Enclosure

Response to Comments and Recommendations

1. Improvements in the National Toxics Inventory (NTI) are critical to the NATA and should be facilitated through the provision of uniform national reporting protocols and rules; the provision of incentives for industry to measure, validate, and report their emissions; and the use of visualization tools (e.g., GIS database and mapping programs) for the NTI. Methods for cross-validation of emission estimates and for the development of industry-specific emission factors for use in other applications are also needed.

   EPA Response: We agree that improvements in the NTI are critical to the NATA. For the 1999 and future assessments, we will seek to improve the coverage of sources and of pollutant species at those sources, and the detail and accuracy of the emission estimates and other source parameters themselves. The Panel has recommended uniform national reporting protocols and rules to accomplish this. Based on text in the body of the Panel's report, we interpret this to mean a formal rule for reporting by sources directly to EPA. The current NTI approach is largely based on indirect reporting by sources through voluntary submissions by state air pollution agencies. We are studying what combination of new requirements, voluntary participation based on self-interest in good science in regulation, provision of more convenient processes for participation based on information technology, and better technical assistance and tools could best achieve the goal of more and higher quality participation in the NTI, within resource constraints facing each of the parties involved.

   We are also working to increase the value we add to the process. We are developing more automated software and visualization tools. These tools will more easily and reliably detect clear errors in the approximately two million separate emission estimates we use to compile the inventory, and help reduce errors in data transfer and conversions by various parties including ourselves. We have adopted for the 1999 NTI a better approach to approximating correct latitude and longitudes when these are missing or illogical in data received from others. While we cannot possibly do field work to collect missing parameters such as stack heights, we are instituting a new approach that will fill in missing data using approximations based on site-specific data reported for similar source types. We will review the literature on metals speciation cited by the Panel, and will likely undertake a literature review and outreach to researchers to locate other published and unpublished data on hazardous air pollutant speciation as part of a project on particulate matter speciation more generally. This may not be completed in time for the first draft of the 1999 NATA, however. Regarding mobile source surrogates, the emissions model used in this regard (called NONROAD) has had many improvements in this area since the version used for the 1996 NATA, and we will be incorporating some state-supplied information into the 1999 NTI. We will continue to look to states for better estimates of nonroad emissions in unique situations, such as for construction in dense urban cores. Also, we have adopted much better approaches for spatial allocation of emissions from planes, trains, and ships for 1999. Finally, for 1999, HAP emissions from

motor vehicles will be estimated using EPA's most recent mobile source emissions model, MOBILE6.2, using inputs for speed, gasoline composition, etc. that will be more realistic than those used in estimating mobile emissions for the 1996 NATA. The new model will make it easier for stakeholders to develop their own highway mobile source emission inventories by better accounting for local conditions. Further, when EPA makes estimates in the absence of state submittals, we will be able to use more locality-specific information than we did for the 1996 NATA.

2. Once the specific recommendations of the SAB for the 1996 NATA are implemented, the model predictions of ambient concentrations and human exposure should be acceptable for presentation to the public. However, NATA's estimates for secondary air pollutants -- those that form as a result of chemical reactions in the atmosphere -- are likely to be incorrect (biased low) because the ASPEN model used by NATA to predict ambient concentrations does not directly consider nonlinear chemical formation processes. High priority should be given to the local-scale adaptation and application of a model platform able to simulate nonlinear chemistry for secondary air toxics and address the larger-scale transport processes important for pollutants with significant background concentrations for future NATAs. In addition, the Panel found that the EPA's application of the HAPEM4 model, used to estimate indoor exposures to pollutants, lacked the appropriate consideration of inter-individual exposure variability and (as acknowledged in the NATA report) indoor sources of air pollution. Recognizing these HAPEM4 limitations, we recommend that the current NATA results be accompanied by presentation of exposure and risk estimates based on simpler transformations (or direct use) of modeled and measured ambient pollutant concentrations and, information on time spent indoors, in parallel with results based on the current HAPEM4 exposure model. In addition, a demonstration of the full modeling procedure now proposed for future NATAs should be made for a well-characterized air toxic, such as benzene. These results would reflect total exposure to the chemical from both outdoor and indoor sources.

