UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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November 19, 1993

EPA-SAB-EC-LTR-94-002

Honorable Carol M. Browner
Administrator
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Subject: Overview of SAB Comments and Recommendations on the Proposed RIA for the RCRA Corrective Action Rule.

Dear Ms. Browner:

This report is one of a series of six reports (listed in Appendix A) generated by the SAB in response to the subject request from the USEPA's Office of Solid Waste and Emergency Response (OSWER). It contains a brief summary and overview of the salient conclusions of the other five reports as well as some observations, comments and recommendations of the RCRA/RIA Steering Committee (RRSC). A roster of RRSC is in Appendix B.

At the October, 1992 meeting of the Executive Committee (EC), the Science Advisory Board (SAB) was asked by OSWER to review its then-nearly-complete RIA methodology which was being applied to the cost/benefit analysis required prior to promulgation of the Agency's final RCRA Corrective Action Rule. The EC, recognizing the importance, complexity, creativity, and novelty of OSWER's work and its multi-disciplinary character, established the RRSC to assure that certain significant aspects of the RIA--both methodology and application--received appropriate attention from the relevant SAB standing committees.

At a public meeting on January 29, 1993, the RRSC concluded, on the basis of presentations by and discussions with OSWER personnel, that four individual SAB standing committees should undertake reviews of the major segments of the RCRA-RIA with appropriate inter-committee liaison. The Environmental Economics Advisory Committee (EEAC) reviewed the contingent valuation (CV) methodology

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(hereafter called CV-1) and the application of CV in the specific case of the RCRA-RIA (hereafter called CV-2). The Environmental Engineering Committee (EEC) reviewed the principal fate and transport model, MMSOILS, used in the RCRA-RIA. The Ecological Process and Effects Committee (EPEC) reviewed the ecological risk assessment portion of the RCRA-RIA and the Environmental Health Committee (EHC) reviewed the human health risk assessment portion of the RCRA-RIA. The RRSC provided coordination and its own insights with respect to the RCRA-RIA methodology and its application.

Interpretation of the Charge

The charge for these reviews is contained in two separate requests for reviews of RCRA-RIA components: the Groundwater Contingent Valuation (CV) Study (October 21, 1992) and the MMSOILS model for fate and transport (March 26, 1993). The latter request also asked the SAB to comment on "the implications that the model has on the human and ecological risk assessment" and to "consider during their review several practical factors including the baseline risk assessment and the fact that the RIA is a predictive analysis". Thus the RRSC concluded that how these risks were determined needed to be reviewed as well. Each of the standing committees of the SAB has addressed its portion of the charge in their separate reports. The RRSC has taken as its charge the task assigned it by the EC of ensuring that the significant aspects of the RIA -- both methodology and application -- received appropriate attention from the relevant SAB standing committees, of ensuring that coordination exists where needed and, ultimately, providing its own comments and overview. As noted by the EHC, this draft methodology is actually a screening analysis which provides preliminary estimates rather than definitive analysis reflecting site specific details.

The SAB was not asked to review the costs of corrective action or the procedures for estimating them, nor was it supplied with the detailed background information needed to do so. The SAB has thus reviewed only the estimation of the benefits of the corrective action and the methodologies used in deriving the expressions of the benefits. A review of the costs and their estimation methods might produce comments. Thus, the absence of comments in this area does not constitute any SAB position as to the costs of remediation or their methods of estimation.

General Comments

This RIA is one of the most complete and complex that OSWER has undertaken and is the first to undergo detailed review by the SAB. In spite of the scientific criticisms which follow, we commend the Agency for this major effort, for its openness of discussion with the SAB, and for its innovative attempts to apply a wide variety of types of information and procedures to assess the risks associated with solid waste management units and the benefits of abating those risks.

