CRESP

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Savannah River

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Task Group Reports

Other Notes

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Cooperation Yields More than Clean Water

By David Kosson, Ph.D.

CRESP-EOHSI Remediation Technology Task Group Leader

When CRESP does research, we get answers to specific questions needed to clean up a given site. More often than not, other sites have similar problems where that new technology may also work. Beyond that, those new answers provide other broad benefits.

CRESP's ability to conduct independent work of national significance can open paths of mutual interest in both the regulatory community and the Department of Energy (DOE). Each advance in research reduces the mystery of risk. Each advance allows the regulatory process to articulate new solutions for its goals. As risk definitions evolve, regulatory approaches often become more effective, efficient, and protective.

One illustration of this process is the work underway at Savannah River Site (SRS) in the clean up of C-Area Burning /Rubble Pit. CRESP Remediation Technology and Exposure Assessment Task Groups have been working with representatives from DOE, Westinghouse Savannah River Company, South Carolina Department of Health and Environmental Control (SC DHEC), and both researchers and regulators from the U.S. Environmental Protection Agency (USEPA).

The task is to remediate from the vadose zone and groundwater volatile organic contaminants (VOCs). Example VOCs include trichloroethylene (TCE) and carbon tetrachloride. They are classified as *volatile* because they evaporate into the air at normal temperatures and pressures. At SRS, TCE is frequently a contaminant of concern.

At SRS and other sites, VOCs are removed in two ways. The first is called soil vapor extraction (SVE). VOC-laden air in the vadose zone, the area between the surface of the ground and the water table, is drawn out of the unsaturated soil. At the surface, activated carbon absorbs the chemical or it is treated by other methods such as catalytic oxidation and the clean air is vented to the atmosphere.

The second method, called air sparging (AS), is to pump air into the groundwater so the air absorbs VOCs as the air bubbles through the

saturated zone on its way up to the vadose zone. From there, VOCs are recovered by SVE.

Once a system is set up, questions arise: How much contaminant can be removed? Since it is not cost effective to operate beyond what is practical, how do we know when to turn it off?

In the past, researchers have looked for those answers in mathematical models that made predictions on certain assumptions. The models assumed that subsurface conditions were uniform. Where subsurface soils are complex and irregular, as they are at SRS, those assumptions lead to an overestimation of the rate and extent to which remediation is possible.

The solution is to develop and validate a model for SVE and AS performance that overcomes these limitations. A contaminant mass transfer model is being evaluated. It is expected to provide insight on process performance, operating conditions, and achievable endpoints. The model development will be integrated with the start-up and operation of the SVE/AS remediation system.

The clean-up target is a TCE plume in the vadose zone and water table aquifer at the C-Area Burning/ Rubble Pit. Beneath the surface, interbedded sands, silts, and clays form a complex, layered structure. The model being developed and evaluated includes information about the subsurface heterogeneity. Built into the model is information about the slow and variable release rates of sediment constituents. At times during remediation, the sediment releases concentrations of TCE. The model will be calibrated and evaluated on laboratory results of subsurface characteristics for the contaminated area and monitoring data from system operation.

Cooperation among CRESP, DOE, Westinghouse, SC DHEC and USEPA should yield more than clean water at SRS. It can lead to ways that help government better address the needs of its citizens for both protection and efficient operation at hazardous waste sites everywhere.

Data Characterization, Analysis, and Statistics

The primary project in progress with this Task Group is an extension and expansion of the SRS worker-mortality study that was conducted by Dr. Donna Cragle of the Oak Ridge Institute for Science and Education. CRESP's goal is to expand the scope of the study to include women and blacks, and to add another nine years of follow up to the previous data.

Last summer, the Task Group received the data on the vital status and causes of death of the workers at SRS. Since the last evaluation, the population has aged and the number of deaths among white males has nearly doubled giving us greater sensitivity to detect any unusual occurrences. Currently, we are looking at the overall cause-specific death rates in each of the race/ gender groups, and looking for trends that may give us insight into possible exposures. Because a small but important excess was reported in Dr. Cragle's study, we are looking most closely at the leukemia deaths. We expect to complete a preliminary report in the next few months.

