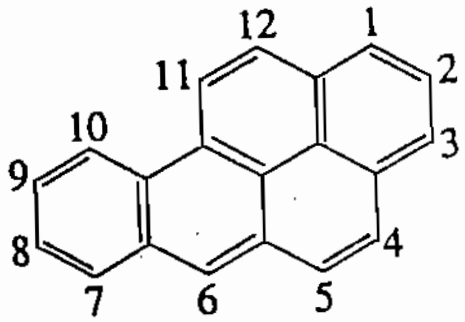
California Environmental Protection Agency

Air Resources Board

Benzo[a]pyrene

as a Toxic Air Contaminant



Part C
Public Comments and ARB/OEHHA Staff Responses

July 1994

PART C

PUBLIC COMMENTS AND ARB/OEHHA STAFF RESPONSES ON THE PRELIMINARY DRAFT OF THE BENZO[A]PYRENE IDENTIFICATION REPORT

Prepared by the staffs of the Air Resources Board
and the Office of Environmental Health Hazard Assessment

December 1993

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PART C

I.

Comment Letters Received on the August 1993 Preliminary Draft of the Benzo[a]pyrene Report

NORTHERN SONOMA COUNTY
AIR POLLUTION CONTROL DISTRICT

109 North Street Healdsburg CA 95448
Telephone (707) 433-5911

August 13, 1993

Genevieve Shiroma, Chief
Toxic Air Contaminat Identification Branch
Stationary Source Division
Air Resources Board
PO Box 2815
Sacramento, CA 95812

Subject: Benzo[a]pyrene Exposure Assessment

Dear Mrs. Shiroma:

One major point is not adequately discussed in the text on exposure: agricultural vs wood stove source exposure contributions.

Table III-1 shows that "Agricultural & Other Waste Burning" would emit a lot of benzo[a]pyrene. I don't doubt this, but no text relates the source's emission to the public exposure. I believe an uninformed person would infer this source is responsible for most public exposure.

I believe that residential wood smoke, pound for pound of emissions, exposes more people and at higher concentrations than agricultural related burns, at least in areas of the state which use significant numbers of wood heaters. Residential wood smoke is released at low stack height, in non-agricultural areas and during times of poor dispersion (winter time cold snaps). On the other hand, agricultural burns emit during times of better dispersion and in open agricultural areas. Plume rise should be good, thus also reducing exposure.

This district did an extensive study (using the EPA's Chemical Mass Balance technique) on high winter-time PM-10 concentrations in urban areas and found 40-60% of the PM-10 was due to residential wood smoke. Most ambient air quality exceeds were during no-burn days in the winter. Agricultural wood smoke was not significant in this District.

Therefore, I disagree with the "could" verb used on page A-39, 2cd paragraph, 1st sentence: "The winter months are a period of intensive woodburning for residential heating in the mountain and valley communities of California, and <u>could</u> be a source of BaP emissions." Furthermore, I disagree with the general statement on page 6 (2cd paragraph) of the executive summary since it does not adequately distinguish benzo[a]pyrene exposure potential between woodsmoke and agricultural smoke.

If you have any questions regarding this matter please call me at (707) 433-5911.

Sincerely,

Michael W. Tolmasoff
Air Pollution Control Officer

MT/mt
s:\correspn\mt\arbenzp.ltr

WSPA
Western States Petroleum Association

September 29, 1993

Genevieve Shiroma, Chief
Toxic Air Contaminant Identification Branch
Stationary Source Division
Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

Subject: Comments on draft ARB Report: Benzo(a)pyrene as a Toxic Air Contaminant.

