# Monitoring of 1,3-Dichloropropene in Fresno and Merced Counties: Results for 2022

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Air Program
Environmental Monitoring Branch
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**Report AIR 23-02**

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# 1. **Introduction**

The soil fumigant 1,3-dichloropropene (1,3-D), also known as Telone®, is one of the most used fumigants in California and plays a critical role in agricultural industries by protecting crops from nematodes in the soil and soil-borne diseases. A portion of the applied chemical can disperse into the atmosphere depending on the field fumigation method used during application as well as environmental conditions. In 2017, the California Department of Pesticide Regulation (CDPR) eliminated 1,3-D use in the month of December and restricted the total allotted application amount within each township - a 6x6 square mile area - to a maximum of 136,000 adjusted pounds (a weighting method to account for emissions based on application method, month, and region) in a calendar year (CDPR 2016).

In 2016, CDPR conducted an evaluation of the reported 1,3-D pesticide use to identify and rank communities surrounded by the highest 1,3-D use. CDPR prioritized regions outside the coverage area of CDPR's Air Monitoring Network and the California Air Resources Board's (CARB) Toxic Air Contaminant programs. As a result, CDPR selected two communities in the Central Valley: Delhi (Merced County) and Parlier (Fresno County). This monitoring study aims to identify the presence of ambient air concentrations of 1,3-D in regions of high use, compare measured air concentrations to sub-chronic and chronic human health screening levels and evaluate the effectiveness of the current township cap on chronic ambient concentrations. Although we evaluate short term exposure as a part of this project for comparison purposes, CDPR emphasizes that this study is designed to evaluate long-term ambient air concentrations of 1,3-D in regions of higher use. Therefore, sampling and analytical methods used for this study are specifically designed to achieve these goals. CDPR staff collected weekly 24-h air samples to monitor 1,3-D in these two communities beginning in November 2016.

This report evaluates the results of samples collected from January 1, 2022, through December 31, 2022, and is the sixth report for this multi-year study.

# 2. **Methods**

## 2.1 Field and Laboratory Methods

From January 1, 2022, through December 31, 2022, one 24-h ambient air sample (primary sample) was collected each week on a randomly assigned day of the week at Delhi and Parlier. Sample start times varied between 7 am to 3 pm, as they were left to the discretion of individual field staff. Samples were collected using a 6-liter SilcoCan® canister (Restek cat. no. 24142-65) pre-evacuated to a pressure of -30" Hg placed on a Xonteck 901 Model automated active sampler. If the Xonteck 901 sampler malfunctioned or was unavailable, a Veriflow SC423XL flow controller (i.e., a regulator) attached to the SilcoCan® canister was used to conduct the air sampling. Xonteck flow rates were set to 7.5 mL/min and regulator samples were targeted to 3.0 mL/min. Acceptable flow rates ranged from +/- 10% of the targeted rate (Appendix V). Approximately once a month, a collocated sample (which was placed adjacent to the primary samples) was collected. Delhi was chosen as the collocated site and was used as the quality control monitoring station. All samples were collected using the same standard air

sampling procedures (Appendix V). Samples were analyzed by the California Department of Food and Agriculture's Center for Analytical Chemistry (CDFA CAC) Laboratory using method EMON-SM-05-019 (Appendix VI). In May 2022, CDFA CAC Laboratory updated their lab method introducing new method detection limits (MDL) for each 1,3-D isomer, and Trace as a reportable result. CDFA CAC Laboratory followed CDPR's standard lab quality control procedures and conducted laboratory blanks and laboratory spikes during each analytical run (CDFA 2022).

## 2.2 Data Analysis

CDPR aggregates the laboratory results of 1,3-D isomers (*cis* and *trans*) per sample as the total 1,3-D concentration. The aggregated values are compared with current health-based screening levels and regulatory targets for each year. When calculating average concentrations, CDPR applies a substitution to non-detections (NDs) and trace values. Data collected before May 2022 substituted one half of the reporting limit (RL) for ND results. However, if either *cis* or *trans* isomers of 1,3-D were detected, then the total 1,3-D result would equal the value of that detection and no substitution would be used for the respective ND isomer. Once CDFA CAC updated the laboratory method in May 2022, a RL of 0.01 parts per billion (ppb) remains for each isomer. MDL were updated, where the MDL for *cis*-1,3-D is 0.00815 ppb and the MDL for *trans*-1,3-D is equal to 0.00655 ppb. In this update, Trace values were introduced. A Trace detection is a value somewhere between the MDL and the RL. Therefore, Trace values are substituted using the following formula: (MDL+RL)/2.

Average concentrations of 1,3-D are calculated for acute, sub-chronic, chronic, and lifetime periods (Table 1). CDPR's sampling methods are limited to a 24-h sample which is used to compare to the established 72-h acute exposure level. A rolling average of 90 days (13 consecutive weeks) is used to calculate a sub-chronic exposure. The one-year average concentration is used to determine the chronic exposure. The life-time exposure of 1,3- D has the regulatory target of 0.56 ppb. This value is derived from submitted toxicology studies and is based on a set of assumptions for one person's cancer risk over a 70-year average of inhalation exposure (CDPR 2016). In the absence of 70 years' worth of 1,3-D monitoring data, CDPR uses the average concentrations from the start of this study, beginning in December 2016, to calculate a lifetime exposure. To determine the risk associated for each exposure period, CDPR uses a Hazard Quotient (HQ). The HQ is calculated as a ratio of the measured 1,3-D concentrations to a screening level or a regulatory target. A HQ of greater than one indicates exceedance of the screening level and requires CDPR to take action to further evaluate the data and assess possible mitigation measures (CDPR 2011).