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www.cresp.org

Ecological Health

The mission of this Task Group is to learn about biodiversity from all levels: individuals and human populations, plants, animals, landscapes. We want to learn how individual species can signal significant changes in both ecological and human health that are the result of human activity. And we want to learn how people value and use ecosystem services such as clean water and recreational opportunities.

To those ends, this Task Group worked under the leadership of Joel Snodgrass of the University of Georgia's Savannah River Ecology Laboratory (SREL) and looked at larval amphibians and fish in 22 relatively pristine wetlands on SRS. We wanted to know if larval amphibians could serve as a bioindicator for wetland ecosystem health. A bioindicator is a species that reflects a measure of ecological or human health. To do so, we compared the following: 1) hydroperiod length (number of days a wetland basin held water), 2) fish presence or absence, and 3) the kinds and numbers of larval amphibians.

One condition that appears to serve as an indicator of ecosystem health was the number of different species of native larval amphibians: The higher the number, the better the wetland ecosystem health.

Several conditions were discovered that do not serve as an indicator of ecosystem health. We discovered no correlation between hydroperiod length and species present. Some wetlands with a long hydroperiod often contained fish yet had a low number of amphibian species. Some larval amphibian species were chiefly in wetlands with fish. The kind and number of larval amphibians varied with hydroperiod length and presence of fish.

We also want to learn how people use ecological resources. With that knowledge, stakeholders can better plan what to do with DOE sites. However, that planning must be done in light of whether humans are at risk using that resource. For example, with hunting or fishing for food, scientists in the past often only looked at risk from eating fish or deer. They did not look at all the meats in a diet. Nor did they see if the meat was self-caught or store-bought. In a study at Idaho National Engineering and Environmental Laboratory (INEEL), we learned that people eat a variety of game besides deer or elk.

In our study at the Palmetto Sportsmen's Classic in Columbia, we are looking for the relative importance and percentage of self-caught game and fish in a participant's total diet. By studying all the meats in a diet — percentages and sources, we learn more about risk associated with those resources. We expect the results early this year.

We are looking at risks to ecological workers on SRS because they are different from risks faced by DOE site workers. The DOE site employees do maintenance, operations, clean up industrial or hazardous facilities, work regular hours, and work near other employees.

Besides those employees, nearly all DOE facilities have on-site DOE ecologists. They include environmental monitors, off-site contractors, or personnel from large ecological laboratories. Some DOE ecologists conduct routine monitoring, compliance, and regulatory work. If they work regular hours from nine to five, they limit their hazard exposure time to the same length as regular employees. However, this is not true of many contractors or ecologists who work in the field. Their jobs may require them to start early or stay late, thus extending their exposure time to hazards.

Additionally, those who work outside or alone face hazards that are unknown to those who work inside or near other employees. If an ecological worker breaks a leg or is bitten by a snake when in a remote area, the worker may have no way of notifying anyone for help. Clearly, help is available sooner for workers who are near others. Ecological workers may also face infectious, chemical, and radiation hazards. J. W. Gibbons, also at SREL, is collaborating in this study of ecological-worker risk.

For more information, contact Joanna Burger at <burger@biology.rutgers.edu> or 732-445-4318.

Outreach and Communication

Members of this Task Group continue to attend local meetings and learn what concerns stakeholders. These ideas are shared with other CRESP researchers so they too know what the public values. By invitation, three CRESP-EOHSI Task Group Leaders gave presentations on CRESP to the SRS-CAB's November meeting. Lynn Waishwell, of the Outreach and Communication Task Group, described the basic mission. Lynne McGrath, Health Hazard Identification Task Group, set the context for risk. Dave Kosson, Remediation Technology Task Group, explained how CRESP efforts contribute to improving effective

groundwater clean up. Lynn Waishwell continues to be active in the Risk Management Working Group effort of the SRS Future Use and Risk Management Subcommittee. She participates on two teams that study aspects of the risk assessment and management processes.

