

September 26, 2000

EPA-SAB-EEC-COM-00-006

Honorable Carol M. Browner  
The Administrator  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue, N.W.  
Washington, DC 20460

RE:    Commentary and Recommendations on Overcoming Barriers to Waste  
       Utilization

Dear Ms. Browner:

The Science Advisory Board's Environmental Engineering Committee (EEC) prepared this commentary with recommendations on overcoming barriers to waste utilization (see Attachment A for details). The Committee is not an expert advisory committee on policy; it is a technical committee. Where the commentary touches upon policy issues, it does so because they emerge directly from consideration of the technical issues.

This commentary is an outgrowth of the Committee's long-standing interest in waste management. Its chief finding is that large-scale waste utilization is needed for cost-effective management of a fraction of the 23 million tons of "hazardous" wastes and hundreds of tons of non-hazardous wastes that are land-disposed annually in the United States. Recent Committee activities that have contributed to the Committee's desire to provide you with this commentary include:

- a)     the 1997 review of EPA's draft Pollution Prevention and Waste Research Strategies;
- b)     discussions of waste utilization and related issues with program officers, engineers and scientists from the Agency, National Science Foundation, Civil Engineering Research Foundation;
- c)     briefings by staff from the Office of Policy and Reinvention the Agency's evolving Industrial Ecology Initiative on December 1, 1998; and
- d)     participation of Committee members in discussion groups on issues related to the focus of this commentary during the U.S. EPA Industrial Ecology Workshop held in Arlington, VA, November 16-17, 1999.

On the basis of the discussions during the meetings mentioned above and EEC's independent assessments, the Committee has concluded that large-scale utilization of wastes in chemical and textural forms, and facility structural configurations that have been proven not to pose serious environmental and health risks can reduce waste managements costs. The Committee has made the following recommendations which are further explained in the attachment, on how the Agency may improve its programs to overcome barriers to waste utilization.

- a) Interpretation of key definitions so that wastes that could be beneficially used as raw materials are not inappropriately labeled as hazardous wastes.
- b) Clarification of roles for the Agency, states and industry on waste utilization issues so that each of these different institutions do not wrongly assume that critical functions on waste utilization are being performed by others.
- c) Promotion of adherence to the existing Comprehensive Procurement Guidelines (CPG) which gives preference to designated items made from recovered materials as required by Executive Order 13101: Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition.
- d) Collaboration with industry to provide incentives and market infrastructure for large-volume waste utilization.
- e) Tracking and publicizing of the long term performance of waste utilization projects in order to counteract some negative publicity that has arisen due to a few instances of failure of waste utilization projects within a larger universe of successes.
- f) Implementation of innovative technology development programs for large-scale utilization of waste materials so that waste utilization potential is not inhibited by conventional technology.
- g) Development of technical guidance manuals on techniques for selecting, characterizing, recovering, and using wastes as partial or full replacements for traditional construction materials.

Some of the recommended actions can be implemented through modification of existing regulations and regulatory definitions while others could be considered. The evolving Industrial Ecology framework within the Agency provides a context for the implementation of waste utilization initiatives. The belief that waste management (including waste utilization) is a materials flow problem that should be treated as such is gaining ground in professional circles. Within this context, waste utilization could be considered as the large-scale recycling component of the material flows in industrial ecology. The

World Resource Institute is in the process of developing a database of material flows from industrial economies. This could be useful to the Agency on waste utilization.

There are many reasons why stakeholder identification and involvement should be part of waste utilization programs. One reason is that stakeholders may be supportive of waste reuse. For example, the National Research Council's 1997 report, *Contaminated Sediments in Ports and Waterways: Cleanup Strategies*, says, "Stakeholder acceptance of contaminated sediments management projects can be fostered by the reuse of dredged material."

There are wastes which, when used in construction, meet both structural and environmental requirements. An increase in the volume of waste materials used in construction, as partial or full substitute for conventional earthen materials, makes economic and environmental sense: waste storage inventory is reduced, project cost is reduced because the aggregate is less expensive, and ecological damage from quarrying for earthen aggregate is reduced. These recommendations, if implemented nationally under the strong leadership of the Agency, will encourage the states and industry to expand their efforts on waste utilization.