Table 1. Screening levels (sl) and regulatory target (rt) for 1,3-dichloropropene.

| Exposure | Exposure Period | SL / RT (ppb) | Potential Health Effect |
|---|---|---|---|
| Acute | 72 hours | 55 | Change in body weight |
| Sub-chronic | 90 days | 3 | Tissue damage in nose and lung |
| Chronic | 1 year | 2 | Tissue damage in nose and lung |
| Lifetime/Cancer Risk | 70 years | 0.56 | Cancer |

### 2.3 Study Limitations

This study has several limitations, including: (1) monitoring is conducted once a week for 24-h to address the study's goal of long-term ambient air of 1,3-D monitoring in a high use region. (2) Similarly, air monitoring results are compared to acute screening levels which are based on submitted toxicology studies which reference a 72-h acute period, rather than a 24-h period. Due to current field methods, CDPR is not able to collect the longer 72-h air sample. Therefore, CDPR practice is to collect 24-h sampling results and compare them to established screening levels. (3) CDPR monitoring is not intended to capture a specific application occurring in the community, but rather aims to capture concentrations within the community at ambient air conditions. (4) The lifetime/cancer risk requires 70 years of data. However, this study was initiated at the end of 2016, so the lifetime risk period is limited to 6 years. (5) Other limitations of this study are from the laboratory methods. Currently, the analytical RL for 1,3-D is 0.01 ppb. Anything under that limit is reported by the CDFA CAC Laboratory as a ND or Trace. CDPR then assumes each ND to be half of the method detection limit when performing average calculations.

## 3. Air Monitoring Results

In 2022, a total of 90 out of 104 valid primary samples were collected from the two sites in Delhi and Parlier (Appendices I and II). Fourteen samples were invalid due to a laboratory equipment malfunction during analysis. A no result (NR) is reported for those samples. During the 2022 calendar year, 1,3-D was detected in 62% of air samples collected from both sites.

### 3.1 Delhi

Forty-five (45 out of 52 possible samples) valid primary samples were collected at the Delhi site. Fifty one percent of Delhi samples were above the RL in 2022 (23 out of 45 samples). Quantifiable detections (above the RL of 0.01 ppb) ranged from 0.022 to 2.79 ppb (Figure 1). No detection exceeded established targets for acute, sub-chronic, chronic, or lifetime exposures. The mean annual concentration for Delhi was 0.28 ppb and a median of 0.014 ppb in 2022. Table 2 summarizes maximum observed concentrations for each exposure period for Delhi. Results for acute, sub-chronic, chronic and lifetime exposure categories were below a HQ of 1.0. The highest observed HQ was 0.57 for the lifetime exposure period.

Table 2. Delhi's maximum concentrations for each exposure period.

| Exposure | Exposure Period | 1,3-D (ppb) | SL / RT (ppb) | Hazard Quotient** |
|---|---|---|---|---|
| Acute | 72 hours*** | 2.79 | 55 | 0.05 |
| Sub-chronic | 90 days | 0.62 | 3 | 0.21 |
| Chronic | 1 year | 0.28 | 2 | 0.14 |
| Lifetime | 70 years | 0.32* | 0.56 | 0.57 |