Dear Ms. Shiroma:

The Western States Petroleum Association (WSPA) appreciates the opportunity to provide comments on ARB's draft document, "Benzo(a)pyrene as a Toxic Air Contaminant". While WSPA appreciates ARB's effort to establish specific Potency Equivalence Factors (PEF's) for Polycyclic Aromatic Hydrocarbons (PAH's) based on available data, we have concerns with the approach proposed in this document. Our comments address the following issues:

- WSPA supports ARB's effort to determine individual potencies for PAH's; recommend that ARB increase the "visibility" of the PEF's in this document - 30 PAH potencies are addressed, not just B(a)P.
- Recommend that ARB and OEHHA not use genotoxicity or structure-activity data for PEF's; staff should consider tumor data as minimum criteria.
- Recommend that ARB broaden the discussion of uncertainty of the PEF's. The same test methods were not used for PAH/B(a)P analysis.
- Recommend inclusion of the Maximum Likelihood Estimate (MLE) for each Toxic Air Contaminant (TAC).
- Recommend that ARB continue to hold public hearings on adoption of Hazardous Air Pollutants (HAP's)/TAC's.

Acknowledge inclusion of 30 PAH's in addition to B(a)P

WSPA supports ARB's proposal to assign potencies (or relative potencies) to many individual PAH's. We believe this approach will lead to a more accurate assessment of cancer risk, rather than assuming that all PAH's are equally potent to B(a)P. However, the B(a)P document does not effectively communicate the broad scope of this ARB action. In addition to B(a)P, the document proposes ARB adoption of the cancer potency estimates for four PAH's developed through the Proposition 65 expedited risk assessment method

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process, and adoption of PEF's for 26 other PAH's. WSPA recommends that the Executive Summary begin with a discussion of the overall impact of this ARB action. Perhaps even the title of the document should be expanded to include B(a)P "and other Polycyclic Aromatic Hydrocarbons".

Do not use genotoxicity or structure-activity data sources for PEF's

A prioritized list of data sources (Part B, Table 7.12) was used to establish the process by which the cancer potency was determined. The two methods with the lowest priority are genotoxicity and structure-activity relationships. WSPA requests that ARB not use genotoxicity or structure-activity as methods of establishing PEF's. We believe that actual tumor incidence data should be the minimum criteria. This change would not significantly impact the document as only one PEF was established using those methods. WSPA is concerned that a precedent is being set without full consideration of possible future regulatory impact.

Expand discussion of PEF uncertainty

The development of the PEF's uses data from a variety of experimental methods. PAH's were, at times, administered by inhalation, by skin application, by implanting wax pellets containing the PAH into the respiratory tract, and by intraperitoneal injection. The site(s) of tumor formation varied depending on route of administration. At least three different test species were used. WSPA requests that ARB expand the discussion of uncertainty inherent in combining these data into a single list of cancer potencies relative to B(a)P. ARB should also explore ways to expand the discussion of the PEF determinations in Appendix A. WSPA does not wish to delay the adoption of the PEF's, but recognizes that even the expedited risk assessments done under Proposition 65 provided more background information.

Include "Most Likely Estimate"

One of the objectives of risk characterization is to convey the uncertainty associated with any estimate of risk. The output of the model used by OEHHA to estimate cancer risk is a distribution of possible values. WSPA believes that the process of characterizing TAC's, like B(a)P, could be improved by providing more than a single "best estimate" of an upper-bound value. One simple method of providing this perspective of uncertainty is to include the MLE in all references to cancer potency. This statistic, along with an upper confidence limit, would give the reader a sense of the range of model uncertainty. It would also aid in assuring the separation of risk assessment and risk

management activities. The choice of a "best estimate" is a matter of policy, not science.

ARB should continue to hold formal adoption hearings

WSPA is concerned that the public has only a single opportunity to give verbal input to ARB on those TAC's that are also HAP's under the Federal Clean Air Act. Public input opportunity must be provided at the workshop that is held with the ARB and OEHHA staff and the lead representative of the ARB Science Review Panel (SRP). While the workshop is an excellent forum for exchanging information and communicating perspectives, it is the last chance for verbal interaction. For most TAC's, formal adoption at a meeting of the ARB is unnecessary under California law. This means that after the SRP evaluates the B(a)P document at a "closed" meeting, the process is complete. WSPA recommends that ARB continue to hold formal adoption hearings for all TAC's. This would assure that the Board is adequately informed with respect to regulated community concerns resulting from a staff evaluation.

WSPA would again like to thank ARB for this opportunity to comment on the B(a)P document. If you have any questions, please do not hesitate to contact Russ White of Chevron at (510) 242-7038 or me at (818) 543-5329.

