FEDERAL REMEDIATION TECHNOLOGIES ROUNDTABLE MEETING
Arlington, Virginia
November 18, 1999

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Welcome/Opening Remarks

Walt Kovalick, U.S. EPA/TIO, welcomed the attendees and opened the meeting of the Federal Remediation Technologies Roundtable by reviewing the agenda for the day. He then introduced the chairman for the meeting, Michael Aimone of the U.S. Air Force.

Chairman=s Remarks

Mr. Aimone thanked the attendees for their participation in today=s meeting and asked each attendee for a commitment to communication and listening for the duration of the meeting. He stressed the importance of knowledge-based information transfer to the Roundtable=s mission. He noted that the various waste cleanup technology assistance and development programs across the federal agencies are all very good at what they do, but they need to make sure the message of their successes gets delivered. He added that information must flow up as well as down federal agency management structures.

Policy Initiative: National Action Plan for DNAPL Source Reduction

Purpose of Plan

Dr. Kovalick announced a new Roundtable policy initiative to produce a national action plan to expedite development, demonstration, and implementation of *in situ* technologies that reduce sources of dense non-aqueous phase liquids (DNAPLs) in groundwater at hazardous waste cleanup sites and create a model for developing similar expedited development procedures for other site cleanup technologies. Dr. Kovalick likened the new approach envisioned in the action plan as moving from the current Ajazz improvisation@ approach to research, development, and deployment of technologies for treating DNAPL sources, an approach that seeks to develop more and more refined technologies, to an Aorchestrated@ approach that seeks to determine what the nation needs to solve the current DNAPL source problem and keep the focus on solving that problem. The ultimate goal of the national action plan (in addition to attacking DNAPL sources) is to develop a national model for technology development programs that reduces the development cycle from the current ten years (approximately) down to three to four years.

Dr. Kovalick described the key to achieving this goal as an integrated Abriefing chain@ that will drive the cost curve down as technology R&D and demonstration project leaders are briefed and learn from the experiences of similar projects. Rather than operating Aon their own@ in pursuing their particular projects, project leaders inform and are informed by every other project. The plan also includes the coordination of public and private resources toward achieving national goals. Dr. Kovalick stated his belief that through these steps to integrate technology development efforts in this areas, economies can be achieved wherein the various national programs can more results for their investments and the national DNAPL cleanup effort is accelerated. He added that he has received firm commitments to see the initiative through from important partners, including DOE and the SERDP/ESTCP program.

Gerald Boyd of the U.S. Department of Energy, echoed Dr. Kovalick=s remarks, adding that DOE sees this effort as a great opportunity that fits into DOE=s plan to begin closing some of its sites by 2006. While the definition of a Aclosed@ site remains an issue, DOE recognizes that subsurface problems are the costliest for DOE and other federal agencies with contaminated sites. Mr. Boyd said he has briefed James Owendoff and

other upper management in DOE on the action plan and was pleased with the commitment to the plan he has seen so far.

Current Draft Plan

Jim Cummings, U.S. EPA/TIO, reviewed the draft action plan, in particular the sections dealing with demonstration and deployment of new technologies. He began with a discussion of the problem set faced by DNAPL site owners. Since DNAPLs are heavier than water, they will sink and become relatively immobile in a groundwater plume. They are both hard to find and hard to remediate. The focus of the initiative is on sites contaminated with free DNAPL product where current technologies (bioremediation, etc.) take too long to meet national needs. Mr. Cummings described the two technologies (steam injection and six-phase heating) at the center of the current draft plan, and reviewed successful demonstrations of the technologies at Visalia Poleyard and Savannah River sites. The initiative will focus on these two technologies in its initial phase before expanding to cover technologies for getting at and treating DNAPLs.

Mr. Cummings reviewed the iterative process envisioned in the draft plan, which focuses on the formation of partnerships among interested parties. Much of the draft plan is modeled on the side-by-side demonstration hosted by NASA underway at Cape Canaveral (see proceedings of the May 1999 General Roundtable Meeting). Mr. Cummings also explained that the federal partners on board under the initiative believe federal action is necessary because of the uncertainty associated with eventual technological success. Venture capitalists have not invested much in the area given the uncertainty. The initiative partners also have asked the National Research Council (NRC) to examine the present state-of-the-technology for the demonstrations underway at Cape Canaveral. A meeting will be held in January 2000 to report out on those findings.

