

**EPA Region 5 Science Integration for Decision Making Fact-Finding Interviews**  
**January 22, 2010**  
**77 West Jackson Blvd.**  
**Chicago, IL**

Four members of the SAB Committee on Science Integration for Decision Making conducted three interviews in EPA Region 5: Drs. James Johns, Catherine Kling, and Thomas Theis in person and Dr. Wayne Landis by telephone. For each interview, Dr. Anthony Maciorowski, Deputy Director of the SAB Staff Office, provided a brief introduction to the purpose of the interview and the Designated Federal Officer, Dr. Angela Nugent, took notes to develop a summary of the conversation. All interviewees were provided a copy of the committee's Preliminary Study Plan in advance.

Dr. Maciorowski noted in each interview that the purpose of the interview was to help SAB Committee members learn about Region 5's current and recent experience with science integration supporting EPA decision making so that the SAB can develop advice to support and/or strengthen Agency science integration efforts. Dr. Maciorowski thanked participants for taking time for the interviews and thanked Dr. Carole Braverman for serving as liaison with the SAB Staff Office in planning the interviews

**Meeting with Acting Regional Administrator and Acting Deputy Regional Administrator (9:45 a.m. - 10:30 p.m.) Participants**

Mr. Bharat Mathur, Acting Regional Administrator  
Dr. Walter Kovalick, Acting Deputy Regional Administrator

The Acting Regional Administrator observed that EPA regions share several common features in their approach to science. They depend on headquarters offices for science, technical assistance, and guidance; they do communicate across regions; and they all have regional-specific science councils.

Region 5 uses science across all its media programs and many different activities (e.g., permits, inspections, and clean-ups). In some cases, "science is prescriptive," as in the air program, where there are EPA- approved methods. In other programs, Superfund and RCRA, for example, there is more flexibility in the interpretation of EPA methodologies and choice of modeling methods.

Typically, the Regional Administrator and Deputy Regional Administrator become involved in problem formulation when an issue involves complex, novel, or controversial science. The region delegates other types of problem formulation down the management chain. The region fosters an environment where Region 5 staff is able to pursue "true science" without some of the political pressures program offices may experience at headquarters. This situation may foster a bit of inflexibility, where a region 5 scientist may not view "outside science" (e.g., sometimes new science from other regions, or from regulated entities) as initially credible. There is a tension between the need for consistency within EPA and concern that consistency may sacrifice keeping pace with evolving state of the science outside EPA. Region 5 scientists

typically keep abreast of scientific and technical literature in their fields and integrate information from published literature into regional strategies, such as the region's refinery initiative. One area for expansion may be in the area of economics. There may also be a need for Region 5 to consider economics more than it currently does in the formulation of different kinds of decisions.

Although the region does not conduct hypothesis-based research, it applies and generates scientific information. Regional scientists develop new analytical methods for EPA and compete and win ORD RARE and monitoring grants.

To create an atmosphere where science is a major input for decision making, the region tries to hire "smart people" with an ability to network with scientists across the agency; "interfere as little as possible" in their work; and consistently send the message that Region 5 relies on the "best science and the best law" to protect the environment. With 1,200 employees, Region 5 is the largest region. It has a 3% annual turnover; departures generally occur among the "Millennials" (employees in late 20's) and employees in the 40-50-year-old range. The regional Science and Technology Council develops programs and seminar series to benefit Region 5 and "refresh scientists." Region 5 has developed an orientation program for "Millennial" employees designed to inform them about different programs (and possible career opportunities) in the regional office. There is a need to recruit new scientific and technical staff with a holistic approach to environmental protection. Environmental science departments increasingly train students with a broad perspective, so that new graduates have backgrounds not only in their specific disciplines, but also in information technology and teamwork.

Region 5 also has a need for scientists who have an ability to listen to and assimilate public input and interact with communities. There's a need for new mechanisms for encouraging exchange of ideas with the public beyond traditional public meetings with the usual follow-up "responsiveness summary". There is a need to teach these skills and for leaders to encourage them.

The region finds it difficult often to find a match between ORD's research and regional science needs. Region 5 is now exploring a possibly larger role in ORD's choice of topics for solicitation of grants and is in the process of reviewing STAR grants awarded in the Region over the past ten years to connect Regional scientists with relevant research and to identify possible speakers for a new seminar series. Overall, there is a need for a system where regional needs get adequate priority or possibly a new role for ORD, where they can be a broker, pointing to other agencies that can provide regions with needed science. Where Region 5 has strong relationships with ORD, as with its Duluth laboratories, the relationship usually springs from personal contacts among scientists and is not institutionalized as an important agency function.

