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## **Toxic Farm Fumigants Drifting Into California Neighborhoods**

### **Study Finds Methyl Bromide in Air in Ventura and Castroville**

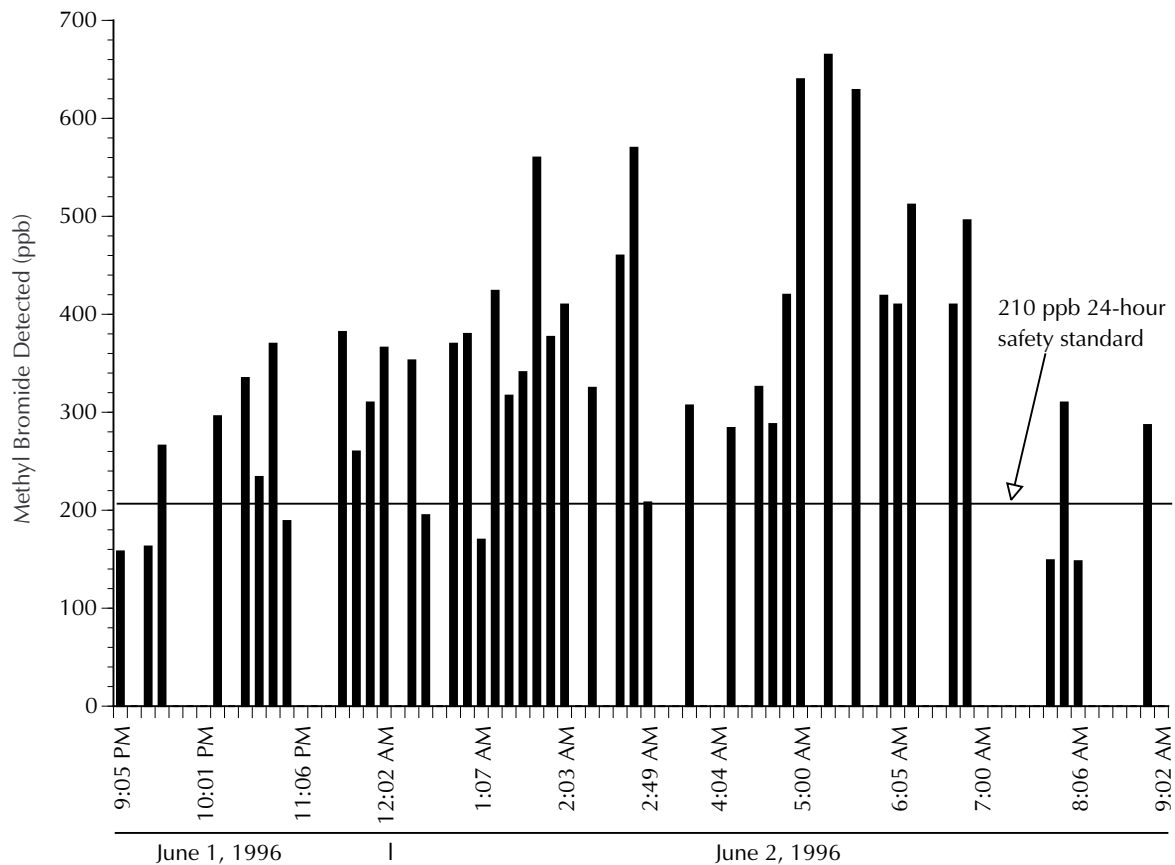
#### **Summary**

Testing of air in two California neighborhoods adjacent to agricultural fields receiving applications of the soil fumigant methyl bromide revealed high levels of this extremely toxic pesticide outside state mandated *buffer zones*. Buffer zones are recommended based on the size of the field and the rate of methyl bromide application and are intended to protect the public from exposure to unsafe levels methyl bromide. Air monitoring was conducted using a state-of-the-art remote sensing device, the open-path FTIR. This system is approved by the US EPA to monitor toxic gas emissions and to measure air pollution releases from factories and refineries. It is recognized as superior to testing methods used by the state of California for monitoring pesticide gases like methyl bromide.