Mr. Cummings said the current draft plan covers technical assistance, technology transfer, and demonstration and deployment plans. The draft is missing a firm plan for the regular briefings identified by Dr. Kovalick earlier as the key to operational success of the initiative. The initiative partners expect to issue the action plan by the end of January 2000.

Skip Chamberlain, U.S. DOE, reviewed the research and development sections of the current draft plan, and discussed R&D needs in general for the steam injection and six-phase heating. Key needs include performance assessment, expanding technology applicability and cost effectiveness, and development of optimal design features. The action plan also includes a process for developing Ahow-to@ manuals for technology transfer needs stemming from R&D efforts. Mr. Chamberlain said DOE=s next R&D procurement cycle will include a narrower scope of activities that will target particular DOE problems. Mr. Chamberlain noted that implementation of the action plan will not impose a drag or learning curve on current efforts: he likened the process to changing a tire while the car is still moving.

Commentary by Initiative Participants

Jeff Marqusee, representing the SERDP and ESTCP programs, said the action plan should serve as an excellent substitute for the multi-site/multi-test programs favored by federal agencies but difficult to administer and afford. The extra effort to keep abreast of developments (beyond attending conferences, etc.) should provide for the kind of informed decision-making needed to expedite the application of new technological solutions to existing problems. Dr. Marqusee said SERDP/ESTCP has no bias in favor of any particular technology for dealing with DNAPLs and is willing to go wherever needs are best served. Dr. Marqusee said the initiative should focus on cost data, performance measurement, and assessing metrics for measuring performance and quantifying the value added by reducing sources of contamination. While cost data are the most important product, Dr. Marqusee stressed the need for the baseline measures to determine

value added, which often are not generated, but are needed to compare options and arrive at sound remedy decisions. Dr. Marqusee also stressed the need to use the initiative to guide the technology procurement in the future.

Johnnie Shockley, U.S. Army Corps of Engineers, said the Corps is working on a manual on *in situ* thermal technologies, including the technologies for treating DNAPL sources including in the action plan. The Corps is a partner in the initiative and plans to develop a medium term product from the development efforts it sponsors. Mr. Aimone said that the initiative should take care to account for the geophysical characteristics of project sites, in particular with regard to water table levels, soil and contaminant types, and fractured zones. He asked whether the vision of the projects is only for a series of briefings. Dr. Kovalick said the emphasis is to shift away from trying to perfect techniques and move toward development of more effective techniques that meet present needs. The multiple concurrent paths envisioned under the action plan are meant to reduce the distraction level: every step forward does not necessarily need to be briefed to every other project. Rather, the initiative is meant to create a framework in which every project moves forward informed by similar work. The key is the mechanism for sharing information, and the initiative foresees using new electronic means (websites, etc.) for accomplishing most of this.

Dr. Marqusee noted that the audience for this information extends beyond technology development efforts. For example, such data are needed when consent decrees are framed, in particular for orders that call for source removal to the maximum extent possible, rather than to a particular standard. Making this determination requires balancing the risks associated with introducing thermal technologies, as well as providing data to regulators to explain why it may not be possible or reasonable to chase down every last molecule of contaminant. Dr. Kovalick acknowledged that other, non-thermal technologies such as surfactant flushing and oxidation may better serve the problem set held by other Roundtable member-agencies, and he reminded the attendees that the proposed action plan in meant to serve as a model for expediting technology development to be used by all as they see fit. For example, chlorinated solvents may be more suited to reduction technologies such as oxidation. Dr. Marqusee noted that his program supports development of many other technologies: the *in situ* thermal technologies were selected for the initiative for their maturity level and the availability of demonstration sites. He announced that an ESTCP was due in two weeks that assesses on-going DNAPL treatment projects.

Mr. Boyd said the importance of the effort is to establish a cross-agency process for creating a model for technology development programs to attack a common problem set more efficiently and effectively than they have done in the past. The partners in the new initiative believe that heat-related technologies for treating DNAPL sources present the best opportunity for developing a model. Mr. Chamberlain stressed the need to get interested parties involved and to document their experiences toward building an institutional memory base for guiding future projects. He added that he knows from experience that *post hoc* technology assessments are too difficult to be worthwhile. Mr. Cummings added that the push for *in situ* technologies also is driven by OSHA regulations and the resulting higher cost of transporting and disposing waste *ex situ*. Dr. Marqusee added that SERDP/ESTCP is examining worker safety issues related to remedy selection.