Sincerely,

Jeff Sickenger
Environmental Representative

cc: Peter Venturini - ARB
Dan Donohue - ARB
Don Aames - ARB
George Alexieff - OEHHA

Air Resources Board Staff Responses to Summarized Comments on the Preliminary Draft Part A and the Executive Summary

o **Northern Sonoma County Air Pollution Control District, August 13, 1993**

Comment 1: The commenter states that an uninformed person reading Table III-1, which shows "Agricultural and Other Waste Burning" emit the majority of BaP in California, could conclude that this source is responsible for most public exposure. The commenter believes that in areas where wood heaters are used, residential wood smoke exposes more people and at higher concentrations than agricultural related burns.

Response: The sources of BaP emissions in the Executive Summary and in Table III-1 (Part A) are listed in order of amount of BaP emitted to the atmosphere and not exposure. Because our emissions inventory for BaP shows that the category "agricultural and other waste burning" is the largest source of emissions, it was listed first.

We agree with the commenter that wood smoke is an important potential source of BaP exposures. Chapter IV in Part A (page A-36) reports higher concentrations and exposure to BaP above ambient background in areas where wood heaters are used. In both the Part A and the Executive Summary, staff indicated that these concentrations "may result in significantly greater health impacts for a local population than the health impacts associated with statewide ambient concentrations."

Comment 2: The commenter disagrees with the "could" verb used on page A-39 in the sentence: "The winter months are a period of intensive woodburning for residential heating in the mountain and valley communities of California, and could be a source of BaP emissions."

Response: The sentence on page A-39 has been revised as follows: "Intensive woodburning for residential heating during the winter months is a source of BaP emissions."

Comment 3: The commenter disagrees with the statement on page 6 of the Executive Summary: "Residential areas where wood and agricultural waste are burned have the potential for elevated ambient BaP concentrations." The potential exposure between woodsmoke and agricultural burning is not adequately distinguished.

Response: The ARB staff do not have data to distinguish the relative differences between exposure to woodburning and agricultural burning. The emission inventory data show that both wood and agricultural burning have a potential for elevated BaP exposures.

o **Western States Petroleum Association, September 29, 1993.**

Comment: WSPA recommends that ARB increase the "visibility" of the potency equivalency factors (PEF's) in the "Exposure Assessment" document. In addition, WSPA recommends that the Executive Summary begin with a discussion of the overall impact of this action and expand the title to include BaP and "other Polycyclic Aromatic Hydrocarbons".

Response: A discussion on the OEHHA's PEF weighting scheme and results for selective PAHs other than BaP has been added to the Executive Summary on page 11 and Part B section 7 and Appendix A. The primary intention of the report was to document the exposure and health effects of BaP because BaP has been used as a surrogate for other PAHs in regulatory programs. However, the OEHHA has assessed that some of the other PAHs may have greater or lesser potential cancer activity than BaP. Therefore, the OEHHA has included a weighting scheme for these PAHs. Because the report is a risk assesment for BaP, the staff has left the title of the report unchanged.

Comment: WSPA is concerned that the public has only a single opportunity to give verbal comments to ARB on TACs which have been identified as TACs at the April 8, 1993, Board hearing. WSPA is concerned that for those substances identified at the April hearing verbal interaction will be limited to the public workshop. WSPA recommends that ARB continue to hold formal adoption hearings for all TACs identified at the April 1993 Board hearing.

Response: On April 8, 1993, the Board conducted a public hearing and identified, by regulation, the 189 federal HAPs as TACs as required by Assembly Bill 2728. A 45-day comment period was provided and there was an opportunity to testify orally and in writing on the proposed regulation at the Board hearing. Specific health values were not presented by the staff as a part of the discussion. For those substances identified last April, it was recognized a process should continue for SRP approval for health values, which provides ample opportunity for public comment during the development of the health assessment values. For the BaP draft report, an initial 45 day comment period was provided and a public workshop. Dr. John Froines, who is the SRP leadperson for the BaP report, was present at the workshop.