- Analysis of air in a residential neighborhood in Castroville found 36 individual confirmed detections exceeding the State of California's 24 hour safety standard of 210 parts per billion at a distance of more than 1,300 feet from the application site, 6 times the state recommended "safety" buffer zone of 220 feet. The average of the confirmed methyl bromide detections during one 12 hour period was 204 ppb, approaching the state safety standard (Figure 1).
- Air monitoring also verified high levels of methyl bromide in a Ventura County suburb where residents were poisoned by methyl bromide applied to a nearby strawberry field in recent weeks. Individual detections ranged from 299 to 1,900 parts per billion. All individual detections were above the state mandated 24 hour safety standard of 210 ppb. During one 12 hour period, the average level detected was 294 ppb, exceeding the 210 ppb safety standard. Air monitoring was conducted along a continuous path from the yard of a home/day care center down a street parallel to the fence line of the fumigated field. The street is regularly used by neighborhood kids as a basketball court. An application of methyl bromide to an adjoining field the week before had a buffer zone that extended into the backyards of a row of homes next to the field, a practice which is legal, but clearly not safe for the residents. A resident and mother of four, who operates a child day-care center in her home, and several of her neighbors, suffered symptoms of methyl bromide poisoning from this fumigation early in August. The day-care center operator temporarily moved the children in her care to a local beach to avoid the fumes, and another neighbor also moved out temporarily, taking along twin, 2 year-old children. State officials are now investigating the case.

Eighteen people have died from methyl bromide exposure during fumigation of homes in California since 1985. At least 454 more have been sickened or poisoned and evacuated from schools and homes due to agricultural methyl bromide exposure during that same time period (Pease 1995).

**Figure 1. High levels of methyl bromide were detected overnight in a Castroville neighborhood 1300 feet from the fumigated field.**



Source: Environmental Working Group. Results from Open-path FTIR monitoring from June 1-2, 1996, Castroville, California.

