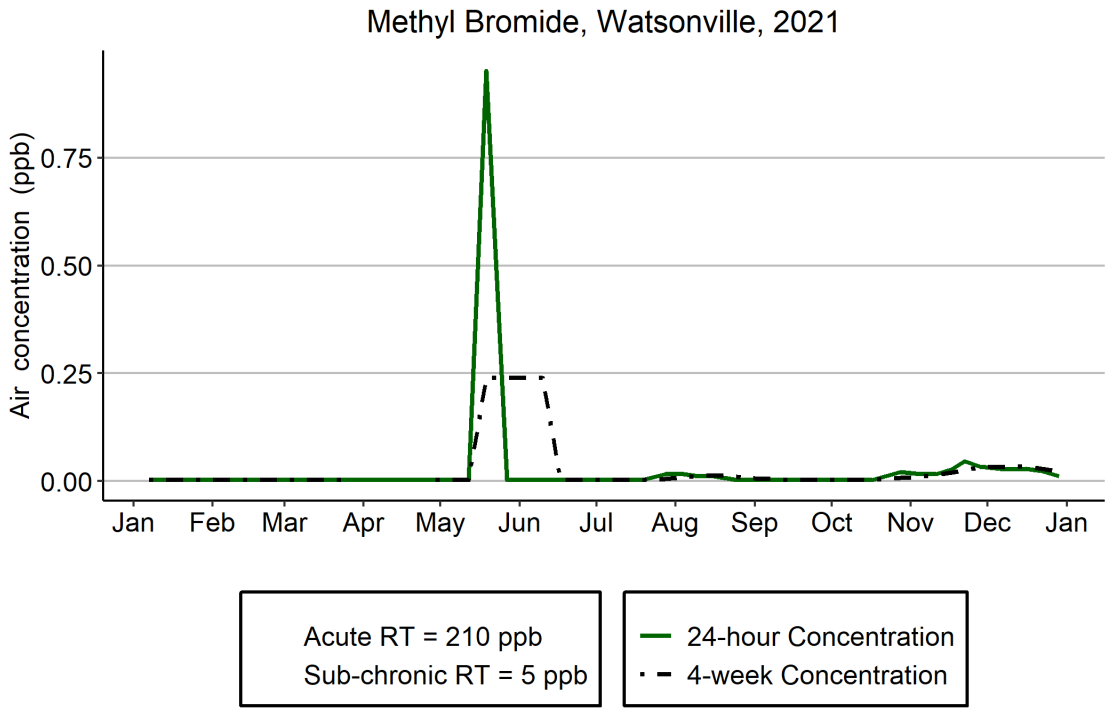

Figure D-3. Temporal trend in Methyl Bromide concentrations in Watsonville in 2021.

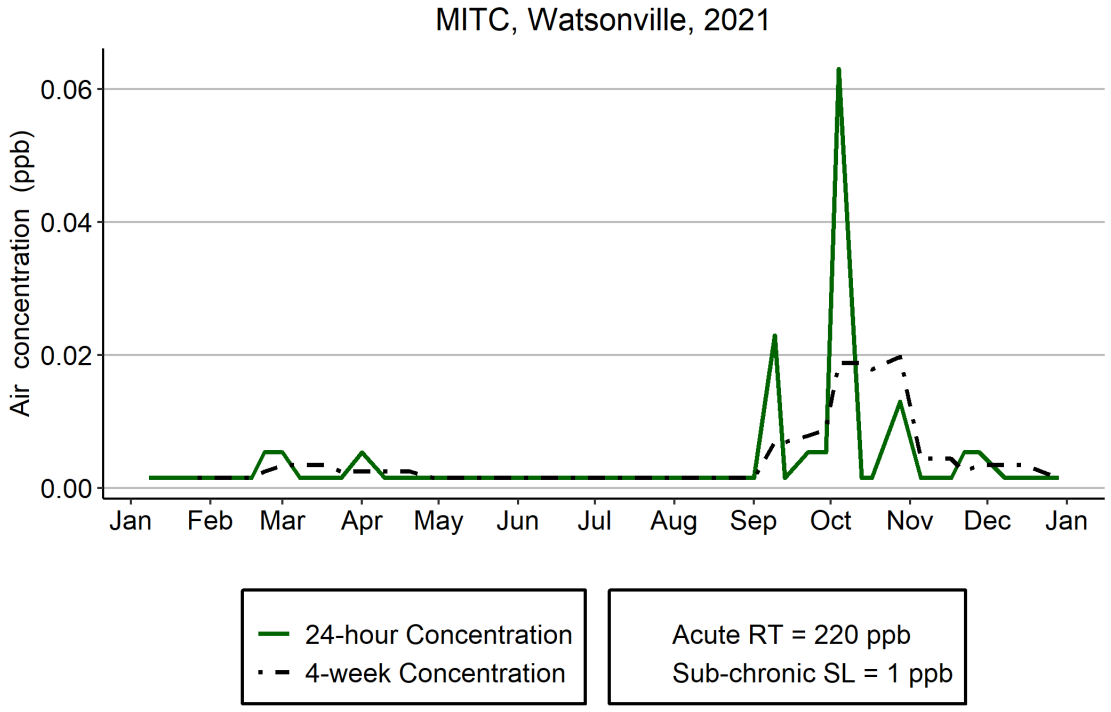

Figure D-4. Temporal trend in MITC concentrations in Watsonville in 2021.

Appendix E: FIELD METHODS

Materials and Methods

Current Air Sampling Methods

As part of the Air Monitoring Network (AMN), the California Department of Pesticide Regulation (DPR) monitors for 31 pesticides and 5 breakdown products. Chemicals included in the AMN were selected based primarily on potential health risk (CDPR 2013). Four sampling methods were used for the collection of air samples.

Volatile Organic Compounds (VOC)

Ambient air was drawn through 1/16" internal diameter PTFE (Teflon) tubing into a Xonteck model 901 ambient air sampler into a 6-L air steel canister. The flow rate using this method was 7.5 mL/min (± 10%) and was sustained for a 24-h period. The sampler itself included an automatically initiated 60-second purge period to clear the sampling lines immediately prior to sample collection.

Multi-Pesticide Residue

Ambient air was drawn through a customized XAD-4 media using channel 1 of a custom-built 3-channel pesticide sampling version of a Speciation Air Sampling System manufactured by Met One Instruments, hereafter referred to as Met One pesticide sampler. Channel 1 provided a sustained flow of 15.0 L/min ± 10%. The average of flow measurements collected at 5-minute intervals was used to directly calculate the volume sampled which was reported by the instrument. This allowed for more certainty than that of the previous method of calculation which used the mean from only two data points (measurements at the start and finish of sample collection). The Met One pesticide sampler includes a solar shield of a sufficient size to shield the multi-pesticide cartridges from direct sunlight exposure during the sampling period.

Methyl Isothiocyanate (MITC)

Ambient air was drawn through Anasorb CSC coconut charcoal sorbent tubes (SKC # 226-16-02) using channel 2 of the Met One pesticide sampler. Channel 2 provided a sustained flow of 1.5 L/min ± 10%. The average of flow measurements collected at 5-minute intervals was used to directly calculate the volume sampled which was reported by the sampler. This feature allowed for more certainty than the previous method of calculation, which used the mean from only two data points (measurements at the start and end of sample collection). The glass sorption tubes containing the sampling media and any collected analyte were shielded from sunlight by the sampler's radiation shield.

Chloropicrin

Ambient air was drawn through XAD-4 sorbent tubes (SKC # 226-175) using channel 3 of the Met One pesticide sampler. Channel 3 provided a sustained flow of 50 mL/min ± 10%. The average of flow measurements collected at 5-minute intervals was used to directly calculate the

volume sampled which was reported by the machine. This feature allowed for more certainty than the previous method of calculation, which used the mean from only two data points (measurements at the start and finish of sample collection). The glass sorption tubes containing the sampling media and any collected analyte were shielded from sunlight by the sampler's radiation shield.

Legacy AMN equipment (2011-2018)

In the event of unforeseen complications with current equipment, DPR has the option to use legacy methodologies and equipment, allowing staff to collect samples during the scheduled timeframe without compromising the sample's integrity.

Should the Xonteck equipment fail or become unavailable, ambient air was drawn into a 6-L air sample canister (cat. # 24142) pre-evacuated to a pressure of -30" Hg for VOC analysis as a backup method. A Restek flow controller (cat. # 24160) was attached to the canister inlet to achieve a flow rate of 3.0 mL/min (± 10%) for a continuous 24-h sampling period. The air sampling inlet of the flow controller was placed at a sampling height of 3-10 meters, depending on the sampling site location, with a sufficient amount of 1/16" internal diameter PTFE (Teflon®) tubing to reach the canister. Bios Defender 530® or DC-Lite® flow meters were used to check the flow rate at the start and finish of the sampling period.

Should the Met One equipment fail or become unavailable, ambient air was drawn through the XAD-4 media using an SKC® AirChek HV30 air pump as a backup method. The pump was calibrated at a flow rate of 15 L/min (± 10%) for a continuous 24-h period. The cartridges were connected to the pump using a combination of threaded ABS plastic fittings, nitrile o-rings, and approximately 8 feet of Tygon® tubing which were all downstream of the sample media. The Teflon® tube containing the sample media was kept sealed prior to sampling at which time the inlet of the cartridge itself was open to the ambient air. Bios Defender 530® or DC-Lite® flow meters were used to obtain flow rates at the start and finish of the sampling period.