Technical Session: Monitored Natural Attenuation of Chlorinated Solvents

History and Introduction

Patrick Haas of the U.S. Air Force Center for Environmental Excellence provided background on the development and implementation of monitored natural attenuation (MNA) at chlorinated solvent sites. He noted the long collaboration between the Air Force and EPA in promoting MNA and reviewed the history of the 1992 bioventing initiative and subsequent development of the principles and protocols manuals used widely

today. He noted that while bioventing uses only one parameter (oxygen levels) to measure performance, MNA examines more than twelve to ascertain that attenuation is occurring. He noted that proper site characterization and an effective measuring and monitoring plan are the critical components when implementing MNA as a remedy. The Air Force has been especially diligent in measuring the effectiveness of the remedy since it regularly finds itself needing to defend the selection of MNA. A report on MNA will be issued by the National Research Council in the near future which will assess the state-of-the-technology.

Mr. Haas reviewed the types of sites where MNA has been implemented, the types of contaminants at these sites, and compared MNA with other physical treatment systems, most notably pump-and-treat systems. He noted that at most groundwater sites the dilute portion makes up 99% of the plume. The upshot is that they could pump-and-treat for decades without catching all of the contaminants given the state of pump-and-treat technologies. Mr. Haas reviewed some performance results, noting that the Air force has been able to measure up to 97% biodegradation using MNA at some sites. The Air Force has achieved regulatory acceptance of MNA at about half of its fuel sites where MNA has been proposed. So far, though, they have achieved regulatory acceptance at only one of the nineteen chlorinated solvent sites where MNA was proposed as part of a remedy. Mr. Haas said regulatory acceptance is a function of good science, sound judgement, strong, astute advocacy, and forward-thinking regulators. However, he acknowledged that implementing MNA at chlorinated solvent sites remains a thorny issue.

Policy Implementation

Ken Lovelace, U.S. EPA, reviewed the substance and implementation of EPA=s policy regarding MNA. The interim policy was issued in late 1997, an EPA protocol, based on the Air Force protocol, was issued in 1998, and the final EPA policy on MNA was issued in April of 1999. The major issues raised in finalizing the policy included cleanup goals, source control, and timeframes. Under the policy, cleanup goals are driven by remedial objectives, rather than what MNA can achieve. The goals include protection of human health and the environment, prevention of exposure to contaminants, source control, plume containment, and plume restoration. Source control under the policy covers containment and removal of free product and treatment of principal threats. This usually requires active removal of sources followed by MNA of plume contaminants. Similarly, regulations for cleanup of underground storage tank sites require removal of free product to the extent practicable.

Under the policy, MNA is considered appropriate where remedial objectives are achieved within a reasonable timeframe, where plumes are already shrinking, or as part of a larger remedy. The issue what constitutes a reasonable timeframe is a site-specific determination developed from an analysis of alternatives. Technical impracticability waivers often come into play in this analysis, and an attenuation rate estimate also is determined based on observed attenuation (an order of magnitude decrease is required) and standard statistical confidence intervals.

Navy Case Study

James Wright, U.S. Navy, presented a case study on MNA implementation at the Naval Air Station at Fallon, Nevada. The site of concern at NAS Fallon is a fire training pit contaminated with chlorinated hydrocarbons. This particular MNA remedy has been successful: the Navy has seen complete destruction of PCE down the daughter product chain. The remedy did require removal of vinyl chloride from sources, and the Navy had to monitor the fate of cis-DCE very closely. Mr. Wright noted that electron donors must be available for MNA to Awork@ and further noted that BTEX at the site attenuated more readily.

DOE Case Study

Kent Sorenson, U.S. DOE/INEEL, presented a case study on MNA implementation at an Idaho National Laboratory test site. Up until 1972, the test area received industrial wastewater, low level radioactive waste, and sanitary sewage. A 2-mile wide TCE plume (with a small source area) now contaminates the aquifer, which is 200-400 feet below the surface in fractured basalt. A Record of Decision signed in 1995 selected pump-and-treat as a default remedy for the plume (with a 100-year timeframe for remediation), but was flexible as to other remedies that could be implemented after further analysis. INEEL has analyzed *in situ* bioremediation and MNA, believes they constitute a cheaper, better remedy for the site (for reasons discussed below), and is seeking regulatory approval for replacing the pump-and-treat remedy with bioremediation of source areas and MNA for the plume. The Idaho Lab believes pump-and-treat will not meet the 100 year objective and cost an additional $6 million. A decision by regulators is pending.