The Acting Deputy Regional Administrator also provided the committee members with a publication summarizing Region 5 efforts to promote innovative technologies and a summary of FY 2009 Region 5 Science & Technology Council Accomplishments (see Attachment A).

**Meeting with Region 5 Senior Managers (10:30 a.m. - 12:00 p.m.) Participants.**

Mr. Doug Ballotti, Deputy Director Superfund Division  
Mr. Jose Cisneros, Remediation and Reuse Branch Chief, Land and Chemicals Division  
Mr. Dave Cowgill, Program Manager, Great Lakes National Program Office  
Ms. Jerri-Anne Garl, Materials Management Branch Chief, LCD  
Ms. Linda Holst, Water Quality Branch Chief, Water Division  
Mr. Dean Maraldo, Wetlands and Watersheds Deputy Branch Chief, Water Division  
Mr. Bruce Sypniewski, Deputy Director Air and Radiation Division  
Ms. MaryPat Tyson, Air Toxics and Assessment Branch Chief, Air and Radiation Division  
Mr. Alan Walts, Director Office of Enforcement and Compliance  
Mr. Dennis Wesolowski, Director Chicago Regional Lab

Managers provided perspectives on science integration from different program areas. The air program responded to a state request to define an exceedance, which could have had an impact on a PM non-attainment decision, as an "exceptional event." Region 5 conducted unusual analyses, engaged cross-disciplinary experts (e.g., meteorology, chemistry, monitoring), and requested additional sampling to make a determination of whether the exceedances related to a fireworks display. Analysis of the data point was critical to a significant decision and merited a high level of scrutiny. Region 5's efforts led to national committee to develop science methods (e.g., protocols, quality assurance, audits, procedures for monitoring for bias) to support determinations for exceptional events,

Remediation programs take a team approach to science integration. For Superfund and RCRA clean-ups, teams of biologists, chemists, engineers, geologists, and toxicologists typically meet to scope the problem and problem solving is tailored to issues at particular sites. Region 5 scientists reach out to state counterparts and scientists in the Fish and Wildlife Service and the U.S. Geological Survey. One area for improvement may be to develop skills for communicating with and listening to communities affected by clean-up sites.

The Superfund Program is not a delegated program. The Region 5 Division Director signs Records of Decisions resulting from evaluation and assessment of risks at sites. The Superfund Program relies on Headquarters guidance for human health and ecological risk assessment and decisions based on that analytical process have huge impacts. Costs can be in the billions. The nation's largest river remediation site is the Fox River in Wisconsin, which will likely take 15 years to remediate. In making decisions, managers consider the cancer slope factor and RfD for the relevant chemicals. In the case of the Fox River, exposure concern related to human fish consumption and contamination through sediments. Region 5 did generate an ecological risk assessment, but human health concerns drove the clean-up decision. The Superfund program mandates community involvement at multiple steps.

EPA does not conduct a formal benefit-cost analysis. Instead it considers the benefits of different remedial options, against the cost and time for recovery. Region 5 managers find it difficult to communicate the cost-effectiveness of different options to the public.

Region 5's enforcement office looks for science to support cross-cutting issues, such as environmental justice, cumulative risk, and community based risk assessment. Science offers a tool for targeting work of enforcement programs on higher levels of risk. Science needs for this work include

- Need for simpler analytical tools for problem formulation.
- Need to link cumulative risk analysis to more holistic problem solving than just to a list of actions that individual programs can take
- Need for process for developing methods to address emerging issues
- Investment in validation of analytical methods by multiple laboratories.

Region 5 has a Materials Management Branch, which relies on scientific information for a voluntary program aimed at preventing hazardous materials from entering the environment and encouraging reuse, recycling, and safe waste disposal. Science needs include:

- Information on emerging chemicals
- Research on lifecycle analysis
- Information on beneficial use of coal ash and a variety of building materials
- Social science for communicating technical information and risk communication

Region 5 includes the Great Lakes National Program Office (GLNPO), whose main mission is to track and report the health of the Great Lakes and to work with Canadian government, states, tribes, and other federal agencies on Great Lakes issues. The region supports two research vessels, the Lake Guardian, which monitors well-mixed water trends and the Mud Puppy, which monitors sediments. The program also has a clean-up component and administrators a new fund (\$475 million) for Great Lakes Restoration, of which \$250 will be transferred to other federal agencies and other funds will be awarded through grants. The overall focus is on actions to improve the Great Lakes.