Field Sampling Procedure

One 24-h sample was collected each week at each of the four sites. The starting day varied each week with the actual dates being randomly selected as much as possible. Actual sampling start times were left to the discretion of the field sampling personnel.

Chain of custody (COC) forms, sample analysis request forms, and sample labels including the study number and unique sample identification numbers were supplied to field sampling personnel to be attached to sample tubes, cartridges, and canister tags prior to sampling.

Each of the four sample types detailed above were set up and started as closely as possible to the same time, except for the occasional make-up sample needed to replace an invalid sample. These make-up samples were typically run on the day following an invalidation event. Reasons why samples might be deemed invalid include, but are not limited to, the following: sampling period out of range, ending flow or pressure out of acceptable range, power interruptions, glass tube breakage during removal (i.e., damaged sampling media), and inoperative sampling equipment. The starting flow rates were measured prior to air sample collection and if any

were determined to be out of the acceptable 10%, the equipment was recalibrated. As the air sampling commenced at each monitoring site, the sample tracking number, date, time, staff initials, weather conditions, and air sampler flow rate were documented on a COC form.

Quality Control Methods

In addition to the primary samples, DPR collected quality control (QC) samples including trip blanks and duplicates (co-located) samples at a rate of at least 10% of primary samples. Table F-5 and Table F-6 summarize the results of these QC procedures and are specific to samples analyzed by CDFA's CAC lab only.

A trip blank sample provides information on possible contamination of field collected samples. For the manufactured pre-packed XAD-4 and charcoal sample tubes, trip blank sample ends were broken open, capped, and placed on dry ice with the field samples. The multi-pesticide residue XAD cartridges were opened in the field, capped, and placed on dry ice to be stored and shipped with the field samples. No air canister trip blanks were collected. Trip blanks were collected from the monitoring stations in Shafter and Watsonville at least once every month of sampling. Trip blank samples containing detectable amounts of any of the pesticides would indicate a problem with contamination during transport or during laboratory extraction.

Additionally, a duplicate sample is a sample that is co-located with a regular field sample to evaluate the overall precision in sample measurement and analysis. The sampling stations at Shafter and Watsonville were designated as quality control sites, hence a second set of sampling equipment were installed at these locations.

APPENDIX F: LABORATORY ANALYSIS

Analytical Methods

A total of four analytical methods were used and analyzed by California Department of Food and Agriculture's Center for Analytical Chemistry (CDFA-CAC):

VOC

Air samples collected in summa canisters were analyzed for the presence of the fumigants 1,3-dichloropropene and methyl bromide (Table F-1) using a gas chromatography-mass spectrometry (GC-MS) methodology similar to US EPA's Method TO-14A established by CDFA-CAC (CDFA 2013). Analysis of 1,3-D includes results for both cis- and trans- isomers, which were then consolidated and reported as a total 1,3-D concentration for use in this report.

Table F-1. Target analytes in volatile organic compound analysis.

Pesticide	Pesticide Group	Chemical Class
1,3-dichloropropene	Fumigant	Halogenated organic
Methyl bromide	Fumigant	Halogenated organic

MITC

Samples were collected on Anasorb CSC coconut charcoal sorbent tubes (SKC # 226-16-02) and analyzed by CDFA-CAC staff. MITC residues adsorbed onto the activated charcoal were extracted from the charcoal with 1% carbon disulfide in ethyl acetate and analyzed via GC-MS (Table F-2, CDFA 2018). Full method validation data was obtained and verified by CDFA-CAC (CDFA 2018).

Chloropicrin

Samples were collected on XAD-4 sorbent tubes (SKC # 226-175) and analyzed by CDFA-CAC staff. Chloropicrin residues adsorbed onto the XAD-4 resin were extracted from the resin with methylene chloride and analyzed via GC-MS (Table F-2, CDFA 2020). Full method validation data was obtained and verified by CDFA-CAC (CDFA 2020).

Table F-2. Target analytes in individual analyte residue analysis.

Pesticide	Pesticide Group	Chemical Class
MITC	Fumigant	-
Chloropicrin	Fumigant	Halogenated organic

Multi-Pesticide Residue

Prior to sampling, CDFA-CAC staff washed, rinsed, and packed 30 mL of XAD-4 sorbent material into a custom-built Teflon cartridge to collect analytes of interest via multi-pesticide residue analysis. Multi-pesticide residues were extracted from the XAD-4 resin using ethyl acetate and analyzed by either GC-MS and liquid chromatography tandem mass spectrometry (LC-MS/MS) (CDFA 2021), depending on the analyte of interest. This analysis can detect a variety of fungicides, insecticides, herbicides, and defoliants. The breakdown products (oxygen analogs) of chlorpyrifos, diazinon, dimethoate, endosulfan, and malathion were also included in the multi-pesticide residue analysis method (Table F-3).

Table F-3. Target analytes in multi-pesticide residue analysis.

Chemical	Chemical Class	Pesticide Group
Acephate	Organophosphate	Insecticide
Bensulide	Organophosphate	Herbicide
Chlorothalonil	Chloronitrile	Fungicide
Chlorpyrifos	Organophosphate	Insecticide
Chlorpyrifos oxygen analog (OA)	Organophosphate	Degradate
Chlorthal-dimethyl (Dacthal, DCPA)	Phthalate	Herbicide
Cypermethrin	Pyrethroid	Insecticide
DDVP	Organophosphate	Insecticide
DEF (SSS-tributyl phosphorotrithioate)	Organophosphate	Defoliant
Diazinon	Organophosphate	Insecticide
Diazinon OA	Organophosphate	Degradate
Dicofol	Organochlorine	Insecticide
Dimethoate	Organophosphate	Insecticide
Dimethoate OA	Organophosphate	Degradate

Chemical	Chemical Class	Pesticide Group
Diuron	Urea	Herbicide
Endosulfan	Organochlorine	Insecticide
Endosulfan Sulfate	Organochlorine	Degradate
EPTC	Carbamate	Herbicide
Iprodione	Dicarboximide	Fungicide
Malathion	Organophosphate	Insecticide
Malathion OA	Organophosphate	Degradate
Methidathion	Organophosphate	Insecticide
Metolachlor	Chloracetanilide	Herbicide
Norflurazon	Pyridazinone	Herbicide
Oryzalin	Dinitroaniline	Herbicide
Oxydemeton methyl	Organophosphate	Insecticide
Oxyfluorfen	Diphenyl ether	Herbicide
Permethrin	Pyrethroid	Insecticide
Phosmet	Organophosphate	Insecticide
Propargite	Organosulfite	Insecticide
Simazine	Triazine	Herbicide
Trifluralin	Dinitroaniline	Herbicide

Laboratory Methods

Method Calibration

The laboratory established method calibration by analyzing a series of standard samples (samples containing known amounts of analyte dissolved in a solvent). The linear range of calibration was determined by analyzing standards of increasing concentration. Within the

linear range, the calibration was determined by conducting a regression analysis of standard concentrations measured by the instrument (peak height or peak area of the chromatogram) using at least five concentrations (CDFA 2018, CDFA 2020). The minimum acceptable correlation coefficient of the calibration was given in the standard operating procedure for each method, but in general was at least 0.95. For gaseous VOC sample analysis, CDFA-CAC uses standard calibration mixture, or mixtures, containing all analytes of interest. The standards are slightly higher in concentration than the typical sample and must be within the dynamic range of the GC-MS system (CDFA 2013).

Method Detection Limits and Limits of Quantitation

The method detection limit (MDL) is the lowest concentration of a pesticide (analyte) that a chemical method can reliably detect (Table F-4). CDFA-CAC laboratory determined the MDL for each analyte by analyzing a standard at a concentration with a signal to noise ratio of 2.5 to 5. This standard was analyzed at least 7 times, and the MDL is determined by calculating the standard deviation and multiplying it by the t-value at the 99% confidence interval of the mean. The limit of quantitation (LOQ) is the level at which concentrations may be reliably measured and is set at a certain factor above the MDL (Table F-4). The level of interference determines the magnitude of this factor, the more interference, the higher the factor.

Table F-4. Method detection limit (MDL) and limit of quantitation (LOQ) established by CDFA-CAC. Multi-pesticide residue's MDLs were updated in March 2021.

