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## **U.S. EPA Environmental Technology Verification (ETV) Program Materials Management and Remediation (MMR) Center**

Summary of the Remediation Stakeholder Committee Teleconference  
Thursday, November 19, 2009

### **Attendees:**

Steve Acree, EPA

Michael Adam, EPA

Doug Grosse, EPA Cincinnati

Kenneth Feathers, CT DEP

Stephanie Fiorenza, BP

Jena Tufts, RTI/ETV Center

Leslie Karr, U.S. Navy

Golam Mustafa, EPA Region 6

Steve Slaten, NASA

Eric Stern, EPA Region 2

Jennifer Griffith, NEWMOA

Marvin Unger, HydroGeologic/SERDP/ ESTCP

### **MMR Center Staff:**

Ramona Darlington, Battelle

Amy Dindal, Battelle

Maria Gordon, Battelle

Teri Richardson, EPA MMR Center Project Officer

Russell Sirabian, Battelle

### **Welcome/Opening Comments**

Teri Richardson, EPA MMR Center Director, welcomed the stakeholders on the Materials Management Committee. She directed most of her comments to the future of the ETV Program.

It has been a year since the MMR Center opened, and the Center has seen quite a bit of progress. Thanks to the involvement of the stakeholders, many areas of interest have been identified.

The MMR Center is one of three new centers recompleted a year ago. There is no funding for the centers, only in-kind assistance. Going forward, there is no ETV base funding in the President's 2010 budget (which has not yet been approved by Congress). We don't know what will happen in 2011. Only after the Office of Budget and Management has completed its analysis by early next year will we have a better idea of funding. The EPA, however, is committed to supporting the ETV centers through 2011. If there is no funding then,

In the meantime, Teri encouraged the stakeholders to press forward, and thanked them for their efforts.

### **ETV MMR Center Update on Activities**

Referring to the slides sent to all participants, Amy Dindal, Battelle MMR Center Director, provided an update on what the Center has accomplished since the last meeting of the Remediation Committee (June 30, 2009):

Battelle completed year one of the three-year cooperative agreement for the MMR Center. We formed two stakeholder committees and conducted five stakeholder teleconferences in February,

March (2), June, and July. We are currently pursuing vendors and collaborators for verification testing in priority technology categories.

Our challenge has been to identify areas of interest and to develop definitions for the scope areas of the Center. Overall, the scope of the Center has encompassed:

- Recycling
- Beneficial use of waste materials
- Recovery of useful components of waste
- Treatment to minimize disposal requirements
- Remediation.

There is some cross-cover between the areas. Activities are going on in each area. We thank the stakeholders for helping us set these priorities. It has produced good accomplishments for our first year.

On the materials management side of the house, the following technology priorities have evolved:

- Anti-Corrosion Tank Sprays (spray under- or aboveground tanks; we anticipate that Albah, which has a cold spray process, will fund their verification test in the near future)
- Recycling Copper Mine Tailings (Lesktech, with SBIR funds, showed it could turn stamp sands into roofing shingles; Jim Harrington and Bob Phaneuf, NY DEC, sent in a valuable evaluation of the technology from an environmental perspective (posted on the External SharePoint of the MMR Center); Lesktech has until January to execute their SBIR Verification Option)
- Tire Recycling (U.S.-Mexico border proposal submitted, and we expect to hear back soon; issuing agency got more money, funded half of applicants last year)
- Electronics Recycling (instructed by stakeholders to look not only at process, but also viability and sustainability of products; applies to tire and electronics recycling)
- Concrete Reuse (Golam Mustafa, EPA Region 6 spoke about the I-10 bridge deconstruction; we're looking for a site)
- Coal Ash Reuse (new regulations for its reuse; time does not appear to be right to pursue this topic)
- Regulated Medical Waste (vendor wants verification registration at state level; can we broaden it?)
- Tyvek™ Suit Recycling (technology promising; vendor a small business but unable to financially support testing on its own).