The draft report was revised based on the comments received, and Part C developed which contains all the letters received and our summary of the comments and our responses. A second public comment period is now being provided along with the SRP's review. We plan to provide all comments received during this second comment period to the SRP and respond to each comment at the SRP meeting. Also, the ARB staff has planned to update the Board periodically on the status of the identification list and development of the health assessment values. The public will be given the opportunity to comment on these periodic updates. However, in anticipation that WSPA may want to further discuss this process with ARB staff as it pertains to BaP, we plan to meet with representatives of WSPA in early 1994.

Office of Environmental Health Hazard Assessment Staff Responses to Summarized Comments on the Preliminary Draft Part B and the Executive Summary

OEHHA Responses to Public Comments

Comments on part B "Health Effects of Benzo(a)pyrene" were submitted by the Western States Petroleum Association (WSPA).

Comment: The commenter supports the relative potency approach and notes the inclusion of expedited potencies from Proposition 65 but believes that the title does not reflect the scope of the document. The commenter requests that acknowledgement of the inclusion of 30 PAH's in addition to B(a)P be made since the title of part B is Health Effects of Benzo(a)pyrene.

Response: OEHHA appreciates the recognition by the commenter of the importance of a relative potency approach to address the PAHs. The document does deal largely with benzo(a)pyrene and the inclusion of the other PAHs occurs at the end of the document. The ARB will include more information in the Executive Summary about the additional PAHs addressed. Facilities emitting PAHs recognize the importance of a risk assessment for benzo(a)pyrene since it is the sentinel compound for PAHs and they know the interest of regulatory agencies and of regulated facilities in a weighting scheme for PAHs. Since OEHHA has decided to not derive PEFs for PAHs or PAH derivatives that are in IARC Group 3 except for chrysene since it is a USEPA Group B2 carcinogen, the total number of PAHs addressed is presently 25, rather than 30.

Comment: OEHHA should not use genotoxicity or structure-activity data sources for establishing PEFs since such use sets a bad precedent without full consideration of its possible future regulatory impact. The commenter believes that actual tumor incidence data should be the minimum criterion for establishing a PEF.

Response: Genotoxicity data sources were not used in the present group of PAHs. OEHHA staff disagree with the suggestion that structure-activity information not be used. Only the PEF for dibenz[a,h]acridine is at issue here. Currently most PAHs are considered to be as potent as BaP based on the general structure-activity relationship to BaP. We are suggesting that the value for dibenz[a,h]acridine be based on dibenz[a,j]acridine instead of BaP. This results in lowering the potency 10-fold. The use of structure-activity information has a long history in risk assessment and in the California Toxic Air Contaminant (AB1807) program. The potencies of chlorinated dibenzodioxin and dibenzofuran isomers are based on structure-activity relationships. The toxicity of metal compounds is also based on underlying structure-activity principles, i.e., the presence or absence of the metal in the compound in question. For example, all hexavalent chromium compounds are considered to be carcinogenic, although not all have been tested. All cadmium and arsenic compounds are also considered to be carcinogenic, although they have not all been tested. OEHHA does not intend to identify carcinogenic PAHs by structure-activity relationships. However, for the compounds identified as carcinogens in this document, such data are used in only one carefully selected instance.

Comment: The discussion of uncertainty in PEF selection should be expanded since a variety of experimental methods of tumor induction, three species of animals, and various sites of tumor formation were involved. The discussion of PEF determination in the Appendix should also be expanded.

Response: OEHHA staff agrees that much uncertainty is involved in the process of deriving PEFs but believes that uncertainty has been addressed by the use of a relative weighting scheme where all factors differ by orders of magnitude. This is stated on p. 7-32 of the document. There is uncertainty in extrapolating from other routes of administration across to the inhalation route. However, the fact that many types of experiments with varying routes are used may reduce any bias caused by using only one species of animal, a single route of administration, or a single type of tumor. There is also some possibility that risk due to PAHs will be underestimated even when using PEFs. Many different PAHs are emitted together and there may be some carcinogenic species for which the carcinogenic database is limited or inadequate so that no PEF can yet be derived. In response to the second part of the comment, OEHHA staff have expanded the discussion of PEF selection in the Appendix which will hopefully give additional clarification to their derivation.

