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
- Tool Objectives
- 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

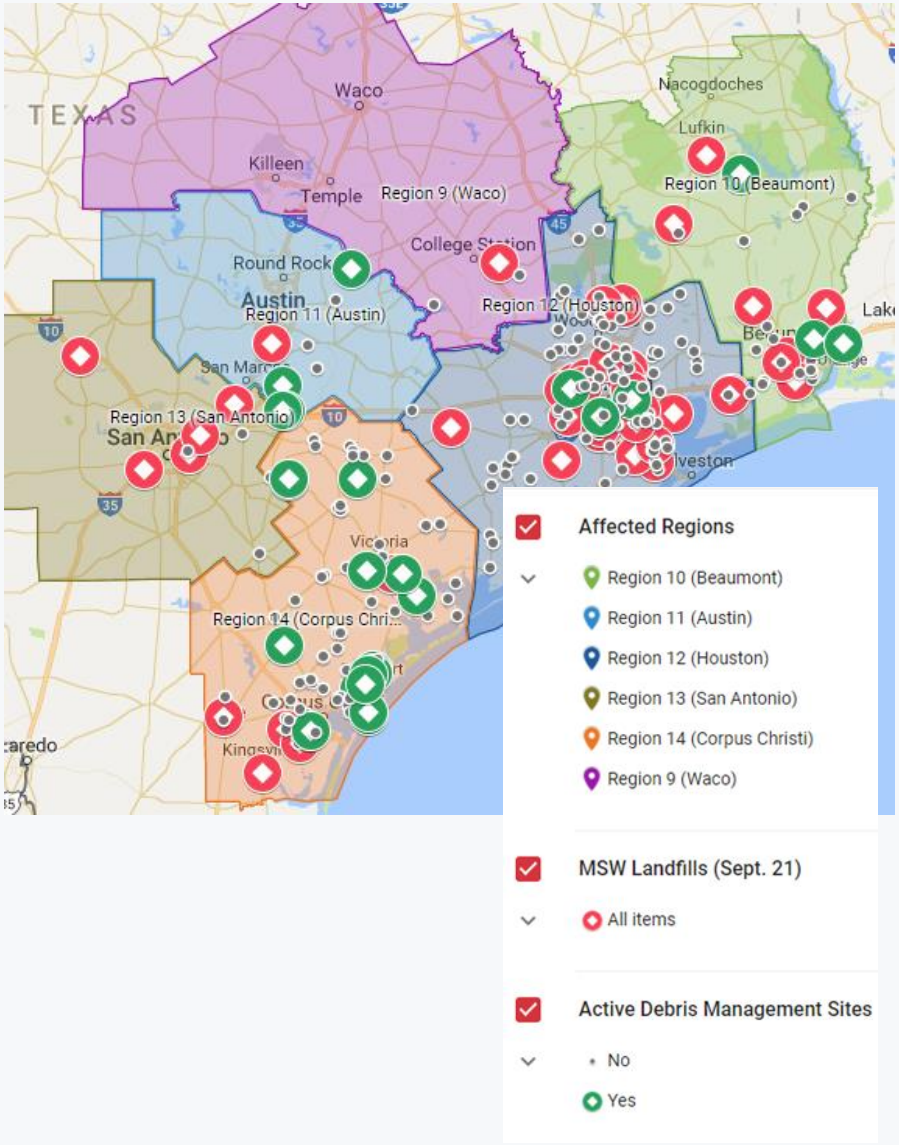
- Develop a GIS-based tool to support the estimation of resource demands and logistics planning associated with transporting large volumes of waste
- Apply spatial information and analysis technologies to locate and prioritize potential waste staging, storage and/or waste management, and disposal sites
- 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)