The OSW/ORD working group is also to be commended for a well-coordinated and focused effort to develop an RIA that will help the Agency and the Nation better understand the risks associated with RCRA sites and the costs and benefits of remediation -- and the size, complexity and difficulty of the analysis. The intra-agency coordination represented by this RIA is itself a model approach that the Agency should apply to other programs to promote effective and efficient interactions of Program Office and ORD to ensure that Program Office activities represent state-of-the-art science and technology.

Finally, despite the large amount of good work that has gone into this RIA, it only accounts for part of the benefits that may accrue from reducing health and ecological risks from RCRA sites. The comments which follow include recommendations for both short term changes to improve this RIA and long-term investments in research and analysis to improve RIAs within the Agency.

Overview of the Major Comments and Recommendations of the SAB Standing Committees

To place into context the specific comments and recommendations of the RRSC, some of the major findings of the SAB's standing committees are summarized here. The reader is referred to the individual reports for full and detailed descriptions of these and other findings. In each case, the standing committees offer recommendations for both short term and long term improvements.

The Agency's CV-1 document represents a substantive contribution, extending understanding of the issues associated with contingent valuation as a method of estimation of non-market values. Even so, concerns were raised about the method which need answering: whether the pretesting and design are such as to truly assure

that a well-defined groundwater commodity was understood properly by the respondents; whether use of the Box-Cox econometric estimates alone is acceptable and defensible; whether embedding was adequately treated; whether the "per household" non-use values from CV-1 can be regarded as either upper or lower bound values; and others. Among the concerns raised about CV-2, given also the concerns about CV-1, itself, are: whether the application of values obtained in CV-1 to the different set of circumstances of CV-2 is possible; that EEAC could not endorse the McClelland *et al* study as a basis for EPA to determine the non-use values of groundwater; and that the hedonic analysis was not actually used in the RIA.

CV methods in general are still controversial and the EEAC concluded that more information was needed to apply CV in this RIA. Nonetheless, the EEAC showed sufficient confidence in the approach to recommend that further research be undertaken, particularly to resolve whether the CV approach can produce information useful in RIAs.

Fate and transport information is fundamental in assessing exposures and, therefore, human health and ecological risks. While noting that the methods and formulations used in the MMSOILS model are well known, documented and accepted and that underlying assumptions are clearly stated in the RIA, the EEC concluded that here, too, there are difficulties (though if MMSOILS is applied to simplified case studies it might be a valid screening tool for assessing the relative risks and costs associated with alternative regulatory options). The primary difficulties are: sparse or inaccurate information, poor parameter estimation especially relative to source terms, suspected over-reliance upon default parameters, and that the Model is applied to cases outside the range of its validity. Given these shortcomings, many of which were already realized by the Agency, the most basic and pressing concern is whether the use of a generic model such as MMSOILS is appropriate as a basis for the assessment of regulatory costs and benefits at the national level since the fate and transport estimates that comprise the model output may be wrong by orders of magnitude for many complex sites. In its report the EEC recommends ways in which the Agency can augment exposure and cost/benefit estimates using alternative approaches.

The human health risk assessment methods used in the RIA are well known and often used in the regulatory arena. There is a question as to how well they can be used to estimate risks -- or exposure levels of concern for risk -- in this case of

multiple exposures, for analytical rather than regulatory purposes. Also there are fundamental differences between the usual methods used for carcinogens and non-carcinogens and the results that can be obtained in each case. Much of the criticism of the human health risk analysis in CV-2 has to do with a confusing use of risk and exposure terminology and is easily rectified. We urge that it be rectified. The EHC also urges that quantities be calculated to describe the population exposed at levels of concern for cancer and non-cancer adverse effects, and the attendant risks so they are comparable and offers suggestions for presenting non-monetized benefits. Some of the proposed calculations can be carried out in the short term (calculating the number of people exposed to carcinogens at levels of concern for cancer risk, as is already done for noncarcinogens for non-cancer adverse effects risk) whereas the method proposed for calculating population risks for noncancer adverse effects will take more time and development. Of all of the sections of RIA, this section is the most easily improved through the application of existing scientific knowledge.

