State of California
AIR RESOURCES BOARD

Response to Significant Environmental Issues

Item: Public Hearing to Consider the Adoption of a Regulatory Amendment Identifying Vinyl Chloride as a Toxic Air Contaminant

Agenda Item No.: 90-19-1

Public Hearing Date: December 13, 1991

Issuing Authority: Air Resources Board

Comment: No comments were received identifying any significant environmental issues pertaining to this item. The staff report identified no adverse environmental effects.

Response: N/A

Certified: Judith M. Lounsbury
Judith M. Lounsbury
Board Secretary

Date: 3/18/91

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State of California
AIR RESOURCES BOARD

Resolution 90-74

December 13, 1990

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WHEREAS, sections 39600 and 39601 of the Health and Safety Code authorize the Air Resources Board (the "Board") to do such acts and to adopt such regulations as may be necessary for the proper execution of the powers and duties granted to, and imposed upon, the Board by law;

WHEREAS, Chapter 3.5 (commencing with section 39650) of Part 2 of Division 26 of the Health and Safety Code establishes procedures for the identification of toxic air contaminants by the Board;

WHEREAS, section 39655 of the Health and Safety Code defines "toxic air contaminant" as an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health;

WHEREAS, section 39662 of the Health and Safety Code directs the Board to list, by regulation, substances determined to be toxic air contaminants, and to specify for each substance listed a threshold exposure level, if any, below which no significant adverse health effects are anticipated;

WHEREAS, in California, vinyl chloride is emitted from sources such as landfills, publicly-owned treatment works, and polyvinyl chloride production and fabrication facilities; and vinyl chloride is not naturally removed or detoxified in the atmosphere at a rate that would significantly reduce the resulting public exposure;

WHEREAS, pursuant to the request of the Board, the Department of Health Services (DHS) evaluated the health effects of vinyl chloride in accordance with section 39660 of the Health and Safety Code;

WHEREAS, the DHS concluded in its evaluation that vinyl chloride is causally associated with cancer in humans; that health effects other than cancer are not expected to occur at existing or expected ambient levels of vinyl chloride; that, based on the upper 95% confidence limit of potency, the estimated range of lifetime (70-year) excess cancer risk from continuous exposure to 1 ppbv of atmospheric vinyl chloride is from 2.5×10^{-5} to 20×10^{-5}; that the DHS best estimate for the unit risk for vinyl chloride is 20×10^{-5} ppb^{-1};

WHEREAS, for the reasons set forth in its evaluation, the DHS treats vinyl chloride-induced carcinogenesis as a nonthreshold phenomenon because the DHS found no evidence that there is a carcinogenic threshold level for vinyl chloride;

WHEREAS, upon receipt of the DHS evaluation, the staff of the Board prepared a report, including and in consideration of the DHS evaluation and recommendations, in the form required by section 39661 of the Health and Safety Code and, in accordance with the provisions of that section, made the report available to the public and submitted it for review to the Scientific Review Panel (SRP) established pursuant to section 39670 of the Health and Safety Code;

WHEREAS, in accordance with section 39661 of the Health and Safety Code, the SRP reviewed the staff report, including the scientific procedures and methods used to support the data in the report, the data itself, and the conclusions and assessments on which the report was based, considered the public comments received regarding the report, and on October 19, 1990 adopted, for submittal to the board, findings which included the following:

1. There is strong evidence that exposure to vinyl chloride results in animal and human carcinogenicity. The United States Environmental Protection Agency (USEPA) assigned vinyl chloride to Group A of its classification scheme for carcinogens. In explaining its Group A category, the EPA states, "This group is used only when there is sufficient evidence from epidemiologic studies to support a causal association between exposure to the agents and cancer." The International Agency for Research on Cancer (IARC) assigned vinyl chloride to Group 1 of its classification scheme for carcinogens. In introducing its list of Group 1 carcinogens which included vinyl chloride, the IARC states, "The Working Group concluded that the following agents are carcinogenic to humans." Based on available scientific data, the Panel agrees with the EPA's and the IARC's classification of vinyl chloride as a human carcinogen.

2. Based on available scientific information, the DHS staff found no evidence of a vinyl chloride exposure level below which no carcinogenic effects are anticipated.

