## U.S. Environmental Protection Agency Board of Scientific Counselors Sustainable and Healthy Communities Subcommittee

### **Virtual Meeting Minutes**

### October 28-29 and November 12, 2021

**Dates and Times:** October 28, 2021, 12:00 p.m. to 4:15 p.m.; October 29, 2021, 12:00 p.m. to 4:30 p.m.; November 12, 2021, 11:00 a.m. to 1:15 p.m. Eastern Time

#### Location: Virtual

### **Meeting Minutes**

Provided below is a list of the presentations and discussions that took place during the meeting with hyperlinked page numbers. The minutes follow. The agenda is provided in Appendix A, the participants are listed in Appendix B, and the charge questions are provided in Appendix C.

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### Thursday, October 28, 2021

The meeting generally followed the issues and timing as presented in the agenda provided in Appendix A of this meeting summary.

### Meeting Kickoff, Federal Advisory Committee Act Rules, Expectations, Logistics

Tom Tracy, Designated Federal Officer, Office of Science Advisor, Policy, and Engagement

The meeting convened at approximately 12:15 p.m., Eastern Time.

Mr. Tom Tracy, Designated Federal Officer (DFO), welcomed and thanked the participants for their attendance. He explained the Federal Advisory Committee Act (FACA) rules, which require the meeting is open to the public and with time reserved for public comments. Matthew Naud introduced himself, thanked the support staff for their efforts, and noted that he would be presenting Courtney Flint's remarks. The rest of the Board of Scientific Counselors (BOSC) Sustainable and Healthy Communities (SHC) Board members introduced themselves.

### Office of Research and Development Welcome

# Chris Frey, Deputy Assistant Administration for Science Policy, Office of Research and Development

Dr. Chris Frey thanked everyone for joining the meeting and serving on the BOSC. The scientific work of the Office of Research and Development (ORD) is critical in informing decisions for regions, partners, and sustainable communities. This administration is committed to addressing environmental justice and climate change issues that challenge communities. He noted that members would provide advice on serving overburdened and poor communities disproportionately affected by a vast number of stressors. Aiming research toward wholistic solutions with a bias toward action is an effective way of applying science to achieve equity is such communities. He concluded by again thanking members for their service to the public and disadvantaged communities.

### Subcommittee Chair Opening Remarks and Introductions

Courtney Flint, Chair, Sustainable and Healthy Communities Subcommittee

Matthew Naud had no opening remarks on behalf of Courtney Flint.

### Sustainable and Healthy Communities Research Program Opening Comments

Maureen Gwinn, National Program Director, Sustainable and Healthy Communities Research Program

Dr. Maureen Gwinn provided an overview of the Sustainable and Healthy Communities Research program, focusing on Research Areas (RA) 7 and 8 from Topic 2. She introduced the team of the Sustainable and Healthy Communities National Research Program and stated the ORD research planning process is committed to an engaged, translational approach with partners for identification and development of products. Research includes planning by the National Research Programs and implementation by research centers, which share accountability and communication responsibility. The four research centers include the Center for Public Health and Environmental Assessment (CPHEA), Center for Computational Toxicology and Exposure

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(CCTE), Center for Environmental Measurement and Modeling (CCTE), and Center for Environmental Solutions and Emergency Response (CESER). This meeting will focus on CESER research and result in recommendations for improving ORD's U.S. Environmentally-Extended Input-Output (USEEIO) life cycle model and facilitating increased usability of life cycle inventories in RA 7 and in recommendations for facilitating increased usability of ORD's construction and demolition materials research and improving future leaching predictions through the Leaching Environmental Assessment Framework (LEAF) in RA 8. She then discussed the BOSC Charge Questions, stating partners' charge roles are to refine problem statements or outputs, determine how Strategic Research Action Plan outputs will support specific decisions, and determine the format of and timeline for products to support decision making. The charge of scientists is to determine whether ORD has the skills and capacity to accomplish outputs and, in conjunction with partners, conceive and develop products to address the outputs. She discussed the focus areas and outputs, noting researchers' comments throughout the meeting will frame them in terms of partnerships and collaborations with the Office of Resource Conversation and Recovery (ORCR). She concluded by reviewing the agenda for the two-day meeting.

### Research Implementation Engagement Between the Office of Research and Development and the Office of Land and Emergency Management

Carolyn Hoskinson, Director, Office of Resource Conservation and Recovery, Office of Land and Emergency Management

Dr. Carolyn Hoskinson introduced herself and spoke on the research implementation engagement between ORD and the Office of Land and Emergency Management (OLEM). This collaboration ensures a sound science foundation and understanding of research areas, which include a focus on climate change and environmental justice. OLEM partnership work includes research on development of tools to assist with recycling of food waste, reduction and recovery of construction and demolition debris, and use of the Hydrollic Evaluation for Landfills Performance model, which predicts liquid flows in landfills. OLEM has a recycling goal of reaching 20 percent by 2030, but additional research is needed to reach that goal. OLEM is working to build decision tools for communities and hopes to work on pool combustion residuals, Coal Combustion Residuals (CCR) impact on facilities, recycled glass uses, construction projects and materials, and more. Dr. Hoskinson concluded by emphasizing ORD's collaboration and research is vital for OLEM's work.

### Implementation of Life Cycle Models, Inventories, and Methodologies Research in the Center for Environmental Solutions and Emergency Response

#### Greg Sayles, Director, Center for Environmental Solutions and Emergency Response

Dr. Greg Sayles discussed CESER's mission, which is to conduct applied stakeholder driven research and provide technical support to help solve the nation's environmental challenges, especially around the built environment. Partners and the SHC team help plan the research CESER and OSAPE conduct to maintain an alignment. He explained the topics of the meeting, which include development and application of sustainable materials and management tools in concert with the USEEIO model, discussion of food waste as an issue of growing concern, the goals of the administration, and management of plastics and microplastics in the environment. He thanked presenters and the subcommittee for their feedback and recommendations.

- Elena Irwin: Have you started thinking about the next ORD strategic plan (StRAP)?
  - **Maureen Gwinn:** We had a kickoff at the end of June and have developed a synopsis document that fed into this administration's priorities. At the time all political appointees were not yet in place, so that is an iterative process. We have held several discussions in the six key areas identified by the new administrator, and we have built on the engagement of these research areas. ORD will issue its next StRAP in October 2022, which would go until 2026. We are kicking off some of the product proposal discussions next month and will continue through next Spring.
  - **Greg Sayles:** There is a holistic engagement with ORD, the scientist, and our partners, who are trying to keep engagement organized. It is an inclusive process. It is challenging in some ways but will result in a useful document. Even though we are focused on StRAP 3 topics here, these are important topics that will carry on into the next StRAP, so advice on these communities is important and useful in moving forward.
  - **Maureen Gwinn:** If they are not in SHC but can partner with any of the key areas and programs, please mention them.
  - **Matthew Naud:** The previous StRAP was not as intentional on climate and equity, so this group will provide insights on that.
- **Rainer Lohmann:** Please let us know if there is anything we should know as we finish the SHC part, given there will be a new advisory committee.
  - Tom Tracy: There is more information about our future on the BOSC website.