Comment: Include the "most likely estimate in all references to cancer potency" since one of the objectives of risk characterization is to convey the uncertainty associated with any estimate of risk. The maximum likelihood estimate (MLE) of risk should be included as well as the upper 95% confidence value for the "best" estimate of potency value. The choice of a best estimate is a matter of policy, not science.

Response: Both MLEs and upper 95% confidence limits (UCL) have been calculated in risk assessments for the Toxic Air Contaminant (TAC) program. MLEs are much less stable statistically than 95% UCLs. For example, in our risk assessment for acetaldehyde, OEHHA staff did a "sensitivity" analysis for acetaldehyde induction of tumors in rats in which the tumor incidence was varied up and down by one tumor in the low dose group (from 17/52) while leaving the control (1/49) and high dose (41/53) incidences alone. The MLE increased 3000% when the incidence was increased by 1 whereas the UCL increased 50%. When the incidence was decreased by 1, the MLE (q_1) became 0 while the UCL (q_1*) decreased 16%. The 95% UCL is also used because it is a linear term which is consistent with the current paradigm for cancer induction that there is no threshold for carcinogenesis. OEHHA assumes that the commenter has equated the MLE or Maximum Likelihood Estimate with the most likely estimate. If so, this is an incorrect assumption on the part of the commenter. The Maximum Likelihood Estimate of a dose coefficient is a statistical estimate that maximizes the likelihood function of the data. It is constrained in the linearized multistage model to be nonnegative. UCLs are used to account for more sensitive members of the population. That is, we use UCLs because of uncertainty, uncertainty that the entire human population would not be protected otherwise. Therefore UCLs have been used for comparison with other chemicals. The range of risks presented in the summaries of the Toxic Air Contaminant reports have usually been a range of 95% UCLs (except for ethylene oxide where the range was from the MLE to the UCL). Actual risks can not be calculated. In regards to a best value, OEHHA staff believes that in the case of benzo(a)pyrene the value selected is the

most scientifically valid value, given the current accepted practices of health risk assessment.

We have calculated MLE risks for benzo(a)pyrene using the hamster inhalation data in GLOBAL86 and compared them to 95% UCLs on risk in the GLOBAL86 output. In this case the MLE and UCL risks are in good agreement at animal doses of 0.33 mg/kg/day (less than 2-fold apart) and at 0.1 mg/kg/day (less than 5-fold apart). As the dose is lowered, the 2 estimates continue to diverge apart. The use of MLE values rather than UCLs in conjunction with a PEF weighting scheme for several PAHs could lead to a underestimation of risk from a PAH mixture.

OEHHA staff further believe that the inclusion of the MLE in all references to cancer potency in the document would not add to the reader's understanding of uncertainty. In this case the uncertainty for BaP risk assessment has little to do with the choice of an MLE or UCL. For BaP the uncertainty results from extrapolation of dose over several orders of magnitude from the lowest hamster exposure of 2.2 mg/m^3 to current average ambient levels of 5.3×10^{-4} $\mu g/m^3$ and from the interspecies extrapolation from rodents to humans.

PART C ADDENDUM

PUBLIC COMMENTS AND ARB/OEHHA STAFF RESPONSES ON THE SCIENTIFIC REVIEW PANEL VERSION OF THE BENZO[a]PYRENE IDENTIFICATION REPORT

Prepared by the staffs of the Air Resources Board
and the Office of Environmental Health Hazard Assessment

March 1994

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PART C ADDENDUM

I.

Comment Letters Received on the December 1993 Scientific Review Panel Version of the Benzo[a]pyrene Report

ENGINEERING PLUS, INC.
JOHN W. ROBERTS, M.S., P.E.
Environmental Toxics, Air Pollution

1-3-94

Genevieve Shiroma, Chief
Toxic Air Contaminant Identification Branch
California Air Resource Board
Attention: Benzo(a)pyrene
P.O. Box 2815
Sacramento, CA 95812

Dear Ms. Shiroma:

Please forgive me that I did not comment on the first draft report on Benzo(a)pyrene (BaP) as a Toxic Air Contaminant. I appreciate the opportunity to comment at this time. I found the report very through, informative, and well written. It is in the tradition of the excellent pioneering studies done by the ARB in relation to assessing and controlling all types of outdoor and indoor air pollution.