Chemical	MDL (ppb)	LOQ (ppb)	MDL (ng/m^3)	LOQ (ng/m^3)
1,3-dichloropropene	0.010	0.010	45.4	45.4
Acephate	0.00009 -> 0.0004	0.0012	0.65 -> 2.9	9.3
Bensulide	0.00005 -> 0.0002	0.0006	0.88 -> 3.3	9.3
Chloropicrin	0.0095	0.0517	63.6	347
Chlorothalonil	0.00008 -> 0.0002	0.0021	0.88 -> 2.2	23.1
Chlorpyrifos	0.00006 -> 0.0001	0.0016	0.88 -> 2	23.1
Chlorpyrifos OA	0.00006 -> 0.0001	0.0007	0.79 -> 2	9.3
Cypermethrin	0.00014 -> 0.0002	0.0014	2.31 -> 3.4	23.1
Dacthal	0.00006 -> 0.0002	0.0007	1.86 -> 2.1	9.3
DDVP	0.00008 -> 0.0002	0.0026	0.74 -> 1.8	23.1
DEF	0.00002 -> 0.0002	0.0007	0.28 -> 2	9.3
Diazinon	0.00003 -> 0.0002	0.0007	0.37 -> 2.1	9.3

Chemical	MDL (ppb)	LOQ (ppb)	MDL (ng/m^3)	LOQ (ng/m^3)
Diazinon OA	0.00003 -> 0.0002	0.0008	0.37 -> 1.9	9.3
Dimethoate	0.00008 -> 0.0002	0.001	0.74 -> 2.3	9.3
Dimethoate OA	0.00007 -> 0.0003	0.0011	0.6 -> 2.9	9.3
Diuron	0.00004 -> 0.0002	0.001	0.37 -> 2.2	9.3
Endosulfan	0.00011 -> 0.0001	0.0014	1.76 -> 2	23.1
Endosulfan Sulfate	0.00005 -> 0.0001	0.0013	0.88 -> 2.1	23.1
EPTC	0.00019 -> 0.0003	0.0012	1.44 -> 2	23.1
Iprodione	0.00008 -> 0.0002	0.0007	1.02 -> 2.7	23.1
Malathion	0.0001 -> 0.0001	0.0007	1.3 -> 1.8	9.3
Malathion OA	0.00003 -> 0.0001	0.0007	0.37 -> 1.9	9.3
Methidathion	0.00007 -> 0.0002	0.0007	0.88 -> 2.8	9.3
Methyl Bromide	0.005	0.01	19.8	39.6
Metolachlor	0.00009 -> 0.0002	0.0008	1.06 -> 2.1	9.3
MITC	0.003	0.00772	8.9	23.1
Norflurazon	0.00004 -> 0.0001	0.0007	0.6 -> 2	9.3
Oryzalin	0.00012 -> 0.0002	0.0007	1.67 -> 2.5	9.3
Oxydemeton Methyl	0.00014 -> 0.0002	0.0009	1.44 -> 2.5	9.3
Oxyfluorfen	0.00009 -> 0.0001	0.0016	1.3 -> 1.7	23.1
Permethrin	0.0001 -> 0.0002	0.0014	1.62 -> 2.5	23.1
Phosmet	0.00029 -> 0.0001	0.0007	3.7 -> 1.8	9.3
pp-dicofol	0.0003 -> 0.0001	0.0015	4.49 -> 1.6	23.1
Propargite	0.00007 -> 0.0002	0.0016	1.02 -> 2.6	23.1
Simazine	0.00004 -> 0.0002	0.0011	0.32 -> 1.9	9.3
Trifluralin	0.00008 -> 0.0001	0.00169	1.16 -> 1.7	23.1

Air Concentration Calculations

For the sorbent tube and cartridge samples, air concentrations are calculated as an amount of pesticide captured from a volume of air moving through the sampling media. Analytical results are presented in micrograms per sample (µg/sample). The concentrations are converted from µg/sample to nanograms per cubic meter (ng/m^3) of sample air using the following calculation:

$$\mu g \rightarrow \frac{ng}{m^3} = \frac{Results\ (\mu g)\ x\ 1000\left(\frac{ng}{\mu g}\right) x\ 1000\left(\frac{L}{m^3}\right)}{Run\ time\ (min)\ x\ Flow\ rate\left(\frac{L}{min}\right)}$$

VOC concentrations were reported as parts per billion (ppb) by volume and converted to ng/m^3 using the following calculation:

$$ppb \rightarrow \frac{ng}{m^3} = \frac{Results\ (ppb)\ x\left(\frac{ng}{ppb\ x\ g}\right) x\ Molecular\ weight\ \left(\frac{g}{mole}\right)}{0.02445\ \left(\frac{m^3}{mole}\right)}$$

In the equation above, 0.02445 m^3 (24.45 L) is the volume of a mole of a gas when the pressure is at 1 atmosphere and the temperature is at 25°C. Additionally, given that 1 ppb = 1 ng/g, we add the unit ng/(g x ppb) for conversion purposes.

Per standard DPR practice, when an active ingredient is detected but the concentration is lower than its quantitation limit, this pesticide is considered to have a "Trace" amount and is presumed to contain a concentration halfway between the MDL and the LOQ (Trace = (MDL+LOQ)/2). Likewise, non-detected (ND) pesticides are presumed to contain one-half their MDL value (ND = MDL/2).

Data Validation/Quality Assurance

Method Validation

The method validation consisted of five sample sets and five fortification (spike) levels for chloropicrin and multi-residue analyses, and three sample sets and seven fortification levels for MITC (CDFA 2008, 2018, 2020). An acceptable range of spike recoveries was established by analyzing laboratory spike sample, and the mean percent recovery and standard deviation were determined based on these data points. The control limits were established as the mean percent recovery ± 3 standard deviations.

General Continuing Quality Control

Samples were stored at DPR's Bradshaw Regional Office under the care of the laboratory liaison until scheduled delivery to the CDFA-CAC laboratory. Storage stability was evaluated for the longest anticipated holding period with at least four sampling intervals and two replicate samples at each sampling interval. All analytes analyzed by CDFA-CAC laboratory have storage stability data for a minimum of 28 days. Each extraction set consisted of 1 to 24 actual samples

and quality control (QC) samples which include a reagent blank, a matrix blank, and a matrix spiked sample. Any subsequent matrix spiked samples outside the control limits required the set of samples associated with that spike to be reanalyzed.

Quality Control Results

Laboratory matrix spikes and matrix blanks were included with every set of samples extracted and analyzed at the CDFA-CAC laboratory and are part of the laboratory's QC program. The matrix spikes are conducted to assess accuracy and precision; the blanks are used to check for contamination at the laboratory or contamination of the media packed in the sorption tubes or cartridges. The blank matrix materials were not fortified but were extracted and analyzed along with the matrix spikes and field samples. Table F-5 lists the average for the QC samples that were extracted and analyzed with the air samples for the entire monitoring period. Average laboratory matrix spike recoveries ranged from 86% to 103% for all chemicals analyzed.

Field blanks and duplicate samples are part of DPR's field and laboratory QC program. The trip blanks were blank matrix samples that were transported to and from the field locations but were not placed on air pumps. These samples were a control to check for contamination during transportation. Table F-5 shows that all field blanks resulted in non-detections.

Table F-5. Quality control/quality assurance results from 2021 analyzed by CDFA-CAC.

Chemical	Lab spikes (% recovery)	Lab blanks (ng/m^3)	Field blanks (ng/m^3)
1,3-dichloropropene	96 %	ND	None taken
Acephate	95 %	ND	ND
Bensulide	99 %	ND	ND
Chlorothalonil	90 %	ND	ND
Chlorpyrifos	94 %	ND	ND
Chlorpyrifos OA	94 %	ND	ND
Chloropicrin	99 %	ND	ND
Cypermethrin	103 %	ND	ND
Dacthal	94 %	ND	ND
DDVP	88 %	ND	ND
DEF	96 %	ND	ND
Diazinon	96 %	ND	ND
Diazinon OA	96 %	ND	ND
Dicofol	101 %	ND	ND

Chemical	Lab spikes (% recovery)	Lab blanks (ng/m^3)	Field blanks (ng/m^3)
Dimethoate	96 %	ND	ND
Dimethoate OA	95 %	ND	ND
Diuron	98 %	ND	ND
Endosulfan	94 %	ND	ND
Endosulfan Sulfate	96 %	ND	ND
EPTC	86 %	ND	ND
Iprodione	100 %	ND	ND
Malathion	100 %	ND	ND
Malathion OA	96 %	ND	ND
MeBr	94 %	ND	None taken
Methidathion	97 %	ND	ND
Metolachlor	95 %	ND	ND
MITC	86 %	ND	ND
Norflurazon	96 %	ND	ND
Oryzalin	96 %	ND	ND
Oxydemeton methyl	95 %	ND	ND
Oxyfluorfen	102 %	ND	ND
Permethrin	102 %	ND	ND
Phosmet	97 %	ND	ND
Propargite	98 %	ND	ND
Simazine	95 %	ND	ND
Trifluralin	96 %	ND	ND

Table F-6 summarizes the results of duplicate samples. A duplicate sample is a sample that is co-located with another sample in the field. These samples serve to evaluate the overall precision in sample measurement and analysis. Consistent with previous reports, there were many non-detection pairs among co-located samples. For sample pairs in which both samples produced a quantifiable detection these concentrations were compared to find the relative difference, expressed as a percentage.

Table F-6. Results for the co-located sample pairs in 2021. Values indicate the total number of events where the Primary sample and its Duplicate sample fell in the specific paired category.