The EPEC recognizes the formidable task undertaken by the Agency in the ecological risk assessment but raises several questions about it. Among the concerns raised are these: the major pathway considered is not necessarily the most likely to cause adverse ecological effects, the range of ecological endpoints considered is limited, there is no consideration of the ecological risks and benefits of site remediation, there is insufficient discussion of data sources and assumptions, and there are a number of application and interpretive errors. The EPEC also suggests that the ecological risk assessment be recast in a form consistent with the Agency's "Framework for Ecological Risk Assessment" (EPA/630/R-92/001, February, 1992).

Specific Comments and Recommendations of the RRSC on RCRA-RIAs

a) The RRSC noted with pleasure that each major chapter in the RIA contained a final section on limitations which served to enhance the understanding of the reader/user of what meaning can be ascribed to the contents of the chapters. It is recommended that the sections be enlarged where necessary to address the criticisms from the SAB relevant to the final text of the RIA.

b) It is important to improve the assessment of fate and transport, and therefore of estimated exposures, as much as possible since the large error band seen by the EEC can only seriously compound and make

more uncertain the assessment of both human health and ecological risks and the benefits to be derived by their abatement. Greater reliance should be placed on measurements of exposure to supplement and validate model predictions, as called for in the Exposure Assessment Guidelines.

c) The risks created by the remediation process should be addressed. EPEC identified additional ecological risks in their report, such as impacts on terrestrial wildlife, habitat, and biodiversity which were not adequately addressed. Additional risks include: loss of contaminants to other media during pumping, treatment, excavation, and hauling, e.g., transferring groundwater eventually to surface water, stripping of volatile compounds, air entrainment of soil particles; accidents to workers during remediation and transportation; and puncturing a confining structure and contaminating a deeper aquifer during installation of wells. These risks are relevant because several Superfund Records of Decisions have been amended/overturned due in part to risks to workers and off-site communities during remediation.

d) While the cost estimates in the RIA for corrective action were not evaluated in a consensus manner by the SAB, several issues of possible concern were identified by the EEC: Should additional sites be included. e.g., pre-HSWA land treatment units, very large DoD sites, more spill sites? Was the cost of a given cleanup underestimated, e.g., quantity of soil to be remediated, labor costs under hazardous conditions, insurance, inflation? What is the comparison of the cost in the draft RIA report with costs developed in 1992 by the University of Tennessee's Waste Management Research and Education institute? Should other cost categories be included, e.g., transaction costs and government administrative costs?

We recommend that these questions be addressed by EPA during the public comment period.

e) The RRSC has considered sampling strategy since, as in all assessments, results and interpretations depend on the samples used in the RCRA-RIA. The current RIA gives much consideration to this subject

and the sample used is large relative to that used in other cases. RIAs operate on a national scale and have multiple components (economics, engineering, human health, and ecological effects). The choice of sample sites has to be representative of the population of sites in the country and it also has to consider the attributes of these multiple components. The RCRA RIA sampling design was based primarily on the size and type of waste sites but did not consider the nature of the ecological risks (based on exposure or effects) or, necessarily, the different nature of health risks (and exposures), in choosing the sites. Thus it is not evident that either type of risk assessment is representative because ecological and health criteria were not part of the stratification process.

We therefore recommend that in future RIAs the sample designs incorporate criteria appropriate for all aspects of the RIA. The categories of samples should include estimates of central tendency and dispersion and a discussion of the sources of variability within each category. Estimates of uncertainty should be included in the National Assessment. In some cases, it may be necessary to use different designs to address particular types of risks. For the long-term the Agency should consider whether calculation of a National Assessment is a useful decision-making tool for rulemaking, particularly where site-specific conditions are highly variable.

f) The RRSC supports the recommendations for further research into and development of the methodologies needed to perform RIAs as set forth in the other five reports. Some further questions which research may be able to answer are: (a) Can the CV methods be sensitive enough to distinguish between the values of clean, cleaner and cleanest ground water? This question is of importance in examining different corrective action options which may yield significantly different costs and different levels of clean-up. If this distinction cannot be made, the distribution of CV values would stand as an invariant and might have little to say about which option to choose, if any. And (b) what are the CV values of sound ecosystems or of good health? These questions, if they can be answered without overlap with other CV values, could greatly assist in valuing benefits.