### Charge Question 1: Improvements to U.S. Environmentally-Extended Input-Output Life Cycle Model and Increased Useability of Life Cycle Inventories and Methodologies

Charles Maurice, Associate National Program Director, Sustainable and Healthy Communities Research Program

Dr. Charles Maurice introduced himself and the first charge question.

### U.S. Environmentally-Extended Input-Output National Models and Applications

# Wes Ingwersen, Environmental Engineer, Center for Environmental Solutions and Emergency Response

Dr. Wes Ingwersen presented on the USEEIO National Models and Applications. The USEEIO models depict environmental and economic performance of all commodities and industries in the United States. He ranked more than 2,000 unique releases or resource types, built on more than 10 million data points, and reported more than 20 environmental, resource, and socio-economic impact indicator scores. To prioritize transparency, the model uses an open-source data and modelling framework. Sustainable materials management prioritization tools use USEEIO. The GHG Emission Factors Hub, Recycling Economic Information Report, Waste Reduction Model (WARM), GHG Reductions Through Materials and Land Management, and the Smart Sectors Program use USEEIO for organization GHG Scope 2 reporting, sustainable purchasing, industry hotspot analysis, food, and other subsystem life cycle modeling. The software behind USEEIO uses an "ecosystem tools, USEEIO API, USEEIO widgets, Excel, and open source Life Cycle

Assessment (openLCA). The application of the model includes creating supply chain factors, coverage of the factors in the product life cycle, sustainable materials management (SMM) tools, and the sustainable communities web challenge 2021. Dr. Ingwersen listed work in progress with near- and medium-term delivery.

### U.S. Environmentally-Extended Input-Output State Models and Applications

## Wes Ingwersen, Environmental Engineer, Center for Environmental Solutions and Emergency Response

Dr. Wes Ingwersen presented on the USEEIO State Models and Application. The work supports EPA's effort to promote SMM by states. States have expressed needs for economic input-output tables, environmental data for industry and states, and an ability to integrate with the USEEIO tool ecosystem. Development work on methods for state input-output tables ended in 2021. The USEEIO state model is structured with the state of interest and then the rest of the United States. The SSM State Prioritization Tool is analogous to the national tool and should soon be available to the public. Oregon was the first state to use the Consumption Based GHS-inventory. Dr. Ingwersen noted the challenge for states without GHS inventory data or input-output tables.

- **Derek Shendell:** Can you comment on the security features of the model, given the data inputs? What are the sources of data, and do they include economics, human health, environmental quality, and data from other agencies and organizations throughout the country? What are the public and private partnerships?
  - **Wes Ingwersen:** We are not too concerned about security because we use public data. We have intentionally made the choice to not use propriety data sources at the state and national level because we value transparency.
  - **Derek Shendell:** Groups wanting to use the model at the local level might have proprietary data.
  - Wes Ingwersen: We have a Department of Defense project that includes some proprietary data components. They have a way of using the data on their own protected device.
- Jay Golden: In the economic input-output (I-O) LCA, you are going to be dependent on NAX codes. There is new bipartisan legislation promoting biobase substitutes, but there are no NAX codes. Is that a hinderance? There has been talk on using North American Product Classification System (NAPCS) codes. How is EPA handling this?
  - Wes Ingwersen: I agree. Model accuracy depends on clear I-O definitions. Facilities are reporting by NAX codes. We take that data and associate it with the code and the I-O. Biobased products, in particular, are working off our model to make their model. For new biotechnology, there might not be separate data, so they instead have to use LCA studies or other modelling studies to estimate emissions. The better those are defined, the more accurate our models will be.
  - **Jay Golden:** Have any of your partners tried to link your model with the economic impact analysis for planning model IMPLAN?
  - Wes Ingwersen: IMPLAN is a widely used I-O model used for a lot of regional impact analyses, but it is a proprietary product. IMPLAN has used our environmental extensions because they have used environmental data. They pair our data with their model.

- **Mike Steinhoff:** Can you comment on the applicability? At what point in the model could you review the direct impact of purchasing compared to everything else? Where do we need to tweak the variable?
  - Wes Ingwersen: If they make changes and their purchases are technologies already represented in the model, then it is applicable. If they want to change production based on an existing technology, the SMM tools would be helpful because they are designed to provide an overarching view.
- Elen Irwin: As you become localized, there is a change in the margin and a need to understand marginal effects versus the average. At the local scale, you do not have the same purchasing power. Are you talking about all development underway in addition to future ideas? Have you tried to integrate with standard regional economic models, such as the CG model?
  - Wes Ingwersen: EPA's environmental economics work pairs with the SAGE model. They are starting at the same place. They have a lot of expertise in that area. Our plan has been to reach out to them and build off their expertise in the area. In response to your first question, there is a difference between consequential attribution of LCA and what kind of considerations we have to apply these models that have a local scale.
  - Elena Irwin: I am glad to hear you are in collaboration with the environmental economists.
  - **Matthew Naud:** Are the state people working directly with you at headquarters, or are they working with their regional partners?
  - Wes Ingwersen: We have been working directly with the states, more or less.

# Materials Life Cycle Applications and Tools – National Facts and Figures on Material, Waste, and Recycling Programs

### Dave Meyer, Chemical Engineer, Center for Environmental Solutions and Emergency Response

Dr. Dave Meyer introduced the EPA's Office of Resource Conversation and Recovery (ORCR) work on the Facts and Figures Reporting Program for communicating waste management. EPA had a desire to improve transparency and communication of municipal solid waste (MSW) models, provide critical analysis of MSW modeling approaches, fill data gaps regarding end-of-life processes for key materials of concern, and evaluate different metrics for recycling. The Facts and Figures Model is a complex blend of industry data, government data, and assumptions. He completed a model review and data quality assessment of the Facts and Figures model to address EPA's needs. Based on his findings, EPA decided to explore other waste management approaches. They are working on Waste Modeling Using an Input-Output Framework (SHC 7.2.2) as an alternative. They have a vision of using a USSEIO team to develop and test MSW estimation methods using an I-O platform. He concluded by reviewing next steps for supporting the Waste Management Program.

- **Mike Steinhoff:** Have you thought about the application of using inputs in the model versus other products for data analysis?
  - **Dave Meyer:** They are investigating available information to support their goals. I believe they are receptive to using different data to address needs.