Lynn recently presented the results of a study comparing news stories of SRS and Rocky Flats at the Society for Risk Assessment Annual meeting. This work was done with Karen Lowrie of the SLUDGE group. (See SLUDGE report in this issue.) Lynn also attended the SRS-CDC Health Effects Subcommittee meeting in early December in Salt Lake City, Utah. At this meeting, all four Health Effect Subcommittees convened to discuss future directions.

For more information, contact Lynn Waishwell at <lwaishwe@eohsi.rutgers.edu> or 732-445-0220.

Social, Land Use, Demographic, Geographic, and Economic

In recent years, the DOE has begun to provide more information about site activities and to involve the public in various ways. Since many people rely on newspapers for information, it is important and timely to evaluate newspapers' emphases in their coverage of these facilities. Karen Lowrie, from this Task Group, and Lynn Waishwell, Outreach and Communication Task Group, performed a content analysis study on newspaper stories about SRS and Rocky Flats Environmental Technology Site in Colorado. Although both facilities pose significant potential health risks to workers and surrounding populations, those two regions were compared because their regional economies and populations differ in size and composition.

For each site, a major local newspaper and one or two major regional papers were included in the study. Articles appearing between July 1996 and June 1997 were coded for their main subject, sources, attention to hazard and risk, and impacts mentioned. The type of coverage and how it differed between the two site areas was examined.

Of those paragraphs attributed to a source, the highest percentages were "official" sources, that is, those from the site (38.4%) and DOE-Washington (20.1%). When an impact was mentioned, it was related to economics more than 50% of the time across all articles. Put another way, almost 90% of all the

Table 1 - Impacts by Site (Paragraphs and Articles)

Impacts	Percent of SRS Paragraphs (n=1,933)	Percent of RF Paragraphs (n=730)	Percent of all Paragraphs (n=2,663)	Percent excluding No Impact (n=846)
Economic-Local	12.1[a]	1.5	9.2	29.0
Economic-National	4.2	5.1	4.5	14.1
Cost-Effectiveness	4.1	2.7	3.8	11.8
Human Health	2.5	2.2	2.4	7.6
Occupational Health	5.4[a]	1.6	4.4	13.7
Environment*	3.8[a]	5.5	4.1	13.2
Stakeholder Involvement	1.3	2.1	1.5	4.8
Multiple	2.0	1.4	1.8	5.8
No Impacts	64.6[a]	77.9	68.2	-.-
Total	100.0	100.0	100.0	100.0

* Environment impacts, as shown here, is a sum of the original categories "environment-general", "water quality", "ecological". and "off-site land use".
[a] Proportion different from RF at p<.05

paragraphs written about the two sites dealt with things other than human health, occupational health, or environmental impact (See Table 1on page 4.).

To summarize, coverage of SRS stressed local economic impacts to a much greater degree than coverage of Rocky Flats; SRS coverage also relied more on site officials for information. Coverage of Rocky Flats offered more alternative views and more balanced, though less frequent, reference to impacts of the site on the region. Findings suggest that newspapers in general downplay health hazard aspects of nuclear facilities. Also, the relative lack of outside experts as sources in articles about sites has implications for public trust of information.

For more information, contact Michael Greenberg at <mrg@rci.rutgers.edu> or 732-932-0387 x673.

Worker Safety and Health

This Task Group is currently focusing on work in three areas. The first is the health of workers who clean up and close DOE sites. These sites may contain chemical and radioactive waste. As the SRS mission has changed, so has the division of labor. At first, the prime contractor was often the only contractor. Today, subcontractors do more work. Many of them have little experience with either hazardous materials or DOE sites. Up to four tiers of subcontractors are common. Each is responsible for the health of its work force. Each is — in principle — responsible for the subcontractors below them.

Unfortunately, little reliable information on health and safety consequences for this structure exists. On DOE sites, subcontract workers have higher injury rates than prime contract employees. Is this because the work they do is intrinsically more hazardous? Are subcontractor training and safety programs limited? Are they adequate?