Mr. Sorenson reviewed the evidence that natural attenuation was occurring, but noted also several interesting phenomena they observed. Reductive dechlorination was very localized as there was not enough carbon available to Afuel@ wider dechlorination, and there was no downgradient dechlorination; however, there also was no evidence of increasing concentrations downgradient, leading them to ask where the source was going. In essence, mass balance at the site did not balance. After conducting a thorough statistical analysis they were able (with 95% confidence) to calculate a half-life for PCE at the site of 8-17 years. Part of the analysis examined two models of the plume, one with degradation occurring and the other without. The observed plume is behaving closer to the model with degradation occurring. Also, the project team simulated concentration ratios for the observed plume which yielded results supporting their conclusions. Mr. Sorenson noted that the analysis could control for dispersion effects by adding or subtracting an order of magnitude from the analysis. They found that the effect of dispersion decreases over time. In response to a question, Mr. Sorenson said the U. S. Geological Survey analyzed dissolved carbon at the site, which was found to be uniform throughout the aquifer. Oxygen needs for the co-metabolite were found to be very low, hence they were very confident in their half-life finding.

EPA Case Study

Guy Sewell, U.S. EPA/Ada National Laboratory, presented a case study on MNA implementation at a small dry cleaning site in Florida (in contrast to the very large site in Idaho) contaminated with chlorinated solvents. The remedy for the site includes solvent extraction for source control and co-solvent (ethanol) flushing and MNA for the plume. Mr. Sewell reviewed the standard electron donor/acceptor pattern and discussed the common problem of plumes that run out of Afuel@ for complete dechlorination. He noted that subsurface conditions may not Aprime@ the system and sustain the biological agents needed for getting past the DCE link in the product chain. Aerobic conditions made the Florida site very stable, with no reduction of PCE occurring. Introduction of ethanol resulted in lots of ethene in the subsurface but little vinyl chloride. However, Mr. Sewell noted that the project need only achieve 2% efficiency to achieve goals. Based on the low rate of reduction seen, they calculate that the dissolved phase contaminant can be dechlorinated in 3 to 30 years, while the source will be clean in 24 to 240 years, which compares favorably to the prospect of permanent contamination without the introduction of ethanol. In response to a concern that ethanol concentrations would kill off necessary biological agents, spent ethanol was recovered, from which contaminants could have been stripped and the ethanol re-used, though that was not done at the site.

Wetlands MNA

Dave Burris, Armstrong Laboratory/Tyndall Air Force Base, briefed the Roundtable on an Air Force study on natural attenuation at a site where a chlorinated solvent plume is discharging into a wetland. Mr. Burris noted that chlorinated substances such as PCE persist longer in the environment than hydrocarbons, resulting in

larger contaminant plumes and an increased likelihood of surface discharges. The three-year study is in its first year: most field work is planned for 2000. The Air Force study is examining different types of wetlands, including groundwater-fed wetlands (Hill AFB), tidal marshes (McGuire AFB) and peat bogs (Aberdeen Proving Ground). Field teams will use a multi-level sampling system that is able to establish discrete sampling locations while saving money. The Air Force also has developed a protocol for the studies at the various sites to minimize deviations.

General Discussion

Guy Sewell opened the discussion by asking about the cost of a failed MNA project where five years later responsible parties are required to eat the cost of the failed project and move on to some other active remedy. He added that stalled cis-DCE plumes at chlorinated solvent sites abound, and project managers need to do a better job up front of whether conditions will support full dechlorination. In response, Mr. Haas said he defines failure by asking Adid the source move?@ Containment is the key, since if containment is achieved, the threat has not increased. Dr. Marqusee cited a recent study by the National Academy of Sciences of risk-based methods for selecting remedies that asked whether there is a qualitative difference regarding risks associated with disturbing a source versus leaving it alone.