- **Rainer Lohmann:** If people order supplies from outside of the United States, is that covered in your statistics?
  - **Dave Meyer:** There is not a lot of availability to track purchasing and source of purchasing, but we are working on that.
- **Rainer Lohmann:** Would your new approach include activities such as turning plastic into oil?
  - **Dave Meyer:** My colleague is speaking after me, and his presentation on plastics might address that. The definition of recycling is a challenging conversation we have held.
- **Matthew Naud:** When you are measuring recycling, are you evaluating the quality of materials recycled? How detailed is your data?
  - **Dave Meyer:** ORCR is working on a recycling guide. Traditionally, the numbers represent plastic tons but do not account for quality.
- Elena Irwin: Have you looked at what the European Union (EU) has done in terms of material flow accounts?
  - **Dave Meyer:** That is something we dream about. We are working towards bringing more EPA tools into a single platform. We are trying to make it into a federal collective.
- Jim Kelly: Why not mandate better reporting data instead of refining models?
  - **Dave Meyer:** The United States is the only developed world that lacks any sort of authority from Congress to collect waste statistics.
  - **Jim Kelly:** That sounds like a political issue rather than a data issue.
- **Matthew Naud:** There is a nongovernmental organization (NGO) in Detroit that is recycling electronic waste (e-waste). It has been closing the digital divide for people without access. Does your model help communities realize the benefits and equity of recycling?
  - **Dave Meyer:** I do not know if that is a focus in work on the community scale, but it could be something we learn from our work at the national scale.

## Developing Life Cycle Models for Managing Plastics

### Ray Smith, Chemical Engineer, Center for Environmental Solutions and Emergency Response

Dr. Ray Smith presented on developing life cycle models for managing plastics, including understanding material flows, processes, and potential consequences. He noted his discussion would focus on material flows of plastics, where generation is a combination of landfill, recycling, compost, energy recovery, and mismanaged waste. He stated modeling of reclaimers used by material recovery facilities (MRF) to describe resource reuse and environmental releases is useful for the USEEIO model and for ORCR's waste measurement program. He explained plastic pollution includes economic, human health, and environmental effects and discussed the example of Ohio's Lake Erie beaches, noting the generation of plastics since the 1950s has increased from two million tons per year to 368 million tons of plastic each year.

The newest law on the subject is the Save Our Seas (SOS) 2.0, which shows the importance of plastics and associated pollution. EPA responsibilities under SOS 2.0 focus on section 305,

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which reports on eliminating barriers to recycling. The National Recycling Strategy has three objectives to strengthen the United States recycling system, which include reducing contamination, increasing processing efficiency, and improving markets. Management approaches require an understanding of system flows and barriers to increased recycling, profile processes and impacts, and the harmful effects of polyethylene terephthalate (PET) in plastics. Dr. Smith explained the importance of Material Flow Analysis (MFA) for PET resin in future recycling calculations and discussed steps for reclaiming PET and removing unwanted impurities, noting this theoretical model could present an opportunity for better performance. He noted the process profiles, including resource use and emissions per metric ton of MRF and reclaimer feed, for electricity, diesel use, bailing wire, natural gas, sodium hydroxide, and other resources. Dr. Smith stated these systems are changing and acknowledged there are still many unknowns, but emphasized there are a variety of research opportunities available, including EPA's needs, China's "National Sword: policy, the Basel convention, the COVID-19 pandemic, pressure from the Ellen MacArthur foundation, brand commitments, and more. He concluded by stating chemical recycling, plastics 3-7, textiles, microplastics, and additives are major areas of on-going interest.

### Board of Scientific Counselors Subcommittee Discussion and Questions and Answers

### Courtney Flint, Chair, Sustainable and Healthy Communities Subcommittee

- Rainer Lohmann: Is PT reclaimer residue from a landfill or a result of burning?
  - **Ray Smith:** I was able to obtain that number from the National Association for PET Container Resources (NAPCOR). They study PET exclusively and reported this value, but did not explain what it is. I assume a fair amount is high density polyethylene caps and labels. PET in bales sorted by a reclaimer can really mess up the system. I think that is what the reclaimer residue is, but I am not sure.
  - Rainer Lohmann: Where would it then go, landfills or energy waste recovery?
  - **Ray Smith:** I do not know.
  - **Matthew Naud:** It depends on the communities, some of which still use incineration or cement kilns.
  - **Rainer Lohmann:** In studying recycling chemically, is there a way to determine the overall impact to evaluate whether there is a net positive end result?
  - Ray Smith: I do not have answers at this point, but it is of high interest.
- **Matthew Naud:** To what extent are robotics impacting the need to place materials into the proper bale? Is there an opportunity to tease out the role of technology versus public education?
  - **Ray Smith:** I think both avenues are important and worthy of pursuit. Educating consumers initiating recycling steps and ensuring communities are not receiving contaminated materials are key. An MRF robot could positively sort a bale rather than remove unwanted materials. One of the interesting aspects of technology is artificial intelligence, where systems can learn to operate more efficiently. There are also some combinations between the two in creating branding items.
- Leslie Rubin: To what extent do government policies influence these issues? And could you compare the United States to Europe in educating the public about concern for the environment? Are all these issues economic in nature?

- **Ray Smith:** I am not going to answer any policy questions. The economics of these systems is to make sure that incentives are aligned with what is important. The cost of merging plastics is lower than recycling, which is an issue. I an unable to discuss any comparisons between the United States and Europe.
- **Derek Shendell:** Teracycle has become popular for schools in New Jersey and New York. What is the role of such nonprofit organizations in your work?
  - **Ray Smith:** I have found numbers for MRF but have not found specific information on private streams of materials. If that grows, we might have to consider that in the future.
- Jim Kelly: Where should we focus efforts on improving this whole system?
  - **Ray Smith:** Forty percent of the United States does not have good access to recycling. The collection step and the infrastructure needed to collect materials might provide the answer. We need to be clear that systems are different across all of America. Encouraging development of products that only use a single plastic would be excellent, because mixed plastics have become a big issue. These are the largest issues.

# Food Waste Management Applications – Holistic and Foundational Organic Waste Management

# Shannon Kenny, Principal Deputy Associate Administrator, Office of Science Advisor, Policy, and Engagement

Shannon Kenny provided an overview of food waste research. Food waste is an issue that has gained a lot of attention because of its prevalence, its impact on the environment, and the establishment of 2015 U.S food waste reduction goals. The topic aligns with stakeholder needs and EPA priorities. The SHC 2019-2022 Food Waste Research Portfolio is meant to inform policy and stakeholders and includes the synthesis of State of the Science papers, which identify future research needs, original research, and environmental indicators. Topics discussed in the papers include food waste as a major contributor to methane emissions from landfills, the inability to accurately estimate how much landfill methane comes from food waste, and the need to reduce land, water, fertilizer, and energy waste and carbon dioxide emissions. If the United States meets the United Nations' goals of combatting food waste and halves food waste by 2050, there would be over a 14 percent reduction in emissions and resource use. Globally, per kilogram and per capita the United States is a major contributor to food waste, especially in comparison to other high-income countries. Prior research has explained the life cycle environmental benefits of food waste pre-processing technologies are unclear. Additionally, contamination of food waste streams by plastic and per- and polyfluoroalkyl substances (PFAS) is a barrier to increasing food waste recycling. The next step is to examine the EPA food recovery hierarchy and management pathways.

