

# Radio Frequency Identification (RFID) in Tracking Hazardous Waste Across Domestic and International Borders

## Supporting GPR A Goal #5: Better Waste Management

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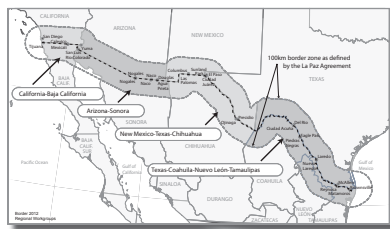
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### Problem

- Resource Conservation and Recovery Act requires cradle-to-grave tracking of all hazardous waste.
- This is difficult when the cradle (generator) is in one country and the grave (receiving facility) is in another.
- Mexican law requires that waste from the maquiladoras (foreign-owned manufacturing facilities) be returned to the country of origin.
- Current paper-based system does not allow for timely confirmation of disposition.
- There is a need to provide more effective compliance monitoring.



This project supports Goal 3 of Border 2012: Reduce Land Contamination.

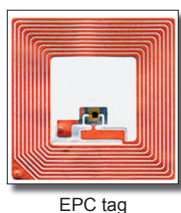
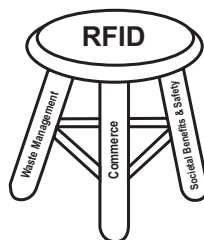
### The Verification Program

- Verification study is being conducted under the Environmental Technology Verification/Environmental and Sustainable Technology Evaluation (ETV/ESTE) Program.
- Various transportation scenarios will be performed to demonstrate the performance of the RFID tracking technology.
- Scenarios will be conducted by NASA-Dryden Flight Research Center. Once the feasibility of the RFID technology is confirmed, a field test will be conducted at U.S.-Mexico border crossings.
- Performance measures will include:
  - tag read rate
  - tag read distance
  - frequency
  - interferences (metal, liquids)
  - security
  - ability to produce actionable data to EPA
  - ease of use

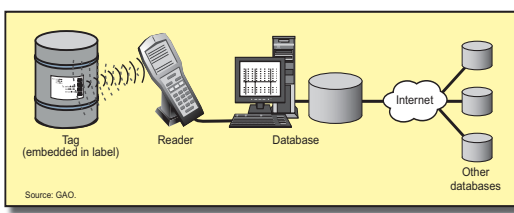
### Solution

- RFID is a commercially ready tracking technology.
- Using RFID to physically track shipments of hazardous waste across the U.S.-Mexican border strengthens environmental compliance.
- Increased coordination between U.S. and Mexican environmental authorities will facilitate increased security of these shipments.
- Drums can be effectively tracked from the Mexican generator to the U.S. receiving facility.
- Accurate, timely notification can be sent to EPA when waste enters the U.S. and when it reaches the designated treatment storage or disposal (TSD) facility.

**RFID is the solution! Improving how hazardous materials are shipped, tracked, and monitored supports EPA's goal of risk reduction, waste recycling, and regulation enforcement, providing sustainable control of these materials while in transport.**



EPC tag



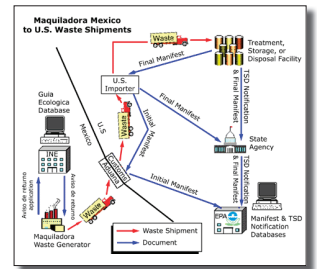
Components of an RFID System

#### Acknowledgments:

We would like to thank Teresa Harten and ETV/ESTE for realizing the value of this project. Special appreciation and thanks to George Brilis for his guidance and expertise on quality assurance.

### Benefits of RFID

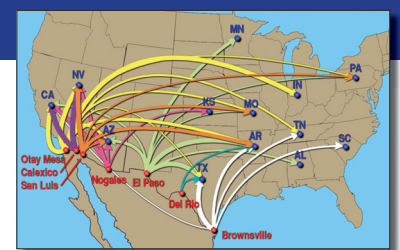
- Physical tracking with RFID will augment paper-based manifest system and provide sustainable documentation for compliance.
- RFID will provide near-real-time notification to EPA officials when maquiladoras waste enters the U.S. and when it reaches the TSD facility.
- RFID-tagged material can streamline border crossings by providing additional information to Customs.
- RFID will increase environmental protection along the border zone, reducing illegal dumping of hazardous waste.



Source: EPA Border Compliance Assistance Center

### Future Uses of RFID Technology

- Provide end-to-end visibility of hazardous materials transportation and storage life cycle.
- Supply critical data to emergency responders.
- Confirm hazardous waste reaches the proper TSD facility.
- Increase security of hazardous waste shipments.



Source: EPA Border Compliance Assistance Center

#### Contributors

##### Partners

U.S. EPA, NASA-Dryden

##### Foreign Border Coordination

**Mexican Officials:** Aduana Mexico (Customs); PROFEPA (Federal Ministry for Environmental Protection); SEMARNAT (Secretary of the Environment and Natural Resources); Director General, Secretaria de Economia (Secretary of the Economy); Border 2012 Waste Policy Forum, Staff del Foro de Politica de Residuos Sólidos y Peligrosos (Staff to the Hazardous and Solid Waste Policy Forum); Maquiladora Association (Generators of hazardous waste)

##### Canadian Officials:

Environment Canada; Enforcement Program; Canadian Customs

##### U.S. Border Coordination

EPA, Office of Solid Waste; Region VI, Regional Compliance Assistance Center; Region IX

##### Federal Agencies:

U.S. Customs and Border Protection; U.S. Department of Homeland Security; U.S. Department of Transportation

##### States:

Texas: Texas Commission on Environmental Quality  
California: Department of Environmental Protection

##### Interstate Truck Stops:

Pilot Travel Centers



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