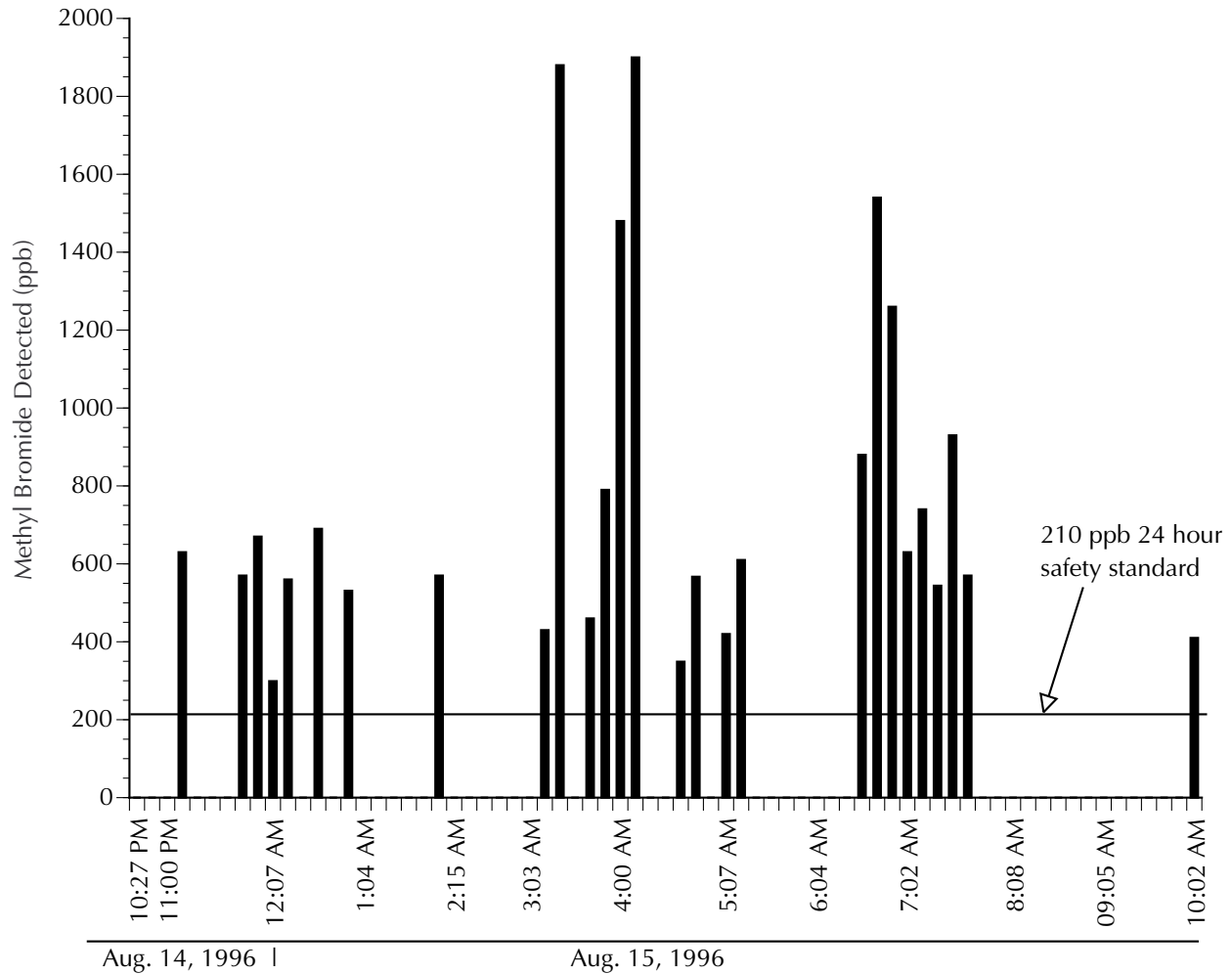
Methyl bromide is classified by the EPA as a *Category I acute toxin*, the most potent class of toxic chemicals. It is a colorless, odorless, and deadly gas, and because it is applied as a gas, it rapidly vaporizes into air and drifts off site into the surrounding community despite the plastic tarps that are placed over the soil. The acute effects of methyl bromide exposure include headaches, drowsiness, lethargy, nausea, vomiting, dizziness, blurred vision, twitching and convulsions, seizures, psychosis and death. The *known* effects of repeated sub-lethal exposure include damage to the brain, the peripheral nervous system, the respiratory system, kidneys, liver, eyes, nose, throat, lungs and skin.

### **Pesticide Use in California: the Ag-Suburban Pesticide Exposure Zone**

In 1993, California agriculture applied about 185 million pounds of pesticides, or about 22 percent of the volume of all agricultural pesticides applied in the United States. This represents a 31 percent increase in the volume of pesticides applied to California farms in 1991 (Pease et al 1996).

Pesticide usage was most intensive on strawberries. An average of more than 234 pounds of pesticides were used per acre of berries planted statewide according to 1993 California Department of Pesticide Regulations (DPR) data (Pease et al. 1996). A more recent USDA survey found that California strawberries

**Figure 2. High levels of methyl bromide were detected overnight in a Ventura neighborhood alongside a newly fumigated field.**



Source: Environmental Working Group. Results from Open-path FTIR monitoring from August 14-15, 1996, Ventura, California.

were treated on average with over 300 pounds of pesticides per acre (USDA 1995). For strawberries, as much as 80 percent of the total volume of pesticides applied are soil fumigants, primarily methyl bromide and chloropicrin.

In California, especially in coastal counties, agriculture is in increasingly close proximity to suburban communities. Specialty crops predominate in these areas, crops which typically are grown using enormous amounts of pesticides. Many of these crops, like strawberries and flowers, continue to be produced even in largely urban areas like Orange and Alameda counties.

The environmental and human health effects of heavy pesticide use near residential neighborhoods are under increasing scrutiny. In particular, the application of the soil fumigant methyl bromide near homes and schools has raised concerns due to the extreme toxicity of the compound, and the propensity for the chemical, which is applied as a gas, to drift off-site for several days after application.

As a first step in studying this issue, the Environmental Working Group examined the use of methyl bromide near schools and day care centers across California (EWG 1996). Statewide methyl bromide use was mapped using 1992 California Department of Pesticide Regulation data (the latest available at the time).