Science issues range widely. Air deposition forces consideration of environmental issues on a continental scale. Each Great Lake has separate issues. Invasive species are an important concern, raising new scientific questions for which policy has not been established (e.g., the validity and use of tests for environmental DNA in water related to possible presence of Asian Carp). There are multiple mechanisms for public involvement. The Great Lakes Restoration Initiative arose from environmental concerns throughout the basin. Each lake has a community involvement group, as do 30 coastal cities, known as "Areas of Concern". The State of the Lakes conferences work on developing indicators, and sharing research results with government managers. GLNPO now is looking to states, cities, port authorities, and industries as sources of cost sharing for sediment clean-up efforts, however states have great difficulty generating the non-Federal match. GLNPO finds it challenging to communicate the benefits of sediment clean up to help persuade potential partners and has identified the need for economic science related to ecological valuation.

For the Water Quality Standards program, the principal science integration issue is lack of data. One success story, where Region 5 worked across disciplines and organizations to fill a key data gap, involves sulfates. EPA's existing water quality criteria for sulfate was set at a level designed only to protect livestock from drinking water contaminated by sulfates. EPA has no

national criteria recommendation for sulfates to protect aquatic life. Environmental groups asked Region 5 to review and object to state of Illinois NPDES permits for mine wastes contaminated by sulfates because Illinois EPA was issuing mining permits based on a less stringent alternative effluent standard for sulfate, rather than limits based on the sulfate water quality standard. Upon review, EPA agreed and the Agency objected to the issuance of numerous subsequently proposed permits. As a result, Illinois EPA backlogged the issuance of more than 80 existing mining permits and permits for six new mining facilities because the applicants could not comply with water quality-based effluent limits to meet Illinois' water quality standard for sulfate. The issue became controversial as coal companies contacted the Administrator and Regional Administrator about permit delays.

To address the problem, Region 5 collaborated over 10 months with a diverse group (including Office of Water scientists, a representative from ORD's Duluth laboratory who authored EPA's aquatic guidelines, a representative of the coal company and their contractor, and environmental groups) to develop a new assessment of the science, including a review of the literature and new toxicity data. The resulting assessment determined that sulfate toxicity is affected by chloride and water hardness and resulted in complex criteria equations that the state adopted, were approved by EPA and that the "coal companies and environmental groups could live with." Several other states are working to adopt the approach. The effort was successful because EPA kept the focus on defensible criteria that were protective of aquatic life and was open to new information.

Regulatory time constraints impose a significant barrier for science integration in the Total Maximum Daily Loads (TMDL) program. States assess waters every 2 years to determine impaired waters [i.e., waters that do not meet state standards and designated uses and that are listed on the states 303(d) list]. If waters are impaired, states must develop a TMDL for point sources of pollution. Region 5 has 30 days to review and approve proposed states' proposed lists. This is a challenging timeframe because waters can be complex. Region 5 has asked states for draft copies of the list so there will be additional time for the review.

Review of TMDLs can involve significant integration of science and data from multiple sources. Last year, for example, Region 5 disapproved a portion of the proposed list provided by Illinois, which wanted to remove nitrogen impairments, on the rationale that nitrogen was not an environmental problem. Region 5 worked with Office of Water experts and academic contacts to develop a rationale for disapproving that action.

The TMDL program uses its grant-making authority to build science capacity at the state level. It has awarded grants to help the State of Wisconsin work with local communities and the University of Wisconsin to develop the science base for TMDL decisions, especially for non-point source. Region 5 also recognizes the need for social science to build understanding of best management practices that can reduce non-point source pollution.

**Meeting with Region 5 Scientific Staff (1:30 p.m. - 3:00 p.m) Participants**

Dr. Carole Braverman, ORD Regional Science Liaison

Dr. James Chapman, Ecologist, Superfund Division

Mr. Chris Choi, Superfund Division

Mr. Michael Compher, Environmental Scientist, Air and Radiation Division.  
Ms. Kimberly Harris, Team leader for the multimedia perfluorinated chemicals (PFC),  
Water Division.  
Dr. Mario Mangino, Toxicologist and risk assessment specialist, Land & Chemicals  
Division  
Mr. Bob Newport, Environmental Protection Specialist, Water Division  
Ms. Michele Knox Palmer, Region 5's Science and Technology Coordinator  
Mr. Randy Robinson, Regional Meteorologist, Air and Radiation Division  
Mr. Paul Ruesch, Environmental engineer, Land & Chemicals Division  
Dr. Maryann Suero, Children's Health Program Manager, Land and Chemicals Division  
Ms. Louann Ungar, Environmental Engineer, Water Division  
Dr. Luanne Vanderpool, Geologist, Superfund Division  
Dr. Mary White, Ecologist, Land and Chemicals Division

The first participant described how staff scientists both apply science in ways approved by national program offices (e.g., through use of approved models), and develop science where national guidance does not fit.