* Calculated from available data Dec. 2016-Dec. 2022

** Calculated as the ratio of measured concentration to screening level

*** Compared using a 24-hr sample

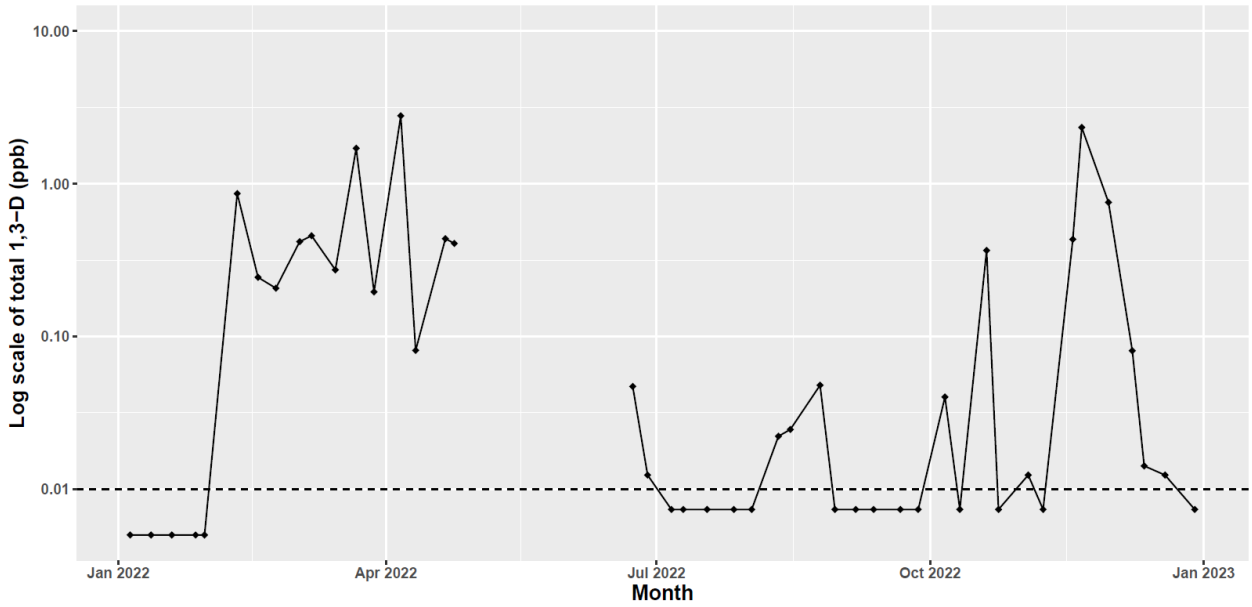


Figure 1. 1,3-D air concentrations detected in Delhi. The data gap is the seven weeks where CDFA CAC experienced an equipment malfunction. The dashed horizontal line is the reporting limit (RL).

### 3.2 Parlier

In Parlier, of the 52 possible air samples, 45 samples were valid. 1,3-D was detected in 73% of the air samples (33 of 45 samples). Twelve samples resulted in NDs. No exceedances for acute, subchronic and chronic targets were seen in 2022. Quantifiable detections in 2022 ranged from 0.01 to 10.82 ppb (Figure 2) with the annual mean and median concentration of 0.78 ppb and 0.034 ppb, respectively.

Aggregating the measured air concentrations at the Parlier monitoring site from December 2016 through December 2022, staff found that an exceedance of the established regulatory target for the lifetime exposure continues (Table 3). This is largely due to a single high detection of 111 ppb in October 2018 and not a direct result of concentrations from 2022 (Gonzalez, 2019). To address the HQs greater than 1, CDPR has proposed regulations to mitigate exposures to 1,3-D (CDPR, 2023).

Table 3. Parlier's maximum concentrations for each exposure period.

| Exposure | Exposure Period | 1,3-D (ppb) | SL / RT (ppb) | Hazard Quotient** |
|---|---|---|---|---|
| Acute | 72 hours*** | 10.82 | 55 | 0.20 |
| Sub-chronic | 90 days | 2.38 | 3 | 0.79 |
| Chronic | 1 year | 0.78 | 2 | 0.39 |
| Lifetime* | 70 years | 1.10 | 0.56 | 1.96 |

* Calculated from available data Dec. 2016-Dec. 2022

** Calculated as the ratio of measured concentration to screening level

*** Compared using a 24-hr sample

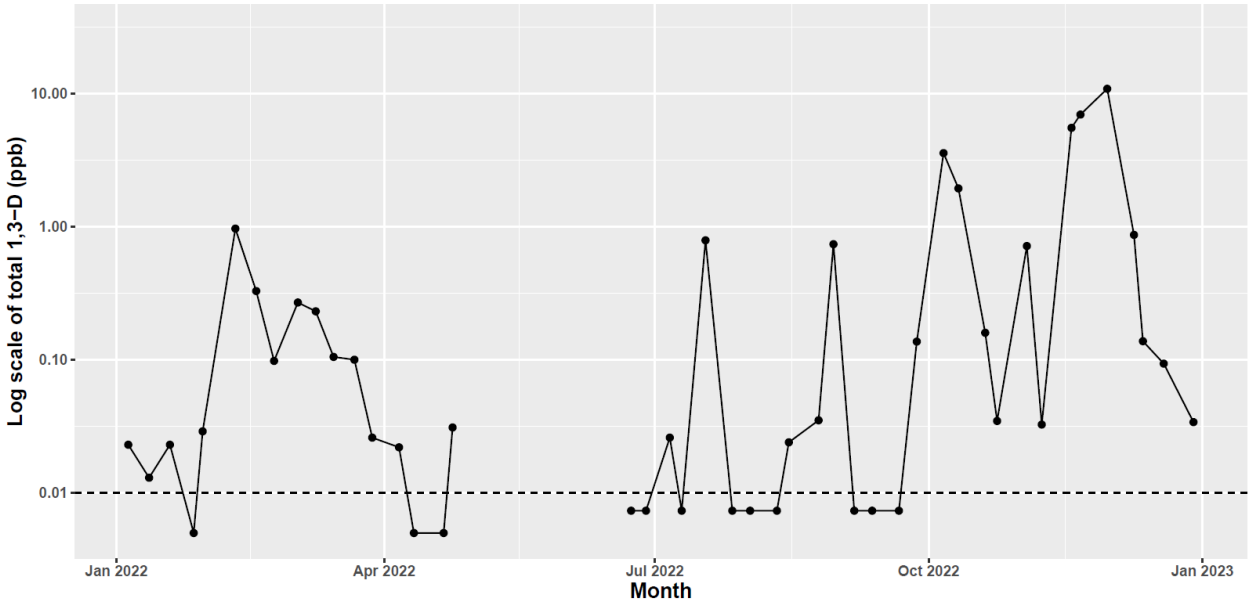


Figure 2. 1,3-D air concentrations detected in Parlier. The data gap is the seven weeks where CDFA CAC experienced an equipment malfunction. The dashed horizontal line is the reporting limit (RL).