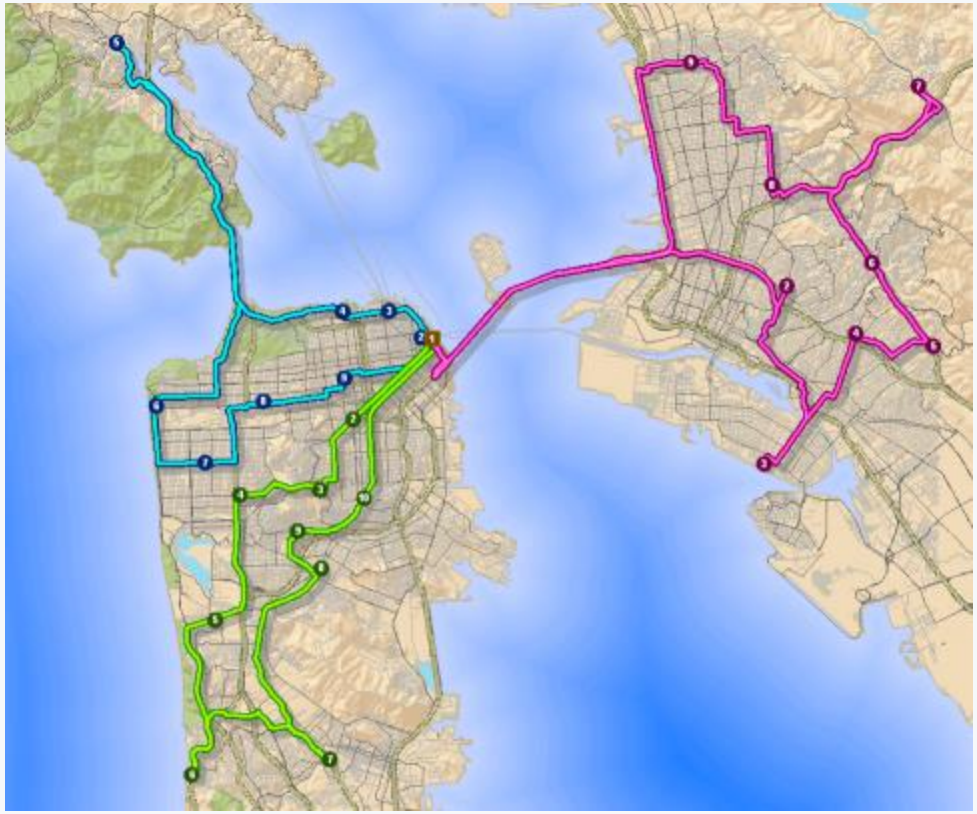
TOOL BENEFITS

- Identify potential storage sites based on certain criteria
- Define triage/sorting locations for specific waste type/ characteristics
- Define staging locations for waste pickup



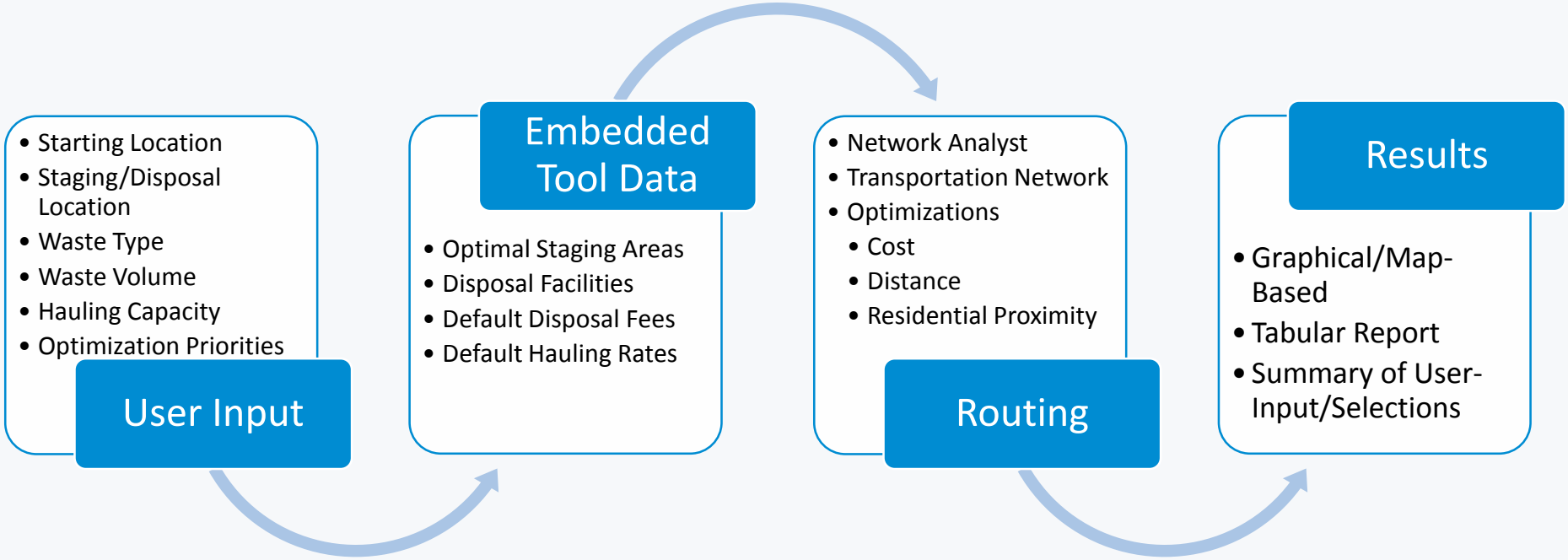
TOOL BENEFITS (CON'T)