EPA Response: The EPA agrees that the simple treatment of chemical transformation in ASPEN needs improvement and has been actively working on developing an improved method. In 1999, EPA modified and applied the research version of the Ozone Isopleth Plotting Program (OZIPR) to temporarily address this limitation. The OZIPR, a grid model, addresses the chemical transformation for three reactive pollutants: formaldehyde, acetaldehyde and acrolein. Although OZIPR and ASPEN model results are not exactly comparable due to nonequivalent emissions and differences in meteorological inputs, OZIPR gave higher estimates of secondary transformation for the three pollutants, which as SAB suggests, is more realistic. However, the OZIPR model results are not compatible with the NATA need for obtaining concentration estimates at a census tract level (one to several kilometers apart in urban areas), since OZIPR provides average estimates in a 36 kilometer grid. Also, the SAB did not appear to favor the use of the OZIPR model. Thus, rather than pursuing OZIPR any further, EPA is waiting for the completion of the development of the state-of-science Community Modeling

System (CMAQ) for these three pollutants. In addition to improved chemical mechanisms, this model can also provide estimates at smaller (e.g., 4-kilometer) grid sizes. The EPA is investigating the viability of using the CMAQ model with 1999 emissions for selected pollutants.

The approach used by HAPEM4 to simulate inter-individual exposure variability was adopted because activity pattern data over periods longer than a few days were not available. An alternative approach, selecting a single day's pattern to represent an individual's activity pattern for every day in a year or a season, is likely to overestimate inter-individual variability. Nevertheless, given the available database, we agree that this alternative is the best approach for estimating inter-individual variability in activity patterns with HAPEM4. Therefore, we developed a revised version of HAPEM4 that selects a single activity pattern to represent an individual's pattern for each of 3 specified day types: weekends, summer weekdays, non-summer weekdays. This version was applied to generate revised exposure estimates for the 1996 NATA national-scale assessment.

Further, regarding SAB concerns over the lack of sources of indoor origin in the assessment, it is important to note that the current HAPEM4 application does simulate exposures resulting from the penetration of sources of outdoor origin into indoor locations. In addition, the HAPEM4 model is structured such that indoor source terms can be added into the assessment. After a review of available indoor source and concentration data for the 1996 assessment, EPA determined that insufficient indoor air data were exist for many of the pollutants of interest. However, EPA plans to include the contribution of indoor sources in future NATA analyses. It is expected that pertinent data, including those obtained by the Total Exposure Assessment Methodology and the National Human Exposure Assessment Survey studies, will be utilized.

Because of HAPEM4 model limitations the SAB is recommending that the NATA results "…be accompanied by presentation of exposure and risk estimates based on simpler transformations…" It is important to note that exposure estimates derived from HAPEM4 differ from those based solely on outdoor concentrations in two ways. First, HAPEM4 accounts for time spent in several indoor, in-vehicle, and outdoor microenvironments, where pollutant concentrations may differ from the average outdoor concentration over the census tract, as estimated by ASPEN. Second, HAPEM4 accounts for time spent at geographic locations outside of the resident census tract by commuting workers. This geographic mobility can be an important determinant of personal exposure, especially in regions where pollutant concentration gradients are steep. While EPA recognizes some of the inherent limitations of HAPEM4 (even in its newly-revised form), we feel that the risk results of the 1996 assessment are best characterized with the exposure assessment included and limitations of the assessment properly framed.

Finally, the SAB recommends that a demonstration/validation of the model application be conducted. To address this concern, EPA is planning a detailed exposure assessment for

benzene. The modeling domain for this case study will be a metropolitan area. In order to address other aspects of inter-individual variability, an air dispersion model more detailed than ASPEN (e.g. the Industrial Source Complex Short Term Version 3 Model) will be applied to estimate air quality at a spatial resolution finer than census tracts. A modified version of HAPEM will be applied that will be able to take advantage of this more finely resolved air quality data to account for inter-individual variability associated with intra-tract concentration gradients. As part of this case study, the sensitivity of exposure estimates to several factors will be assessed. These will include commuting, microenvironment factors (inter-cohort variability, seasonal patterns, and geographic factors), indoor sources, and variability of outdoor concentrations within census tracts. The results of this case study will be documented in a future NATA technical report and will help us design ASPEN and HAPEM modifications for the 1999 version of the national-scale assessment.

3. The NATA study makes generally appropriate use of available dose-response information, consistent with currently accepted protocols. Dose-response tables used for cancer and noncancer health effects estimation should be checked for accuracy and expanded to identify the date of the assessment, the source of the data, the level of peer review provided, and whether or not the chemical is currently undergoing re-review. When new changes are being considered to replace those currently in EPA's Integrated Risk Information System (IRIS), conduct a scenario-based assessment to identify the implications of possible changes. Ongoing improvements to IRIS are critically important to a number of Agency programs, including NATA.