## 4. Quality Assurance Results

### 4.1 Collocated Samples

During 2022, 12 out of 14 scheduled collocated paired air samples were valid and collected from the Delhi site. Two paired samples from May 10 and June 13 were invalid because of the CDFA CAC Laboratory equipment issue. Six pairs (309-A380/309-A381, 309-A412/309-A413, 309-A417/309-A418, 309-A423/309-A424 and 309-A444/309-A445) of sample results reported NDs for the primary sample and the collocated sample; thus, CDPR was not able to calculate a relative percent difference for these pairs. Similarly, one pair (309-441/309-A442) resulted in a ND for *cis*-1,3-d and 0.01 for *trans*-1,3-D and the duplicate resulted in a ND; therefore, no relative percent difference for that pair was calculated. The remaining 5 pairs had measurable detections above the RL resulting in an average relative percent difference of 15% (standard deviation [SD] = 17.6). To minimize differences in calculated relative percent difference largely due to low concentrations, the absolute relative difference was divided by the acute screening level of 55 ppb. Table 4 summarizes the results of the 14 collocated samples.

**Table 4. Summary of collocated sample results and absolute relative percent difference.**

| Sample Date | Primary Sample | Primary Result (ppb) | Collocated Sample | Collocated Result (ppb) | \|Relative % Difference\| | \|Relative % Difference/ Acute\| |
|---|---|---|---|---|---|---|
| 1/12/2022 | A380 | ND | A381 | ND | N/A | N/A |
| 2/23/2022 | A387 | 0.207 | A388 | 0.18 | 14 | 0.3 |
| 3/7/2022 | A390 | 0.457 | A391 | 0.48 | 5 | 0.1 |

| Sample Date | Primary Sample | Primary Result (ppb) | Collocated Sample | Collocated Result (ppb) | \|Relative % Difference\| | \|Relative % Difference/ Acute\| |
|---|---|---|---|---|---|---|
| 4/11/2022 | A397 | 0.081 | A398 | 0.049 | 49 | 0.9 |
| 5/10/2022 | A402 | -- | A403 | -- | N/A | N/A |
| 6/13/2022 | A408 | -- | A409 | -- | N/A | N/A |
| 7/7/2022 | A412 | ND | A413 | ND | N/A | N/A |
| 8/2/2022 | A417 | ND | A418 | ND | N/A | N/A |
| 9/6/2022 | A423 | ND | A424 | ND | N/A | N/A |
| 10/11/2022 | A430 | ND | A429 | ND | N/A | N/A |
| 11/18/2022 | A435 | 0.433 | A436 | 0.449 | 4 | 0.1 |
| 11/30/2022 | A438 | 0.756 | A439 | 0.775 | 2 | <0.01 |
| 12/12/2022 | A441 | ND/0.01 | A442 | ND | N/A | N/A |
| 12/29/2022 | A444 | ND | A445 | ND | N/A | N/A |

### 4.2 Laboratory Spikes and Blanks

For quality assurance purposes, the CDFA CAC Laboratory conducted 28 laboratory spikes when performing the air sample analysis. Spike recovery rates averaged 98% (SD = 4.2) and 96% (SD = 6.5) for the *cis*- and *trans*- isomers, respectively. In addition, 28 laboratory blanks were evaluated; no cross contamination was detected in these samples. Appendices III and IV include Individual results of laboratory spikes and laboratory blanks.

## 5. **Discussion**

### 5.1 December Air Concentrations

Current 1,3-D permit conditions do not allow the application of 1,3-D during the month of December. Quantifiable detections of 1,3-D were present in six of the eight samples collected from Delhi and Parlier during December. Delhi experienced decreasing low-level detections for the month ranging from 0.0806 to NDs. In Parlier, decreasing low-level detections were seen from 0.866 to 0.034 ppb. Untarped applications of 1,3-D, studies have shown that the fumigant's cumulative emission tends to stabilize roughly two weeks after application (Gao et al. 2008, Gao and Trout 2007), which may explain in part the low levels of detections seen during December even in the absence of 1,3-D applications during that month.

### 5.2 Comparisons to Previous Year

All maximum concentrations for acute, sub-chronic and chronic exposures levels decreased considerably in Delhi and Parlier in 2022 when compared to 2021 (Figures 3 and 4, Tables 5 and 6).

In Delhi, the maximum acute (1-day) exposure decreased 70% from 9.37 to 2.79 ppb, the maximum sub-chronic (90-day) decreased 72% from 2.29 to 0.62 ppb, and the chronic (1-year) exposure decreased 59% from 0.68 to 0.28 ppb (Table 5). Likewise, the cumulative lifetime exposure decreased from 0.322 to 0.315 ppb.

In Parlier, the maximum acute (1-day) concentration decreased 56% from 24.93 ppb to 10.82 ppb, the sub-chronic (90-day) concentration decreased 28% from 3.30 to 2.38 ppb, and the maximum chronic (1-year) average exposure decreased 50% from 1.55 to 0.78 ppb (Table 6, Figure 4). Likewise, the cumulative lifetime exposure decreased from 1.16 to 1.10 ppb.

