State of California
AIR RESOURCES BOARD

Resolution 92-8

March 12, 1992

Agenda Item No.: 92-3-1

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 a "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, the major identified sources of outdoor ambient formaldehyde are direct emissions from mobile sources and oil refineries and secondary formation by photochemical reactions;

WHEREAS, formaldehyde is not naturally removed or detoxified in the atmosphere at a rate that would significantly reduce public exposure;

WHEREAS, section 39660.5 of the Health and Safety Code requires the state Board to assess the level of potential human exposure to formaldehyde in indoor environments in consultation with the Office of Environmental Health Hazard Assessment (OEHHA) and to refer data on indoor exposures to specified state agencies;

WHEREAS, pursuant to the request of the Board, the OEHHA evaluated the health effects of formaldehyde in accordance with section 39660 of the Health and Safety Code;

WHEREAS, the OEHHA concluded in its evaluation that formaldehyde is a probable human carcinogen; that noncancer health effects are not expected to occur at existing statewide outdoor ambient levels of formaldehyde; that, based on the upper 95 percent confidence limit of potency, the estimated range of lifetime (70-year) excess cancer risk from continuous exposure to 1 ppbv of atmospheric formaldehyde is from 0.3 to 40 x 10^{-6}; and that the OEHHA best value for the upper 95 percent confidence limit of cancer unit risk for formaldehyde is 7 x 10^{-6} $ppbv^{-1}$;

WHEREAS, based on OEHHA's best value cancer unit risk factor of 7×10^{-6} per ppbv and the corresponding concentrations for indoor and outdoor environments, the number of potential excess cancer cases due to indoor and outdoor exposure to formaldehyde is estimated to be 230 and 5 per million, respectively, for a 70-year lifetime which corresponds to a potential excess cancer burden of 7,000 and 150 for indoor and outdoor exposures, respectively, for a California population of 30 million;

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

WHEREAS, upon receipt of the OEHHA evaluation, the staff of the Board prepared a report including, and in consideration of, the OEHHA evaluation and recommendations and 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 December 5, 1991, adopted, for submittal to the Board, findings which include the following quoted material:

1. There is evidence that exposure to formaldehyde results in animal carcinogenicity and probable human carcinogenicity. Both the International Agency for Research on Cancer (IARC) and the United States Environmental Protection Agency (EPA) have classified formaldehyde as a probable human carcinogen, on the basis of sufficient evidence for carcinogenicity in animals and limited evidence in humans.

2. Because formaldehyde is listed as a hazardous air pollutant under Section 112 of the United States Clean Air Act of 1990, identification of formaldehyde as a toxic air contaminant is required by the California Health and Safety Code section 39655.

3. Based on available scientific information, a level of formaldehyde exposure below which no carcinogenic effects are anticipated cannot be identified.

4. Based on a health protective interpretation of available scientific evidence, the upper 95 percent confidence limits on the lifetime risk of cancer from formaldehyde range at ambient concentrations from 0.3 to $40 \times 10^{-6}\text{ppbv}^{-1}$ [0.25 to $33 \times 10^{-6}(\text{ug/m}^3)^{-1}$]. Furthermore, $7 \times 10^{-6}\text{ppbv}^{-1}$ [$6 \times 10^{-6}(\text{ug/m}^3)^{-1}$] is the best value of the upper confidence limit of risk. Appendix I compares the best value of upper-bound formaldehyde cancer unit risk with those of other compounds reviewed by the SRP (the dates these compounds' identification reports were approved by the SRP are included in Appendix I). These 95 percent

upper confidence limits for excess lifetime risks are health-protective estimates; the actual risk may be significantly lower.

5. The major identified sources of outdoor ambient formaldehyde are direct emissions from mobile sources and oil refineries and secondary formation by photochemical reactions.

6. Based on data collected by the ARB's ambient toxic air contaminant monitoring network, the estimated mean annual population-weighted outdoor ambient exposure for approximately 20 million Californians is 4.4 ppbv.

7. Based on the ARB emission inventory, areas that are expected to have formaldehyde levels higher than the mean statewide concentration are near commercial production sources, reconstituted wood processing plants, oil refineries, and in urban areas [with] congested freeways. However, the emission inventory is incomplete and a number of potential hot spots have not yet been adequately evaluated.

8. Based on its gas-phase reactivity from photolysis and oxidation by the hydroxyl radical, formaldehyde's estimated tropospheric lifetime is approximately 0.3 days.

9. Results from indoor monitoring in California's conventional and mobile homes, offices, and public buildings indicate that people are exposed frequently to much higher indoor concentrations than outdoor formaldehyde concentrations due to the abundance of building materials and other domestic products in buildings that emit formaldehyde. The results of recent surveys indicate that formaldehyde concentrations inside California residences generally range from less than 10 ppbv to 500 ppbv. Mean concentrations can range from 24 ppbv in office and public buildings to 72 ppbv for mobile homes, with a mean concentration of 50 ppbv found in conventional homes.