### **Discussion of Priority Remediation Technology Categories**

The stakeholders were able to follow the presentation on slides received before the teleconference as Russell Sirabian, Battelle, addressed the following technology category:

- **Emerging Contaminant Remediation – 1,4-Dioxane**  
The stakeholders had expressed an interest in technologies that can be applied to emerging contaminants. 1,4-Dioxane is a particularly important emerging contaminant. It is extremely mobile, exhibits low retardation, is recalcitrant, and is difficult to treat either in situ or ex situ. Ex situ treatment is done with advanced oxidation that requires either energy-intensive ultraviolet light or energy-intensive ozone generation.  
*Rapid Chemical Treatment (RCT)* uses organo-metallic reactant that works in conjunction with hydrogen peroxide to produce hydroxyl radicals. It involves a simple process of in-line chemical injection with low on-site energy use; however, it requires continuous feed of low

concentration reactant. It works in a wide pH range (5.0-8.5), and uses a lower concentration of iron (1-2 mg/L). A possible vendor is Ross Technology Corp. Ross expressed an interest in the ETV Program and is happy to share the cost of the test, but they want to see some level of stakeholder investment in order to demonstrate a real interest. Ross claims success with its process on MTBE and a variety of VOCs, and is now testing on 1,4-dioxane. Need test site and interested stakeholder(s).

**Discussion:** Russ asked whether any of the stakeholders had heard of this technology before, but no one had. He also asked whether anyone had 1,4-dioxane groundwater that they're treating with standard tests. Stephanie Fiorenza replied that BP has a site for a bioremediation process. Ken Feathers had a Connecticut site a dozen years ago that had 1,4-dioxane. He can check whether they have problems now; they did ex situ polishing. Russ said that it can be used in situ as well. Ex situ is easier and less expensive to handle. A stakeholder asked what kind of support the vendor was looking for from stakeholders. Russ replied they wanted to see stakeholder support to show that there is a genuine interest and that Ross Tech is not doing it on their own. Golam Mustafa added that there are lots of SuperFund sites; does anyone know if there are some with 1,4-dioxane? Mike Adam commented that he knew they exist, but couldn't name them off the top of his head.

Referring to the slides sent to all participants, Ramona Darlington, Battelle, gave an update on Center activities on in-situ chemical oxidation, fracturing delivery methods, and reactive sediment capping.

- **ISCO at Gas Station Sites**

We are continuing to pursue ISCO (persulfate and/or peroxide) application at active gas station sites. We have identified one vendor and several potential technologies --**Vironex** is interested in testing. The site manager changed at a BP test site that we thought was committed to testing, and the current manager is now reviewing the project. Vironex would like to proceed with the test during the first quarter of 2010 and is reaching out to potential sites via consultants also for ISCO chemicals.

**Discussion:** Ramona asked whether any stakeholders have or know of sites where the Vironex testing can be done. Mike Adam asked whether they are looking for one site or for an area grouping. Ramona replied that it was one site.

- --**VeruSOLVE Peroxide, VeruTek:** This is Surfactant-Enhanced In Situ Chemical Oxidation (S-ISCO) technology that uses a plant surfactant-based stabilized peroxide. It has proven successful on source contaminants such as chlorinated solvents, insecticide/herbicide, coal tar, PCB oils, creosote, and others. S-ISCO is the only remedial technology that can remedy source materials at depth and under buildings safely in urban and other environments. The MMR Center has not approached them yet. We know that the New Jersey Department of Environmental Protection issued a No Further Action Letter with VeruSolve.

**Discussion:** Ken Feathers said that VeruTek is a Connecticut company, but he was not aware of the use of their technology in Connecticut. Marvin Unger said ESTCP has lots of experience with ISCO technology. There's nothing magical about persulfates. They have had issues when surfactants used to solubilize NAPL have gotten out of control. Ken Feathers agreed; the site will be clean because the contaminants have migrated downstream. Marvin said that a carefully engineered scientific design has to be adhered to. Ken added that persulfates have to be weighed vs. other oxidizers; there are issues with underground injection control (UIC). Marvin asked whether there are data on ISCO and secondary water standards.