Paired category: Primary / Duplicate	1,3-D	MeBr	Chloropicrin	MITC	Multi-residue
ND / ND	18	21	2	3	127
ND / Trace	0	0	0	0	0
ND / >LOQ	0	2	0	0	0
Trace / ND	0	0	0	0	1
Trace / Trace	0	0	0	1	0
Trace / >LOQ	0	0	0	0	0
>LOQ / ND	1	3	0	0	0
>LOQ / Trace	0	0	0	0	0
>LOQ / >LOQ	14	7	2	0	0
RD %	18 %	13 %	6 %	--	--

ND = Not detected; Trace = Detection confirmed but less than the quantitation limit; LOQ = Limit of quantification; RD = Relative Difference for pairs with both concentrations >LOQ.

Lost and Invalid Samples

A valid sample is a sample that meets all the sampling criteria for its corresponding sampling method. For example, A VOC sample collected by Xonteck ambient air sampler (model 901) should run for 24 hours and the ending pressure must be between 6 and 16 PSI. The criteria for each sampling method and each sampling media are explained in detail in Appendix E.

In 2021, 31 samples were lost or invalidated. Table F-7 lists the location, operator, date, and type of samples.

Table F-7. Lost or invalid samples in 2021.

Community	Operator	Date	Sample type
Shafter	DPR	01/07/2021	Chloropicrin, MITC, Multi. Equipment inoperable.
Santa Maria	SB CAC	03/13/2021	1,3-D and MeBr. Equipment malfunction.
Santa Maria	SB CAC	03/19/2021	Chloropicrin. Tube flooded during rainstorm.

Community	Operator	Date	Sample type
Santa Maria	SB CAC	03/27/2021	MITC. Tube broke during shipping.
Santa Maria	SB CAC	03/31/2021	Chloropicrin. Flow rate was out of range.
Watsonville	DPR	04/02/2021	1,3-D and MeBr. Equipment malfunction.
Santa Maria	SB CAC	04/14/2021	Chloropicrin. Flow rate was out of range.
Santa Maria	SB CAC	05/04/2021	Multi-pesticide. Flow rate was out of range.
Santa Maria	SB CAC	05/12/2021	Multi-pesticide. Flow rate was out of range.
Santa Maria	SB CAC	06/17/2021	All pesticides. SB CAC staff were unavailable.
Watsonville	DPR	06/18/2021	Multi-pesticide. Tube broke in the laboratory.
Santa Maria	SB CAC	06/23/2021	MITC. Flow rate was out of range.
Santa Maria	SB CAC	11/02/2021	MITC. Tube broke during shipping.
Oxnard	V CAC	11/04/2021	Chloropicrin, MITC, Multi. Equipment inoperable.
Oxnard	V CAC	11/10/2021	All pesticides. Equipment inoperable.
Santa Maria	SB CAC	11/10/2021	1,3-D and MeBr. Invalidated by laboratory staff.
Shafter	DPR	11/17/2021	MITC. Tube broke during sampling.
Oxnard	V CAC	11/21/2021	Chloropicrin and MITC damaged during shipping.
Oxnard	V CAC	12/30/2021	Chloropicrin. Tube flooded during rainstorm.
Shafter	DPR	12/30/2021	1,3-D and MeBr. Equipment malfunction.

Appendix G: HEALTH EVALUATION AND CALCULATIONS

Calculation of Sub-chronic Rolling Averages

In 2016, DPR updated the calculation of sub-chronic concentrations for 1,3-dichloropropene and chloropicrin from 4-week rolling average concentrations to 13-week rolling average concentrations to be compared with their sub-chronic screening levels and regulatory targets (CDPR 2016b). This determination was based on evaluations conducted by DPR's Human Health Assessment Branch that investigated seasonal reference concentrations for 1,3-D and chloropicrin in 2012 and 2015, respectively (CDPR 2012, CDPR 2015).

Health Evaluation Methods

Pesticides can cause a variety of health effects when present at concentrations above health-protective levels. The pesticides included in the Air Monitoring Network (AMN) were selected in part because (1) risk assessments indicate the high potential for exposure, or (2) they are high priority for risk assessment due to toxicity and/or exposure concerns. Some of the pesticides in the AMN can cause adverse effects such as respiratory illnesses, damage to the nervous system, cancer, and birth defects (CDPR 2013). No state or federal agency has established health standards for pesticides in air. Therefore, DPR in consultation with the Office of Environmental Health Hazard Assessment developed health screening levels or regulatory targets to place the results in a health-based context.

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. An air concentration that measures less than the screening level for a given pesticide would not be considered a significant health concern and the pesticide would not undergo further evaluation at this time. A measured concentration above the screening level would not necessarily indicate a significant health concern, but would indicate the need for a further, more refined evaluation. DPR (2013) summarizes more information on DPR-determined screening levels including information on deriving screening levels for each pesticide.

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. DPR normally establishes a regulatory target after completing a formal risk assessment of a chemical's toxicity and potential exposures. DPR management determines a regulatory target using its risk assessment, as well as risk assessments from other agencies, pesticide use patterns, potential effects on use of alternative pesticides, and other factors. A regulatory target is based on a more comprehensive evaluation than a health screening level. Therefore, a regulatory target supersedes a health screening level (i.e., a specific pesticide and exposure duration will have either a regulatory target or a health screening level, but not both). Out of the 36 pesticides monitored in the AMN, 1,3-dichloropropene, chloropicrin, methyl bromide, and MITC have regulatory targets for one or more exposure periods.

Cumulative Exposures

Cumulative exposure and risk were estimated using a hazard quotient and hazard index approach for pesticides classified as organophosphates, which are a class of chemical compounds that can cause adverse health effects on humans, such as inhibiting cholinesterase, an enzyme in the nervous system. The potential risk of the measured concentrations of a pesticide in air was evaluated by comparing the air concentration measured over a specified time (e.g., 24 hours, 4 weeks, 1 year) with the screening level derived for a similar exposure (i.e., acute, sub-chronic, chronic). The ratio of measured air concentration of a pesticide to a reference concentration or screening level for that pesticide is called the hazard quotient (HQ). In this case,

$$HQ = \frac{Air\ Concentration\ Detected\ (ng/m^3)}{Screening\ Level\ (ng/m^3)}$$

If HQ is greater than 1, then the air concentration exceeds the screening level. Such a result would indicate the need for a further, more refined evaluation. Similarly, the risk from multiple pesticides (cumulative risk) is evaluated using the hazard index (HI) approach, which sums of the HQs for the pesticides monitored.

HI = HQ1 (pesticide 1) + HQ2 (pesticide 2) + HQ3 (pesticide 3) + … (and so forth)

An HI greater than 1 indicates that the cumulative toxicity of the multiple pesticides should be further evaluated and that potential health impacts may have been missed by only considering the pesticides individually.

Appendix H: COMPARISON TO PREVIOUS YEARS OF AMN DATA

All AMN Sites

This report covers results from the eleventh year of monitoring by the Air Monitoring Network (AMN), which has been collecting samples since 2011. Annual AMN reports from 2011 to 2020 can be found in Air Monitoring Reports page at DPR's website and are available upon request.

The initial number of pesticides monitored by the AMN was 39 in 2011 (34 pesticides and 5 breakdown products). On January 1, 2012, acrolein was removed from AMN monitoring because is mainly produced as a byproduct of automobile emissions and other combustion sources not related to pesticidal uses (ATSDR, 2007), and uncertainties related to the laboratory methodology. On March 21, 2012, DPR canceled the registration of all products containing methyl iodide at the request of the registrant. Therefore, monitoring for methyl iodide as part of the AMN stopped on June 20, 2012. In December 2016, carbon disulfide was removed from the list of monitored chemicals due to detections originating from non-pesticidal sources and the voluntary withdrawal of registration of pesticide products that produce carbon disulfide.

Table H-1 shows the number of individual pesticides and breakdown products monitored each year. This data is further broken down into whether pesticides were detected at quantifiable levels during monitoring in that year. Table H-2 shows the results presented in terms of individual analyses as raw counts.

Table H-1. Pesticide detection trends aggregated by chemical from 2011 to 2021.

Year	Total monitored chemicals	Total non-detected chemicals	Total detected chemicals*	Total quantifiable chemicals
2011	39	10	29	9
2012	38	14	24	11
2013	37	13	24	14
2014	37	14	23	11
2015	37	11	26	14
2016	37	12	25	11
2017	36	9	27	10
2018	36	8	28	11
2019	36	11	25	10
2020	36	7	29	10
2021	36	14	22	10

*Includes both quantified and trace detections.

Table H-2. Pesticide detection trends as individual analyses from 2011 to 2021.

Year	Total analyses	Total non-detected analyses	Total detected analyses*	Total quantifiable analyses
2011	5,676	5,251	425	173
2012	6,002	5,671	331	81
2013	6,033	5,607	426	159
2014	5,966	5,468	498	225
2015	5,892	5,286	606	306
2016	5,928	5,393	535	307
2017	7,396	6,868	528	122
2018	12,058	11,316	742	152
2019	14,621	14,066	555	139
2020	4,692	4,315	377	152
2021	7,161	6,687	474	251

*Includes both quantified and trace detections.

Table H-3 summarizes this information into the percentages of possible detections. Further inspection reveals that the highest percentage of detections occurred in 2015 with 10.3% of possible detections and 5.2% of quantifiable detections. On the other hand, the lowest percentage of detections occurred in 2019 with 3.8% of possible detections and 0.95% of quantifiable detections.