Finding out who is doing what kind of work has been very difficult. We need to know how many are engaged in various tasks. We need to know whether it is waste management or site remediation. The Task Group can identify subcontract workers who do construction. But many remediation activities are not grouped under construction. Therefore, our goal is to get better information. We want data that tells about site remediation work, how many workers are involved, and what risks they face.

A second activity of the Task Group also deals with relevant information: The information that goes between primary care providers — physicians, nurses, physician assistants — and their patients. The provider needs to know the kinds of questions to ask. This will help them better serve their patients. Providers also need information about hazards and exposures so they can give the patient the best counsel. Such clinicians serve both regular workers and those in site remediation. And those who live near the site.

The Task Group wants to learn what questions workers and community residents have about site-related health matters and what needs clinicians identify. A curriculum is being written to fulfill this two-way need.

A third project concerns risks to field workers who encounter natural hazards. These workers are ecologists, hydrologists, foresters, etc.

- At Hanford, for example, workers cleaned a site that was also a winter den for rattlesnakes.
- Infectious agents are also a problem for field workers: In the East, it is Lyme disease; West, hantavirus (hantavirous pulmonary syndrome known as HPS).
- SRS researchers and CRESP staff captured raccoons to assess their degree of contamination. Workers were immunized against rabies. Fortunately, all 48 raccoons tested negative for rabies.

Researchers and staff are learning various precautions to reduce risk from natural hazards.

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Other Notes

Report from CRESP-University of Washington

Second Health of Hanford Site Conference a Success

The Hanford Advisory Board and CRESP were two of the cosponsors of the second annual Health of the Hanford Site. CRESP provided many of the presentations, roundtable discussion leaders, and posters during the two-day event that hosted 250 participants held last November in Richland, Washington. Reviewers saw that organizers adopted suggestions from 1997's conference and made positive comments about

1998's. Hanford Advisory Board Chair Merilyn Reeves called for continued HAB sponsorship for 1999. Among the 37 sponsors were educational institutions; stakeholder and citizen groups; federal, state, and regional regulating agencies; plus DOE offices and contractors.

Second Series of Openness Workshops Funded by DOE

The Department of Energy Richland Field Office (DOE-RL) has approved funding for a second series of Hanford Openness Workshops (HOW) in 1999. CRESP-UW's Outreach and Communication Task Group worked with DOE-RL, the Washington Department of Ecology, and the Oregon Office of Energy to coordinate and host the first series of four workshops. The goal was to help DOE fulfill former Secretary O'Leary's commitment to openness in decision-making. The workshops brought together citizen advocates, Tribal leaders, and DOE managers from RL to examine barriers to openness and see the progress made. HOW participants forwarded a set of 51 recommendations to DOE. A set of fact sheets and the final report are available from CRESP-UW.

CRESP-UW Task Group Leader Named to Hanford Expert Panel

Dr. James Karr, head of CRESP-UW's Ecological Health Task Group, was named by DOE as one of eight members of a Hanford Expert Panel. The Panel will provide DOE with recommendations and advice on ways to reduce contamination of groundwater and the vadose zone (the area from the ground surface down to groundwater) at the Hanford site. The Expert Panel is a key component of the Hanford Groundwater/Vadose Zone Integration Project. The Panel will develop a site-wide approach to managing many Hanford projects that address impacts on soil, groundwater, and the Columbia River. Scientists from universities, consulting firms, and the public sector compose the Panel which plans to meet several times a year.

For more information, contact Deirdre Grace at <dagrace@u.washington.edu> or 206-616-7378.

The **Consortium for Risk Evaluation with Stakeholder Participation** (CRESP) is a university-based national organization created specifically to develop a credible strategy for providing information needed for risk-based cleanup of complex contaminated environments, especially those for which the Department of Energy is responsible. The Consortium specifically responds to the request by the Department of Energy and the National Research Council for the creation of an independent institutional mechanism capable of integrating risk evaluation work. As a result of a national competition, a five-year cooperative agreement was awarded to CRESP in March of 1995. *CRESP Update: Savannah River* is one way to share research plans and programs with Savannah River Site stakeholders.

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