Large Volume Waste Transport

All-Hazards Tool for Estimating the Resource Demand Associated with Transporting Large Volumes of Waste

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TOPICS

• The Need
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• Primary Audience & Platform
• Tool Benefits
• Proposed Data Flows
• Anticipated Inputs, Routing & Outputs
• Timeline & Next Steps
THE NEED

• Large-scale disasters have the potential to generate a significant amount of waste and debris
  • Hurricane Katrina resulted in 100 million cubic yards
  • Joplin, Missouri Tornado resulted in 1.5 million cubic yards

• Man-made chemical, biological, radiological or nuclear (CBRN) incidents either by way of terrorism, war, or accidents could generate even more contaminated waste and debris

• Management and transportation of large volumes of debris and waste will be a challenging process

• Planning tools to aid decision-making related to handling large volumes of waste can aid response and recovery processes
TOOL OBJECTIVES

• Develop a GIS-based tool to support the estimation of resource demands and logistics planning associated with transporting large volumes of waste

• Apply spatial information and analysis technologies to locate and prioritize potential waste staging, storage and/or waste management, and disposal sites

• Support systems-based decision making
  • Interdependency of response and recovery decisions
  • Appreciation for constraints that may influence decisions
PRIMARY AUDIENCE & PLATFORM

• Primary Audience
  • EPA, Regions, and Department of Homeland Security (DHS) response personnel
  • Regional and local planning officials

• Tool Platform
  • ArcGIS tool
  • Leveraging the Network Analyst extension
  • Focus on routing within the contiguous 48 states via on-road transportation only
    • Flexible design to add multimodal transportation in the future
  • Accept input data from other tools (WEST, I-WASTE, RADAR)
TOOL BENEFITS

- Identify potential storage sites based on certain criteria
- Define triage/sorting locations for specific waste type/characteristics
- Define staging locations for waste pickup
TOOL BENEFITS (CON’T)

- Automatically establish routes to avoid sensitive areas
- Split routes according to contract or service
- Estimate the most optimal route with consideration to time, cost, and personnel

Vehicle routing problem analysis:
PROPOSED DATA FLOWS

User Input
- Starting Location
- Staging/Disposal Location
- Waste Type
- Waste Volume
- Hauling Capacity
- Optimization Priorities

Embedded Tool Data
- Optimal Staging Areas
- Disposal Facilities
- Default Disposal Fees
- Default Hauling Rates

Routing
- Network Analyst
- Transportation Network
- Optimizations
  - Cost
  - Distance
  - Residential Proximity

Results
- Graphical/Map-Based
- Tabular Report
- Summary of User-Input/Selections
ANTICIPATED INPUTS

• Allow users to enter and/or select the following:
  • Starting event location (point location)
  • Staging area(s) (point location)
  • Disposal site(s) (point location)

• Enter site selections by:
  • Manual street address entry
  • Possible “pin-drop” to populate street address

• Allow users to enter:
  • Waste volume or mass
  • Capacity data
  • Hauling fees (default value by waste type provided)
  • Hauling capacity (default value provided)

• Allow users to characterize waste quantities by type:
  • Municipal Solid Waste (MSW)
  • Construction and Demolition (C&D)
  • Hazardous Waste (HW)
  • Low-Level Radioactive Waste (LLRW)
ANTICIPATED INPUTS – CON’T

• Support selection of temporary debris management sites (TDMSs)

• Leverage GIS data to visually assess suitability, considering factors such as:
  • Site capacity
  • Social sensitivities (i.e., proximity to sensitive areas)
  • Transportation considerations
  • Resource demands
  • Contaminant fate and transport concerns
EMBEDDED TOOL DATA

• Optimal staging areas informed by geospatial data sets
  • Homeland Infrastructure Foundation - Level Data (HIFLD)
  • Data.Gov
  • U.S. Census Bureau
  • National Hazardous Materials Route Registry

• Disposal facilities
  • I-WASTE

• Default hauling rates
TOOL ROUTING

• ArcGIS Network Analyst
• Transportation Network
• Optimizations
  • Distance
  • “Proximate Population”
    • Dependent on Census tract population adjacent to the route within an established radius
    • Consideration given to other defined avoidance features (e.g., proximity to nearby populations, schools, etc.)

• Roadways will be weighted based on nearby population estimates from the U.S. Census Bureau and will include a defined buffer
  • Weighting scheme may also consider road types
ANTICIPATED OUTPUTS

• Graphical/Map-Based
  • Color-coded routes
  • Plotted Destinations
  • Time
  • Other optimization attributes

• Tabular Report
  • Route Length
  • Cost
  • Travel Time
  • Proximate features

• Summary of User-Input/Selections
TIMELINE & NEXT STEPS

Next Steps
- Continue data gathering efforts
- Begin developing staging/storage siting module
- Continue defining routing logic and related algorithms
- Begin user interface design and development
DISCLAIMER

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