Table H-3. Pesticide detection trends as percentage of possible detections from 2011 to 2021.

Year	Percent of non-detected analyses	Percent of detected analyses*	Percent of quantifiable analyses
2011	92.5%	7.5%	3.0%
2012	94.5%	5.5%	1.3%
2013	92.9%	7.1%	2.6%
2014	91.7%	8.3%	3.8%
2015	89.7%	10.3%	5.2%
2016	91.0%	9.0%	5.2%
2017	92.9%	7.1%	1.6%

Year	Percent of non-detected analyses	Percent of detected analyses*	Percent of quantifiable analyses
2018	93.8%	6.2%	1.3%
2019	96.2 %	3.8 %	0.95 %
2020	92 %	8 %	3.2 %
2021	93.4 %	6.6 %	3.5 %

*Includes both quantified and trace detections.

Historic Air Concentrations in Oxnard

The following tables summarize results for four years of air monitoring in Oxnard. Monitoring in 2020 was only conducted for 11 weeks due to COVID-19; therefore, comparisons across years should be performed with caution.

Table H-4. Percentage of analyses performed resulting in a quantifiable or trace detection in Oxnard in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	6 %	2 %	0 %	18 %
Bensulide	0 %	0 %	10 %	0 %
Chloropicrin	20 %	14 %	0 %	46 %
Chlorothalonil	65 %	18 %	20 %	0 %
Chlorpyrifos OA	5 %	2 %	0 %	0 %
Dacthal	40 %	6 %	0 %	31 %
DDVP	0 %	16 %	0 %	4 %
Malathion	5 %	29 %	0 %	17 %
Malathion OA	15 %	33 %	0 %	10 %
Methyl Bromide	0 %	0 %	0 %	35 %
MITC	55 %	20 %	40 %	30 %
Oxyfluorfen	0 %	0 %	0 %	2 %
Simazine	0 %	0 %	0 %	2 %

Table H-5. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Oxnard in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	0.35 ppb (1,589 ng/m^3)	0.51 ppb (2,315 ng/m^3)	ND	0.57 ppb (2,587 ng/m^3)
Bensulide	ND	ND	Trace	ND
Chloropicrin	0.8 ppb (5,365 ng/m^3)	1 ppb (6,939 ng/m^3)	ND	2.6 ppb (17,771 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	ND
Chlorpyrifos OA	Trace	Trace	ND	ND
Dacthal	Trace	0.002 ppb (20.6 ng/m^3)	ND	ND
DDVP	ND	Trace	ND	Trace
Malathion	Trace	0.008 ppb (113 ng/m^3)	ND	0.009 ppb (121 ng/m^3)
Malathion OA	Trace	0.001 ppb (19.1 ng/m^3)	ND	0.001 ppb (18.9 ng/m^3)
Methyl Bromide	ND	ND	ND	0.029 ppb (113 ng/m^3)
MITC	0.016 ppb (48.2 ng/m^3)	0.028 ppb (84 ng/m^3)	0.008 ppb (23.4 ng/m^3)	0.18 ppb (527 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace
Simazine	ND	ND	ND	Trace

Table H-6. Highest rolling 4- or 13-week average concentrations for pesticides with at least one detectable concentration in Oxnard in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene*	0.073 ppb (332 ng/m^3)	0.085 ppb (388 ng/m^3)	ND	0.073 ppb (330 ng/m^3)
Bensulide	ND	ND	Trace	ND
Chloropicrin*	0.095 ppb (639 ng/m^3)	0.2 ppb (1,359 ng/m^3)	ND	0.42 ppb (2,845 ng/m^3)

Chemical	2018	2019	2020	2021
Chlorothalonil	Trace	Trace	Trace	ND
Chlorpyrifos OA	Trace	Trace	ND	ND
Dacthal	Trace	0.0007 ppb (8.2 ng/m^3)	ND	0.00045 ppb (5.7 ng/m^3)
DDVP	ND	Trace	ND	Trace
Malathion	Trace	0.0045 ppb (62.3 ng/m^3)	ND	0.0025 ppb (34.4 ng/m^3)
Malathion OA	Trace	0.00068 ppb (9.9 ng/m^3)	ND	0.00055 ppb (8.9 ng/m^3)
Methyl Bromide	ND	ND	ND	0.024 ppb (95.1 ng/m^3)
MITC	0.011 ppb (32.7 ng/m^3)	0.014 ppb (40.7 ng/m^3)	0.0051 ppb (15 ng/m^3)	0.046 ppb (139 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace
Simazine	ND	ND	ND	Trace

*Represents a 13-week rolling average rather than the default 4-week rolling average.

Table H-7. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Oxnard in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	0.061 ppb (279 ng/m^3)	0.059 ppb (270 ng/m^3)	ND	0.026 ppb (119 ng/m^3)
Bensulide	ND	ND	Trace	ND
Chloropicrin	0.068 ppb (454 ng/m^3)	0.066 ppb (442 ng/m^3)	ND	0.13 ppb (861 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	ND
Chlorpyrifos OA	Trace	Trace	ND	ND
Dacthal	Trace	0.000084 ppb (1.5 ng/m^3)	ND	0.00019 ppb (2.4 ng/m^3)
DDVP	ND	Trace	ND	Trace

Chemical	2018	2019	2020	2021
Malathion	Trace	0.00067 ppb (9.4 ng/m^3)	ND	0.00029 ppb (4 ng/m^3)
Malathion OA	Trace	0.00015 ppb (2 ng/m^3)	ND	0.000093 ppb (1.6 ng/m^3)
Methyl Bromide	ND	ND	ND	0.0077 ppb (30 ng/m^3)
MITC	0.0048 ppb (14.1 ng/m^3)	0.003 ppb (8.8 ng/m^3)	0.0033 ppb (9.8 ng/m^3)	0.0068 ppb (20.3 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace
Simazine	ND	ND	ND	Trace

Historic Air Concentrations in Santa Maria

The following tables summarize results for four years of air monitoring in Santa Maria which was the only site where all 36 chemicals were monitored throughout the year in 2020.

Table H-8 shows that the percentage of detections of Malathion OA decreased considerably from 57% to 8% in 2021 while Methyl bromide detections increased from 4% to 63%.

Table H-9 thru H-11 show that the acute, subchronic, and chronic concentrations of 1,3-D decreased by 50% while MeBr concentration more than double from 2020.

Table H-8. Percentage of analyses performed resulting in a quantifiable or trace detection in Santa Maria in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	6 %	2 %	49 %	53 %
Acephate	0 %	2 %	2 %	0 %
Chloropicrin	17 %	6 %	29 %	28 %
Chlorothalonil	8 %	6 %	29 %	2 %
Chlorpyrifos	4 %	0 %	0 %	0 %
Cypermethrin	0 %	2 %	2 %	0 %
Dacthal	39 %	43 %	53 %	63 %
DDVP	16 %	25 %	37 %	31 %
Diazinon	0 %	0 %	2 %	0 %

Chemical	2018	2019	2020	2021
Diazinon OA	2 %	0 %	2 %	2 %
Dimethoate	0 %	0 %	2 %	0 %
Dimethoate OA	0 %	2 %	2 %	0 %
Diuron	2 %	0 %	2 %	0 %
Endosulfan	4 %	0 %	0 %	0 %
Iprodione	2 %	0 %	2 %	0 %
Malathion	59 %	49 %	61 %	59 %
Malathion OA	63 %	39 %	57 %	8 %
Methidathion	0 %	0 %	2 %	2 %
Methyl Bromide	0 %	0 %	4 %	63 %
Metolachlor (S-Metolachlor)	0 %	0 %	2 %	2 %
MITC	58 %	22 %	37 %	38 %
Norflurazon	0 %	0 %	2 %	2 %
Oryzalin	0 %	0 %	2 %	2 %
Oxydemeton Methyl	0 %	0 %	2 %	2 %
Oxyfluorfen	0 %	0 %	0 %	10 %
Permethrin	0 %	0 %	4 %	2 %
Phosmet	0 %	0 %	2 %	2 %
Simazine	2 %	0 %	4 %	2 %
Trifluralin	22 %	24 %	24 %	31 %

Table H-9. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Santa Maria in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	0.48 ppb (2,179 ng/m^3)	0.13 ppb (590 ng/m^3)	1.1 ppb (5,097 ng/m^3)	0.8 ppb (3,617 ng/m^3)
Acephate	ND	Trace	0.002 ppb (12.5 ng/m^3)	ND