Table 5. Maximum Delhi air concentrations (ppb) by year.

| Monitoring Period | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| 1 day | 1.06 | 1.8 | 2.04 | 3.75 | 9.37 | 2.79 |
| 90 days | 0.29 | 0.48 | 0.42 | 1 | 2.29 | 0.62 |
| 1 year | 0.13 | 0.19 | 0.15 | 0.46 | 0.68 | 0.28 |
| Lifetime | 0.315 | | | | | |

Table 6. Maximum Parlier air concentrations (ppb) by year.

| Monitoring Period | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| 1 day | 15.96 | 111.29 | 2.07 | 10.61 | 24.93 | 10.82 |
| 90 days | 1.83 | 10.53 | 0.78 | 1.62 | 3.3 | 2.38 |
| 1 year | 0.62 | 2.94 | 0.27 | 0.51 | 1.55 | 0.78 |
| Lifetime | 1.112 | | | | | |

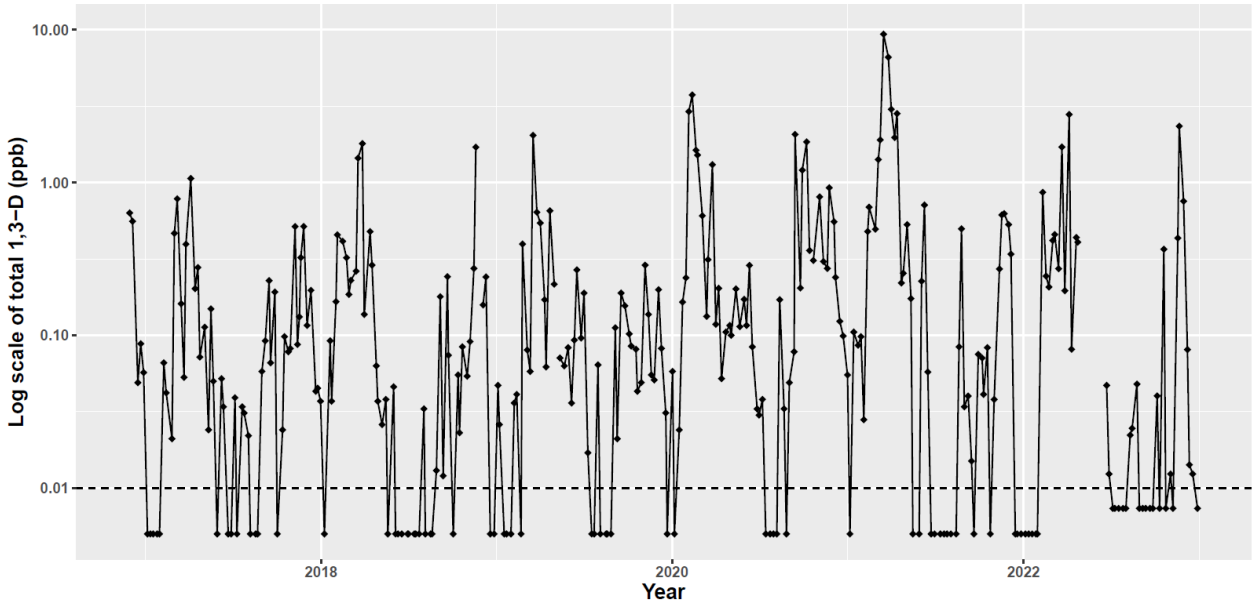


Figure 3. Log-scale of Delhi air concentrations since the beginning of the study from December 2016- December 2022. The dashed horizontal line shows the reporting limit (RL).

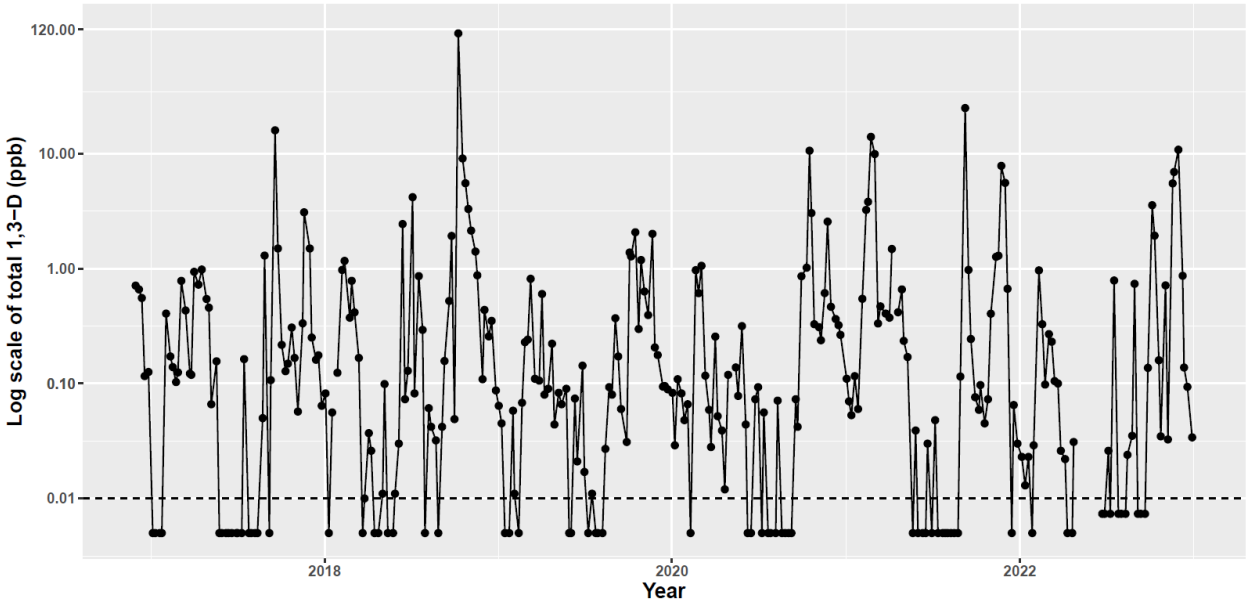


Figure 4. Log- scale of Parlier air concentrations since the beginning of the study from December 2016-December 2022. The dashed horizontal line shows the reporting limit (RL).