10. A number of adverse health effects have been associated with formaldehyde exposure. Acute effects include irritation of the skin, eyes and mucous membranes, as well as causing [sic.] nausea and headaches. Skin contact with formaldehyde can induce long-term allergic dermal sensitization, and limited evidence suggests that inhalation of high concentrations of formaldehyde can cause respiratory tract sensitization. Adverse health effects other than cancer are not expected to occur at mean statewide outdoor ambient concentrations. However, there is sufficient evidence that adverse acute health effects may result from exposure to levels found in indoor environments for those sensitive to formaldehyde.

11. Based on the OEHHA staff's best value for cancer unit risk of $7 \times 10^{-6} ppbv^{-1}$ and the ARB staff's population-weighted outdoor ambient exposure of 4.4 ppbv, up to 31 potential excess cancers per million are predicted if exposed to this level over a 70-year lifetime. In addition, the staff of ARB and OEHHA have developed cancer risk based on relative exposure to indoor and outdoor concentrations. Using the OEHHA staff's best value for cancer unit risk of $7 \times 10^{-6} ppbv^{-1}$ and the corresponding concentrations found in indoor and outdoor environments, the number of excess cancer cases due to indoor and outdoor exposure to

formaldehyde is estimated to be 230 and 5 per million, respectively, for a 70-year lifetime. This corresponds to an excess cancer burden of 7,000 and 150 for indoor and outdoor exposures, respectively, for a California population of 30 million.

12. Based on available scientific evidence indicating that formaldehyde is an animal and a probable human carcinogen, we conclude that formaldehyde should be identified as a toxic air contaminant.

WHEREAS, Appendix I of the SRP findings which compares the best value of upper-bound formaldehyde cancer unit risk with those of other compounds is incorporated in the reference herein;

WHEREAS, the SRP found the staff report to be without serious deficiency, and the SRP agreed with the staff recommendation that formaldehyde should be listed by the Air Resources Board as a toxic air contaminant, and found that, based on available scientific information, the formaldehyde 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 the provisions of Chapter 3.5 (commencing with section 11340), Part 1, Division 3, Title 2 of the Government Code;

WHEREAS, in consideration of the staff report, including the OEHHA's 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:

1. There is evidence that formaldehyde is a probable human carcinogen;

2. Adverse health effects other than cancer are not expected to occur at statewide outdoor average ambient concentrations;

3. Formaldehyde has been measured in significant concentrations in indoor environments;

4. The OEHHA and the SRP agree, and the Board concurs, that the best value of the upper bound of the overall formaldehyde cancer unit risk is 7×10^{-6} ppbv^{-1};

5. Formaldehyde 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;

6. There is not sufficient available scientific evidence to support the identification of a threshold exposure level for formaldehyde;

7. This regulatory action will not automatically lead to new costs for California small businesses; and

8. Given the scientific basis of the Board's action, no alternative to identifying formaldehyde as a TAC would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective and less burdensome to affected private persons than the proposed regulation.

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 hereby identifies formaldehyde as a toxic air contaminant and adopts the proposed regulatory amendment to section 93000, Titles 17 and 26, California Code of Regulations, as set forth in Attachment A.

BE IT FURTHER RESOLVED, that the Board directs the Executive Officer to clarify the staff report to reflect staff's recommendations regarding the contribution to potential risk of indoor and outdoor concentrations of formaldehyde, and other clarifications recommended by the staff.

BE IT FURTHER RESOLVED, that the Board directs the Executive Officer to forward all available data on indoor exposure to formaldehyde to the Department of Health Services, Division of Occupational Safety and Health of the Department of Industrial Relations, the State Energy Resources Conservation and Development Commission, the Department of Housing and Community Development, and the Department of Consumer Affairs.

BE IT FURTHER RESOLVED, that a summary of the state's risk assessment/risk management process for toxic air contaminants pursuant to AB 1807 be included into the Executive Summary portion of the ARB staff report.

I hereby certify that the above is a true and correct copy of Resolution 92-8, as adopted by the Air Resources Board.

Pat Hutchens

Pat Hutchens, Board Secretary

STATE OF CALIFORNIA
AIR RESOURCES BOARD
2020 L STREET
P.O. BOX 2815
SACRAMENTO, CA 95812

PETE WILSON, Governor

State of California
AIR RESOURCES BOARD

Response to Significant Environmental Issues

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

Agenda Item No.: 92-3-1

Public Hearing Date: March 12, 1992

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: Pat Hutchens
Pat Hutchens
Board Secretary

Date: 11/23/92