INTEGRATED SCIENCE & TECHNOLOGY, INC.

1349 Old Highway 41, Suite 225
Marietta, Georgia 30060
(770) 425-3080
FAX (770) 425-0295

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Contact:
H. James Reisinger, MS, CHMM
President & Principal Scientist
1349 Old Highway 41, Suite 225
Marietta, Georgia 30060
Phone: 770-425-3080
istatlanta@aol.com
www.integratedscience.com

ESTCP Awards IST Research Contract for Vapor Intrusion Micro Sensor Technology

Marietta, Ga. – (March 19, 2007) – The Environmental Security Technology Certification Program has awarded Integrated Science & Technology, Inc. (IST) a research contract for the project "Application of Advanced Sensor Technology to Department of Defense Soil Vapor Intrusion Problems."

IST's advanced sensor technology approach is a creative application of existing technology to address the emerging Department of Defense (DoD) vapor intrusion (VI) issue. IST's Principal Civil and Environmental Engineer Rob Hinchee will direct the project with Principal Scientist, Biogeochemistry David Burris. IST staff will team with scientists from Honeywell to develop the micro sensor and investigation and sampling processes.

"With this ESTCP research funding, the IST and Honeywell Team has the opportunity to transform the current approach to identify vapor intrusion issues," explains Dr. Hinchee. "Our technology will provide more sensitive detection and source identification, while being less intrusive for the resident and more economical for the DoD. It will create a win-win scenario for everyone."

Vapor intrusion is the entry of vapors into inhabited structures from underlying contaminated soils or ground water. VI is an emerging problem, the extent of which has only recently been recognized by the Department of Defense (DoD), regulators, and others. DoD facilities investigating VI include Hill AFB, Altus AFB, Ft. Lewis, Paris Island, NAS Jacksonville, McClellan AFB, Ft.Ord, NAS Moffett Field, DoDHG Novato, and NS Pearl Harbor. In addition to these, investigations will be required at many more facilities. Currently, vapor samples are collected in Summa canisters and analyzed in a laboratory by U.S. EPA TO-15 (GC/MS). Target concentration levels for some compounds of concern such as trichloroethylene (TCE) are in the parts per trillion by volume (ppt_v) range. This approach yields costly, limited data that: 1) seldom is representative of exposure conditions (indoor air concentrations vary substantially); 2) often can not determine if a detected contaminant is of VI-origin or an indoor source; and 3) intrusive (it is often difficult to gain access to homes). If excessive risk is identified, the usual mitigation approach is sub-slab depressurization, which can have substantial long-term OM&M costs. Presently, there are no commercially available sensor products adapted to or proven for VI application.

The overall objective of IST's project is to take existing and emerging technology and to build and demonstrate the best sensor packages possible for application to VI problems. Specific project objectives include screening of available advanced sensor technologies, selecting the most promising ones, and building and demonstrating the sensor packages for the following applications: 1) **portable "sniffer" unit** for near-real-time compound-specific determination for contaminant source assessment; 2) **fixed "smoke detector" unit** for compound-specific exposure concentrations interfaced with remote communications; and 3) an **in-line pressure unit** installed in sub-slab depressurization system for long-term low maintenance system performance monitoring interfaced with remote communications.

Existing and emerging gas detection technologies will be identified, and, in Phase 1, technologies will be selected for three VI applications. To the extent possible, emphasis will be placed on Micro Electro Mechanical System (MEMS) miniaturization and microanalytics to reduce cost, complexity, and the level of intrusiveness. The cost of production and operation of a MEMS-based sensor or pre-concentrator will be significantly less than conventional technologies. A MEMS-based, chip-scale pre-concentrator will likely be selected for both the portable and fixed units to increase both sensitivity (lower detection

limits) and selectivity (pre-concentrator can be adapted to trap specific compounds). Technologies to be considered for compound detection include micro-scale gyroscope cavity ring down spectroscopy (G-CRDS), micro-scale robust photoionization detector (PID), and MEMS-based □-GC with various detectors. The in-line unit will be a commercial pressure sensor with remote communications. Only one technology approach for each of the three VI applications (portable, fixed, and in-line) will be carried through to Phase II, which will involve prototype construction and testing, including extensive field demonstration at sites with TCE VI concerns at Hill AFB (residential homes overlying shallow TCE ground-water plumes).

"This is truly Buck Roger's type technology!" enthuses IST President Jim Reisinger. "We will revolutionize vapor intrusion detection and remediation with a microsensor."

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