Impediments to science integration across all the categories of interest to the SAB committee include:

- Difficulty in communicating uncertainties
- Short time frames for science to support decisions.
- Limited resources
- Limited data to support decisions (because of limited time and resources)
- Limited public interest in ecological risk, as compared with human health risks
- Limited interaction in some programs between risk assessment staff and decision makers. Some staff report decision making as a "black box experience;" scientific input goes to a project manager and division directors make decisions, but technical staff don't know how the decision was made
- Outdated IRIS assessments
- Annual commitment measures that create barriers to adoption/testing of new approaches, such as ecosystem services
- Need for science approaches for cross-program initiatives like children's health (e.g., EPA is not using tools consistently, building a common strategy for using public health data)
- Difficulties learning about ORD research efforts underway, ORD experts regions can tap, and ORD products relevant to regional needs.
- Lack of Regional expertise in energy and environmental impacts
- Reduced size of Region's traditional library; lack of awareness about how to use on-line library tools; difficulty of finding scientific information in EPA's on-line dockets
- Limited hiring of new staff; especially expertise at a senior level
- Lack of succession planning to replace experienced staff who retire
- Lack of travel money and time for professional conferences
- Lack of advancement and promotion potential for scientific staff

Factors that help science integration across all the categories of interest to the SAB committee include:

- Information exchange with states, ORD.
- Information exchange with OAQPS on air modeling issues
- Information exchange through the Groundwater Forum with experts in other regions, states, ORD's Ada Oklahoma laboratory, and OSWER
- Adequate time for staff to keep current on relevant research
- Successful roll-outs of ORD products and tools.
- Consultations with Headquarters and ORD when issues raised by an emerging contaminant fit no single environmental programs or guidance. Discussions of how solving a regional issue could strengthen a larger program can result in a study that can generate data to help a regional need and help solve a potential national problem.
- Partnerships with associations and non-governmental organizations (e.g., US Green Building Association and Center for Neighborhood Technologies) to strengthen the science base and impact of voluntary programs

# Solving Environmental Problems with Innovative Technology: A Midwest Perspective



INNOVATION

Function: noun

Date: 15th century

1 : the introduction of something new

2 : a new idea, method, or device

*great ideas for the environment... waiting to happen*

U.S. EPA Region 5



Chicago, Illinois

*EPA Region 5 believes innovative technologies offer great promise to improve environmental conditions at lower cost or to significantly improve the performance of currently available technologies at no additional cost. This is a snapshot – as of summer 2009 – of current technology developments and needs for both mitigation and measurement of environmental conditions. Contacts are listed for each entry to facilitate further discussion.*

[epa.gov/region5/business/innovation/](http://epa.gov/region5/business/innovation/)

## Near-commercial-ready Technologies

*The technologies in this section have undergone or will undergo verification by EPA's Environmental Technology Verification program. Please visit [www.epa.gov/etv](http://www.epa.gov/etv).*

### **Reducing Endocrine Disruptors in Watersheds**

**EPA Contact: John McKernan, 513-569-7415, [mckernan.john@epa.gov](mailto:mckernan.john@epa.gov)**

*Situation:* Endocrine Disruptor Chemicals, or EDCs, are being discovered in many watersheds at measurable, low levels.

*Need:* A cost-effective method to locate EDC problem areas within watersheds – a method that provides actual biological evidence of a problem rather than just a number or concentration of EDCs – and a cost-effective method to qualitatively detect the presence of extremely low levels of EDCs in surface water, rather than measuring individual chemical concentrations.

*EPA will complete verification this year of two test kits for rapid estrogen detection.*

### **Spray Drift Technology**

**EPA Contact: Mike Kosusko, 919-541-2734, [kosusko.mike@epa.gov](mailto:kosusko.mike@epa.gov)**

*Situation:* Pesticide spray drift is the movement of spray droplets through the air at the time of application, or soon thereafter, from the target site to any non- or off-target site. Spray drift can expose people, domestic animals and bodies of water to pesticides. Spray drift management technologies are of interest to pesticide and other chemical manufacturers, application equipment manufacturers, pesticide applicators, government agencies and advocacy groups.

*Need:* Drift reduction technologies that can reduce drift downwind and reduce undesired pesticide exposures.

*EPA is completing validation testing this year on a protocol for testing spray drift reduction technology. We plan to use data from these verifications to modify labeling language for pesticides applied with the tested technologies.*

### **Trichloroethylene (TCE) and Perchloroethylene (PCE) Indoor Air Monitoring**

**EPA Contact: John McKernan, 513-569-7415, [mckernan.john@epa.gov](mailto:mckernan.john@epa.gov)**

*Situation:* TCE and PCE are chlorinated compounds commonly found as soil or ground-water contamination. Though originally liquids, they may migrate upward as vapor intrusion from the ground into buildings. Indoor air monitoring for vapor intrusion is now done with summa canisters or Tedlar bags, both of which collect an air sample that must be analyzed off-site. Another method uses EPA's Trace Atmospheric Gas Analyzer, which gives real-time indoor air readings but is so large it is contained in a special bus. Both types of indoor air vapor intrusion analysis are time-consuming and costly, and require multiple entries into a residence.