Dr. Kovalick added that he often sees MNA confused with biodegradation of chlorinated solvents, which can be one component of MNA. He stated his preference calling the process intrinsic bioremediation and thereby having it seen by regulators as on a par with other bioremediation remedies. Mr. Lovelace agreed that the loose terms used by technical staff in describing what is occurring are a significant problem when dealing with regulators. For example, if the focus is on the dispersion that occurs during natural attenuation, regulators tend to interpret this as sources running loose. Dr. Marqusee added that advocates for MNA need to measure and report performance and achievements much more effectively to overcome the reluctance of regulators to sign off on MNA. Performance measures should extend beyond mere reports of monitored reductions in contaminant concentrations, and should be linked to cleanup objectives to report how the approach is meeting those objectives. The critical step is to figure out the key metrics early in the process and collect the data required by those metrics to demonstrate that the remedy is progressing and will succeed.

Optimization of Groundwater Monitoring and Pump/Treat: Development of Action Agenda

Review of Major Conclusions at FRTR St. Louis Conference

Kathy Yager, U.S. EPA/TIO, reviewed highlights and planned future actions from the conference on optimization of long-term groundwater monitoring and pump-and-treat systems held in St. Louis last June. [Summary conference proceedings are available on the Roundtable homepage (**www.frtr.gov).]** Several recommendations were reached at the conference, including the scheduling of regular, low-cost evaluations/audits of monitoring systems. Ms. Yager said the checklist developed by the Army Corps of Engineers was very useful in this area. Project managers should use geostatistical and other statistical methods to reduce the number of monitoring samples needed. Remote, *in situ* sensors for monitoring can be useful, but cost data and further R&D for the instruments are still needed. Standards for data management and visualization tools also are needed. Action items identified at the conference include addressing the lack of incentives to perform optimization analysis, outreach and technology transfer issues, and further development of optimization tools.

Summary of Current Agency/Department Activities

Dr. Marqusee reviewed current Roundtable member-agency activities regarding long-term monitoring and pump-and-treat systems. SERDP/ESTCP is presently conducting a survey of these activities. Survey results should be reported in early 2000. ESTCP has put out a call for the development of management procedures for long-term monitoring and has kicked off an optimization initiative for pump-and-treat systems with several public and private partners. SERDP has provided seed money for development of sensor technologies at the proof-of-concept stage. Dr. Marqusee noted that remote sensors work but are prohibitively expensive; SERDP is looking for advances that will drive costs down.

Discussion of Future Action Agenda

Mario Iarerdi, U.S. Air Force AFCEE, said interest in the St. Louis was high (attendance was approximately 550) and the Roundtable should consider convening a biennial optimization conference. The American Chemical Society planned a similar meeting for March 2000 based in large part on the interest demonstrated at the St. Louis conference. Engineering consultants see broad opportunities in the area. He added that the five year review cycle should be used to reinforce the push for optimization, while recognizing that modifying RODs can be tricky. The key is sell the benefits of optimization to project managers prior to seeking approval from regulators. Ms. Yager agreed, noting that regulators often will let such proposals for system improvements languish because getting state and management buy-in is difficult. Dr. Kovalick, citing the 9th edition of the Annual Status Report on Innovative Technologies issued by TIO, noted that modifying RODs is not a problem, and occurs regularly.

Mr. Cummings said the benefits of optimization are often enhanced technical capability, not cost savings. The added capital investment provides better, but not necessarily cheaper, results. Mr. Iarerdi agreed, adding that incentives for optimization are needed. Mr. Cummings suggested development of guidance on optimization to put project managers on notice that they should expect to refine their remedial systems over time.

Ongoing Roundtable Projects

Update on Roundtable Agency Cost and Performance Reports

John Kingscott, U.S. EPA/TIO, gave a progress report on the issuance of Roundtable agency cost and performance reports. The number of reports available through the Roundtable homepage is up to 140, with an additional 69 to be available soon to bring the total to 209. The reports are accesed via the homepage about 600-900 times per month, and the guide for reporting cost and performance data has been downloaded more than 1,000 times. Currently, the Fall 1999 round of 69 projects is being assembled and indexed for publication in six or seven volumes, including a possible CD-ROM version.

Technical Session: Environmental Cleanup Decisions Using Technical Information Systems (TIS)

Expectations, Results, and Goals

Jennifer Rock, U.S. Air Force/Scott AFB, said the Air Force is working to create a network encompassing the remediation programs across the twelve separate Air Mobility Commands that will consolidate remediation data, depict remediation concerns and needs, and deliver technical information to the broadest audience possible. The Air Force has created a browser application as part of the system. Ms. Rock gave an online demonstration of the system. The URL for the current version is amc-ce.org.