3. Based on the interpretation of available scientific evidence, the DHS staff estimated that the upper 95 percent confidence limits on the lifetime risk of cancer from vinyl chloride ranged from 2.5×10^{-5} ppb^{-1} to $20 \times 10^{-5} ppb^{-1}$. The DHS staff identified the best estimate of vinyl chloride cancer unit risk as the top of the upper confidence limits range, $20 \times 10^{-5} ppb^{-1}$ or $7.8 \times 10^{-5} (ug/m^3)^{-1}$. Table 1 compares the best estimate of vinyl chloride cancer unit risk with those of other compounds recently reviewed by the SRP.

TABLE 1

Compound	Unit Risk (ppb^{-1})	Unit Risk $(ug/m^3)^{-1}$
Vinyl chloride	20×10^{-5}	7.8×10^{-5}
Chloroform	2.6×10^{-5}	5.3×10^{-6}
Trichloroethylene	1.1×10^{-5}	2×10^{-6}
Inorganic arsenic	particulate	3.3×10^{-3}
Methylene chloride	3.5×10^{-6}	1×10^{-6}

Upper bound excess lifetime risks are health-protective estimates; the actual risk may well be below these values.

4. Landfills, publicly-owned treatment works, and polyvinyl chloride producers and fabricators are the major identified sources of vinyl chloride emissions in California's outdoor air.

5. Based on its gas-phase reactivity with hydroxyl radicals, vinyl chloride's estimated tropospheric lifetime ranges from 1.6 to 3.9 days.

6. Vinyl chloride has not been detected by the ARB's statewide ambient toxic air contaminant monitoring network. However, vinyl chloride has been detected in the ambient air near emission sources such as landfills.

7. The limited monitoring conducted in the Landfill Gas Testing Program which began in 1987 was designed to identify landfill sites that pose a potential risk to public health. Preliminary findings show that vinyl chloride concentrations ranging from the detection limit of 106 ppbv to 72,000 ppbv were detected in the internal gas of 160 (47 percent) out of the 340 landfills at which internal gas testing was performed. 24-hour averaged ambient vinyl chloride concentrations ranging from the detection limit of 2 ppbv to 15 ppbv were detected at 24 (10 percent) out of the 251 landfills at which ambient monitoring was performed.

   The limited testing conducted was designed to be used for screening purposes. For that reason, vinyl chloride may be present in the ambient air at additional landfills, but was not detected in the one to three days of ambient testing specified in the testing guidelines for the Program. Further interpretation of the data from specific landfill sites must also consider factors such as how the testing was carried out, along with location, size, and proximity to sensitive receptors.

8. Ambient vinyl chloride data from perimeter monitoring by the South Coast Air Quality Management District (SCAQMD) at two landfills in 1986 and 1987 were used in a model to estimate population-weighted exposures near the sites. These exposure estimates were based on ambient outdoor data and do not include any possible elevated indoor exposures that may occur inside homes near the landfills. The cancer risk from vinyl chloride exposure to people residing in the vicinity of the landfills may be determined using the DHS's best estimate of vinyl chloride

cancer unit risk of 20 x 10^{-5}ppb^{-1}(see Finding 3 above) and the modeled population-weighted exposure estimates.

a. Population-weighted exposure for maximally exposed individuals living immediately adjacent to the landfills (at the fenceline) was estimated to range from an annual average of approximately 0.6 to 9 ppbv vinyl chloride at OII Landfill and from approximately 2 to 10 ppbv at BKK Landfill.

b. Modeled estimates of exposure (not population-weighted) for 0 to 6,000 people living close to OII and for 0 to 2,500 people living close to BKK are included to provide an idea of the predicted exposure levels and risk directly downwind from the landfills. According to the model, 0 to 6,000 people near OII may have been exposed to annual average vinyl chloride concentrations of at least 3 ppbv and 0 to 2,500 people near BKK may have been exposed to annual average concentrations of at least 7 ppbv. Using the DHS's best estimate of cancer unit risk, 0 to 4 or more cancers were estimated to occur among the 6,000 people living closest to OII; and 0 to 4 or more cancers were estimated to occur among the 2,500 people living closest to BKK.

c. Population-weighted exposure results were calculated for the people living within a 41 square-kilometer area (or, approximately 25 square-mile area) of each landfill. For OII Landfill, approximately 4 million people may have been exposed to average annual concentrations ranging from 0.004 to 0.06 ppbv. For BKK Landfill, approximately 2 million people may have been exposed to annual average concentrations ranging from 0.08 to 0.34 ppbv. Using the DHS's best estimate of cancer unit risk, 4 to 48 cancers were estimated for the 4 million people living within approximately 25 square miles of OII; and 32 to 136 cancers were estimated for the 2 million people living within approximately 25 square miles of BKK.