The analysis found that at least 826 schools and day care centers statewide were within 2 miles of over 10,000 pounds of methyl bromide use in 1992. At least 10 schools were less than 2 miles from over 100,000 pounds of methyl bromide application in that same year. Twenty schools were within 2 miles of 75,000 pounds or more of methyl bromide use in 1992, and eighteen of these were in Ventura, Monterey, and Santa Barbara counties. The top five (and 10 of the top 15) vulnerable schools in the state were all located in Oxnard, in Ventura County.

Ventura and Monterey counties had 131 and 112 elementary schools and day care centers respectively within 2 miles of 10,000 pounds or more methyl bromide use. Orange County had the most elementary schools and day care facilities at risk, with 83 elementary schools (enrolling 45,000 children), plus 212 day care centers, within 2 miles of 2,000 pounds or more methyl bromide use.

### **Air Monitoring for Methyl Bromide**

To better understand the extent of off-site drift of methyl bromide and the need for increased monitoring and improved mitigation measures, the Environmental Working Group initiated a pesticide air monitoring project in California in June of 1996.

The project is designed to provide reliable and timely data on pesticide drift, through air monitoring typically performed soon after pesticide applications. To the extent practical, samples are taken in residential subdivisions or other locations near agricultural fields, that provide a good indication of the potential for human exposure.

**Methods.** The monitoring results for methyl bromide reported here were obtained using a state-of-the-art analytical device called an *Open-path FTIR*, technically an open-path infrared remote sensing monitor. The device gives a real-time readout of the level of pollutants in the air. It projects a beam of infrared light out a distance of up to 1000 meters to a specialized mirror. The light beam is reflected back to the FTIR unit and an attached computer measures interference in the path of the beam. Three hundred different gases, including methyl bromide have “signatures” of interference that the FTIR is programmed to recognize.

This method is currently being used by the U.S. EPA to monitor toxic gas emissions from abandoned hazardous waste dumps, but is not used by the California Air Resources Board (ARB) or the Department of Pesticide Regulation to monitor methyl bromide applications. The open-path FTIR method of testing air pollutants is superior to single point sampling using filters or canisters because it allows a wide area to be monitored at once over a long stretch of time. It also gives immediate results versus other methods which require time consuming laboratory analysis. However, the open-path FTIR has a higher detection limit than other lab based methods, meaning it is not as sensitive to very low levels (below 41 ppb for methyl bromide in ideal conditions).

The FTIR methodology has been thoroughly examined and reviewed by the US EPA. A *Guidance Document* on data quality assurance was issued in February 1995 (Russwurm et al. 1995). The *Toxic Organics 16* (TO16) document on operating procedures is expected to be issued shortly by the EPA. These two documents give the FTIR full approval as a verifiable and reliable monitoring device to be used in circumstances where real-time, continuous readout of pollutants is critical.

**Table 1. Results of methyl bromide air testing.**

Location/Date	Crop	Size of Field Fumigated	Total MB applied (pounds)	Testing method	Distance from treated field to monitor	Positive MB Detections: range (ppb)	Comments
<b>Castroville, Monterey County</b> Field Fumigated: June 1, 1996 Air Monitored: June 1-2, 1996	Strawberries	25 acres	5,863	Open Path FTIR* 24-hour continuous monitoring	>1300 feet	148 - 665	Sampling was done more than 1000 feet outside the approved buffer zone for the field fumigated (220 feet)
<b>Ventura, Ventura County</b> Field Fumigated: Aug. 12-15, 1996 Air Monitored: Aug 13-16, 1996	Strawberries	76 acres	15,276	Open Path FTIR* 24-hour continuous monitoring	30 feet	299 - 1,900	27 positive detections including 5 samples above 1000 ppb (1 ppm). The state buffer zone for this series of applications was 30 feet.

\*FTIR: Infrared Fourier Transform Interferometer.  
Source: Environmental Working Group.