g) Chapter 13 of the RIA should be renamed to indicate that costs and benefits are characterized, since the non-monetized and the monetized benefits cannot be compared to costs in the same manner. Monetization is not always possible so other types of characterizations should be presented in ways that make comparisons possible and that facilitate judgments about costs versus benefits; also terms should be clearly defined and used consistently. Indeed, even if complete monetization is achieved, presenting additional characterizations of costs and benefits is highly desirable. All characterizations should include a description of their uncertainties. Specific suggestions for improvements are provided in Appendix C to this report. Similar clarifications of meaning and definition should be made consistently throughout the entire report.

In closing, we commend the Office of Solid Waste for its pioneering efforts in the development of this RCRA RIA. Regulatory impact assessments by their very nature are not site specific and operate at the national scale or even international and/or global scale. Based on our review of this RIA, we recommend that the Agency build on the experience gained here to develop a technical support document (TSD) providing guidance on the development of an RIA. The TSD should include a variety of approaches for assessing the economic, human health, and ecological benefits and costs associated with proposed regulation. We suggest that the TSD incorporate as building blocks the Human Health Risk Assessment Guidelines and the Framework for Ecological Risk Assessment.

Finally, we make one additional recommendation. In the first stages of approaching and defining a major project such as the RIA, the Agency might consider availing itself of the consultation role of the SAB. In this role the individual members and consultants of SAB committees offer advice and comments as individuals in public meetings on points of interest raised by the staff members about their nascent project. Although the occurrence of such a consultation is recorded and reported to the Administrator, the details of the advice are not. Such advice at an early stage, can serve to raise questions that are better addressed early rather than close to the end of a project. The SAB may later conduct a peer review of the final agency document.

The SAB is pleased to have had the opportunity to review this important project, and we look forward to your response to these comments, as well as reviewing other RIAs in the future.

Sincerely yours,

Dr. Raymond C. Loehr, Chair
Executive Committee
Science Advisory Board

Dr. Paul Deisler, Chair
RCRA-RIA Steering Committee
Science Advisory Board

APPENDIX A. LIST OF SAB REPORTS REVIEWING DIFFERENT ASPECTS OF OSWER'S RCRA/RIA CORRECTIVE ACTION COST/BENEFIT ANALYSIS METHODOLOGY AND ITS APPLICATION.

The reports are, in brief:

1. EPA-SAB-EEAC-94-001 "Review of the Contingent Valuation Method for the proposed RIA for RCRA Corrective Action Rule" by the Environmental Economics Advisory Committee (Also referred to as CV-1)

2. EPA-SAB-EEAC-LTR-94-001 "Review of Economic Aspects of the proposed RIA for the RCRA Corrective Action Rule" by the Environmental Economics Advisory Committee (Also referred to as CV-2)

3. EPA-SAB-EEC-94-002 "Review of MMSOILS component of the Proposed RIA for the RCRA Corrective Action Rule" by the Environmental Engineering Committee

4. EPA-SAB-EPEC-COM-94-001 "Commentary on the Ecological Risk Assessment for the proposed RIA for the RCRA Corrective Action Rule" by the Ecological Processes and Effects Committee

5. EPA-SAB-EHC-LTR-94-003 "Review of the Health Benefits for the proposed RIA for the RCRA Corrective Action Rule" by the Environmental Health Committee

6. EPA-SAB-EC-LTR-94-002 "Overview of SAB Comments on the proposed RIA for RCRA Corrective Action Rule" by the RCRA/RIA Steering Committee

APPENDIX B.

