Actionable Science for Communities

SHC 3.63, Task 3 – Innovation and Long-Term Performance

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Problem Summary & Decision Context

- The purpose of the Innovation and Long-Term Performance Task is to evaluate the current practices for managing used electronics and long term performance of materials management systems
- The Task is comprised of several distinct research areas which, collectively, address a wide spectrum of topics central to the goals of the management of used electronics and electronic waste, sustainable materials management options for electronic, industrial, construction/demolition, municipal materials, evaluation of hazardous waste containment systems, open dumps, mapping of soil moisture, long-term performance and adaptation to climate change of its materials management systems, and adaptation to climate change.
- The resulting information and data will provide information that can be used by the Agency to identify areas for the improvement of materials management.

Task/Sub-Task Overview

Sub Task 1: Used Electronics Flow and Tracking –Teri Richardson

Research focuses on evaluating the effectiveness of current management practices for used electronics and identifying gaps where significant lapses of sustainable management exist. Data are being collected in order to develop a material flow model to track the flow of used electronics at different stages of end-of-life and recycling processes in the U.S.

- **Recovery of Critical Elements and the Conversion from Electronic Waste:** Identify sustainable techniques that are applicable for the recovery of critical elements from used electronics.

Sub Task 2: Containment System Performance - Edwin Barth, David Carson, Thabet Tolaymat, and Dale Werkema

Research focuses on the long-term performance and adaptation to climate change of its materials management systems. The evaluation of containment performance will inform the next generation management approaches for containment systems.

- **Modelling Heat Generation and Migration Profiles in Landfills**: Estimates the heat transfer and air flow in porous media using finite element computer models to simulate a reactive waste placed in a landfill.
- **Evaluation of Open Dumps in Remote Pacific Islands Communities:** Examine the state of practice of materials management on pacific islands that are U.S. territories in an effort to assist with the identification of implementable approaches and technologies.
- **Evaluation of Performance of Hazardous Waste Containment Systems:** Quantifies the field performance of engineered systems based on data from Subtitle C landfills that are nearing completion of 30 years of post-closure care and to ground- truth expected leachate generation rates and chemistry during PCC in relation to current industry norms and expectations.
- **Resiliency of Waste Containment System to Extreme Weather Events:** Evaluates the impact that extreme weather events may have on the robustness of waste containment structures.
- **Software and Field Approaches for Landfill Moisture Characterization:** Code development, documentation, publication, and field demonstration at a landfill site. A field demonstration will showcase innovative, geophysical technologies to help ground-truth soil-moisture, porosity, and hydraulic-conductivity variability.
- **A Landfill Module for the Geophysical Toolbox Decision Support System (GTDSS)**: The Geophysical Toolbox Decision Support System will provide an interface for quantitative modeling tools to support decisions for which geophysical methods can be used given the combination of intended targets, project goals, and the geologic and physical conditions present at a site.
- **Adapting Materials Management Approaches to Climate Change :** Most waste materials in the U.S. are handled at landfill sites. Some of these sites are in areas that could easily be impacted by climate change. This task evaluates the impact of extreme weather event on these sites.
- **Scientific Review of Materials Management Requirements:** Science has advanced greatly since the introduction of some of the material management regulations. This task will evaluates the effectiveness of Agency policies and may help address some of the questions regarding the improvement of the current material management approach.
- **State of Bioreactor Landfills:** Summarizes the data and findings of five bioreactor landfills that the Agency has been tracking since 2004. The findings will allow the Agency to evaluate the performance of these landfills for future regulatory considerations.

Accomplishments

- **FY16 Product:** Review of Causes and Mitigation of Subsurface Heat Accumulation in Municipal Solid Waste Landfills (Thabet Tolaymat)
- Reports the results of an investigation of the occurrence of sustained subsurface heating (SSH) events at MSW landfills.
- Summarizes the state of the science with regard to the detection, causes, effects, control, and long-term mitigation.

- **FY16 Product:** Sustainable Approaches for Materials Management in Remote, Economically Challenged Areas of the Pacific (David Carson)
- Provides a survey of materials management practices at these remote areas and tries to present economically feasible approaches for the sustainable management of materials at these locations.

- **FY16 Product:** Modeling Thermal Changes at Municipal Solid Waste Landfills: A Case Study of the Co-Disposal of Secondary Aluminum Processing Waste (Thabet Tolaymat)
- Identifies factors that impact temperature distribution in landfills and the magnitude of their impact

- **FY16 Product:** Preliminary Assessment of the Flow of Used Electronics in Selected States: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin (Teri Richardson)
- Documents a preliminary assessment of available data and development of the model that can be used as a starting point to estimate domestic flows of used electronics from generation, to collection and reuse, to final disposition

Future Directions

- The research will proceed as initially planned; however, the research can be adapted to address the needs and priorities of Program Offices, Regions, and other clients and/or end-users.
- Research products are scheduled to be delivered in FY17, FY18 & FY19