## Results

Testing revealed the presence of this extremely toxic pesticide outside state mandated buffer zones in two sample locations (Table 1):

### Castroville

- One set of samples from a residential neighborhood in Castroville detected methyl bromide at peak levels exceeding the 24 hour safety standard, 1,300 feet from the application site, more than 6 times the state recommended “safety” buffer zone. Buffer zones are recommended based on the size of the field and the rate of methyl bromide application and are intended to protect the public from exposure to unsafe levels methyl bromide. The monitor was left in place for two days. Over one twelve hour period, from 9 p.m. June 1, 1996 to 9 a.m. June 2, 1996, 75 analyses were run and 44 were positive for methyl bromide. Detections ranged from 148 to 665 parts per billion (ppb). The California state health standard for short term exposure to methyl bromide is an average of 210 ppb over a 24 hour period.

### Ventura

- Air testing also verified the presence of methyl bromide in a Ventura County suburb where residents were poisoned by methyl bromide applied to a nearby strawberry field in recent weeks. Monitoring was conducted over three days. The closest application of methyl bromide took place on August 14. That night, monitoring between 10:27 p.m. August 14 and 10:02 a.m. August 15, revealed 27 confirmed detections of methyl bromide in 71 total data points collected. Detections ranged from 299 - 1,900 ppb. Five samples were measured at levels above 1000 ppb. The average of these 71 data points, counting unconfirmed detections as zero, was 294 ppb, above the 210 ppb state standard. Residents of the area were poisoned after the fumigation of an adjacent field the week before this monitoring was initiated. The buffer zone for this first methyl bromide application extended into the backyards of houses bordering the field, a practice that is legal, but clearly unsafe for the residents. One home doubled as a day care center for 14 local children. The FTIR monitor path during the second series of fumigation days, was set up along a dead end street between the field and the day care center/ home that was impacted by the first methyl bromide fumigation. The dead end street also has a basketball court popular with neighborhood kids.

## Californians Are Inadequately Protected from Pesticides In Air

The California Air Resources Board (ARB) is responsible for the regulation and monitoring of all toxic air pollutants in California *except* pesticides. Pesticides are the only toxic air contaminants not regulated by the ARB, and instead are regulated by the Department of Pesticide Regulation (DPR).

Under this unique, special interest regulatory accommodation, health standards and so-called “mitigation measures” are developed by the DPR. These measures include buffer zones, warnings and other efforts designed to protect the public from poisoning and the long term health consequences of pesticide exposure.

Monitoring to determine the adequacy of DPR’s mitigation measures may be performed by the ARB, but only at the request of the Director of the DPR. County agricultural commissioners, who implement mitigation measures and monitor pesticide use, generally do not have the equipment necessary to monitor methyl bromide or other pesticides in the air after application.

Several problems have been identified with DPR air regulations and buffer zones, particularly with regard to the highly volatile pesticide and soil fumigant, methyl bromide:

- The DPR used an obsolete air dispersion model to develop buffer zones and other mitigation measures for methyl bromide. Notably, the ARB and U.S. EPA regulate and monitor *non-agricultural uses of methyl bromide* using more accurate, sophisticated models that typically provide far larger buffer zones. The adequacy and accuracy of the DPR buffer zone calculations have been publicly challenged by many experts, including the scientists who developed the methyl bromide air dispersion models now used by the California ARB and the U.S. EPA (Wagner 1996).
- Second, the DPR has initiated no ongoing, systematic monitoring of the ambient air near agricultural fields for methyl bromide or any other pesticide, in spite of peer reviewed published data from the ARB showing that many different pesticides drift off-site into the surrounding community after routine, legal applications. Samples taken in 13 counties by the ARB from 1986 through 1995 detected a total of 20 different pesticides in the air of residential areas across the state. Typically schools and firehouses were used as sampling locations. In urban areas away from agricultural zones, 10 different pesticides were detected at measurable levels (Baker et al 1996).

Methyl bromide was slated to be banned in March 1996 due to missing animal testing data required under the California Birth Defects Prevention Act. At the request of methyl bromide users and producers, California Governor Pete Wilson called a Special Session of the State Legislature for the purpose of extending the March ban. After heated debate, the legislature passed a bill extending the use of methyl bromide until the end of 1997. The legislature defeated amendments that would have required larger buffer zones around methyl bromide applications and notification of residents near fields.