## 6. Conclusion

The year 2022 marked the sixth consecutive year of 1,3-D ambient monitoring in the communities of Delhi and Parlier. The ambient 1,3-D results collected from this study continue to supply meaningful information for the evaluation of acute, sub-chronic, chronic and lifetime exposures in high use communities. Delhi's 1,3-D concentrations seen in calendar year 2022 were below currently established thresholds of 1,3-D for acute, sub-chronic, chronic and lifetime exposures. In, Parlier concentrations of 1,3-D were below acute, sub-chronic and chronic exposures. Lifetime exposures were above currently established thresholds in Parlier. CDPR has proposed regulations to mitigate 1,3-D acute and lifetime exposures to non-occupational bystanders that will go into effect in 2024. CDPR will propose additional regulations in 2024 to mitigate 1,3-D lifetime exposures to occupational bystanders in California.

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## Appendices

Appendix I. Raw data for Delhi. Results listed as 0.005 are non-detections substituted for one-half of the reporting limit of 0.01 ppb.

| Sample Date | Sample ID | Total 1,3-D (ppb) | Cis 1,3-D (ppb) | Trans 1,3-D (ppb) |
|---|---|---|---|---|
| 1/5/2022 | 309-A379 | 0.005 | 0.005 | 0.005 |
| 1/12/2022 | 309-A380 | 0.005 | 0.005 | 0.005 |
| 1/19/2022 | 309-A382 | 0.005 | 0.005 | 0.005 |
| 1/27/2022 | 309-A383 | 0.005 | 0.005 | 0.005 |
| 1/30/2022 | 309-A384 | 0.005 | 0.005 | 0.005 |
| 2/10/2022 | 309-A385 | 0.863 | 0.516 | 0.347 |
| 2/17/2022 | 309-A386 | 0.244 | 0.134 | 0.11 |
| 2/23/2022 | 309-A387 | 0.207 | 0.111 | 0.096 |
| 3/3/2022 | 309-A389 | 0.418 | 0.237 | 0.181 |
| 3/7/2022 | 309-A390 | 0.457 | 0.224 | 0.233 |
| 3/15/2022 | 309-A392 | 0.273 | 0.105 | 0.168 |
| 3/22/2022 | 309-A393 | 1.71 | 0.7 | 1.01 |
| 3/28/2022 | 309-A394 | 0.196 | 0.117 | 0.079 |
| 4/6/2022 | 309-A395 | 2.79 | 1.71 | 1.08 |
| 4/11/2022 | 309-A397 | 0.081 | 0.041 | 0.04 |
| 4/21/2022 | 309-A399 | 0.437 | 0.222 | 0.215 |
| 4/24/2022 | 309-A400 | 0.407 | 0.188 | 0.219 |
| 5/6/2022 | 309-A401 | Invalid | NR | NR |
| 5/10/2022 | 309-A402 | Invalid | NR | NR |
| 5/17/2022 | 309-A404 | Invalid | NR | NR |
| 5/26/2022 | 309-A405 | Invalid | NR | NR |
| 6/1/2022 | 309-A406 | Invalid | NR | NR |
| 6/11/2022 | 309-A407 | Invalid | NR | NR |
| 6/13/2022 | 309-A408 | Invalid | NR | NR |
| 6/23/2022 | 309-A410 | 0.047 | 0.025 | 0.022 |
| 6/28/2022 | 309-A411 | 0.01235 | 0.004075 | 0.008275 |
| 7/6/2022 | 309-A412 | 0.00735 | 0.004075 | 0.003275 |
| 7/10/2022 | 309-A414 | 0.00735 | 0.004075 | 0.003275 |
| 7/18/2022 | 309-A415 | 0.00735 | 0.004075 | 0.003275 |
| 7/27/2022 | 309-A416 | 0.00735 | 0.004075 | 0.003275 |
| 8/2/2022 | 309-A417 | 0.00735 | 0.004075 | 0.003275 |
| 8/11/2022 | 309-A420 | 0.022175 | 0.004075 | 0.0181 |
| 8/15/2022 | 309-A419 | 0.024575 | 0.004075 | 0.0205 |
| 8/25/2022 | 309-A421 | 0.0479 | 0.025 | 0.0229 |