Dr. Catherine Birney discussed the environmental impacts of the United States food system, which involves all economic and household activities and their associated natural resource needs and potential environmental impacts required for the production, distribution, storage, preparation, consumption and disposal of food and beverages for people, pets, and all associated materials and wastes. Research objectives include identifying hotspots and opportunities for making the food system sustainable, evaluating life cycle impacts of food waste generation and management scenarios, and increasing availability of this food system model for user exploration via the SMM National Prioritization Tool. Future research should include refining the understanding of food waste contribution to landfill methane, building decision tools for generators and communities that consider local infrastructure and environmental impacts, quantifying environmental implications of sending food waste down the drain, gathering field data on PFAS species and concentrations in food waste streams after recent voluntary actions, and identifying and testing innovative food waste prevention strategies to maximize environmental benefits.

### Board of Scientific Counselors Subcommittee Discussion and Questions and Answers

Courtney Flint, Chair, Sustainable and Healthy Communities Subcommittee

- Jay Golden: When studying food waste, are you looking at the value chain from the farm to post use?
  - Shannon Kenny: Yes. We had to separate it into two different reports.
  - Jay Golden: There is a push by brands to add carbon intensity to labels. The communication analysis needs to include the linkages between the food waste.
  - Shannon Kenny: Most work to date has studied average factors in the United States. One underexplored piece is imports, and work conducted thus far in agriculture shows wide variations in the environmental impacts from one area versus another. We try to compare ourselves to the countries from which we import most often.
  - Jay Golden: Could we add this report to SharePoint?
  - Shannon Kenny: Yes, we will release it soon.
- Elena Irwin: Would you elaborate on the USEEIC model?
  - **Catherine Birney:** There are many different pathways and methods of food waste recovery. We plan to run different scenarios of these different pathways and study environmental impact scenarios.
  - Elena Irwin: You can run those scenarios with the model, but do you need to study the behavioral aspect also?
  - **Shannon Kenny:** Yes. The Agency is interested in the social science aspect. Lately we have been focusing on prevention and feeding the global population.
- **Rainer Lohmann:** Is PFAS in food waste linked to plastics?
  - Shannon Kenny: There is a coating on compostable materials that contains PFAS, but PFAS is also comes from other materials mixed in with food waste. People are not accustomed to separating materials well, which leads to this mixing.
- **Matthew Naud:** Is the Agency is using an urban model to study composting on urban land?
  - **Shannon Kenny:** I am unsure from a policy aspect, but from a science aspect we are discussing this and working on a unified effort in the future.
- Leslie Rubin: Would you comment on contamination associated with microplastics?
  - Shannon Kenny: There is enough data to say there are microplastics in our food, but we are unsure of its origina. We hope to explore policy issues associated with this in the next research plan.

- **Ray Smith:** One of my colleagues in CESER is working on microplastics in food, and the results from that research should be interesting.
- Charles Maurice: Before you have microplastics you have plastics, so it seems looking upstream is the way to approach this issue.
- Leslie Rubin: Are these islands of plastics in the ocean real?
- Matthew Naud: I believe they are real.
- **Rainer Lohmann:** They are areas of floating plastics, but not whole islands of plastic.

### Wrap-up Day 1

### Courtney Flint, Chair, Sustainable and Healthy Communities Subcommittee

Matthew Naud thanked the participants and subcommittee members for their contribution. He noted members can post their thoughts and any questions in the SharePoint site.

### Adjourn

The meeting adjourned at 4:15 p.m., Eastern Time.

### Friday, October 29, 2021

### Welcome – Day 2

The meeting reconvened at approximately 12:15 p.m., Eastern Time.

### **Board of Scientific Counselors Subcommittee Chair Opening**

### Courtney Flint, Chair, Sustainable and Healthy Communities Subcommittee

Dr. Barrett Ristroph introduced herself and welcomed participants to the second day of the meeting. She stated the previous discussion from Charge Question 1 was educational and she is intrigued about the discussion of Charge Question 2.

### **Public Comments**

Tom Tracy, Designated Federal Officer, Office of Science Advisor, Policy, and Engagement

Mr. Tom Tracy asked for public comments, but there were none.

### Implementation of Waste Recovery and Beneficial Use Research in the Center for Environmental Solutions and Emergency Response

Greg Sayles, Director, Center for Environmental Solutions and Emergency Response

Dr. Greg Sayles thanked everyone for their engagement on Day 1 and introduced topics for discussion on Day 2 before introducing Dr. Carlos Nunez.

### Charge Question 2: Increased Useability of Construction/Demolition Materials Research and the Leaching Environmental Assessment Framework

Carlos Nunez, Assistant Center Director, Center for Environmental Solutions and Emergency Response

Dr. Carlos Nunez introduced the first speaker for Charge Question 2, Susan Thorneloe. Ms. Thorneloe's work includes studying land fill emissions, sustainable materials management, fate

and transport of contaminants, and particularly development of support tools that help regulators and industries in evaluating future environmental policy options. She will discuss work on expanding the application of new methods to study waste treatment and the beneficial use of organics and PFAS. These methods support policy decisions arising from the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and other industries.

### Leaching Tests to Develop Source Terms to Evaluate Potential Leaching from Waste Beneficial Use, Land Disposal, and Treatment

## Susan Thorneloe, Senior Chemical Engineer, Center for Environmental Solutions and Emergency Response

Susan Thorneloe presented on equilibrium-based tests, percolation column tests, and mass transport rate tests to develop source terms to evaluate potential leaching from waste beneficial use, land disposal, and treatment. This research helps identify trends and appropriate treatment strategies. Materials tracked include inorganics and PFAS, biosolids, contaminated soil, and many other materials. Ms. Thorneloe defined leaching as the process by which constituents of a solid material are released into a contacting aqueous phase. She provided background information on leaching tests, highlighting past materials testing on leaching from 1960 to 1990 that investigated protection from hazardous wastes, the toxicity characteristic leaching procedure (TCLP), and the synthetic precipitation leaching procedure (SPLP). She explained how researchers use LEAF to evaluate the potential for leaching to support Resource Conservation and Recovery Act of 1976 (RCRA) and CERCLA waste management policy decisions regarding beneficial use, land application, waste treatment, and site remediation. She noted there is a free LEAF guide that discusses treatment, disposal, and remediation decisions and provides guidance for a uniform assessment process by defining the assessment scenario, the selection of test materials, evaluation of test data, and screening or scenario-specific release. Applications of LEAF evaluation include risk assessments on coal combustion and beneficial use in construction materials. Broader benefits of LEAF include improved accuracy of methods, better characterization of the behavior and variability of constituents of potential concern (COPC), and establishment of a consistent analytical framework.

### Board of Scientific Counselors Subcommittee Discussion and Questions and Answers

### Courtney Flint, Chair, Sustainable and Healthy Communities Subcommittee

- Leslie Rubin: What are the chemicals in fly ash, and what properties does it contribute to concrete?
  - **Susan Thorneloe:** There are a number of constituents within fly ash. We did not find any leachable elements in it. Our concern was whether a change in air pollution control causes harm in its use, but the data shows that cement is fine.
  - **Leslie Rubin:** What happens to concrete structures that are destroyed?
  - **Susan Thorneloe:** Examining the controlling factors is important. We study whether any cracking or erosion could lead to leaching in the future.
  - Leslie Rubin: How toxic are selenium and boron?
  - **Susan Thorneloe:** That is not my area of expertise. I add risk assessment values to models and make sure to use the appropriate numbers for toxicity.