--**Nano-Ox™ Chemistries, PARS Environmental Inc.:** PARS is a small business. Its technology relies on chemical oxidation via a Fenton reaction to produce enhanced bio-remediation via nano-bubbles. It treats dissolved plume and source area(s), and has no depth limitations. It is highly reactive, producing rapid degradation with no toxic intermediates. In addition, it is portable, easily injected, and flows with groundwater. It requires a low capital investment, as well as operating and maintenance costs.

**Discussion:** Ramona Darlington said that Nano-Ox™ is interested in having the technology verified by ETV. What do the stakeholders think? Eric Stern said that EPA Region 2 had been approached by PARS concerning contaminated sediments in a barge injection of Nano-Ox for sediments. Marvin Unger commented that, considering its reactivity, how do you control delivery? Once you inject, what about nano-particles from a health and safety perspective? Calcium oxide is being deposited. Are precipitates formed by this technology? Ken Feathers added that we don't understand thoroughly what nanoparticles do in the environment. Ramona said she'll check into these questions, but her understanding was that they did not expect any clogging of the aquifer. Marvin was concerned with the manufacture of the nanoparticles—quality control is a major concern. Are they all the same batch to batch? What type of controls do they have? Ken Feathers said that VeruTek is trying to make nanoparticles in situ, adding a new challenge to quality control.

- **Fracturing Delivery Methods**

- Hydraulic Fracturing:**

- Potential Sites: Dow has tentative sites in 2010 and 2011, depending on the budget

- Potential vendor: FRx, Bill Slack, but we have not had direct contact yet with FRx concerning ETV testing

- Pneumatic Fracturing:**

- Potential Sites: Deborah Schnell of Pneumatic Fracturing Inc. (PFI) is still interested and is currently looking for a site

- **Reactive Sediment Caps**

**Potential Vendor:** AquaBlok Ltd./Adventus Group.

AquaBlok® is a patented composite-aggregate. It consists of a central core (often stone aggregate), and a clay/polymer outer layer that expands when hydrated.

AquaBlok®+ORGANOCLAY™, when compared to conventional powdered or pelletized organoclay products, offers:

- Improved delivery to sediments through a standing water column

- More efficient use of organoclay through use of a thin coating on a substrate/core

- Better product effectiveness through higher organoclay surface area

- Lower cost per pound for a target volume

- Ease of handling and placement.

**Potential Sites:**

- A Navy site, since the Navy is interested in reactive capping as a potentially suitable remedial alternative if additional remedial action is required at a site, and in conjunction with an ESTCP/SERDP project.

- Potentially stand-alone.

**Discussion:** Ramon Darlington asked whether any of the stakeholders had any interest in AquaBlok®. Marvin Unger commented that his group is aware of it, and it would be wonderful if a test could occur. Eric Stern said he was very familiar with AquaBlok® from the Hackensack River SERDP project.

In summary, the ETV MMR Center has strong stakeholder participation from 30 state, industrial, and federal organizations. In the past year there has been vendor and collaborator interest in a variety of remedial and materials management technology categories covering the broad scope of the MMR Center. We will keep our focus on the most viable technologies and look for leverage with ongoing projects. Identifying sites for verification testing is critical. However, securing funding to proceed with verification testing has been challenging due to the current economic climate. We have two years to get the testing going. Once we have tests set up, we'll ask you for peer reviewers. We welcome any stakeholder funding suggestions and/or collaboration in priority technology categories.

### **Innovative Approaches to the Management and Remediation of Contaminated Sediments and Their Application to Integrated Sustainable Systems**

Eric Stern, EPA Region 2, presented highlights from his keynote address given at Ecomondo 2009, in Rimini, Italy, October 30, 2009. All stakeholders received a copy of his slides and they are posted on the External SharePoint of the ETV MMR Center.