*Need:* A real-time, hand-held, direct-reading air monitoring device that can determine vapor intrusion in a structure, measured in parts per billion.

*EPA is developing a vapor intrusion monitoring device verification with the Navy.*

### **Real-Time Microcystin Measurement Tools**

**EPA Contact: John McKernan, 513-569-7415, [mckernan.john@epa.gov](mailto:mckernan.john@epa.gov)**

*Situation:* Microcystin is a toxin produced by certain types of algal bloom in fresh waters like the Great Lakes. It is toxic to birds, fish and mammals. Recreational water managers need a rapid means of detecting the toxins to warn the public that it is not safe to swim in certain areas. Current methods require sampling and lab analysis that may not produce data for several days.

*Need:* Real-time microcystin test kits.

*EPA is conducting a microcystin verification project. Two vendors with five rapid test kits are planned for testing later this year. Reports should be available by mid 2010.*

### **Economical, User-friendly Lead Test Kit**

**EPA Contact: Julius Enriquez, 513-569-7285, [enriquez.julius@epa.gov](mailto:enriquez.julius@epa.gov)**

*Situation:* Dust is a natural result of doing abatement and renovation work, but in older homes and apartment buildings the dust can pose a potentially hazardous exposure to lead.

*Need:* A reliable, low-cost, user-friendly tool to accurately detect lead in samples of paint or dust, and contribute to more expeditious removal of lead-based paint hazards and the associated risks of exposure.

*EPA has developed a test plan for verifying performance of lead test kits, and expects to verify from nine to 13 test kits this year and next. Vendor meetings have been held and applications are being received for verification.*

### **Conversion of Liquid, Solid, and Gaseous Wastes to Commercial Products and Energy**

**EPA Contact: Lee Beck, 919-541-0617, [beck.lee@epa.gov](mailto:beck.lee@epa.gov)**

*Situation:* Conversion of waste to commercial products and energy offers extensive opportunities for researchers looking for profitable technologies, especially those looking for ways to create fuel from biomass and biological wastes.

*Need:* Cost-effective technologies that can economically convert biosolids and biomass into energy.

*By mid-2010, EPA will complete a state-of-the-technology pre-verification assessment of gasification technology as it applies to converting pulp and paper mill waste and municipal solid waste to fuels and commercial products received for verification.*

### **Open-Path Ambient Air Monitoring to Characterize Emissions from Landfills and Industrial Sources**

**EPA Contact: Motria Caudill, 312-886-0267, caudill.motria@epa.gov**

**Situation:** Complex chemical reactions within landfills cause air emissions of a multitude of compounds including benzene, methane and hydrogen sulfide. The ultraviolet differential optical absorption spectrometer, or UV-DOAS, uses a projector fitted with a xenon-vapor lamp, which transmits an ultraviolet light beam to a spectrometer built within a receiver. The spectrum's absorption bands are analyzed, various gases are identified, and the concentrations of these gases are detected simultaneously. EPA has approved this method for routine sampling of sulfur dioxide, nitrogen dioxide and ozone. The agency is now working toward use of UV-DOAS to detect various air toxics at landfills and industrial sources.

**Need:** A portable monitor that can continuously identify and quantify gaseous pollutants in real time.

**EPA has piloted UV-DOAS at multiple sites and found it practical to measure dangerous ammonia, hydrogen sulfide, carbon disulfide, benzene, formaldehyde, xylenes and toluene.**

## **Mitigation, Treatment and Remediation Technologies**

### **Additional Technologies to Attenuate or Prevent H<sub>2</sub>S Emissions from Landfills**

**EPA Contact: Paul Ruesch, 312-886-7898, ruesch.paul@epa.gov**

**Situation:** When loads of mixed construction and demolition debris are processed for recycling, a residual product called C&D debris fines is produced. This material is often used as alternative daily cover at landfills. It often contains gypsum, which can – under certain conditions – be reduced to hydrogen sulfide gas, an irritant at low concentrations and potentially deadly at high concentrations.

**Need:** A technology that will allow C&D fines to be used safely as alternative daily cover, because the C&D recycling industry claims this form of recycling cannot be profitable without this market for C&D fines.

### **Sustainable Reuse of Great Lakes Sediments**

**EPA Contact: David Cowgill, 312-353-3576, cowgill.david@epa.gov**

**Situation:** Over the next 20 years, EPA must address contaminated sediment at 75 sites in the Great Lakes. Of those, five sites with approximately 1.5 million cubic yards of sediment are expected to be cleaned up in the next three to eight years. Current technology is a mix of dredging and disposal in commercial landfills or confined disposal facilities at a cost of \$20-\$40 per cubic yard. Alternative technologies tend to exceed \$100-200 per cubic yard.