We look forward to the response of the Assistant Administrator for the Office of Solid Waste and Emergency Response (OSWER). The Science Advisory Board is prepared for further consultations on this issue.

Sincerely,

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Science Advisory Board

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Dr. Hilary I. Inyang, Chair  
Environmental Engineering Committee  
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Dr. Calvin Chien, Chair  
Waste Utilization Subcommittee  
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## APPENDIX A - DETAILED COMMENTS

### 1. BACKGROUND

The growth in population and industrial activity implies an increase in the diversity and volume of statutory-defined waste materials produced through energy production, mining, industrial processes, municipal construction and domestic activities. In 1990 alone, about 200 million tons of municipal solid wastes were generated in the United States (U.S. EPA, 1995, 1998). It was projected then that most of the 222 million tons of municipal solid wastes that would be generated by 2000 would end up in landfills. Assessments by Wernick and Themelis (1998) indicate that generally more than 60% of metals in these wastes are unrecovered. Annually, about 12,000 manufacturing facilities in the United States produce approximately 7.6 billion tons of industrial solid waste (U.S. EPA, 1987, 1997), most of which are managed in surface impoundments, landfills, land application units and waste piles. Annual land-disposal of hazardous waste is about 23 million tons.

Traditional limited-scale recycling of waste materials into goods is not enough to significantly reduce the current and future waste storage problems. Thus, the environment would benefit from programs that increase the utilization of wastes in large volume applications. A component of such programs could be the development of an environmental screening process for wastes considered for reuse. Examples of the components of such a screening process are: development of test protocols, assessment of the chemical make of such wastes; assessment of worker exposure issues; and assessment of the long term performance of the structures in which such materials would be used. An increase in the volume of environmentally-screened waste materials used in construction as partial or full substitutes for conventional earthen materials makes economic and environmental sense: waste storage inventory is reduced, project cost is reduced because the aggregate is less expensive; and ecological damage from quarrying for earthen aggregate is reduced.

Examples of waste materials that have been found to have sound structural characteristics are mining wastes, cement-kiln dust, incinerator ash, wood chips, demolition masonry and glass, blast furnace slags, foundry wastes, milled urban refuse, coal combustion ash, and sewage ash. Fortunately, these materials are often located near urban areas where high volumes of construction often generate high demand for construction materials. For those wastes on which there is limited experience, issues such as contaminant leachability and material durability need to be addressed, using appropriate test protocols, numerical and physical models, design, and demonstration projects.

Waste utilization is consistent with the Agency's growing awareness of the importance of industrial ecology and sustainable development approaches to environmental management. Not only does it make long-term economic and environmental sense, it is necessary in the light of the increasing waste generation rate, decreasing waste disposal options, lack of cost-effective treatment alternatives for some wastes and the need for resource conservation. The Agency projected in 1994 that solid

waste recycling rates could reach levels between 25 and 35% by 2000. To achieve this recycling rate, about 50% or more of some wastes would need to be recovered (U.S. GAO, 1995).

A variety of factors have combined to slow down progress towards the achievement of high waste recycling rates. During its analysis of waste utilization factors through workgroup discussions, presentations by Agency and external personnel and review of Agency and general literature, the EEC identified key barriers to increased waste utilization that impact upon waste recycling rate. These barriers and recommendations to the Agency on how they could be overcome are briefly presented in the following section.

## **2. BARRIERS AND RECOMMENDATIONS**

### **2.1 Interpretation of Key Definitions that Impact upon Waste Utilization**

The interpretation of the federal definitions of “solid waste” is a barrier to waste utilization implementation. In addition, multiple regulatory requirements can impact the feasibility of waste utilization. As a practical matter, once a material is labeled a hazardous waste, it is very difficult to use as raw material in a manufacturing operation. As an operational matter, in the United States, MRF permits are often necessary when companies decide to reuse materials in their manufacturing process or in infrastructure development outside the manufacturing process. If a material is labeled as a hazardous waste, it may not be possible for such companies to get permits for the reuse of the so-labeled material. The EPA should consider regulatory changes that either exempt such manufacturers from excessively strict and unnecessary standards, or, make it easier for such companies to satisfy current waste utilization criteria.