His basic argument is that we must stop seeing contaminated sediments simply as waste, but rather as a resource. Consider contaminated sediment: what do you do once you've dredged it? There's capping and stabilization. Where do you put it? There's confined disposal, confined aquatic, containment islands, landfills, reclaimed mines.

In a U.S. that has less than 20 years of landfill capacity left, we have to look for approaches to dealing with contaminated sediments that provide environmental sustainability, environmental manufacturing, and beneficial use. Placing contaminated sediments in landfills is an expensive disposal proposition, and it carries with it a high carbon footprint.

Between 1994 and 2007, the USEPA/NJDOT conducted decontamination programs that tested the following ex situ treatment technologies:

- Sediment washing
- Thermo-chemical rotary kiln
- Plasma arc vitrification
- Base-catalyzed decomposition
- Rotary kiln-thermal absorption
- Solvent extraction
- Solidification/stabilization with oxidation
- Fluidized bed reactor.

They identified the following technologies as having beneficial use:

- Cement-Loc<sup>®</sup> Technology
- Biogenesis Enterprises
- Upcycle/Baycycle Aggregates
- Harbor Resource Environmental Group, Inc.
- Westinghouse/The Solena Group.

Eric Stern then showed how the products of the first two technologies were applied at Montclair State University in New Jersey. Cement-Loc<sup>®</sup> produces EcoMelt, a 20% replacement for Portland cement, used in making construction grade cement and concrete. This product was poured as cement walkways near Mallory Hall on the university campus. Biogenesis Enterprises produces manufactured soil—a decontaminated sediment blend with sand and organic material (mulch) to create a high end topsoil. This manufactured soil was used to top-dress the beds

around Mallory Hall.

**Discussion:** Marvin Unger congratulated Eric on a great presentation. He then raised the issue of contaminants in sediments. Contaminants are not homogeneously distributed, and often form hot spots. Decontamination treatments may not effectively remove the hot spots. With all thermal technologies, you are essentially nuking the organic contaminants. What about the heavy metals? Eric responded that there are amalgamation capture methods for mercury, lead. You need a good first assessment of what you are taking out, but that is not always possible. The future of sediment management will be multiple applications to even out the highs and lows.

Marvin asked about follow-up testing on treated material before it gets reused. Eric said that for the soil market, there are no USDA criteria. Does liability end with vendor? The soil goes to a landscape company, who mixes it with compost and mulch to restore the organic content. Sometimes these additives have more contaminants than the manufactured soil. Ken Feathers said that in Connecticut the soil after the first round did not meet standards. But there is another problem—naturally occurring arsenic in soils. Eric said they had to dilute the arsenic with sand. Ken replied that the manufactured soil market is essentially unregulated. Eric remarked that in garden centers you will find bags of soil marked for “landscape use only” (not for vegetable gardens). Biogenesis found that bagged top soil from Home Depot and Lowe’s had a higher concentration of contaminants than the manufactured soil. At any rate, he said there are only 80 years of natural top soil left in the U.S.

Amy asked whether there are any ETV applications here. Leslie Karr said she was also working with a manufactured soil vendor and have a site. In Ken Feather’s view, the soil product was already in people’s pipelines, so there was no value added with ETV testing. Basically with manufactured soil there was no certainty in what you are getting. Eric summed up by saying we do not know what the individual company provides, but that’s more a regulatory issue. We do know that the person pouring the cement at MSU was interested in working with EcoMelt again.

**Review of Action Items and Next Meeting:**

- Michael Adam: look for possible SuperFund sites for 1,4-dioxane testing
- Battelle: get more data on 1,4-dioxane testing from vendor
- Battelle: locate gas station sites for ISCO testing
- Battelle: get more information from VeruTek and PARS
- Battelle: pursue reactive capping test
- The next meeting of the Remediation Committee will take place in the later winter/early spring 2010.

**Adjourn**

Respectfully submitted,

Maria Gordon  
Battelle Stakeholder Coordinator