The report could be improved by adding a discussion of the accumulation of BaP road and house dust in Part A, IV F, Exposure Through Other Routes. The 8 to 12 % of toddlers with pica who may consume up to 5 g of soil and dust a day (Mahaffey, 1985; Calabrese, 1991) have a special need to be protected from PAHs in road and house dust. Road dust accumulates in cars and is in intimate contact with the infants and toddlers who ride in them.

There are many metals and organic pollutants such as BaP that partition toward soil and house dust. BaP, which originated in the air, may accumulate and persist much longer in soil than the air. When organic soil pollutants are tracked in to house dust they may last for years in old carpets where they are protected from degradation by sunlight, moisture, bacteria, rain and wind. The persistence of BaP in house dust should be mentioned in Part A, VB. Such accumulation of BaP in house dust from past emissions and other sources may reach 41 ppm (Roberts, 1993) and present more health risks to a small child than present emissions. Some 13 pesticides were found in house dust that could not be detected in indoor air (Roberts, 1992 [enclosed]). It also appears that the best single predictor of a toddler's blood lead (Pb) is the loading of Pb in the carpet where the child plays (Davies, 1990). Even before Pb was removed from gasoline, a child in a clean newer urban home (with little lead in paint) was expected to get 40 times as much Pb from ingesting dust as from inhalation (Davidson, 1986). The same intake ratios may be true for other metals and organic compounds with a low vapor pressure.

I have participated in two studies of PAHs and PCBs in soil and house dust sponsored by the US Environmental protection Agency (EPA). One study has been published and is enclosed. The BaP in house dust in eight houses in Columbus, Ohio, varied from 1.5 to 41

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house dust in eight houses in Columbus, Ohio, varied from 1.5 to 41 ppm. The sum of the seven potentially carcinogenic PAHs ranged from 11 to 290 ppm (Roberts, 1993). The second study in a west coast city also had such PAH sums in the ppm range. A high correlation (r= .86 to .99) between the carcinogenic PAHs in the entry mat dust and the house dust in Columbus suggest most of such PAHs in house dust were being tracked in. Tobacco smoke did not appear to be a major source BaP in house dust. While it is unclear how much of the BaP in house dust comes from air pollution it is likely a high percentage comes from combustion either as air pollution or as by-products such as wood or coal ashes and used motor oil. Air pollution may be a major source of BaP in house dust and contribute to the total exposure of infants and toddlers to BaP.

Road dust is a major source of BaP emissions and should be mentioned in your report in Part A, Section III C. It should also be mentioned in the Part B Health Assessment because of its ability to induce cancer in mice. Two studies suggest that auto traffic as well as the accumulation of PAHs in soil and road dust appears to be related to cancer incidence in humans and animals (Blummer, 1977; Campbell, 1937). Blummer (1977) observed a correlation between accumulation of total PAHs in soils and inverse distance from the road. He also noted the same correlation between distance from the road and cancer rates. Campbell (1937) found that 70 and 74 % of 69 mice exposed to road dust on the floor of their cage and in the air developed skin and lung cancer respectively during their lifetime. A dust cloud was produced with a fan in the sealed cage four to six times a day at hourly intervals during five days a week for about a year. When the study was repeated and the organics were removed from road dust with benzene, the skin cancer rate dropped to zero and the lung cancer rate dropped to 45%. Used motor oil is found in road dust and may contain Pb, Cd, PAHs, polychlorinated biphenyls (PCBs), chlorine, and dioxin (Rotard, 1987: EPA, 1984).

The potential health effects of BaP emissions will be understated if the exposure through road and house dust are not considered. The recognition that BaP accumulates in road and house dust and contributes to the total exposure of small children to BaP provides additional benefits from reducing emissions to the air. It also suggests that there is a need for public education to reduce exposure to BaP that has accumulated in soil and house dust from past emissions.