**Need:** A portable system that can provide sustainable reuse of sediment at a cost below current dredge-and-disposal options. There is also a need to identify and demonstrate the large-scale effectiveness of innovative technologies for sediment dewatering, soil separation and/or sediment washing.

### **“Dustless” Lead Abatement and Renovation Technologies**

**EPA Contact: Maggie Theroux, 617-918-1613, theroux.maggie@epa.gov and David Turpin, 312-886-7836, turpin.david@epa.gov**

**Situation:** Dust is a natural result of doing abatement and renovation work, but in older homes and apartment buildings the dust can pose a potentially hazardous exposure to lead.

**Need:** More efficient and cost-effective technologies for stabilizing or removing lead-based paint. These technologies would be of interest to environmental pollution abatement companies and anyone – including homeowners and do-it-yourselfers – that may disturb paint during a renovation, remodeling, repair, abatement or painting project.

### **Lower-cost Wastewater Treatment and Nutrient Control**

**EPA Contact: Peter Swenson, 312-886-0236, swenson.peter@epa.gov**

**Situation:** As wastewater treatment facilities are pushed to achieve tighter limits on total phosphorus and total nitrogen, they are examining technologies in use in coastal states. But the 3,600 facilities in the Midwest region note that many of these technologies require a significant investment in capital and also utilize much more energy and chemicals than existing operations.

**Need:** Lower-cost solutions and technological solutions that utilize less energy and fewer chemicals than existing technologies.

### **Improved Industrial Wastewater Treatment for Mercury Control**

**EPA Contact: Peter Swenson, 312-886-0236, swenson.peter@epa.gov**

**Situation:** The Great Lakes guidance established strict limitations for the control of mercury in wastewater discharges to the Great Lakes. The ability to meet water quality limits for mercury is in question. Because of this, many states are allowing for variances. A number of emerging technologies have the potential to meet more stringent standards (nanograms per liter range), but the viability, dependability and cost-effectiveness of these processes has not been tested, particularly for large industrial applications such as coal mines, coal-fired power plants, steel mills, paper mills and refineries.

**Need:** Efficient new technologies for improved mercury control.

### **Improved Bedbug Pesticides**

**EPA Contact: Dan Hopkins, 312-886-5994, hopkins.daniel@epa.gov and Don Baumgartner, 312-886-7835, baumgartner.donald@epa.gov**

**Situation:** Infestations of bedbugs have increased recently in numerous metropolitan areas, particularly in Ohio where bedbug infestations have been reported in hospitals, nursing homes, police stations, apartment buildings and residences. A major problem is resistance to registered pesticides, notably pyrethroid insecticides, commonly used for bedbug control. Treatment for bedbug infestations is often complicated, expensive and requires multiple visits by professional pest control specialists.

**Need:** New pesticide products – such as insect growth regulators – that will control bedbugs but which are not susceptible to the development of insect resistance, and are relatively less toxic to mammals.

# Measurement, Monitoring and Sampling Challenges

## **Development of a Cost-effective Rapid Assessment Technique to Quantify Type E Botulism (*Clostridium botulinum*) Toxin**

*EPA Contact:* David Cowgill, 312-353-3576, cowgill.david@epa.gov

*Situation:* Botulism is a neuromuscular disease caused by several different strains of the bacterium *Clostridium botulinum*. The bacterium is classified into seven types by characteristics of the neurotoxins that are produced. Four of these types (A, B, E and rarely F) cause human botulism, while types C, D and E cause illness in mammals, birds and fish. Type C botulism and Type E botulism are responsible for extensive waterfowl and some fish kills in North America. Type C and E botulism poisonings are elicited by the consumption of the botulinum toxin through food web interactions. Type C botulism mostly affects waterfowl and is typically restricted to marshes and wetlands in prairie regions, primarily found west of the Mississippi River. Type E botulism is more prevalent in the Great Lakes, and has also been documented in California.

*Need:* A cost-effective, rapid-assessment field technique to quantify the botulism toxin in various environmental media (sediments, invertebrates, macroalgae, birds, fish). This would help to understand the mechanism by which botulism is transferred through the food chain, and ultimately help state managers potentially mitigate the impacts of these outbreaks by providing an environmental monitoring tool for rapidly detecting the presence of the botulism toxin.

## **Wireless Sensor Technology**

*EPA Contact:* Andrew Tschampa, 312-886-6136, tschampa.andrew@epa.gov

*Situation:* Significant advances in wireless sensor technology have helped create wireless field monitoring networks over wide areas. This improving technology is creating new possibilities for continuous field monitoring of environmental conditions.