- **Rainer Lohmann:** Could you explain the methods?
  - **Susan Thoreneloe:** During the mercury power rule, there was a push to use these methods to study inorganics. After that, we started to work on organics, which are much harder to study compared to inorganics. We took a chance and used our methods to study both materials, and it worked. We are endeavoring to study all constituents of concern.
- Jon Meiman: How have you incorporated the benefits for the future scale and any challenges you have seen with weathering?
  - **Susan Thorneloe:** We are modifying the screening software so we can examine changes over time. We are taking all of that into account in our work.

### Current and Future Focus for Leaching Environmental Assessment Framework

## Susan Thorneloe, Senior Chemical Engineer, Center for Environmental Solutions and Emergency Response

Susan Thorenloe presented on the current and future focus for LEAF, including validating new LEAF methods for evaluation of semivolatile organic compounds (SVOCs) and inorganic COPCs, supporting program offices in using LEAF to inform future regulations and policy decisions, developing and demonstrating LEAF as a framework for evaluating PFAS and leaching in impacted media, and deploying LEAF to support decisions regarding waste treatment, beneficial use, and land application. Validation helps ensure methods are standardized, provides reproducible results, and identifies and addresses any confounding factors. She described a study of the leaching potential of fresh and aged LEAF concrete slags marketed for aggregate residential groundcover relative to granite replacement aggregate. Results showed that the primary COPCs included chromium (Cr), iron (Fe), manganese (Mn), and vanadium (V), where LEAF slags have a higher fraction of fine particles in the reference granite, and the actual potential of hydrogen (pH) differed. The National Academy of Sciences is reviewing this work. The Office of Land and Emergency Management and EPA's Office of Water requested an evaluation with the state of Michigan of the leaching potential for PFAS and other biosolids. Validation of updated LEAF methods for evaluating both inorganics and SVOCs. Leveraging Department of Defense funding for developing methods for PFAS, leveraging DOE for data management software, and continuing support to regions and programs offices in use of LEAF and RCRA and CERCLA policy decisions.

### Board of Scientific Counselors Subcommittee Discussion and Questions and Answers

Courtney Flint, Chair, Sustainable and Healthy Communities Subcommittee

- **Mike Steinhoff:** What is the process by which the different materials get identified?
  - **Susan Thorneloe:** I respond to the program offices and regions quickly. It is based on the program offices and regions in considering what is important.
  - **Maureen Gwinn:** That is part of our strategic planning process, but we reevaluate every few years. We try to be as responsive as we can.
- **Rainer Lohmann:** What kind of materials are you considering for the new method development?
  - Susan Thorneloe: DOD is sending us three materials, which I assume is a form of contaminated soil, but I am not sure.

- **Rainer Lohmann:** The collaboration with DOD and the academics, does that fall into the LEAF paradigm?
- **Susan Thorneloe:** A proposal was sent and they wanted to use it. The novel method is LEAF with a focus on leaching.
- Rainer Lohmann: How are you navigating the organic and inorganic materials?
- **Susan Thorneloe:** We use a whole new configuration, using amber glass and no plastics, where we have gone through everything to make sure that we can recover everything. QA/QC is extremely important in this process.
- **Derek Shendell:** When you have contaminated materials with mold, fungi, or asbestos contamination, do you think about these in your process?
  - **Susan Thorneloe:** We don't do mold, but we do a range of contaminated materials. Europe looks at a comparison of the old material with what material will be used to replace it. You need to examine both the treated and untreated material to understand the treating effectiveness. We have not looked at material that has gone through water, but that is something that we might consider in the future.
- **Rainer Lohmann:** You had a chart with dioxins and does it include coal ash?
  - **Susan Thorneloe:** We can examine all of these constituents. It requires separate analytical trends which makes it expensive, but it is possible. The coal ash evaluation has been fully published, but other materials results are still being worked on.

### Technology-Enabled Construction and Demolition Debris Recovery

### Thabat Tolaymat, Engineer, Center for Environmental Solutions and Emergency Response

Dr. Thabat Tolaymat introduced the technology-enabled construction and demolition debris recovery. SHC will document and develop best practices to encourage the reuse and recovery of building materials from deconstruction and demolition. Dr. Tolaymat stated that 75% of the construction demolition debris material is recycled. End of life management tends to have barriers accounts for 25 percent of construction and demolition materials not recycled. The objective of SHC was to identify and describe emerging technology options that might advance or increase material recovery and recycling the in the future. LEAF is one of those technologies. Potential future innovations include using artificial intelligence (AI) to assist construction and demolition (C&D) recovery, evaluate deconstruction, and examine cross contamination.

- Jay Golden: Are waste tires a source of recycling for construction?
  - **Thabat Tolaymat:** We are not using waste tires, but we do make recommendations to communities on how to make construction durable. The problem with tires is that they are too large.
  - **Jay Golden:** Do you work with other organizations, such as Habitat for Humanity, that would love to receive C&D materials?
  - **Thabet Tolaymat:** Yes, we have. Habitat regularly receives large pieces of recycled lumber from houses.
- **Rainer Lohmann:** Do you know the origin of PFAS from the construction debris?
- **Thabet Tolaymat:** We have our theories. We believe it comes from carpets and other household products. A lot of landfill leachate goes directly into the groundwater.

- **Rainer Lohmann:** Are flame retardants an issue for the United States in C&D recycling?
- **Thabet Tolaymat:** Yes, and currently this is unregulated. If the chemical of question is outside of PFAS, we can advise against its use.
- **Rainer Lohmann:** You mentioned the 75 percent recycling rate. What is the certainty of these numbers, given they are often not current? What is the number you hope to achieve?
- **Thabet Tolaymat:** The 75 percent number is uncertain, but I do believe recycling of C&D is higher than the number provided. Fortunately for us, people do think about reusing materials as recycling and as a part of their business model. Drywall is a big problem. Trying to enhance the recycling of items such as drywall is better than doing nothing.
- Leslie Rubin: Hurricane Katrina affected many Superfund sites and refineries in Louisiana. To what extent is there an awareness of the effect of the residue from water that inundated these sites and then evaporated?
  - **Thabet Tolaymat:** The issue is well known, but we are not studying it. Are there others within the SHC program who could chime in?
  - Sarah Mazur: In Region 3 we have researched the effect of flooding in Superfund sites. There is also research on the impact of flooding in homes. I do not know if that answers your question.
  - **Maureen Gwinn:** The Department of Homeland Security might have conducted research in this topic area. I cannot say for sure whether we have researched this.
- Leslie Rubin: Is there any research on the residuals from fires in California?
  - **Thabet Tolaymat:** I know ORD is involved in evaluating fires and residues from fires, but I do not know how far along they are in this research.
- **Mike Steinhoff**: Is there potential for manufacturers to include radio frequency identification (RFID) tags in materials to enable tagging of contaminants?
  - **Thabet Tolaymat**: The idea is out there. Some patents to support that approach exist, but we have not seen it in practice.
  - **Mike Steinhoff:** Many communities I work with are wrestling with questions about labeling building materials so they can update building standards.
- Leslie Rubin: I read one article on how ancient Egyptians would reuse rather than waste materials. Use of materials from previous structures in new structures is not a new concept.
  - **Thabet Tolaymat:** Yes, it is not new, and people like it. The more people know about the potential reuse of home parts, the more it happens.
- Jay Golden: Are there incentives EPA can use to promote deconstruction?
  - **Thabet Tolaymat:** We worked in a home in Region 5 where resources were provided to the deconstruction process so it would be profitable.
- Susan Thorneloe: There are other programs that study resiliency in waste infrastructure. We are conducting interviews with 10 different communities across the country.
- **Maureen Gwinn**: In terms of wildland fire recovery, there is also work within the Agency and ORD. Details are on <u>EPA's wildfires web page</u>.