The references listed above are found at the end of one the paper enclosed (Roberts, 1992). Thank you for this second opportunity to comment on this important document. It may have made your life easier if I had commented on the first draft.

Sincerely

John Roberts

A chapter on Reducing Health Risks from Dust in the Home from the Master Home Environmentalist Traning Manual is enclosed.

WSPA
Western States Petroleum Association

February 07, 1994

Genevieve Shiroma, Chief
Toxic Air Contaminant Identification Branch
Stationary Source Division
Air Resources Board
Attention: Benzo[a]pyrene
P.O. Box 2815
Sacramento, CA 95812

Dear Ms. Shiroma:

The Western States Petroleum Association (WSPA) appreciates the opportunity to submit additional comments concerning the ARB/OEHHA report entitled "Benzo[a]pyrene (B[a]P) as a Toxic Air Contaminant" for consideration by the Science Review Panel (SRP) in their deliberations on February 15, 1994. We would also like to thank ARB for providing an informal forum on January 28 to discuss our concerns with the AB1807 public input process. ARB's commitment to work with WSPA to increase public access to this process and to improve the interaction between ARB, OEHHA, the SRP, and industry is very encouraging. WSPA looks forward to further dialogue with ARB concerning expeditious implementation of these objectives.

With regard to our outstanding concerns with the ARB B[a]P report, WSPA would like to reiterate our recommendation to include both the Maximum Likelihood Estimate (MLE) and the Upper Confidence Limit (UCL) in the Executive Summary text and in Table I (pp. 10). Specifically, WSPA requests that the SRP consider use of the MLE in combination with an UCL to convey the range of potency estimates derived from the GLOBAL 86 model.

WSPA believes that one of the critical objectives of a good risk assessment is to convey the uncertainty inherent in the process by expressing any quantitative description of risk, exposure, potency, etc., as a range. Moreover, we believe that a good risk assessment should strive to develop accurate and representative data concerning potential health risks. Risk assessment results should not be obscured by unstated "health protective" assumptions. The degree of health protection prescribed in regulatory standards must be determined by those engaged in risk management, not through the risk assessment process. However, risk managers must be provided all relevant information in order to make an informed and credible policy decision. WSPA believes that inclusion of the MLE will contribute to responsible policy. With specific reference to

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B[a]P, it will provide a balanced perspective concerning the uncertainty of the cancer potency estimate.

WSPA appreciates your reconsideration of this matter. Please contact Russ White of Chevron at (510) 242-7038, or me at (818) 543-5329, if you have any questions.

Best Regards,

Jeff Sickenger,
Environmental Issues
Coordinator

cc: Bruce Oulrey - ARB
Peter Venturini - ARB
Don Aames - ARB
George Alexieff - OEHHA

ENGINEERING PLUS, INC.
JOHN W. ROBERTS, M.S., P.E.
Environmental Toxics, Air Pollution

3-16-94

Genevieve Shiroma, Chief
Toxic Air Contaminant Identification Branch
California Air Resource Board
Attention: Benzo(a)pyrene
P.O. Box 2815
Sacramento, CA 95812

Dear Ms. Shiroma:

Thank you for including my comments on the report on Benzo(a)pyrene (BaP) as a Toxic Air Contaminant. May I suggest that the addition to Section IV F, "Exposure Through Other Routes" be changed to read, "BaP and other PAHs can accumulate in road and house dust and be a significant source of exposure through ingestion, especially for toddlers. Roberts et al., (1992) reported an average concentration of BaP in house dust in 9 Seattle homes of .16 ppm from a 1981 study by Bailey. Roberts et al., (1993) also reported an average concentration of BaP of 9.6 ppm with a range of 1.5 to 41 ppm, in house dust in eight homes in Columbus, Ohio." The new references are:

Bailey, G., 1981. "Air quality and respiratory health: A comparison study of two Seattle communities", Submitted as a Master thesis at the University of Washington, Seattle, Washington.