EPA Response: We have re-checked the tables of dose-response values and also updated them to account for changes since our January, 2001 report to the SAB. The NATA risk estimates now reflect these updates. We added columns to indicate external peer review, date of the existing assessment, expected date of the next IRIS assessment (if any), and clear citations for the source documents (usually as web links). As the revised table will show, EPA has for several years been moving aggressively to develop new IRIS cancer and noncancer assessments – based on current science – for all NATA risk drivers with pre-1996 IRIS (or non-IRIS) dose-response values. The suggested scenario-based evaluation of potential implications of new IRIS values will be developed as part of a more complete evaluation of uncertainty and variability recommended in SAB comments under item #6 below.

4. NATA's overall conceptual approach to risk characterization is reasonable and generally follows EPA guidelines and procedures. However, NATA's approach to summing carcinogens is not conventional, nor is it appropriate. It would be appropriate and certainly more precautionary for the Agency to combine and report the Class A and Class B carcinogens separate from the Class C carcinogens. Changes in the 1996 NATA are also needed to ensure that the addition of noncancer effects follows current mixtures guidance limiting such aggregation to effects with a common mode of action. Finally, future NATAs should address

additional (non-inhalation) pathways for exposure and sub-chronic (less than lifetime) effects.

EPA Response: We have substantially revised the approaches used to aggregate cancer and noncancer risks, along with the supporting discussion which will appear in the on-line NATA materials, in response to this concern by the SAB. We revised the aggregations scheme by separating carcinogens for which human data exist (Groups A and B1) from animal carcinogens (Groups B2 and C), as recommended in the SAB's detailed comments. Also, in response to a recommendation in the body of the SAB report (though not in the summary table), we also combined the risks of all four groups of carcinogens. While the revisions in the aggregation scheme did not substantially affect the conclusions about risk drivers, we agree that it represents sound science.

For noncarcinogens, we dropped the hazard indexes (HIs) for five of the six target organs or systems presented in the draft report, and revised the sixth – the HI for the respiratory system – to include only a single adverse health effect, respiratory irritation. We believe that, given current mode-of-action data for compounds in the assessment, that this method represents a reasonable interpretation of the approach recommended by the mixtures guidelines. We will continue to make improvements to the HI approach in future NATA assessments as supporting dose-response assessments become available.

We will continue to develop multimedia dispersion and exposure models that can be applied on a national scale, but we are not confident that such a model will be ready for the 1999 NATA assessment. We remain concerned about non-inhalation exposures, and intend to include them in future assessments as soon as it is technically feasible. Regarding risks from acute and subchronic exposure, our ability to include these in the national-scale assessment is currently limited by the lack of short-term emission data in the NTI. When it becomes possible to estimate less-than-lifetime exposures on a national scale, it will be critically important to match these exposures with appropriate acute and subchronic dose-response information. We will select these dose-response values from a variety of sources, including the National Advisory Committee for Acute Exposure Guideline Levels, the American Industrial Hygiene Association, and the Agency for Toxic Substances and Disease Registry. Sources will be prioritized according to applicability and level of review in a manner analogous to our procedure for selecting chronic dose-response data. Also, as part of including less-than-lifetime exposures in future NATA assessments, we will estimate children's risks separately wherever possible.

5. The lack of an accepted unit risk estimate for diesel cancer risk prevents the treatment of these important emissions in parallel with the other toxics evaluated by NATA. Diesel should be treated in a separate, succinct section of the report in which the calculations for assessing exposures and the present knowledge of risks are described clearly, including the concerns for health effects associated with fine particulate matter.

EPA Response: The Agency agrees with the Science Advisory Board that the lack of an acceptable unit risk estimate for diesel exhaust precludes the Agency from treating this pollutant in the same manner as it does the other pollutants included in the assessment. In response to this comment, the Agency will address risk from this pollutant separately from the others when presenting NATA results on the website. The discussion on the website will explain the basis for EPA's conclusion that diesel exhaust ranks with the other substances that the national-scale assessment suggests pose the greatest relative risk, and will also point out that there is a significant potential for noncancer health effects as well, based on the contribution of diesel particulate matter to ambient levels of fine particles. In any reporting of NATA results, EPA will address diesel exhaust cancer risk in a manner consistent with SAB recommendations.