### **Methyl Bromide is Extraordinarily Toxic**

Eighteen people have died from methyl bromide exposure during structural fumigations in California since 1985. Four hundred and fifty-four more have been sickened or poisoned and evacuated from schools and homes due to methyl bromide exposure during that same time period (Pease 1995, Brodberg et al. 1992).

Methyl bromide is classified by the EPA as a *Category I acute toxin*, the most potent class of toxic chemicals. It is a colorless, odorless, and deadly gas, and because it is applied as a gas, it naturally drifts off site into the surrounding community. The acute effects of methyl bromide exposure include headaches, drowsiness, lethargy, nausea, vomiting, dizziness, blurred vision, twitching and convulsions, seizures, psychosis and death. More disturbing, these effects may persist long after a single poisoning incident (CEPA 1994). The *known* effects of repeated sublethal exposure include damage to the brain, the peripheral nervous system, the respiratory system, kidneys, liver, eyes, nose, throat, lungs and skin. Methyl bromide is also a “direct acting mutagen” that is toxic to DNA (CEPA 1994). And methyl bromide causes “treatment related,” “biologically significant,” developmental (birth) defects including absence of gall bladders, fused sternbrae (spine), and decreased fetal weight (CEPA 1994).

Methyl bromide is listed under Proposition 65 for *structural* applications but not for *agricultural* applications in an unusual twist of regulatory logic. Structural applicators of methyl bromide are required to give “reproductive toxin” warnings to neighboring dwellings, agricultural applicators are not. A 1993 DPR study proposed that warning zones of up to 3 miles be imposed for agricultural methyl bromide applications at rates typical today around the state (250-300 pounds per acre). This same DPR study listed a Prop 65 “safe harbor”

average dose of 21 ppb for a 24 hours. (DPR 1993) Later these proposed warning requirements were dropped for agricultural applications due to opposition from agricultural and pesticide industries.

Methyl bromide is also a powerful destroyer of the Earth's protective stratospheric ozone layer. An international assessment of methyl bromide by hundreds of the world's leading atmospheric scientists rated methyl bromide 50 times more damaging than chlorofluorocarbons (CFCs) to the stratospheric ozone layer, on an atom per atom basis (UNEP 1994, EPA 1995). Scientists believe that industrial releases of the gas are responsible for a measurable portion of present and predictable future ozone depletion as the ozone layer continues its steady decline (WMO 1994). Reducing methyl bromide emission has been identified as the most effective next step to healing the depleted ozone layer. Increased UV radiation exposure increases the incidence of fatal skin cancer and causes hundreds of thousands of cases of cataract induced blindness and non-melanoma skin cancer each year, as well as immune suppression and disruption of global ecosystems (World Health Organization, UNEP 1992, Kripke 1995).

Current federal law mandates the elimination of methyl bromide production and sale in 2001 under the Clean Air Act. Industry is pushing for that date to be rolled back to the year 2010. The California DPR has taken no action to reduce methyl bromide use in preparation for the 2001 deadline.

The United States is the largest consumer of methyl bromide by far, using 40% of global production annually, or at least 60 million pounds per year. California and Florida are the largest user states (NAPIAP 1993, EPA 1994, UNEP 1994).

## Recommendations

The findings presented here represent the first results of an ongoing air monitoring initiative coordinated in California by the Environmental Working Group and a network of local activists and organizations in California. Although the sample is small, the data show that methyl bromide drifts off site into nearby residential neighborhoods following legal applications of the compound. These findings raise serious questions about the adequacy of the current mitigation measures employed by the DPR.

- The California Air Resources Board should immediately initiate statewide monitoring of methyl bromide and other pesticides for off site drift. The monitoring program should employ state-of-the-art equipment like the Open Path FTIR, and the results should be made immediately available to the public.
- The DPR and other state and federal agencies should work aggressively to provide farmers with safe alternatives to methyl bromide, and;
- The use of methyl bromide as an agricultural fumigant should be phased-out immediately and in no event later than the 2001 deadline currently in place under the federal Clean Air Act.