The Committee views the recently proposed Resource Conservation and Recovery Act (RCRA) “mixture rule” as a positive step in this direction. This rule would establish constituent-specific “exit levels” for low-risk wastes that are currently designated as “hazardous” because they are listed as, or have been mixed with, derived from or contain listed hazardous wastes. This implies that some “low-risk” wastes that are currently classified as “hazardous” would become more available for reuse as a management option. In general, the ongoing RCRA re-invention effort provides an opportunity for the Agency to clarify and improve regulatory definitions.

### **2.2 Clarify Roles for the Agency, States and Industry**

The Agency has encouraged states and industry to act on waste utilization issues. Because the actual processing and reuse of wastes constitute an interstate and national endeavor, a greater role by the EPA is warranted. The EPA’s leadership is essential to convince decision-makers to use waste-derived material. For example, the EPA conducted research to determine the suitability and performance of municipal incinerator ash in various applications. The research, which was performed by the Agency’s Laboratory in Cincinnati, clarified the performance capabilities of this material and,

thereby, eliminated some of the misconceptions associated with its use. EPA programs similar to those for municipal incinerator ash or a national level policy are examples of how technical support and a federal research program can provide the basis for good decision-making.

The EEC recommends that the EPA develop a program in collaboration with others, including: industry, the environmental community, and other state and federal agencies (e.g., Federal Highway Administration and the evolving CONMAT program of the Civil Engineering Research Foundation) to establish evaluation criteria and tests for the reuse of specific wastes in large-scale applications.

### **2.3 Promotion of adherence to the existing Comprehensive Procurement Guidelines (CPG)**

RCRA requires EPA to designate items made from recovered materials. Once designated, federal agencies are required to give preference to those items made from recovered materials when purchasing goods from vendors (US, 1998). This approach is attractive because it is proactive. However, an assessment suggested that “limited progress has been made in implementing the procurement program” (U.S. GAO, 1992). The Committee finds no evidence that indicates that the situation has since significantly changed for the better. Being that this is the case, the EEC recommends consistent and unwavering support for the CPG by the EPA including participation on the Workgroup to Streamline and Improve Procurement Reporting related to Executive Order 13101 (US, 1998). By helping develop a framework to address the issues associated with waste utilization, EPA will eventually reduce barriers to reuse. Without such leadership, waste utilization efforts will continue to be stymied.

### **2.4 Collaborate with Industry to Provide Incentives and Market Infrastructure**

The need for incentives and infrastructure is critical. For a successful waste utilization program to be established, one of two things must occur. Either regulations must mandate the program or market forces must make it profitable. The latter is more attractive and sustainable. However, when profits are uncertain or too small to justify capital investment, companies need regulatory incentives to explore markets for products containing recovered material.

The EEC, therefore, recommends that the EPA assist the industrial sector in developing appropriate market-economic incentives to create an infrastructure with which to bring products containing reusable materials to the forefront. States and industry could initiate programs for addressing waste utilization, but *only* in those areas that have the highest likelihood of becoming economically successful, independent of incentive programs.

The Agency’s Brownfields Program is generally acknowledged to be a success. Some of the elements of the Brownfields program that contributed to its success and can be adapted to a waste reutilization program are:

- a) standards development,

- b) criteria setting, data-collection,
- c) external outreach, and
- d) technical guidance to support waste utilization.

Elements of EPA's Jobs Through Recycling (JTR) program to develop markets for secondary markets could also be used.

## **2.5 Track and Publicize the Long Term Performance of Waste Utilization Projects**

Although waste utilization projects have been demonstrated to date, they are largely unknown and scarcely publicized. In addition, public and community fears based on some news about mismanaged contaminated waste make implementation of waste utilization initiatives difficult and challenging. A greater number of successful demonstrations and improved publicity will increase the confidence of all stakeholders and will enable waste utilization efforts to get past the demonstration phase. The Agency may want to do this by identifying all stakeholders and implementing programs to address their concerns and take their wishes into consideration so that the Agency's position on waste is more reuse.