U.S. EPA

John Bing-Canar, U.S. EPA Region 5, demonstrated the Fully Integrated Environmental Location Decision Support (FIELDS) system developed by Region 5 that uses GIS to support decision-making in the field. Bob Furlong, U.S. Air Force, asked how the FIELDS system could facilitate data sharing. Mr. Bing-Canar said they plan to use Equus to compile data, but need to decide where the data will reside and which viewer application(s) will be supported. Ms. Shockley added that the Defense Department is creating similar capabilities for use on the DENIX network.

U.S. Navy

Ed Lohr, U.S. Navy/SOUTHDIV, gave a presentation on the Navy=s use of GIS to support real-time decision-making. Under the BRAC program, the Navy has used GIS to enhance data visualization at public meetings, briefings, and other forums where technical presentations can benefit from such visualization. Mr. Lohr said mixing and matching of overlays is the key to effective presentations.

U.S. Air Force

Al Brickeen, U.S. Air Force/Travis AFB, gave a presentation on cleanup decision-making using GIS. Mr. Brickeen is the remedial project manager (RPM) at Travis AFB. He said GIS offers the advantage of presenting site data clearly, which can reduce the time regulators need to arrive at decisions. Mr. Brickeen gave a demonstration of the technique using a wetland site at Travis, overlaid with IRP sites and further overlaid with landfill and soil contamination locations. GIS also can be used to distinguish different types of wetlands. Mr. Brickeen also presented an overlay of groundwater sites at Travis, showing a large TCE plume across the center of the base. He demonstrated how GIS can be used to show the expected movement of the plume over the next 100 years.

Discussion and Next Steps

Mr. Furlong led a discussion on the state of technical information systems and next steps for the Roundtable to take. He said the Air Force would like to see a cooperative effort on the subject move forward, and offered to lead such an effort. He asked whether the Corps of Engineers has developed similar capabilities. Ms. Shockley said the Corps has a GIS Center of Expertise at its Savannah Division and has developed other TIS capabilities. She said the Corps regularly uses real-time data via GIS for water projects, and added that the Corps has developed a real-time capability for modeling groundwater contamination.

Mr. Furlong said struggles over system components, viewers, etc., have delayed wider use of TIS in the past, but added that standardization issues are becoming less important as more and more applications can read and manipulate multiple types of data. The development of cross-capabilities should enhance the usefulness of TIS. He noted that the RPM at Andrews AFB, which was recently added to the National Priorities List, is able to carry an electronic data set for the site around on his person and can get real-time updates as needed. Mr. Iarerdi said record retention has become an important issue since decision documents must be supported by performance data using the proper metrics.

Dr. Kovalick asked whether they see any risk to presenting visuals that, for a lay audience, seem to paint an exact picture of site conditions rather than just a model of what engineers believe conditions to be with some level of confidence based on the data available and assuming all the algorithms are correct. An audience of project managers may understand these limitations, but what about presenting visuals at a public meeting? For example, the GIS-enhanced Apicture@ of the Massachusetts Military Reservation (MMR) site displayed at a public meeting conveyed a wide variety of possibly erroneous information, but the picture stuck with the audience because it is visually compelling. Since public education is the key to the usefulness of TIS, Dr. Kovalick called upon designers to find ways to convey the level of uncertainty associated with the information. Mr. Haas agreed, noting that MMR is a heterogeneous site, and as heterogeneity increases, the usefulness of geostatistics decreases.

Mr. Furlong restated the Air Force=s commitment to a federal initiative for the development of TIS. He said the result otherwise could be a lot of duplication of effort. Mr. Haas said the key is data compatibility, and any effort should set goals of keeping data productive, useful, and useable. Jim Woolford, U.S. EPA/FFRRO, said the topic could be put on the agenda for the EPA Federal Facilities meeting to be held in January 2000.

Closing Remarks

For the next Roundtable meeting, Ms. Shockley suggested the topic of unexploded ordnance (UXO) be put on the agenda. She said the issue has become an overriding concern within all of the DoD services and is important to other member-agencies. Dr. Kovalick asked whether the topic is not being covered elsewhere and whether Roundtable attention will add to other efforts, especially those of the Joint UXO Coordinating Office. Mr. Furlong agreed that the topic is ripe for a Roundtable meeting, and suggested that the meeting focus on both characterization/delineation of sites and response, which are really two separate issues. Jim Jenkins, U.S. Army, agreed to have the Army coordinate the agenda and chair the meeting.

The meeting adjourned.