Chemical	2018	2019	2020	2021
Chloropicrin	0.46 ppb (3,100 ng/m^3)	0.44 ppb (2,992 ng/m^3)	0.59 ppb (3,966 ng/m^3)	0.62 ppb (4,191 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	Trace
Chlorpyrifos	Trace	ND	ND	ND
Cypermethrin	ND	Trace	Trace	ND
Dacthal	Trace	Trace	Trace	Trace
DDVP	Trace	0.003 ppb (23.6 ng/m^3)	0.01 ppb (88.9 ng/m^3)	Trace
Diazinon	ND	ND	Trace	ND
Diazinon OA	Trace	ND	Trace	Trace
Dimethoate	ND	ND	Trace	ND
Dimethoate OA	ND	Trace	Trace	ND
Diuron	Trace	ND	Trace	ND
Endosulfan	Trace	ND	ND	ND
Iprodione	Trace	ND	Trace	ND
Malathion	0.001 ppb (9.8 ng/m^3)	0.007 ppb (96.5 ng/m^3)	0.003 ppb (35.6 ng/m^3)	0.001 ppb (19.4 ng/m^3)
Malathion OA	Trace	0.001 ppb (12.5 ng/m^3)	Trace	Trace
Methidathion	ND	ND	Trace	Trace
Methyl Bromide	ND	ND	0.024 ppb (93.2 ng/m^3)	0.079 ppb (307 ng/m^3)
Metolachlor (S-Metolachlor)	ND	ND	Trace	Trace
MITC	0.42 ppb (1,269 ng/m^3)	0.12 ppb (375 ng/m^3)	0.042 ppb (124 ng/m^3)	0.13 ppb (400 ng/m^3)
Norflurazon	ND	ND	Trace	Trace
Oryzalin	ND	ND	Trace	Trace
Oxydemeton Methyl	ND	ND	Trace	Trace
Oxyfluorfen	ND	ND	ND	Trace
Permethrin	ND	ND	Trace	Trace

Chemical	2018	2019	2020	2021
Phosmet	ND	ND	Trace	Trace
Simazine	Trace	ND	Trace	Trace
Trifluralin	Trace	Trace	0.002 ppb (25.5 ng/m^3)	0.008 ppb (112 ng/m^3)

Table H-10. Highest rolling 4- or 13-week average concentrations for pesticides with at least one detectable concentration in Santa Maria in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene*	0.093 ppb (422 ng/m^3)	0.056 ppb (255 ng/m^3)	0.28 ppb (1,285 ng/m^3)	0.23 ppb (1,022 ng/m^3)
Acephate	ND	Trace	0.00053 ppb (3.4 ng/m^3)	ND
Chloropicrin*	0.11 ppb (748 ng/m^3)	0.078 ppb (523 ng/m^3)	0.11 ppb (728 ng/m^3)	0.094 ppb (631 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	Trace
Chlorpyrifos	Trace	ND	ND	ND
Cypermethrin	ND	Trace	Trace	ND
Dacthal	Trace	Trace	Trace	Trace
DDVP	Trace	0.0013 ppb (11.9 ng/m^3)	0.0035 ppb (31.2 ng/m^3)	Trace
Diazinon	ND	ND	Trace	ND
Diazinon OA	Trace	ND	Trace	Trace
Dimethoate	ND	ND	Trace	ND
Dimethoate OA	ND	Trace	Trace	ND
Diuron	Trace	ND	Trace	ND
Endosulfan	Trace	ND	ND	ND
Iprodione	Trace	ND	Trace	ND
Malathion	0.00055 ppb (6.4 ng/m^3)	0.002 ppb (26.9 ng/m^3)	0.0015 ppb (17.2 ng/m^3)	0.0007 ppb (10.5 ng/m^3)

Chemical	2018	2019	2020	2021
Malathion OA	Trace	0.00036 ppb (4.8 ng/m^3)	Trace	Trace
Methidathion	ND	ND	Trace	Trace
Methyl Bromide	ND	ND	0.015 ppb (58.2 ng/m^3)	0.048 ppb (184 ng/m^3)
Metolachlor (S-Metolachlor)	ND	ND	Trace	Trace
MITC	0.11 ppb (323 ng/m^3)	0.043 ppb (130 ng/m^3)	0.012 ppb (34.4 ng/m^3)	0.057 ppb (171 ng/m^3)
Norflurazon	ND	ND	Trace	Trace
Oryzalin	ND	ND	Trace	Trace
Oxydemeton Methyl	ND	ND	Trace	Trace
Oxyfluorfen	ND	ND	ND	Trace
Permethrin	ND	ND	Trace	Trace
Phosmet	ND	ND	Trace	Trace
Simazine	Trace	ND	Trace	Trace
Trifluralin	Trace	Trace	0.00088 ppb (12.1 ng/m^3)	0.003 ppb (40.6 ng/m^3)

*Represents a 13-week rolling average rather than the default 4-week rolling average.

Table H-11. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Santa Maria in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	0.061 ppb (276 ng/m^3)	0.052 ppb (234 ng/m^3)	0.11 ppb (519 ng/m^3)	0.077 ppb (348 ng/m^3)
Acephate	ND	Trace	0.000085 ppb (0.57 ng/m^3)	ND
Chloropicrin	0.041 ppb (277 ng/m^3)	0.032 ppb (216 ng/m^3)	0.046 ppb (306 ng/m^3)	0.038 ppb (252 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	Trace
Chlorpyrifos	Trace	ND	ND	ND
Cypermethrin	ND	Trace	Trace	ND

Chemical	2018	2019	2020	2021
Dacthal	Trace	Trace	Trace	Trace
DDVP	Trace	0.0004 ppb (3.5 ng/m^3)	0.00075 ppb (6.7 ng/m^3)	Trace
Diazinon	ND	ND	Trace	ND
Diazinon OA	Trace	ND	Trace	Trace
Dimethoate	ND	ND	Trace	ND
Dimethoate OA	ND	Trace	Trace	ND
Diuron	Trace	ND	Trace	ND
Endosulfan	Trace	ND	ND	ND
Iprodione	Trace	ND	Trace	ND
Malathion	0.00027 ppb (3.5 ng/m^3)	0.00036 ppb (5 ng/m^3)	0.00042 ppb (5.2 ng/m^3)	0.00032 ppb (4.4 ng/m^3)
Malathion OA	Trace	0.00015 ppb (2.1 ng/m^3)	Trace	Trace
Methidathion	ND	ND	Trace	Trace
Methyl Bromide	ND	ND	0.006 ppb (23.4 ng/m^3)	0.017 ppb (66.7 ng/m^3)
Metolachlor (S-Metolachlor)	ND	ND	Trace	Trace
MITC	0.015 ppb (43.7 ng/m^3)	0.0061 ppb (18.1 ng/m^3)	0.0059 ppb (17.7 ng/m^3)	0.012 ppb (35 ng/m^3)
Norflurazon	ND	ND	Trace	Trace
Oryzalin	ND	ND	Trace	Trace
Oxydemeton Methyl	ND	ND	Trace	Trace
Oxyfluorfen	ND	ND	ND	Trace
Permethrin	ND	ND	Trace	Trace
Phosmet	ND	ND	Trace	Trace
Simazine	Trace	ND	Trace	Trace
Trifluralin	Trace	Trace	0.00027 ppb (3.7 ng/m^3)	0.0005 ppb (6.9 ng/m^3)

Historic Air Concentrations in Shafter

The following tables summarize results for four years of air monitoring in Shafter. In 2020, 1,3-dichloropropene and methyl bromide were sampled all year (53 weeks), while all other chemicals were only sampled the first 11 weeks due to COVID-19. Therefore, comparisons across years should be performed with caution.

Table H-12. Percentage of analyses performed resulting in a quantifiable or trace detection in Shafter in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	38 %	10 %	71 %	69 %
Bensulide	4 %	0 %	0 %	0 %
Chloropicrin	0 %	2 %	0 %	4 %
Chlorothalonil	64 %	43 %	91 %	24 %
Chlorpyrifos	30 %	4 %	0 %	0 %
Chlorpyrifos OA	25 %	0 %	0 %	0 %
Cypermethrin	2 %	2 %	0 %	0 %
Dacthal	4 %	2 %	9 %	0 %
DDVP	8 %	10 %	0 %	4 %
Diazinon	0 %	0 %	9 %	0 %
Diazinon OA	2 %	0 %	9 %	2 %
Dimethoate	0 %	0 %	9 %	0 %
Diuron	4 %	4 %	9 %	2 %
Endosulfan Sulfate	0 %	0 %	9 %	0 %
EPTC	6 %	10 %	0 %	6 %
Iprodione	2 %	2 %	0 %	0 %
Malathion	0 %	6 %	0 %	0 %
Malathion OA	2 %	4 %	9 %	2 %
Methyl Bromide	13 %	0 %	12 %	55 %
Metolachlor (S-Metolachlor)	0 %	0 %	9 %	0 %
MITC	83 %	59 %	82 %	40 %
Norflurazon	0 %	0 %	9 %	0 %

Chemical	2018	2019	2020	2021
Oryzalin	2 %	0 %	0 %	0 %
Oxyfluorfen	9 %	2 %	9 %	6 %
Permethrin	0 %	2 %	0 %	0 %
Simazine	6 %	0 %	9 %	0 %
Trifluralin	2 %	6 %	18 %	4 %