A program similar in concept to the Superfund Innovative Technology Evaluation (SITE) program may be useful in promoting, demonstrating, and communicating waste utilization technologies. Another option may be the Civil Engineering Research Foundation's (CERF's) Innovation Centers. CERF currently operates centers for highway-related, environmental, building, and general construction and public works technologies. The centers perform independent evaluation of new products and technologies by using a consensus-based, panel-driven process. Also, under Executive Order 13101, the National Institute of Standards and Technology in the Department of Commerce is to provide technical assistance to help identify environmentally preferable attributes of products and services used in pilot and demonstration projects. EPA may wish to consider encouraging NIST to work with CERF's Innovation Centers to test recycled products and help bring them to market.

Regardless of the program selected, the EEC recommends a more focused approach in tracking and subsequently disseminating long-term performance data on past demonstration projects. A database on the location, volumes and characteristics of reusable waste materials should be developed. Initial data are obtainable from state and regional waste exchanges such as those listed by U.S. EPA (1990), and Covey and Shew (2000). The EEC is also aware that the World Resource Institute is in the process of developing a database of material flows from industrial economies. This could be useful to the Agency on waste utilization.

## **2.6 Implement Innovative Technology Development Programs for Large-Scale Utilization of Waste Materials**

New technologies can use waste materials to create products with similar or greater performance. In many cases, the use of these materials may require processes that are a departure from the conventional. Regardless, results should be the criteria for acceptance, not whether the process mimics traditional construction technology. The EEC recommends that the range of possible applications of waste utilization technologies and materials not be limited to conventional approaches. In fact, the EPA should support programs that encourage development and implementation of innovative waste utilization technologies and projects. As an example of an innovative project, a large fraction of the savings estimated at \$30 million (Civil Engineering, 1998), that will accrue to the state of Massachusetts on the construction of a 470-acre recreation complex near Boston comes from the use of contaminated spoil, excavated from the Boston Central Artery and Tunnel project. In another project (ES and T, 1997), the state of Pennsylvania will use mixtures of incinerator ash and about 500,000 cubic yards of dredge material from the Delaware and Hudson Rivers, and New York Harbor to reclaim about 15 acres of an old surface mine. It is estimated that there are about 9,000 abandoned surface mines in Pennsylvania, covering about 250,000 acres. In these projects, contaminant leachability assessments were made. The implication is of the assessments is that the projects would not have been approved if the assessments showed their work would have presented an unacceptable risk.

## **2.7 Develop Technical Guidance Manuals on Waste Utilization**

Industry experts and state officials agree that recycling goals and objectives are not being met because there are few national standards for products containing recovered material (U.S. GAO, 1995). Although the Federal Highway Administration (FHWA) recently stated that current regulations provide an “environmental regulatory framework” for testing, reporting, storing, treating, and disposing of waste materials, the FHWA notes that “there is no analogous regulatory framework for selecting, characterizing, recovering, and recycling of waste and by-product materials” (FHWA, 1998). This lack of coherent framework and/or guidance that address waste utilization has led to a lack of science in decision-making and contractor fear of potential liability claims. Furthermore, the lack of appropriate and adequate technical guidelines negatively affects the market acceptance of recovered materials (Van Beurden et al., 1998).

The EEC suggests that national guidance and/or a regulatory framework be developed to bridge the gap between demonstrated performance and regulations. National standards or regulations, as opposed to state-specific ones, are needed because manufacturers cannot be expected to conform to numerous and varied standards across states (U.S. GAO, 1995).

## **3. SUMMARY**

The growth in industrial activities to support a growing population implies that the volume of wastes from energy production, mining, industrial processing, manufacturing, and municipal operations will continue to increase. Although research and technology development in the waste utilization arena are expanding, tools are needed to advance these technologies and efforts to the implementation phase. Encouragement of the adherence to Executive Order 13101 by federal agencies, regulatory incentives or changes, a formalized demonstration project program, and a regulatory framework or national guidance are all concrete actions that can be taken to promote waste utilization. However, the role of economics in this process cannot be overstated. Without economics as the driver for waste utilization, our recommendations will miss the mark. The EEC recognizes the importance of economics in helping the Agency focus attention on wastes that are the most attractive for large-scale recycling. Clarification of roles for all stakeholders is essential if success is to be achieved. By forming partnerships among industry, agency leaders, and others the proper balance of environmental stewardship and economic viability can be found.

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