## Board of Scientific Counselors Subcommittee Deliberations and Summarize Back and Final Question and Answers

### Courtney Flint, Chair, Sustainable and Healthy Communities Subcommittee

Mr. Mike Steinhoff summarized the main ideas the BOSC discussed for Charge Question 1. They thought the research and work presented were impressive and appreciated the focus on characterization of impacts, waste flows, and state of knowledge. They were concerned about the generality of the research and would like to see specific use cases. They would have liked to understand how to better use resources and link them to practitioners. Dr. Leslie Rubin added they would have liked to have heard more about real-world applications and implications of the work. Dr. Elena Irwin noted the team had made excellent progress and BOSC SHC is impressed by how they integrated basic I-O models into other models. The tools are useful for identifying hotspots. Dr. Rubin mentioned the social components were illuminous in various parts of the conversation and wondered whether they should recommend incorporating these powerful human and economic components. Dr. Barrett Ristroph described how the group divided the charge question into two parts. They saw strengths in LEAF and its scope and were impressed with the work on C&D. They suggested adding other uncertainties to the models, such as climate change. They wanted to be sure the models incorporated different leachate rates and other uncertainties. They had questions about what point materials could no longer be reused. They were also interested in the recovery rate and whether EPA could clarify uncertainty in the rates. They wondered whether tracking items would indicate the recycling path. They were curious about dissemination of materials. Dr. Rainer Lohmann emphasized the importance of dissemination for practitioners.

- Leslie Rubin: To what extent does climate change apply to the charge question?
  - **Barrett Ristroph:** We understand there is research currently happening in parallel to this. Is your question about disasters or how to diseeminate information?
  - **Maureen Gwinn:** There is work in our sister program in terms of natural disasters. We are working closely with them so as not to duplicate work. Particularly with community resilience work, there will be collaboration between SHC and Homeland Security (HS). ORD is studying how to share information with end users and plans more translational work across the board. Let us know if it would be helpful for us to share information about what we are doing in HS.
- Leslie Rubin: To what extent is there a forum for collaboration on these overlapping issues?
  - **Maureen Gwinn:** We are putting together a process for reviewing these crosscutting issues across the different research programs. We are trying to make sure we have in place redundant communication systems.
- **Barrett Ristroph:** Should each of the charge questiosn have their own meetings?
  - **Tom Tracy:** If you need assistance organizing a meeting, let Taylor Lass or I know. There is a meeting on November 12<sup>th</sup> and a follow up meeting on the Friday after.
  - **Barrett Ristroph:** When is the report due date?
  - Tom Tracy: I was hoping early December.

• Matthew Naud: My suggestion is to complete work by November 12<sup>th</sup> and only meet the next week if we are unable to finish then.

### Adjourn

The meeting adjourned at 4:30 p.m., Eastern Time.

### Friday, November 12, 2021

### Welcome – Follow up

The meeting convened at approximately 11:00 a.m., Eastern Time.

### **Board of Scientific Counselors Subcommittee Chair Opening**

### Courtney Flint, Chair, Sustainable and Healthy Communities Subcommittee

Matthew Naud welcomed everyone to the BOSC SHC follow-up meeting. He noted the agenda would focus on whether any BOSC SHC members had questions or comments for EPA and vice versa. He opened the floor to questions and public comments.

### **Public Comments**

### Tom Tracy, Designated Federal Officer, Office of Science Advisor, Policy, and Engagement

Mr. Tom Tracy asked for public comments, but there were none.

### Board of Scientific Counselors Subcommittee Discussion and Questions and Answers

- **Rainer Lohmann:** For Charge Question 2, are there any documents describing collaboration with specific tribal or state programs?
  - **Maureen Gwinn:** We have been working closely with states and tribes, but I cannot think of any examples to provide.
  - Susan Thorneloe: We have such examples on the leaching front, but if you are only asking about C&D I do not have any examples. We have worked closely with state and solid waste management officials, so we have made sure that everyone is aware of these new methods, and we are developing new documents. For LEAF we have developed software to help people with data management and visualization. We have also developed a guide to understanding these methods. We have demonstrated the way we used to evaluate leaching is not reliable, so we are collaborating with the Department of Defense (DOD) and Department of Energy (DOE). We could reach out to tribal communities in the future. This would be a huge change for states, so we are aware we have to reach out to everybody to help out.
  - **Maureen Gwinn:** Generally we do C&D work with states and tribes, but it has not been a priority in our discussions this year. If you are aware of anything in that space that would be beneficial, please let us know.
  - **Carlos Nunez:** That is accurate. Some of the research is done broadly to serve the Office of Land and Emergency Management (OLEM), so they might reach out to

different communities, but I cannot recall any research designed and communicated directly to tribes.

• **Susan Thorneloe:** We realize that once we develop something, we are invested in working with everybody, including states and tribes.

# Board of Scientific Counselors Subcommittee Deliberations and Summarize Back and Final Question and Answers

Courtney Flint, Chair, Sustainable and Healthy Communities Subcommittee

Charge Question 1 Breakout Group: Improvements to U.S. Environmentally-Extended Input-Output Life Cycle Model and Increased Useability of Life Cycle Inventories and Methodologies

Charles Maurice, Associate National Program Director, Sustainable and Healthy Communities Research Program

Mr. Matthew Naud described BOSC SHC recommendations from the Charge Question 1 group. First, BOSC SHC recommends that ORD investigate how they can adjust the USEEIO model for additional considerations, including Social and/or Consequential Life Cycle Analysis (LCA) that also incorporates ecosystem services. Additionally, ORD could puruse applications that combine the right set of impact indicators in the USEEIO model with other types of economic models, including the Computable General Equilibrium (CGE) and/or econometric models that are able to account for the effect of price changes on consumption and production decisions.