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APPENDIX C. Recommendations from the Steering Committee for Clarifying the Cost Benefit Presentation

The characterizations of costs and benefits in Chapter 13 can be improved, particularly in the way the information is presented in Section 13.3 and in Exhibits 13-1 and 13-2. These exhibits, in particular, are very important since they summarize the output of the entire cost/benefit study; great care should therefore be taken to be sure they are not easily misunderstood or misused.

In Exhibit 13-1, for example, the values given might be designated as "Preferred Value" instead of "Effect of Corrective Action" and a second line added entitled "Range of Estimates" with the corresponding figures to give the decision maker some immediate understanding of the uncertainties. In the draft as written, the non-use value of ground water would then be shown as the preferred value of $2.3 billion (as now, unless changed in response to the SAB review) and the ranges of the estimate would be given as $0.17-18.0 billion (using different numbers if the numbers should change as a result of the SAB review). Exhibit 13-2 also offers opportunities for improvement ranging from changing captions to more suitable ones (including correcting risk terminology) to adding further information to make useful comparisons possible. Here are some examples of desirable changes: the figure of $18.7 billion should be shown as the preferred value with its ranges of estimate as suggested for Exhibit 13-1; the caption "Avoided Non-Cancer Effects" should be changed to "Avoided Non-cancer Exposures of Concern", which is what they are; the 100 to 12 million "cases" under the Non-Cancer column should become "exposures of concern" since these are not cases of actual effect as in the case of cancer; and at least one additional column needs to be added to the exhibit. It would shed further light on the benefits to be obtained is one giving the number of "Avoided Cancer Exposures of Concern"; it would be based on the numbers of people, exposed at levels of exposure yielding a risk of cancer of 10 or higher using much the same information already used to estimate cancer risks (as suggested in the EHC report) . As the exhibit now stands, the cancer and non-cancer effects -- the totality of health effects -- cannot be compared or placed in context with each other. Although the definitions of what is "of concern" differ for cancer and non-cancer effects, they do nonetheless exist and are accepted as meaningful and so this additional column, compared to the one retitled "Avoided Noncancer Exposures of Concern", would provide useful additional information to the decision maker. If, in the future, columns for non-cancer effects

comparable to the column entitled "Averted Population Cancer Cases" can be provided, so much the better. Such information might assist in providing a basis for monetizing non-cancer effects avoidance as do the figures for cancer cases now in hand in appropriate cases (medical costs and productivity losses avoided and the like). Finally, expanding the footnote to offer some idea of the meaning of current ecological risk and whether corrective action will have any effect on it will add further to the value of this Exhibit in shedding light on benefits to be expected from the corrective action.

The two exhibits should also be changed to reflect the fact that there are two baseline cases: one with the entire population either treating or substituting its water supply (which now forms the basis of the small monetary benefit ascribed to averting treatment and substitution in Exhibit 13-1) and a second in which no one in the population treats or substitutes their water supply (the one for which the relatively large decreases in cancer incidents shown in Exhibit 13-2 are estimated). As they stand now, Exhibits 13-1 and 13-2 appear to be anomalous in this regard and the full information that could be displayed in the characterization is not displayed.

These few examples illustrate ways in which the characterization of the costs and benefits can be greatly enriched; they and others like them apply not only to the two exhibits cited but to Chapter 13 as a whole.

APPENDIX D. List of Acronyms

CV	Contingent Valuation Methodology
EEAC	Environmental Economics Advisory Committee (SAB/EEAC)
EEC	Environmental Engineering Committee (SAB/EEC, also referred to as "The Committee")
EHC	Environmental Health Committee (SAB/EHC)
EPEC	Ecological Processes and Effects Committee (SAB/EPEC)
MMSOILS	A Mathematical Model for Soils (Includes other media transfer from soils.)
OSW	Office of Solid Waste (U.S. EPA)
OSWER	Office of Solid Waste and Emergency Response (U.S. EPA)
RCRA	Resource Conservation and Recovery Act
RRSC	RCRA RIA Steering Committee
RIA	Regulatory Impact Analysis
SAB	Science Advisory Board (U.S. EPA)
SWMUs	Solid Waste Management Units

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