## References

Brodberg, Robert K., Harvard Fong, Tareq Formoli, David Haskell, Dana Meinders, Tian Thongsinthusak. 1992. Draft Report: Estimation of Exposure of Persons in California to Pesticide Products Containing Methyl Bromide. California Environmental Protection Agency. Department of Pesticide Regulation. Worker Health and Safety Branch. June 1992.



Baker, Lynton W., Donald Fitzell, James Seiber, Thomas Parker, Takayuki Shibamoto, Micheal Poore, Karl Longley, Ruth Tomlin, Ralph Propper, David Duncan. 1996. Ambient Air Concentrations of Pesticides in California. *Environmental Science & Technology*. 30 (4): 1365-68.

California Environmental Protection Agency, Department of Pesticide Regulation. 1993. Information Sheet Discussing Size of Warning Zone. Proposition 65 - Safe Drinking Water and Toxic Enforcement Act. Safe Use Determination for Methyl Bromide. November 30, 1993. California Environmental Protection Agency, Department of Pesticide Regulation. 1994. Methyl Bromide. Prepared for the Developmental and Reproductive Toxicant Identification Committee for consideration of methyl bromide as a developmental toxicant under Proposition 65. March 1994.

Department of Pesticide Regulation. 1993. California Environmental Protection Agency. Information Sheet Discussing Size of Warning Zone, Proposition 65 - Safe Drinking Water and Toxic Enforcement Act, Safe Use Determination for Methyl Bromide. November 30, 1993.

Environmental Working Group. 1996. Heavy Methyl Bromide Use Near California Schools. Policy memorandum. February 8, 1996.

Kripke, Margaret L. 1995. Human Health Effects of Ultraviolet-B Radiation. Testimony before the U.S. House of Representatives Committee on Science, Subcommittee on Energy and Environment. Hearing on Accelerated Phase out of Stratospheric Ozone Depleting Substances. September 20, 1995.

Pease, William S., James Leibman, Dan Landy, David Albright. 1996. Pesticide Use in California: Strategies for Reducing Environmental Health Impacts. California Policy Seminar report. School of Public Health. University of California, Berkeley.

Pease, William. 1995. Testimony before the California Senate Health and Human Services Committee on Senate Bills addressing methyl bromide. January 24, 1995.

Russwurm, George M., Jeffrey W. Childers. 1995. FT-IR Open-Path Monitoring Guidance Document. Submitted to William A McClenney, Project Officer, Ambient Methods Research Branch, Atmospheric Research and Exposure Assessment Laboratory, Environmental Protection Agency, Research Triangle Park, NC. February 1995.

United Nations Environment Programme. 1992. Methyl Bromide: Its Atmospheric Science, Technology and Economics. Synthesis Report of the Methyl Bromide Interim Scientific Assessment and Methyl Bromide Interim Technology and Economic Assessment. June 1992.

United Nations Environment Programme. 1994. 1994 Report of the Methyl Bromide Technical Options Committee: 1995 Assessment. Montreal Protocol on Substances that Deplete the Ozone Layer.

United Nations Environment Programme. 1994. Environmental Effects of Ozone Depletion: 1994 Assessment. EPA 430/K-94/030. November 1994.

US Department of Agriculture. 1995. Agricultural Chemical Usage: Vegetables, 1994 Summary. National Agricultural Statistics Service. July 1995.

United States Department of Agriculture. National Agricultural Pesticide Impact Assessment Program (NAPIAP). 1993 Biologic and Economic Assessment of Methyl Bromide. Washington, D.C. April 1993.

United States Environmental Protection Agency 1994. Methyl Bromide Consumption Estimates. Prepared for the Stratospheric Protection Division, Office of Air and Radiation. May 3, 1994.

United States Environmental Protection Agency 1995. Methyl Bromide Home Page.

Wagner, Mike 1996. Study Warns of Pesticide Risk to O.C. Schools. Los Angeles Times (Orange County edition) February 8, 1996.

World Meteorological Organization. 1994. Scientific Assessment of Ozone Depletion: 1994. Executive Summary. Report by National Oceanic And Atmospheric Administration, National Aeronautics and Space Administration, United Nations Environment Programme, World Meteorological Organization.

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