- 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:
http://desktop.arcgis.com/en/arcmap/latest/extensions/network-analyst/vehicle-routing-problem.htm

PROPOSED DATA FLOWS



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

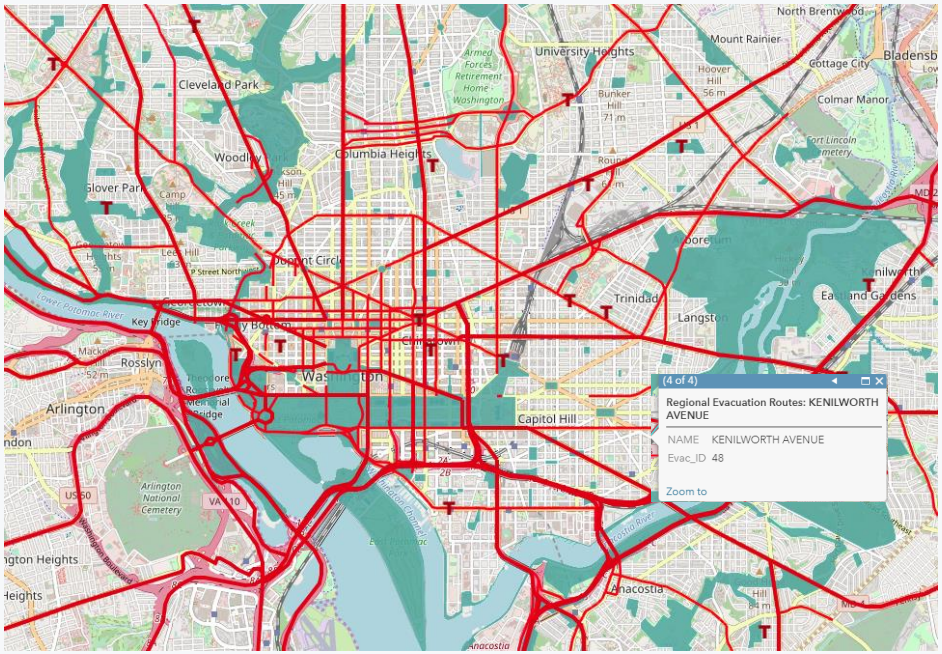
- Optimal staging areas informed by geospatial data sets
  - Homeland Infrastructure Foundation - Level Data (HIFLD)
  - Data.Gov
  - U.S. Census Bureau
  - National Hazardous Materials Route Registry
- Disposal facilities
  - I-WASTE
- Default hauling rates

TOOL ROUTING

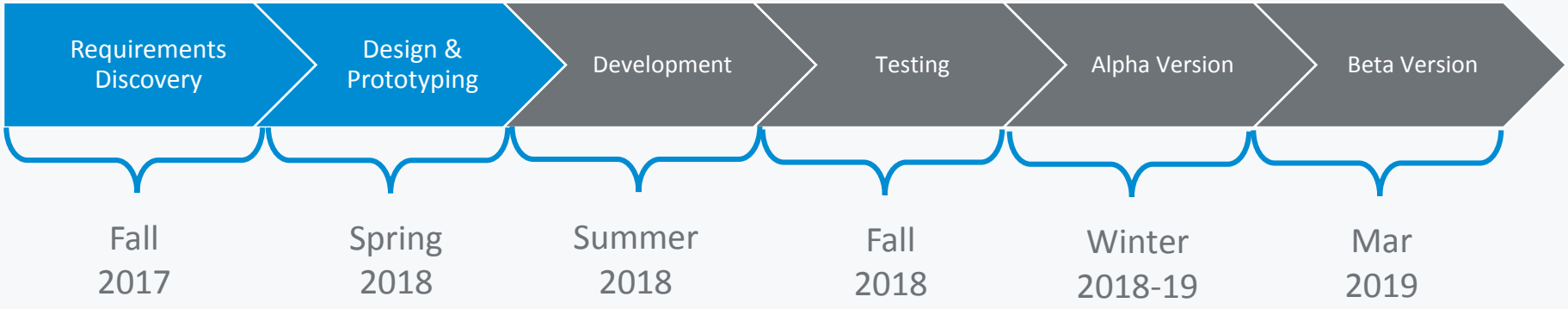
- ArcGIS Network Analyst
- Transportation Network
- Optimizations
  - Distance
  - "Proximate Population"
    - Dependent on Census tract population adjacent to the route within an established radius
    - Consideration given to other defined avoidance features (e.g., proximity to nearby populations,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

The U.S. Environmental Protection Agency, through its Office of Research and Development, is funding and managing the research described here under Contract #EP-C-16-015 to Eastern Research Group. Final publications will be subject to the Agency's review process.

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