| Sample Date | Sample ID | Total 1,3-D (ppb) | Cis 1,3-D (ppb) | Trans 1,3-D (ppb) |
|---|---|---|---|---|
| 8/30/2022 | 309-A422 | 0.00735 | 0.004075 | 0.003275 |
| 9/6/2022 | 309-A423 | 0.00735 | 0.004075 | 0.003275 |
| 9/12/2022 | 309-A425 | 0.00735 | 0.004075 | 0.003275 |
| 9/21/2022 | 309-A426 | 0.00735 | 0.004075 | 0.003275 |
| 9/27/2022 | 309-A427 | 0.00735 | 0.004075 | 0.003275 |
| 10/6/2022 | 309-A428 | 0.0401 | 0.0233 | 0.0168 |
| 10/11/2022 | 309-A430 | 0.00735 | 0.004075 | 0.003275 |
| 10/20/2022 | 309-A431 | 0.366 | 0.207 | 0.159 |
| 10/24/2022 | 309-A432 | 0.00735 | 0.004075 | 0.003275 |
| 11/3/2022 | 309-A433 | 0.01235 | 0.009075 | 0.003275 |
| 11/8/2022 | 309-A434 | 0.00735 | 0.004075 | 0.003275 |
| 11/18/2022 | 309-A435 | 0.433 | 0.267 | 0.166 |
| 11/21/2022 | 309-A437 | 2.34 | 1.15 | 1.19 |
| 11/30/2022 | 309-A438 | 0.756 | 0.409 | 0.347 |
| 12/8/2022 | 309-A440 | 0.0806 | 0.0356 | 0.045 |
| 12/12/2022 | 309-A441 | 0.014175 | 0.004075 | 0.0101 |
| 12/19/2022 | 309-A443 | 0.01235 | 0.004075 | 0.008275 |
| 12/29/2022 | 309-A444 | 0.00735 | 0.004075 | 0.003275 |

Appendix II. Raw data for Parlier. Results listed as 0.005 are non-detections substituted for one-half of the reporting limit of 0.01 ppb.

| Sample Date | Sample ID | Total 1,3-D (ppb) | Cis 1,3-D (ppb) | Trans 1,3-D (ppb) |
|---|---|---|---|---|
| 1/5/2022 | 309-B274 | 0.023 | 0.011 | 0.012 |
| 1/12/2022 | 309-B275 | 0.013 | 0.005 | 0.013 |
| 1/19/2022 | 309-B276 | 0.023 | 0.012 | 0.011 |
| 1/27/2022 | 309-B277 | 0.005 | 0.005 | 0.005 |
| 1/30/2022 | 309-B278 | 0.029 | 0.016 | 0.013 |
| 2/10/2022 | 309-B279 | 0.965 | 0.515 | 0.45 |
| 2/17/2022 | 309-B280 | 0.328 | 0.166 | 0.162 |
| 2/23/2022 | 309-B281 | 0.098 | 0.05 | 0.048 |
| 3/3/2022 | 309-B282 | 0.269 | 0.137 | 0.132 |
| 3/9/2022 | 309-B283 | 0.231 | 0.107 | 0.124 |
| 3/15/2022 | 309-B284 | 0.105 | 0.038 | 0.067 |
| 3/22/2022 | 309-B285 | 0.1 | 0.042 | 0.058 |
| 3/28/2022 | 309-B286 | 0.026 | 0.012 | 0.014 |
| 4/6/2022 | 309-B287 | 0.022 | 0.012 | 0.01 |
| 4/11/2022 | 309-B288 | 0.005 | 0.005 | 0.005 |
| 4/21/2022 | 309-B289 | 0.005 | 0.005 | 0.005 |
| 4/24/2022 | 309-B290 | 0.031 | 0.014 | 0.017 |
| 5/6/2022 | 309-B291 | Invalid | NR | NR |
| 5/10/2022 | 309-B292 | Invalid | NR | NR |
| 5/17/2022 | 309-B293 | Invalid | NR | NR |
| 5/26/2022 | 309-B294 | Invalid | NR | NR |
| 6/1/2022 | 309-B295 | Invalid | NR | NR |
| 6/11/2022 | 309-B296 | Invalid | NR | NR |
| 6/13/2022 | 309-B297 | Invalid | NR | NR |
| 6/23/2022 | 309-B298 | 0.00735 | 0.004075 | 0.003275 |
| 6/28/2022 | 309-B299 | 0.00735 | 0.004075 | 0.003275 |
| 7/6/2022 | 309-B300 | 0.026 | 0.015 | 0.011 |
| 7/10/2022 | 309-B301 | 0.00735 | 0.004075 | 0.003275 |
| 7/18/2022 | 309-B302 | 0.788 | 0.488 | 0.3 |
| 7/27/2022 | 309-B303 | 0.00735 | 0.004075 | 0.003275 |
| 8/2/2022 | 309-B304 | 0.00735 | 0.004075 | 0.003275 |
| 8/11/2022 | 309-B306 | 0.00735 | 0.004075 | 0.003275 |
| 8/15/2022 | 309-B307 | 0.023975 | 0.004075 | 0.0199 |
| 8/25/2022 | 309-B308 | 0.0351 | 0.0168 | 0.0183 |
| 8/30/2022 | 309-B309 | 0.737 | 0.413 | 0.324 |
| 9/6/2022 | 309-B310 | 0.00735 | 0.004075 | 0.003275 |