*Need:* Wireless surface-water monitoring networks that would monitor for water quality, water chemistry and associated measurements, sediment enzymes, chlorophyll-a and fecal indicators.

## **Rapid in-situ Monitoring Technologies for Sediments**

*EPA Contact:* David Cowgill, 312-353-3576, cowgill.david@epa.gov

*Situation:* It is very costly to survey Great Lakes Areas of Concern, located primarily at river mouths and harbors around the Great Lakes. Typically a series of sediment sampling surveys involving chemical and toxicological analyses in laboratories are performed to identify hot spots that require cleanup. Volume estimates are made based upon the data provided by sediment coring and chemical analysis.

*Need:* Cost-effective monitoring technologies that can quickly characterize concentrations of heavy metals and organic chemicals to help define the dimensions of an excavation or cleanup. This technology could also be used for sediment sampling after a cleanup to verify that project goals had been achieved or document ecological recovery.

## **Smart Sampling Technology for Water and Air**

*EPA Contact:* Dennis Wesolowski, 312-353-9084, wesolowski.dennis@epa.gov

*Situation:* The Chicago Regional Laboratory did a record number of analyses in 2007. However, many of the samples analyzed show contaminant amounts less than the established reporting limit for that analysis. Depending on the monitoring objective or project objective, such information may be of little or no value.

*Need:* A way to take samples of water or air only if there is reasonable likelihood that the compounds of concern will be found at some detectable level. The savings in time and resources could help increase the lab's capacity to provide more useful information for many more projects.

## **Sampling of Porous Surfaces**

*EPA Contact:* Dennis Wesolowski, 312-353-9084, wesolowski.dennis@epa.gov

*Situation:* Responding to a chemical attack on an inhabited area presents significant sampling difficulties. To assess the extent of contamination and the effectiveness of cleanup efforts, chemicals must be sampled from a variety of surfaces. Current sampling techniques work well on non-porous surfaces, but porous surfaces such as concrete, wood, fabric and carpet may allow the agent to penetrate and avoid initial detection. The porous surface may allow off-gassing of the agent for some time, which could re-contaminate the area or building, thus delaying repopulation.

*Need:* A device or system to extract chemical agents that may penetrate porous surfaces for analysis either in the field or the laboratory in a fast and effective manner, thus verifying that an area is safe for repopulation.

## **GPS Technology to Measure Stream Slope to cm Level**

*EPA Contact:* Andrew Tschampa, 312-886-6136, tschampa.andrew@epa.gov

*Situation:* During field monitoring work, it is critical to obtain the slope or drop of a stream or river. All current methods rely on a form of surveying, which involves line of sight. So as a stream meanders around bends, continued measurements are necessary. This is very labor intensive. Improvements to current GPS technology would be of great value.

*Need:* A cost-effective GPS survey device, sensitive to the level of centimeters or less, that could be exposed to water.

## **Improved Bedbug Monitors**

*EPA Contact:* Dan Hopkins, 312-886-5994, hopkins.daniel@epa.gov and Don Baumgartner, 312-886-7835, baumgartner.donald@epa.gov

*Situation:* Infestations of bedbugs have increased recently in numerous metropolitan areas, particularly in Ohio where bedbug infestations have been reported in hospitals, nursing homes, police stations, apartment buildings and residences.

*Need:* Simple, cost-effective monitoring traps that can be used to assess the presence and abundance of bedbugs, before and after control efforts.

## **Continuous Portable Ambient Monitoring of Hydrogen Sulfide at Landfills, Concentrated Animal Feeding Operations and Oil Facilities**

*EPA Contact:* Marta Fuoco, 312-886-6243, fuoco.marta@epa.gov

*Situation:* Hydrogen sulfide is a colorless gas with a characteristic rotten-egg odor that can be detected at low levels. It occurs naturally in crude petroleum, results from the breakdown of organic matter and is produced by human and animal waste. It is also produced in certain industrial processes. Exposure at low concentrations can result in irritation, while high concentrations could result in death. Region 5 receives complaints dealing with nuisance odors and adverse health effects from people who live near facilities that emit hydrogen sulfide, mainly concentrated animal feeding operations, landfills and oil facilities.

*Need:* A portable continuous instrument that can be deployed in the field with minimal maintenance and calibration.

# FY2009 Region 5 Science & Technology Council Accomplishments

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## **I. Assessed and Prioritized Regional Science and Technology Needs**

1. Members of the Region 5 Science and Technology Council (RSTC or the Council) integrated science needs across divisions to foster teamwork and multi-media networking. This was fostered by both formal and informal networking, as reflected in the items below.