Second, BOSC SHC recommends that ORD partner with appropriate government agencies, including Census, the United States Department of Agriculture (USDA), and DOE to evaluate an update to North American Industry Classification System (NAICS) codes to include biobased feedstocks, biobased products, and sustainabile chemistry to ensure that these beneficial alternatives are represented in the model.

Third, BOSC SHC recommends ORD and regional partners develop a communication and outreach strategy for end users and practitioners to highlight the utility of the USEEIO model, answer practical questions, and improve the environmental literacy of the general public to understand the utility of Life Cycle Analysis (LCA). Additionally, ORD should work with the network of university LCA researchers to include the USEEIO model in their curricula so that increased exposure to the USEEIO model via university courses leads to increased use of these methods by trained practitioners.

Fourth, BOSC SHC recommends ORD engage with standard setting and capacity building for states, such as the United States Climate Alliance and EPA State and Local Programs Office, to shape how state level greenhouse gas inventories and other impact assessments are performed and reported in order to facilitate continuous updates of the State-EEIO with high quality updates that capture differences in the carbon intensity of the economics of states enacting low-carbon and resource efficient policies.

• Leslie Rubin: Matt did a fantastic job of representating our group's thoughts and recommenations.

- **Rainer Lohman:** There are sub-recommendations within the recommendations, which is a bit of a stretch.
- **Michael Steinhoff:** I cannot remember whether we previously only had one recommendation or multiple recommendations. Perhaps Charge Group 1 needs a primary recommendation and the others can be suggestions instead.
- **Derek Shendell:** I like them all, but if you are thinking about cutting the number down, consider they are separate issues. How much attention do you want to focus on each point?
- **Matthew Naud:** We typically have a core set of recommendations. We can finalize and share them with you before submission.
- Jay Golden: I could help combine the first and second recommendations.
- **Matthew Naud:** That would be wonderful, thank you.
- **Susan Thorneloe:** We have a community-specific model for developing solid waste plans that involves environmental justice and economic issues. It is important to increase education and use these models at universities so people better understand life cycle assessments.
  - **Matthew Naud:** Especially for those of us working directly with communities, we do not see a lot of innovation happening at the state level. Instead, regional groups or organizations decide to tackle climate change and conduct the novel, analytical work.
  - **Maureen Gwinn:** The recommendations are all within the realm of the ORD's interest. There can be challenges working with other federal agencies when we do not know their bandwidth, so I appreciate the suggested partners and flexibility in working with others. Across the program, we want to promote education in communities, whether that is through trainers or videos.
  - **Matthew Naud:** Historically, we have tried to stay within SHC. We wanted to be sensitive in our suggestion about partnering with other agencies. You do not set the NAICS code, but perhaps you could explore collaborations with federal partners who have control.

### Charge Question 2 Breakout Group: Increased Useability of Construction/Demolition Materials Research and the Leaching Environmental Assessment Framework

# Carlos Nunez, Assistant Center Director, Center for Environmental Solutions and Emergency Response

Dr. Barrett Ristroph explained Charge Group 2's recommendations were less about science and more about research dissemination, which is powerful work. She hopes communities are able to take advantage of the research and use it in meaningful ways. BOSC SHC recommends EPA develop a definitive dissemination plan to present the results of both LEAF and C&D research to industry and local decision makers in a "user-friendly" manner so that by local decision makers and companies can effectively use the information. Additionally, EPA should consider expanding the LEAF model to include a broader range of climatic conditions potentially

impacting leaching of chemicals of concern. This includes diverse conditions that currently exist across the United States and any future conditions that occur as a result of climate change.

- **Maureen Gwinn:** Thank you for these recommendations. Our program hopes to review models with a climate change lens. It is one thing for us to develop tools, but our goal is to share our work.
  - Susan Thorneloe: I agree. These are helpful reommendations.
  - **Leslie Rubin:** When we were compiling our list of recommendations, the term "environmental literacy" arose. These recommendations emphasize the real-world value.
  - Susan Thorneloe: It is crucial to partner with universities and educate people.
  - **Matthew Naud:** I have been trying to share LEAF work with the state of Michigan.
  - **Rainer Lohman:** Regarding the second recommendation, is there limited availability of tools due to outreach and communication issues, or does the model not properly reflect environmental conditions?
  - **Susan Thorneloe:** The model includes actual conditions and relationships to certain materials. We are trying to update our system, include inorganics and PFAS, and work across national laboratories.

Mr. Naud noted he, Michael Steinhoff, and Barrett Ristroph would finish editing the document and distribute it to everyone for a final review before submitting the recommendations to the Agency. He concluded the meeting by thanking the SHC subcommittee and Agency staff members for all their work.

### Adjourn

The meeting adjourned at 1:15 p.m., Eastern Time.

### Appendix A: Agenda

### United States Environmental Protection Agency Board of Scientific Counselors (BOSC) Sustainable and Healthy Communities Subcommittee Waste and Sustainable Materials Management Research

Meeting Agenda – October 28-29, 2021

Virtual

### Thursday, October 28, 2021 Eastern Time

TIME (EST)	TOPIC	PRESENTER
12:00 - 12:15 PM	Sign on and Technology check	
12:15 - 12:25	Meeting Kickoff / FACA Rules / Expectations / Logistics	<b>Tom Tracy</b> , Designated Federal Official (DFO), EPA Office of Research and Development (ORD) Office of Science Advisor, Policy, and Engagement (OSAPE)
12:25 - 12:40	Welcome	<b>Chris Frey,</b> ORD Deputy Assistant Administrator for Science Policy
12:40 - 12:50	Subcommittee Chair Opening Remarks and Introductions	<b>Courtney Flint</b> , Chair, BOSC Subcommittee
12:50 - 1:10	SHC Opening Comments	Maureen Gwinn, ORD National Program Director for SHC
1:10 - 1:25	Research Implementation Engagement between ORD and OLEM	Carolyn Hoskinson, Director, Office of Resource Conservation and Recovery (ORCR / OLEM)
1:25 – 1:35	Implementation of Life Cycle Models, Inventories, and Methodologies Research in CESER	<b>Greg Sayles</b> , Director, ORD Center for Environmental Solutions and Emergency Response (CESER)
1:35 - 1:50	15-Minute Break	
<u>Charge Question 1</u> : Improvements to USEEIO life cycle model and increased useability of life cycle inventories & methodologies		
Charles Maurice Associate National Program Director for SHC		
1:50 - 2:05	USEEIO national models and applications	Wes Ingwersen, CESER
2:05 - 2:20	USEEIO state models and applications	Wes Ingwersen, CESER