Table H-13. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Shafter in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	50.5 ppb (229,166 ng/m^3)	3.2 ppb (14,524 ng/m^3)	37.5 ppb (170,199 ng/m^3)	2.3 ppb (10,421 ng/m^3)
Bensulide	Trace	ND	ND	ND
Chloropicrin	ND	0.1 ppb (694 ng/m^3)	ND	Trace
Chlorothalonil	0.005 ppb (49.9 ng/m^3)	Trace	0.003 ppb (36.3 ng/m^3)	Trace
Chlorpyrifos	0.003 ppb (44.9 ng/m^3)	Trace	ND	ND
Chlorpyrifos OA	Trace	ND	ND	ND
Cypermethrin	Trace	Trace	ND	ND
Dacthal	Trace	Trace	Trace	ND
DDVP	Trace	Trace	ND	0.003 ppb (30.2 ng/m^3)
Diazinon	ND	ND	Trace	ND
Diazinon OA	Trace	ND	Trace	Trace
Dimethoate	ND	ND	Trace	ND
Diuron	Trace	Trace	Trace	Trace
Endosulfan Sulfate	ND	ND	Trace	ND
EPTC	Trace	0.005 ppb (35.6 ng/m^3)	ND	0.017 ppb (128 ng/m^3)

Chemical	2018	2019	2020	2021
Iprodione	Trace	Trace	ND	ND
Malathion	ND	Trace	ND	ND
Malathion OA	Trace	Trace	Trace	Trace
Methyl Bromide	0.097 ppb (377 ng/m^3)	ND	0.048 ppb (186 ng/m^3)	0.047 ppb (182 ng/m^3)
Metolachlor (S-Metolachlor)	ND	ND	Trace	ND
MITC	1.3 ppb (3,747 ng/m^3)	0.11 ppb (316 ng/m^3)	0.054 ppb (162 ng/m^3)	0.13 ppb (388 ng/m^3)
Norflurazon	ND	ND	Trace	ND
Oryzalin	Trace	ND	ND	ND
Oxyfluorfen	Trace	Trace	Trace	Trace
Permethrin	ND	Trace	ND	ND
Simazine	Trace	ND	Trace	ND
Trifluralin	Trace	Trace	Trace	0.00027 ppb (3.8 ng/m^3)

Table H-14. Highest rolling 4- or 13-week average concentrations for pesticides with at least one detectable concentration in Shafter in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene*	5.6 ppb (25,443 ng/m^3)	0.45 ppb (2,056 ng/m^3)	4.5 ppb (20,620 ng/m^3)	4.5 ppb (20,493 ng/m^3)
Bensulide	Trace	ND	ND	ND
Chloropicrin*	ND	0.023 ppb (156 ng/m^3)	ND	Trace
Chlorothalonil	0.0028 ppb (30.6 ng/m^3)	Trace	0.002 ppb (22.6 ng/m^3)	Trace
Chlorpyrifos	0.0014 ppb (20.2 ng/m^3)	Trace	ND	ND
Chlorpyrifos OA	Trace	ND	ND	ND

Chemical	2018	2019	2020	2021
Cypermethrin	Trace	Trace	ND	ND
Dacthal	Trace	Trace	Trace	ND
DDVP	Trace	Trace	ND	0.00082 ppb (8.2 ng/m^3)
Diazinon	ND	ND	Trace	ND
Diazinon OA	Trace	ND	Trace	Trace
Dimethoate	ND	ND	Trace	ND
Diuron	Trace	Trace	Trace	Trace
Endosulfan Sulfate	ND	ND	Trace	ND
EPTC	Trace	0.00072 ppb (6.7 ng/m^3)	ND	0.0044 ppb (32.7 ng/m^3)
Iprodione	Trace	Trace	ND	ND
Malathion	ND	Trace	ND	ND
Malathion OA	Trace	Trace	Trace	Trace
Methyl Bromide	0.04 ppb (155 ng/m^3)	ND	0.023 ppb (90.2 ng/m^3)	0.033 ppb (128 ng/m^3)
Metolachlor (S-Metolachlor)	ND	ND	Trace	ND
MITC	0.5 ppb (1,509 ng/m^3)	0.14 ppb (424 ng/m^3)	0.031 ppb (92.2 ng/m^3)	0.034 ppb (100 ng/m^3)
Norflurazon	ND	ND	Trace	ND
Oryzalin	Trace	ND	ND	ND
Oxyfluorfen	Trace	Trace	Trace	Trace
Permethrin	ND	Trace	ND	ND
Simazine	Trace	ND	Trace	ND
Trifluralin	Trace	Trace	Trace	0.00026 ppb (3.7 ng/m^3)

*Represents a 13-week rolling average rather than the default 4-week rolling average.

Table H-15. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Shafter in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	1.5 ppb (6,921 ng/m^3)	0.13 ppb (599 ng/m^3)	1.8 ppb (8,163 ng/m^3)	0.16 ppb (745 ng/m^3)
Bensulide	Trace	ND	ND	ND
Chloropicrin	ND	0.018 ppb (123 ng/m^3)	ND	Trace
Chlorothalonil	0.00091 ppb (10 ng/m^3)	Trace	0.0013 ppb (14.8 ng/m^3)	Trace
Chlorpyrifos	0.00033 ppb (4.8 ng/m^3)	Trace	ND	ND
Chlorpyrifos OA	Trace	ND	ND	ND
Cypermethrin	Trace	Trace	ND	ND
Dacthal	Trace	Trace	Trace	ND
DDVP	Trace	Trace	ND	0.00017 ppb (1.6 ng/m^3)
Diazinon	ND	ND	Trace	ND
Diazinon OA	Trace	ND	Trace	Trace
Dimethoate	ND	ND	Trace	ND
Diuron	Trace	Trace	Trace	Trace
Endosulfan Sulfate	ND	ND	Trace	ND
EPTC	Trace	0.0003 ppb (2.4 ng/m^3)	ND	0.00049 ppb (3.9 ng/m^3)
Iprodione	Trace	Trace	ND	ND
Malathion	ND	Trace	ND	ND
Malathion OA	Trace	Trace	Trace	Trace
Methyl Bromide	0.018 ppb (69.1 ng/m^3)	ND	0.0068 ppb (26.4 ng/m^3)	0.012 ppb (46.6 ng/m^3)
Metolachlor (S-Metolachlor)	ND	ND	Trace	ND
MITC	0.059 ppb (176 ng/m^3)	0.015 ppb (44.5 ng/m^3)	0.02 ppb (59.7 ng/m^3)	0.011 ppb (33.8 ng/m^3)
Norflurazon	ND	ND	Trace	ND

Chemical	2018	2019	2020	2021
Oryzalin	Trace	ND	ND	ND
Oxyfluorfen	Trace	Trace	Trace	Trace
Permethrin	ND	Trace	ND	ND
Simazine	Trace	ND	Trace	ND
Trifluralin	Trace	Trace	Trace	0.000069 ppb (1.1 ng/m^3)

Historic Air Concentrations in Watsonville

The following tables summarize results for four years of air monitoring in Watsonville. 1,3-dichloropropene and Methyl Bromide were sampled all year (53 weeks), while all other chemicals were only sampled the first 11 weeks due to COVID-19. Therefore, comparisons with other years should be performed with caution.

Table H-16. Percentage of analyses performed resulting in a quantifiable or trace detection in Watsonville in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	6 %	4 %	49 %	47 %
Chloropicrin	25 %	24 %	0 %	29 %
Chlorothalonil	0 %	2 %	0 %	0 %
Dacthal	2 %	18 %	0 %	6 %
DDVP	10 %	25 %	0 %	12 %
Diuron	0 %	2 %	0 %	0 %
EPTC	0 %	2 %	0 %	0 %
Malathion	6 %	14 %	0 %	0 %
Malathion OA	6 %	16 %	0 %	0 %
Methyl Bromide	0 %	0 %	2 %	29 %
MITC	48 %	30 %	9 %	19 %
Oxyfluorfen	0 %	0 %	0 %	2 %
Trifluralin	2 %	4 %	0 %	0 %

Table H-17. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Watsonville in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	0.27 ppb (1,225 ng/m^3)	0.29 ppb (1,316 ng/m^3)	0.83 ppb (3,753 ng/m^3)	0.4 ppb (1,811 ng/m^3)
Chloropicrin	0.12 ppb (778 ng/m^3)	0.85 ppb (5,741 ng/m^3)	ND	0.31 ppb (2,074 ng/m^3)
Chlorothalonil	ND	Trace	ND	ND
Dacthal	Trace	Trace	ND	Trace
DDVP	Trace	Trace	ND	Trace
Diuron	ND	Trace	ND	ND
EPTC	ND	Trace	ND	ND
Malathion	Trace	0.004 ppb (56 ng/m^3)	ND	ND
Malathion OA	Trace	Trace	ND	ND
Methyl Bromide	ND	ND	0.023 ppb (89.3 ng/m^3)	0.95 ppb (3,693 ng/m^3)
MITC	0.042 ppb (125 ng/m^3)	0.055 ppb (164 ng/m^3)	0.01 ppb (28.7 ng/m^3)	0.063 ppb (188 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace
Trifluralin	Trace	Trace	ND	ND

Table H-18. Highest rolling 4- or 13-week average concentrations for pesticides with at least one detectable concentration in Watsonville in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene*	0.07 ppb (316 ng/m^3)	0.082 ppb (374 ng/m^3)	0.36 ppb (1,612 ng/m^3)	0.19 ppb (875 ng/m^3)
Chloropicrin*	0.063 ppb (426 ng/m^3)	0.15 ppb (1,042 ng/m^3)	ND	0.097 ppb (652 ng/m^3)
Chlorothalonil	ND	Trace	ND	ND
Dacthal	Trace	Trace	ND	Trace
DDVP	Trace	Trace	ND	Trace
Diuron	ND	Trace	ND	ND
EPTC	ND	Trace	ND	ND

Chemical	2018	2019	2020	2021
Malathion	Trace	0.0011 ppb (15.7 ng/m^3)	ND	ND
Malathion OA	Trace	Trace	ND	ND
Methyl Bromide	ND	ND	0.015 ppb (58.2 ng/m^3)	0.24 ppb (931 ng/m^3)
MITC	0.015 ppb (44.6 ng/m^3)	0.024 ppb (71 ng/m^3)	0.0036 ppb (10.5 ng/m^3)	0.02 ppb (58.6 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace
Trifluralin	Trace	Trace	ND	ND

*Represents a 13-week rolling average rather than the default 4-week rolling average.