Topics of interest this year included perfluorocarbon (PFC) contamination of the environment, measurement and mitigation of Pharmaceuticals and Personal Care Products (PPCP) in surface and drinking waters, real-time microcystis measurement kits, improved measurement of emerging contaminants, smart sampling of environmental media, landfill emissions mitigation and accurate measurement of ambient levels of hydrogen sulfide, vapor intrusion of trichloroethylene (TCE) into residential buildings, waste to energy options for the Midwest and biofuels research.

2. Contributed to the selection of the agency Science Priorities developed by Office of the Science Advisor (OSA).
3. Conducted a facilitated Waste Minimization Focus group, which engaged staff scientists in cross-divisional dialogue on the problems of waste production and disposal in the Midwest. The central theme was the need for a holistic approach to waste that involved life-cycle analysis of various waste streams and the optimization of final disposition, whether recycling, reuse, energy production or land filling. The Council will follow developments in this area in OSWER, ORD and elsewhere for application to R5. Through further dialogue, ideas will be developed and promoted for science & technology (S&T) opportunities in 2010.

## **II. Advocated Regional Science and Technology Needs**

1. Hosted 2 Cleantech meetings: one with investors to engage in a dialogue on how to gain support for Cleantech investment and the other with university researchers and entrepreneurs to raise awareness of EPA and federal funding vehicles for technology development. Members of the Council participated and contributed to discussions with investors and entrepreneurs. These meetings have served as a model for EPA headquarters to propose a venture capital outreach for other regions.
2. Developed a brochure advocating innovative technology to solve the region's technology needs as a result of the dialog of the RSTC and staff contributions. This brochure was well received by the investors and entrepreneurs.

3. Developed a Digest of technology implications of selected EPA regulations from the 2009 Spring Regulatory Agenda for use by technology investors and developers. This was especially well received by the investor community who wants to optimize opportunities and minimize any risks associated with Cleantech investment. The Digest also received the interest of Headquarters; the Council is seeking to elevate this task as a recurring activity at the national level.
4. Developed a Cleantech website to foster on-going dialogue on R5's Cleantech needs and funding opportunities for technology developers.

### **III. Pursued Partnerships and Funding to Respond to Regional S&T Needs**

1. Pursued Advanced Monitoring Initiative funds from the Environmental Technology Council (ETC) – a current R5 proposal has received funding for \$100k for semi-continuous air monitoring of toxic metals. Through the cross-divisional communication opportunity provided by the Council, needs were elevated and connections were made with ORD, OCFO and other regions to leverage funding, collaborate, and pursue projects of mutual benefit.
2. Worked with the Environmental Technology Council to select projects to fund for the ORD Monitoring Support Initiative that matched R5 needs. For example, R5 advocated funding projects in other regions corresponding with our needs on microcystis testing, nitrate sensors for groundwater, and E. Coli contamination indicators in water.
3. Partnered with R6 on an Ultraviolet Differential Optical Absorption Spectroscopy project to measure contaminants in a long range distance open path. It was funded for FY10.
4. As a result of Council-wide interest in cumulative risk assessment, the Region received \$60K to host the 2009 ORD/Regional Cumulative Risk Assessment Workshop, July 28-30. The Workshop was well attended and well received. Cumulative risk assessment is a shared science need of ARD, OW, SF and OECA. Staff requires greater skill in this approach in their day to day work making assessments of the complex environmental exposures that burden communities.
5. Provided management review for selection of R5 Regional Applied Research Efforts (RARE).
6. Managed the competitive national selection process for the Regional Methods Initiative (RMI). R5 received \$85K in funding for a joint need of WD and the Central Regional Lab for rapid testing of microbial contaminants for beach safety.
7. Submitted R5 S&T needs for inclusion in the Small Business Innovative Research program; these needs will be part of the FY2010 request for proposals.

#### **IV. Supported Sound Science in Region 5**

1. Carried out ministerial functions: nominated regional staff members to Risk Assessment Forum (RAF), FEM Workgroups, IRIS Update Team and the CREM.
2. Communicated with each division and Regional Management regarding Science Policy Council issues of national importance: for example, the SAB Science Integration Study; Science Inventory; Peer Review; among others.
3. Hosted high-level visitors from ORD, OCFO, HQ and universities--among them Andrew Geller, ORD, Pai-Yei Whung, OSA and Hal Zenick, NHEERL.
4. Hosted two NNEMS Fellows who performed research and prepared reports on two of the region's technical needs: waste to energy and measurement of emerging contaminants.
5. Organized speakers to inform staff and managers on topics of current interest – e.g. Structure of ORD, Risk Indicators, Climate Change, Waste to Energy, Reg 5 Climate Change Strategy, Chemical Management, and Stormwater management.

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