| Sample Date | Sample ID | Total 1,3-D (ppb) | Cis 1,3-D (ppb) | Trans 1,3-D (ppb) |
|---|---|---|---|---|
| 9/12/2022 | 309-B311 | 0.00735 | 0.004075 | 0.003275 |
| 9/21/2022 | 309-B312 | 0.00735 | 0.004075 | 0.003275 |
| 9/27/2022 | 309-B313 | 0.1368 | 0.0847 | 0.0521 |
| 10/6/2022 | 309-B314 | 3.56 | 2.35 | 1.21 |
| 10/11/2022 | 309-B315 | 1.934 | 0.904 | 1.03 |
| 10/20/2022 | 309-B316 | 0.1594 | 0.0806 | 0.0788 |
| 10/24/2022 | 309-B317 | 0.0347 | 0.0157 | 0.019 |
| 11/3/2022 | 309-B318 | 0.714 | 0.359 | 0.355 |
| 11/8/2022 | 309-B319 | 0.0326 | 0.0156 | 0.017 |
| 11/18/2022 | 309-B320 | 5.51 | 3.19 | 2.32 |
| 11/21/2022 | 309-B321 | 6.93 | 3.28 | 3.65 |
| 11/30/2022 | 309-B322 | 10.82 | 5.81 | 5.01 |
| 12/9/2022 | 309-B323 | 0.866 | 0.405 | 0.461 |
| 12/12/2022 | 309-B324 | 0.1378 | 0.0652 | 0.0726 |
| 12/19/2022 | 309-B325 | 0.0935 | 0.046 | 0.0475 |
| 12/29/2022 | 309-B326 | 0.034 | 0.0182 | 0.0158 |

Appendix III. Laboratory and spike recovery data.

| Analysis Date | Spike Amount (ppb) | Cis Result (ppb) | Cis 1,3-D Recovery (%) | Trans Result (ppb) | Trans 1,3-D Recovery (%) |
|---|---|---|---|---|---|
| 1/13/2022 | 0.15 | 0.152 | 101 | 0.135 | 90 |
| 1/24/2022 | 0.15 | 0.135 | 90 | 0.128 | 85.3 |
| 2/11/2022 | 0.15 | 0.14 | 93.3 | 0.125 | 83.3 |
| 2/28/2022 | 0.15 | 0.138 | 92 | 0.138 | 90.7 |
| 3/3/2022 | 0.15 | 0.142 | 94.7 | 0.129 | 86 |
| 3/11/2022 | 0.15 | 0.124 | 82.7 | 0.132 | 88 |
| 3/25/2022 | 0.15 | 0.134 | 89.3 | 0.141 | 94 |
| 4/11/2022 | 0.15 | 0.158 | 105 | 0.134 | 89.3 |
| 4/22/2022 | 0.15 | 0.136 | 90.7 | 0.138 | 92 |
| 5/6/2022 | 0.15 | 0.137 | 91.3 | 0.14 | 93.3 |
| 6/23/2022 | 0.15 | 0.14 | 93.3 | 0.139 | 92.7 |
| 7/5/2022 | 0.15 | 0.147 | 98 | 0.148 | 98.7 |
| 8/23/2022 | 0.15 | 0.154 | 103 | 0.152 | 101 |
| 8/26/2022 | 0.15 | 0.147 | 98 | 0.148 | 98.7 |
| 9/6/2022 | 0.15 | 0.151 | 101 | 0.15 | 100 |
| 10/21/2022 | 0.15 | 0.142 | 94.7 | 0.139 | 92.7 |
| 10/24/2022 | 0.15 | 0.15 | 100 | 0.15 | 100 |
| 10/28/2022 | 0.15 | 0.149 | 99.5 | 0.151 | 101 |
| 11/14/2022 | 0.15 | 0.146 | 97.3 | 0.147 | 98 |
| 12/13/2022 | 0.15 | 0.148 | 98.7 | 0.15 | 100 |
| 12/15/2022 | 0.15 | 0.148 | 98.7 | 0.148 | 98.7 |
| 12/23/2022 | 0.15 | 0.149 | 99.3 | 0.146 | 97.3 |
| 12/29/2022 | 0.15 | 0.15 | 100 | 0.151 | 101 |
| 1/3/2023 | 0.15 | 0.143 | 95.3 | 0.145 | 96.7 |
| 1/6/2023 | 0.15 | 0.152 | 101 | 0.151 | 101 |

Appendix IV. Laboratory and blank recovery data.

| Analysis Date | Cis Result | Trans Result |
|---|---|---|
| 1/13/2022 | ND | ND |
| 1/24/2022 | ND | ND |
| 2/11/2022 | ND | ND |
| 2/28/2022 | ND | ND |
| 3/3/2022 | ND | ND |
| 3/11/2022 | ND | ND |
| 3/25/2022 | ND | ND |
| 4/11/2022 | ND | ND |
| 4/22/2022 | ND | ND |
| 5/6/2022 | ND | ND |
| 6/23/2022 | ND | ND |
| 7/5/2022 | ND | ND |
| 8/23/2022 | ND | ND |
| 8/26/2022 | ND | ND |
| 9/6/2022 | ND | ND |
| 10/21/2022 | ND | ND |
| 10/24/2022 | ND | ND |
| 10/28/2022 | ND | ND |
| 11/14/2022 | ND | ND |
| 12/13/2022 | ND | ND |
| 12/15/2022 | ND | ND |
| 12/23/2022 | ND | ND |
| 12/29/2022 | ND | ND |
| 1/3/2023 | ND | ND |
| 1/6/2023 | ND | ND |

Appendix V. Study #309: Monitoring of 1,3-dichloropropene in Merced and Fresno Counties.

(Document Attached)

Appendix VI. Determination of bromomethane, carbon disulfide, cis-1,3- dichloropropene and trans-1,3-dichloropropene in air samples collected in summa canisters, Revision 3.

(Document Attached)