Table H-19. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Watsonville in 2018-2021.

Chemical	2018	2019	2020	2021
1,3-dichloropropene	0.046 ppb (210 ng/m^3)	0.057 ppb (260 ng/m^3)	0.12 ppb (543 ng/m^3)	0.059 ppb (267 ng/m^3)
Chloropicrin	0.03 ppb (203 ng/m^3)	0.052 ppb (348 ng/m^3)	ND	0.029 ppb (197 ng/m^3)
Chlorothalonil	ND	Trace	ND	ND
Dacthal	Trace	Trace	ND	Trace
DDVP	Trace	Trace	ND	Trace
Diuron	ND	Trace	ND	ND
EPTC	ND	Trace	ND	ND
Malathion	Trace	0.00017 ppb (2.3 ng/m^3)	ND	ND
Malathion OA	Trace	Trace	ND	ND
Methyl Bromide	ND	ND	0.0055 ppb (21.4 ng/m^3)	0.026 ppb (103 ng/m^3)
MITC	0.0056 ppb (16.6 ng/m^3)	0.0046 ppb (13.6 ng/m^3)	0.0023 ppb (6.7 ng/m^3)	0.0038 ppb (11.4 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace
Trifluralin	Trace	Trace	ND	ND

APPENDIX I: REFERENCES

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APPENDIX J: COMMENTS

Number	Comment	Response	Action
1	**From California Rural Legal Assistance Foundation (CRLAF) & Californians for Pesticide Reform (CPR)** Thank you for the opportunity to provide comment on the 2020, 2021 and 2022 Air Monitoring Network Reports. We are concerned that the presentation of air monitoring results in the annual report continues to be misleading and incomplete and have inaccuracies. We offer the following specific comments for your consideration. We urge you to revise the draft report to address these concerns, many of which were previously flagged in our comment letter dated August 28, 2020, but which remain unaddressed.	DPR's Air Program is dedicated to establishing monitoring programs that address the concerns of all Californians. Our goal is to provide transparent results that contribute to protecting human health and the environment, aligning with DPR's missions. The AMN and 1,3-D reports strive to consistently deliver representative, comprehensive, and accurate monitoring data. DPR and our scientists then provide clear and concise analysis based on that data along with existing research information currently available. DPR remains committed to utilizing feedback from stakeholders to rectify any mistakes or typos in the report and to offer clarifications that prevent misinterpretation of monitoring data. Appendix O of the "2019 Pesticide Air Monitoring Network Report" addresses such comments and feedback.	We appreciate your comment, and no changes are required at this time.
2	**From CRLAF & CPR** The reports do not tabulate or discuss analyses and detections of unregistered pesticides appropriately or account for local pesticide use patterns in calculating detection frequency. See comments on 2022 draft report. Possible reasons for trace detections of methidathion, endosulfan sulfate and oxydemeton methyl should be covered in the report since these pesticides were no longer registered in 2020 or 2021.	The scientific objectives of the AMN, as outlined in the Introduction, emphasize DPR's focus on monitoring pesticides in the ambient air and comparing measured concentrations to screening levels or regulatory targets. It is important to note that the count and percentage of detections serve only to provide an overview of the patterns identified in the report. Therefore, they should be interpreted solely in that context. As part of DPR's ongoing evaluation efforts, we remain dedicated to	We appreciate your comment, no changes are required at this time.

Number	Comment	Response	Action
		year-round pesticide monitoring. DPR does not base its monitoring and data reporting on assumptions about whether a pesticide was applied or the proximity of the application(s) to monitoring locations. Relying on the assumption that a chemical was not applied could potentially lead to undetected concentrations. Consequently, it is not recommended to limit the long-term pesticide monitoring to historical levels of use. This practice is just one example of measures in place to prevent biased monitoring or interpretation of data. Moreover, the value of air monitoring lies in its ability to assess pesticide concentrations relative to established screening levels and regulatory targets. This evaluation helps determine the effectiveness of existing mitigations and whether additional measures are necessary.	
3	**From CRLAF & CPR** When only one day a week is monitored, one or two high concentrations are of great concern. The report states that the exceedance of the 1,3 D sub-chronic screening level in Shafter was due to "one high concentration" and that the exceedance of the chloropicrin sub-chronic screening level in Oxnard was due to "two high concentrations in July of 2021". When monitoring is only conducted once a week it will not capture all high concentrations and may not capture the highest concentration	To achieve an unbiased and representative outcome within the available resources, the AMN sampling schedule is prepared at the start of each year. This process entails randomly selecting one sampling date per week. Random sampling is widely accepted in the scientific community and has statistically demonstrated to be a robust approach for obtaining an unbiased representation of the data, even if collected more frequently. In our current approach and to address the concern raised as part of this comment, a 24-hour sampled concentration is assumed to represent the entire week. For	Thank you for your comment, no changes are required at this time.

Number	Comment	Response	Action
	in any given week, so one or two high concentrations can be in the midst of a week or more of high exposures.	instance, the 24-hour concentration of 37 ppb sampled on 10/16/2020 is assumed to be repeated every day for the entire week from 10/11/2020 to 10/17/2020. Additionally, the AMN focuses on long-term (annual and multi-year) trends. DPR and CARB conducts intensive monitoring through seasonal studies where the ambient air is sampled daily for several consecutive weeks that are focused on sub-chronic and acute exposures.	
4	**From CRLAF & CPR** DPR's current screening or regulatory levels should be compared to other recommended levels and previous DPR recommended levels. See comparison table in comments above on 2022 draft report. We remain extremely concerned that chronic levels of exposure to 1,3 D at all AMN sites exceed the OEHHA NSRL and that levels of exposure are higher averaged over 2020-2022 than for previous time periods. We note that the highest 24 hour chloropicrin concentration of 2.6 ppb (measured in Oxnard) in 2021 exceeds by 2.5-fold the 0.92 ppb reference level for protection of children that is in both the TAC report and DPR risk characterization. Since the 2021 and 2020 reports were prepared in 2023 they should list the screening levels and regulatory levels in place in 2023 in all relevant tables and graphs. Levels in place in 2021 could be	DPR is the leading agency in pesticide monitoring and evaluations. The Screening Levels and Regulatory Targets utilized in the AMN report have been established by our expert toxicologists in DPR's Human Health Assessment branch. DPR's Human Health Assessment branch leverages all available data and evolving scientific knowledge to determine screening levels and regulatory targets or update existing values for specific pesticides. As mentioned in our response to comments on the AMN report for previous years, it is important to note that comparing current DPR exposure levels to previous levels or those from other agencies is neither sound nor scientifically justifiable.	We appreciate your comment, no changes are required at this time.

Number	Comment	Response	Action
	mentioned in footnotes. For example, the 55 ppb acute screening level for 1,3 D should be listed in Tables and graphs in place of the previous 110 ppb level which could be referenced in a footnote.		
5	**From CRLAF & CPR** Captan and malathion should also be listed as proposition 65 designated carcinogens. On page 17, captan and malathion should be added to the list of carcinogenic pesticides being monitored. Both are listed as carcinogens under Proposition 65 and Safe Harbor NSRLs have been set: oehha.ca.gov/proposition-65/general-info/current-proposition-65-no-significant-risk-levels-nsrls-maximum	The Human Health Assessment branch is currently updating the AMN carcinogen list. These changes will be reflected in the coming AMN reports.	Thank you; no changes are required at this time.
6	**CRLAF & CPR** Dacthal was detected in 2021 at trace levels in about a third of samples in Oxnard and two thirds of samples in Santa Maria, and with one quantifiable detection in Oxnard. We note with special concern that dacthal was detected in over 90% of samples collected in Chualar between 2018 and 2020. While the highest 24 hour sample was 0.003 ppb, which we calculate to be 1.25% of the exposure level EPA now recommends, the level could be much higher for people who live or work next to broccoli or cauliflower fields.	As part of the AMN procedures, we collect 24-h air samples, which are compared with established screening levels or regulatory targets for individual pesticides, to determine the need for further analysis and whether the existing mitigations are effective, and whether additional mitigations are needed. Dacthal detections are all below its current Screening Levels. DPR is currently examining the documentation that US EPA recently published on Dacthal (DCPA).	Thank you for your comment; no changes are required at this time.