Roberts J.W., W. T. Budd, J. C. Chuang, and R. G. Lewis, 1993. Chemical Contaminants in house dust: Occurrences and sources. *Proceedings of the 6th International Conference on Indoor Air Quality and Climate*. K. Saarela et al., eds., Helsinki; Indoor Air 93; 2:27-32.

The second study is enclosed. Thank you for the opportunity to comment.

Sincerely,

John Roberts

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II.

Air Resources Board Staff Responses to Summarized Comments on the SRP Version Part A and the Executive Summary

Air Resources Board Staff Responses to Summarized Comments on the Scientific Review Panel Version Part A.

- **Mr. John Roberts, Engineering Plus, Inc., January 3, 1994**

  Comment 1: The commenter states that a discussion of accumulation of BaP in road and house dust should be added to section IV F, "Exposure Through Other Routes". He feels this is particularly important for toddlers.

  Response: We agree with the commenter that BaP can accumulate in road and house dust. Mr. Roberts sent us several of his recent publications which indicate that PAHs, such as BaP, can accumulate in road and house dust. We added several sentences and references to section IV G, "Exposure Through Other Routes", page A-52.

  Comment 2: The commenter recommends that the persistence of BaP in house dust be mentioned in Part A, section V B "Atmospheric Fate of Benzo[a]pyrene". He indicates that BaP, and other PAHs, can be protected in old carpets from degradation by sunlight, moisture, bacteria, rain, and persist for years on old carpets. This can lead to accumulation and present health risks to children.

  Response: We agree with the commenter that BaP can be protected in old carpets and persist for a long period of time presenting an additional source of exposure. We added a sentence in section B of Chapter V "Atmospheric Persistence and Fate of Benzo[a]pyrene", which references Mr. Roberts data and acknowledges the possibility of a much longer lifetime for BaP in house dust.

  Comment: The commenter believes that road dust is a major source of BaP emissions and should be mentioned in section III C of the Part A.

  Response: We agree that road dust may be a source of emissions of BaP. However, we do not have any quantitative estimates for road dust as a source of BaP emissions.

- **Mr. John Roberts, Engineering Plus, Inc., March 16, 1994**

  Comment: The commenter suggests that we change the language of section IV G to reflect the results from the Roberts et al., 1992 and Roberts et al., 1993 studies.

Response: We looked at both of these studies, and decided to use the Roberts et al., 1993 study, because it presents the most recent data on range and average BaP concentrations in house dusts. This information has been added on page A-53 of the Part A.

III.

Office of Environmental Health Hazard Assessment Staff Responses to Summarized Comments on the SRP Version Part B and the Executive Summary

Office of Environmental Health Hazard Assessment Staff Responses to Summarized Comments on the SRP Version Part B and the Executive Summary.

o **Western States Petroleum Association (WSPA)., February 07, 1994.**

Comment: The commenter reiterated a comment submitted previously to include both maximum likelihood estimate (MLE) of risk and the upper 95 percent confidence value. The commenter believes that inclusion of the MLE will contribute to the responsible policy of developing accurate and representative data concerning potential health risks and in the case of BaP provide a balanced perspective concerning the uncertainty of the cancer potency estimate.

Response: OEHHA staff reiterate what was said earlier on pages III-2 and III-3 of Part C. Both MLEs and upper 95 percent confidence limits (UCL) have been calculated in risk assessments for the Toxic Air Contaminant program. MLEs are much less stable statistically than 95 percent UCLs. The 95 percent UCL is also used because it is a linear term which is consistent with the current paradigm for cancer induction that there is no threshold for carcinogenesis.

We have calculated MLE risks for BaP using the hamster inhalation data GLOBAL86 and compared them to 95 percent UCLs on risk in the GLOBAL86 output. In this case the MLE and UCL risks are in good agreement at animal doses of 0.33 mg/kg/day (less than 2-fold apart) and at 0.1 mg/kg/day (less than 5-fold apart). As the dose is lowered, the two estimates continue to diverge apart. The use of MLE values rather than UCLs in conjunction with a PEF weighting scheme for several PAHs could lead to a underestimation of risk from a PAH mixture.

We have added a description in the Executive Summary, on the areas of possible uncertainty in the BaP risk assessment.