6. Methods and supporting information are not yet sufficient to adequately represent uncertainty in each of the NATA model components. It would be valuable for EPA to supplement its current "top down" approach for assessing uncertainty with a scenario-based approach to identify the key model and data uncertainties.

EPA Response: In response to this concern we have already developed an extensive qualitative discussion of variability and uncertainty for use with the on-line NATA materials. This discussion defines and describes the uncertainties, variabilities, and limitations associated with the assessment and also differentiates between uncertainties that are specific to NATA and those that are universal to the risk assessment process. Within the NATA-specific uncertainties, the material clarifies which are the most important.

We will also develop a scenario-based quantitative analysis of variability and uncertainty for a limited geographic area and number of pollutants. This analysis will include uncertainty and variability associated with the emissions data, dispersion modeling, exposure modeling, and dose-response components of the assessment, and consider each of these parts separately and in combination. We expect this analysis to produce a range of risk descriptors that will serve as a useful comparison between NATA results and other possible risk estimates. The scenario-based analysis will be developed as part of a series of technical reports that expand the analyses and improve the documentation of the 1996 national-scale assessment.

It is not clear if we will be able to extend the scenario-based uncertainty/variability analysis to include aggregate risks, since only a limited number of pollutants will be assessed. However, for 1999 and future NATA assessments, which EPA hopes to calculate probabilistically, we will also consider the effects of correlations among various input variables upon uncertainty and variability in aggregate risk.

7. As EPA recognizes, it is a challenge to clearly communicate the NATA results to the public. To this end, our panel recommends that NATA results should be presented in a hierarchical manner (e.g., on different, color-coded web pages) to differentiate between data and model

predictions based on scientific results at different stages of development and with different degrees of confidence.

EPA Response: In addition to the extensive new on-line discussion of uncertainty, variability, and limitations of the NATA assessment described under item #6 above, we have also developed a system of color-coded symbols that expresses our overall confidence in the exposure estimates for each substance. The symbols have been applied to all charts and maps, along with links to explanatory pages where the meaning of the symbols, and the methods by which we assigned them to substances, are described in detail. The explanatory material also breaks down the overall confidence estimates into relative confidence in the inventory, dispersion modeling, and exposure modeling. We hope this information will help us in setting the research agenda, and also support planning of local assessments.

We are now in the process of developing further on-line material to help the lay public place the NATA risk estimates, and eventually similar estimates from other air toxics assessments, in the context of other risks. These materials should be completed by April 2002 and posted shortly thereafter.

8. The current exposure methodology and results in NATA are not ready for use in the national scale benefits analysis required in Section 812 of the Clean Air Act. Such estimates should consider the full distribution of exposure and risk to affected populations (not just the county median values computed in the current NATA) and should also address less than lifetime health effects. The Agency's NATA and Section 812 study teams should work together to ensure that the important goals of these related assessments are attained in a timely manner.

EPA Response: The Agency agrees with the recommendation of the Panel that the NATA results should not be used in national-scale benefits assessments. The NATA team will work with the Section 812 study team to ensure that improvements in future

NATA assessments are of the greatest utility in the assessment of benefits associated with reducing exposures to air toxics on a national scale.

9. Because the Agency's air toxics research program has been historically underfunded, significant, well-focused new research is needed to provide an improved basis for future NATAs. The Agency's research strategy for this purpose should be reviewed by this or a similar panel.

EPA Response: We agree that significant data gaps remain in our national understanding of air toxics problems. As a result, we have been putting a significant amount of effort into developing an air toxics research strategy and multiyear plan for implementing that strategy. This research strategy, which will rely heavily on NATA results for its development, is currently targeted for peer review by the SAB, possibly before the end of this fiscal year. We have also

recently expanded our national efforts on ambient monitoring for air toxics after having our national monitoring network strategy peer reviewed by a subcommittee of the SAB. While these monitoring efforts will provide important information that will help local areas address specific air toxics problems, they will also play a key role in the Agency's overall research plan for air toxics. It is our view that air toxics research will require a sustained effort over time, and that our strategy should lead to a more focused research program which will better inform national air toxics policies.

Again, thank you for your letter. I appreciate the opportunity to be of service and trust the information provided is helpful.

Sincerely yours,

Christine Todd Whitman

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