

## Environmental and Sustainable Technology Evaluations (ESTE): Radio Frequency Identification (RFID) Tracking of Hazardous Wastes Across International Borders

### Impact Statement

The unchecked and untracked shipment of harmful chemicals and hazardous waste across borders poses a threat to our environment, human health, and economic security. The Resource Conservation and Recovery Act (RCRA), EPA's regulatory and statutory authority for hazardous waste management, imposes cradle-to-grave requirements on the management of hazardous wastes, including their import and export. RCRA is complemented by three multilateral agreements that address hazardous waste shipment across borders, the U.S. and Mexico Border 2012 Agreement, the Smart Border Accord with Canada, and the North American Free Trade Agreement.

The emergence of RFID technology has important implications for tracking the movement of hazardous wastes and other materials, including the international transport of hazardous waste into the United States for disposal. RFID is an automated data capture technology that can be used to electronically identify, track, and store information about tagged items. It consists of a tag, reader, and database. The tag contains a chip and antenna. The chip is encoded with a unique identifier, which can be scanned by a radio frequency reader and uploaded to a database, allowing for real-time tracking of harmful chemical and hazardous wastes.

Since the physical characteristics of chemical wastes and waste containers could potentially interfere with the radio frequency signal, it is important to verify how well technologies perform during the shipment of harmful chemical and hazardous waste from one site to another.

### RFID Draft Protocol Development

In 2005, EPA's Environmental Technology Verification (ETV) Program started the ESTE project to verify the performance of RFID systems during hazardous waste transport. This project was managed by the EPA Office of Research and Development, with collaboration from the EPA Office of Air and Radiation and EPA Office of Enforcement and Compliance Assurance. A draft protocol for testing the performance of RFID systems was developed based on input from EPA, stakeholders, vendors, and many international and national collaborators. This phase of the project was completed in February 2008, following the completion of the draft protocol.

### RFID Testing and Verification

In March 2008, ETV's Advanced Monitoring Systems Center (AMS), which verifies the performance of technologies that monitor air, water and soil, identified RFID systems as a priority technology category for verification, and decided to use the existing ESTE draft protocol for final test plan development and verification testing. AMS released an announcement inviting vendors to participate in verification testing

### ETV Program

The ETV Program operates as a public-private partnership mainly through cooperative agreements between EPA and private nonprofit testing and evaluation organizations. These ETV verification organizations work with EPA technology experts to create efficient and quality-assured testing procedures that verify the performance of innovative technologies. ETV operates six centers which cover a broad range of environmental technology categories. Vendors and others in the private sector, as well as federal, state and local government agencies, cost-share with EPA to complete priority ETV protocols and verifications. In 2005, a new element of ETV was initiated, Environmental and Sustainable Technology Evaluations (ESTE), in which the most important technology categories for meeting EPA needs are verified through contracts with verification organizations. ETV developed the draft RFID protocol under an ESTE project. See <http://www.epa.gov/etv/este.html> for more information on the ESTE project.

in Spring 2008. Currently, two vendors of RFID technologies have agreed to participate in the verification test, which AMS will perform in February 2009.

These technologies will be tested using an EPA approved test/quality assurance plan that lays out testing conditions and quality assurance requirements. Passive, semipassive, and active tags will be verified and various RFID tracking scenarios will be employed. RFID tag location, antenna orientation, read distance (distance from which the tag can be read), and communication speed will be examined. Cost, speed, and ease of use will also be considered. Results will be published in verification reports and statements, which will be made publicly available on the ETV web site along with the approved test/quality assurance plan, and stakeholder meeting minutes.

### References

EPA, May 2007. *EPA's Environmental Technology Verification Program*. EPA/600/F-07/005.

Battelle, August 2008. *U.S. EPA's Environmental Technology Verification Program Advanced Monitoring Systems Center*.

### For further information contact:

#### RFID Final Test Plan, Testing and Verification

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#### RFID Draft Protocol Development

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### ETV Advanced Monitoring Systems Center

The ETV Advanced Monitoring Systems Center (AMS) verifies the performance of technologies that detect contaminants and natural species in air, water, and soil. AMS is operated by Battelle, a non-profit technology research and development organization, under a cooperative agreement with EPA.

AMS develops test plans, conducts independent tests of technologies, and prepares verification reports and statements for the technologies tested. Vendors of these technologies can use the verification reports and statements for marketing purposes. Regulators, permittees, and users of the verified technologies can refer to the verification reports and statements to help make permitting and purchasing decisions.

To date, AMS has completed verification tests of over 125 technologies, including continuous emission monitors for mercury, dioxin, and ammonia; ambient monitors for fine particulate, ammonia, hydrogen sulfide and ozone; test kits for arsenic, cyanide, atrazine, and other water contaminants; and multi-parameter water probes. Nearly 20 additional technologies are currently in the verification testing process.

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