### EPA BOSC Sustainable and Healthy Communities Subcommittee October 28–29 and November 21, 2021 Meeting Minutes

TIME (EST)	TOPIC	PRESENTER
2:20 - 2:35	BOSC Subcommittee Discussion and Q/As	<b>Courtney Flint</b> , Chair, BOSC Subcommittee
2: 35-2:50	Materials life cycle applications and tools - National facts and figures on material, waste, and recycling programs	Dave Meyer, CESER
2:50 - 3:05	BOSC Subcommittee Discussion and Q/As	<b>Courtney Flint</b> , Chair, BOSC Subcommittee
3:05 - 3:20	Developing life cycle models for managing plastics - Understanding material flows, processes, and potential consequences	Ray Smith, CESER
3:20 - 3:35	BOSC Subcommittee Discussion and Q/As	<b>Courtney Flint</b> , Chair, BOSC Subcommittee
3:35 - 3:50	Food waste management applications - Holistic and foundational organic waste management	Shannon Kenny, OSAPE
3:50 - 4:05	BOSC Subcommittee Discussion and Q/As	<b>Courtney Flint</b> , Chair, BOSC Subcommittee
4:05 - 4:15	Wrap-up Day 1	<b>Courtney Flint</b> , Chair, BOSC Subcommittee

### Friday, October 29, 2021 Eastern Time

TIME (EST)	TOPIC	PRESENTER
12:00 – 12:15 PM	Sign on and Technology check	
12:15 - 12:20	BOSC Subcommittee Chair Opening	<b>Courtney Flint,</b> Chair, BOSC
	Remarks	Subcommittee
12:20-12:30	Public Comments	Tom Tracy, DFO, OSAPE
12:30 - 12:40	Implementation of Waste Recovery and Beneficial Use Research in CESER	Greg Sayles, CD, CESER

### <u>Charge Question 2</u>: Increased useability of construction/demolition materials research and the Leaching Environmental Assessment Framework (LEAF)

	<b>Carlos Nunez</b> Assistant Center Director, CESER	
12:40-12:55	Leaching Tests to develop source terms to evaluate potential leaching from waste beneficial use, land disposal, and treatment	Susan Thorneloe, CESER
12:55 – 1:10	BOSC Subcommittee Discussion and Q/As	<b>Courtney Flint</b> , Chair, BOSC Subcommittee

## EPA BOSC Sustainable and Healthy Communities Subcommittee October 28–29 and November 21, 2021 Meeting Minutes

TIME (EST)	TOPIC	PRESENTER
1:10 - 1:25	Current and future focus for Leaching Environmental Assessment Framework (LEAF)	Susan Thorneloe, CESER
1:25 – 1:40	BOSC Subcommittee Discussion and Q/As	<b>Courtney Flint</b> , Chair, BOSC Subcommittee
1:40 - 1:55	15-Minute Break	
1:55 - 2:10	Technology-Enabled Construction and Demolition Debris Recovery	Thabet Tolaymat, CESER
2:10 - 2:25	BOSC Subcommittee Discussion and Q/As	<b>Courtney Flint,</b> Chair, BOSC Subcommittee
2:25 - 2:35	Wrap up Day 2	<b>Courtney Flint,</b> Chair, BOSC Subcommittee
2:35 - 4:00	BOSC Subcommittee Deliberations	<b>Courtney Flint,</b> Chair, BOSC Subcommittee
4:00 - 4:30	BOSC Subcommittee Summarize Back and Final Q/As	<b>Courtney Flint,</b> Chair, BOSC Subcommittee

### Friday, November 12, 2021 Eastern Time

TIME (EST)	TOPIC	PRESENTER
11:00 – 1:15 PM	Public Comments, Discussion, and Summary	BOSC Subcommittee

### Appendix B: Participants

### EPA Designated Federal Official (DFO): Tom Tracy, Office of Research and Development

### **Presenters:**

Matthew Naud, Vice Chair, Board of Scientific Counselors (on behalf of Courtney Flint, *Chair, Board of Scientific Counselors*) Chris Frey, Deputy Assistant Administrator for Science Policy, Office of Research and Development Maureen Gwinn, Director, Office of Research and Development Carolyn Hoskinson, Director, Office of Resources Conservation and Recovery Wes Ingwersen, Environmental Engineer, Center for Environmental Solutions and Emergency Response Shannon Kenny, Principal Deputy Associate Administrator, Office of Science Advisor, *Policy, and Engagement* Dave Meyer, Chemical Engineer, Center for Environmental Solutions and Emergency Response Greg Sayles, Director, Office of Research and Development, Center for Environmental Solutions and Emergency Response Ray Smith, Chemical Engineer, Center for Environmental Solutions and Emergency Response Susan Thorneloe, Senior Chemical Engineer, Center for Environmental Solutions and Emergency Response Thabat Tolaymat, Engineer, Center for Environmental Solutions and Emergency Response Tom Tracy, Designated Federal Officer, Office of Science Advisor, Policy, and Engagement

### **Other EPA Attendees:**

Souhail Al-Abed
Lara Beaven
Norman Birchfield
Catherine Birney
Conner Burke
David Carson
Giles Chickering
Swarupa Ganguli
Michael Gonzalez

Intaek Hahn Priscilla Halloran Cheryl Hawkins Terra Haxton Annelise Hill Thomas Holdsworth Anne Holleran Taylor Lass Nick Loschin Charles Maurice Sarah Mazur Carlos Nunez Teri Richardson Bruce Rodan Mary Ross Gerardo Ruiz-Mercado Darcie Smith Valerie Vines

### **Other Participants:**

David Dunlap Jay Golden Kimberly Gray Elena Irwin Lucinda Johnson James Kelly Jake Kennedy Stephani Kim Rainer Lohmann Jonathan Meiman Taylor Meredith Donald Nelson Barrett Ristroph Leslie Rubin Derek Shendell Charlotte Singleton Michael Steinhoff Linda Wilson

### **Contractor Support:**

Canden Byrd Denyse Marquez Sanchez Afroditi Katsigiannakis Kathryn Van Artdalen

### Appendix C: Charge Questions

**Charge Question 1**: SHC expanded its research on life cycle inventories and methodologies in response to OLEM, regional, and state priorities under the Resource Conservation and Recovery Act (RCRA), which focuses on reducing material use at the source and recovering and reusing valuable materials from waste streams. ORD is focusing on the development of US-Environmentally-Extended Input-Output (USEEIO) economy-wide life cycle models to support key functionalities of various waste reduction, recovery, and reuse tools, as well as potential refinements or enhancements to the underlying datasets and models of those tools. What recommendations does the BOSC have to improve ORD's USEEIO life-cycle model? What recommendations can the BOSC SC offer to facilitate increased usability of ORD's life cycle inventories and methodologies by EPA and state- or tribal-delegated programs?

**Charge Question 2**: SHC expanded its research on waste recovery and beneficial reuse in response to OLEM's priorities of improved methods for sorting construction and demolition materials for reuse, and regarding source-term development to evaluate potential leaching from beneficial use, land disposal, and remediation. ORD research addresses effective and efficient materials reuse, protecting health and the environment while reducing natural resources consumption, waste generation, and the volume of materials disposed into landfills. What recommendations can the BOSC offer to facilitate increased usability of ORD's construction and demolition materials research by EPA and state- or tribal-delegated programs? What recommendations can the BOSC offer to improve future leaching predictions through increased use of the Leaching Environmental Assessment Framework (LEAF)?