9. The limited data available indicate that the vast majority of homes have very low, often undetectable, indoor vinyl chloride concentrations. However, grab samples collected by the South Coast Air Quality Management District (SCAQMD) in 1985 showed concentrations ranging from 8 to 100 ppbv inside a few homes near OII Landfill mentioned in Finding 8. Current indoor concentrations in the homes studied by the SCAQMD in 1985 are expected to be lower because of the subsequent installation of a landfill gas collection and flare system. In order to test this idea, additional indoor air monitoring at homes adjacent to the landfill is being considered.

   Since vinyl chloride is not typically detected in indoor air, exposure through this route is not expected to significantly contribute to overall risk, except in the vicinity of certain landfills.

10. Non-carcinogenic health effects are not known to occur at: 1) the highest recorded 24-hour average outdoor concentration in California

(15 ppbv) (see Finding 7), 2) the estimated outdoor average annual vinyl chloride concentrations (see Findings 6 and 8), or 3) the highest recorded vinyl chloride concentration from the air inside a California home (100 ppbv) (see Finding 9).

11. Prior to 1975, vinyl chloride monomer levels as high as 20 ppmw were found in food packaged in vinyl chloride polymer containers or materials. In 1986, the Food and Drug Administration (FDA) proposed to limit the maximum amount of residual vinyl chloride monomer in rigid and semi-rigid food containers to 10 ppbw and the maximum amount of vinyl chloride monomer allowed in polymeric coatings and films which contact food to 5 ppbw. According to an FDA official, the regulation was not promulgated because it was believed that monomer stripping processes leave no residue of vinyl chloride monomer. There is no further information available on the levels of vinyl chloride in food containers and packaging. The exposure estimates in Finding 8 do not account for potential exposure from polymeric food packaging.

    In California, surface water and ground water from public water systems are generally free of vinyl chloride. Since it is not typically detected in drinking water, exposure through this route is not expected to significantly contribute to the cancer burden attributed to vinyl chloride.

12. Because vinyl chloride was identified as a hazardous air pollutant under Section 112 of the United States Clean Air Act, identification of vinyl chloride as a toxic air contaminant is required by California Health and Safety Code Section 39655.

13. Based on all available scientific evidence, including consistent animal and human studies and the small range of dose extrapolation (from the animal studies), we conclude that the data are overwhelming that vinyl chloride is a toxic air contaminant.

WHEREAS, the SRP found the staff report to be without serious deficiency, and the SRP agreed with the staff recommendation that vinyl chloride should be listed by the Air Resources Board as a toxic air contaminant, and found that, based on available scientific information, the vinyl chloride exposure level below which carcinogenic effects are not expected to occur cannot be identified;

WHEREAS, the California Environmental Quality Act and Board regulations require that no project having significant adverse environmental impacts be adopted as originally proposed if feasible alternatives or mitigation measures are available;

WHEREAS, a public hearing and other administrative proceedings have been held in accordance with provisions of Chapter 3.5 (commencing with section 11340), Part 1, Division 3, Title 2 of Government Code;

WHEREAS, in consideration of the staff report, including the DHS' evaluation and recommendations, the available evidence, the findings of the SRP, and the written comments and public testimony it has received, the Board finds that:

There is strong evidence that vinyl chloride is a human carcinogen;

Health effects other than cancer are not anticipated at existing or expected vinyl chloride exposure levels in ambient outdoor air;

The DHS and the SRP agree that the most plausible estimate of the upper bound of the overall vinyl chloride cancer unit risk is 20×10^{-5} ppb^{-1};

There is not sufficient available scientific evidence to support the identification of a threshold exposure level for vinyl chloride;

Vinyl chloride is an air pollutant which, because of its carcinogenicity, may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health; and

WHEREAS, the Board has determined, pursuant to the requirements of the California Environmental Quality Act and Board regulations, that this regulatory action will have no significant adverse impact on the environment.

NOW, THEREFORE BE IT RESOLVED, that the Board adopts the proposed regulatory amendment to section 93000, Titles 17 and 26, California Code of Regulations, as set forth in Attachment A.

I hereby certify that the above is a true and correct copy of Resolution 90-74, as adopted by the Air Resources Board.

Pat Hutchens for

Judith M. Lounsbury, Board Secretary