Supporting Secure and Resilient Inland Waterways

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Project Overview

- Funded through DHS National Transportation Security Center of Excellence
  - Collaborative project between University of Arkansas and Rutgers University
- Project dates July 2010 through June 2013
Project Goal

- Develop a prototype decision support system that
  - Integrates cargo prioritization models, freight movement models and geographic information system (GIS) technology
  - Provides decision-making support for prioritization and offloading of waterborne cargo during major disruptions
  - Indicates level of resiliency in terms of multi-modal capacity in the event of attacks or natural disasters against inland waterway transportation systems
Conceptual Framework for National Model

- Current Emergency Response Protocols
- Decision Support System (DSS) w/ Graphical User Interface
- Infrastructure Knowledgebase
- Real-time data via Web Services
- Automated prioritization of cargo movements
- Improved, DSS supported response protocol workflow
Study Area

- Upper Mississippi River including Lock & Dam #14 just north of Davenport, Iowa and Lock & Dam #19 at Keokuk, Iowa
- Develop a digital and geospatially accurate map and related database of all
  - Locks, dams and bridges
  - Ports and terminals
  - Freight rail
  - Highways
  - Other infrastructure
What we’ve seen about data...

• Data is detailed, but usability depends on mission
  – “useful lists of stuff”
• Different characteristics captured by different agencies for same assets
• Assets not uniformly represented
• Different approaches to prioritization
What we’ve heard about response...

- Increased focus on system resilience and opportunities to understand the flexibility of the system
- Decision making for prioritization based on industry and federal cooperation
- Responses to previous events
  - Source from alternate suppliers
  - Use rail
  - Consider moving business
Cargo Prioritization

• To prioritize and direct disrupted barges, we need the following data
  – Location of each barge and terminal within impacted region
  – Volume and type of cargo on each barge
  – Capacity of each terminal for each cargo type
  – Handling time of each barge at potential offload terminals
  – Value decreasing rate of each cargo type
  – Water depth of each terminal
  – Draft of each barge tow
Cargo Prioritization (cont.)

• For research purposes
  – Historical annual tonnage data by two-digit commodity group (coal, petroleum, chemicals, etc.) for each lock & dam is publically available (US Army Core of Engineers Water Commerce Statistics Center (USACE WCSC)). Four-digit commodity data can be obtained for aggregate waterway sections (e.g., the Upper Mississippi River).
  – Historical vessel trip data for aggregate sections of the waterways is publically available from USACE WCSC.
  – Federal agencies can obtained more refined historical data including monthly data and vessel trip data associated with commodity type.

• For practical implementation purposes
  – Currently, the US Coast Guard treats each event separately. Data on vessel locations and cargo is collected through individualized data requests during an event response.
  – Improved tools and technologies such as Lock Operations Management Application (LOMA) via AIS (Automated Identification System) are expected to provide real time vessel data. In addition to supporting event response, these tools will facilitate better data for planning purposes.
Current Infrastructure Data

Aerial Imagery

Navigation Data
Center / Master Docks Data

Marine Transportation System Recovery Unit Data

CTA Intermodal Network and Terminal Database*

Number of Terminals by River Mile

Upper Mississippi River Mile

Potential Offload Terminal

Current Infrastructure Data

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Owner</th>
<th>Operator</th>
<th>Business Purpose</th>
<th>Contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail Facilities</td>
<td>Facility type and capacity</td>
<td>Handling Equipment</td>
<td>Commodities Construction Type Draft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Potential for Emergency Use

- Active Rail?
- Temporary Storage?
- How Fast?
- How Fast?
- How could it be handled?
- Can we handle other cargo?

Can current data help us to answer these questions?

- Name
- Location
- Owner
- Operator
- Business Purpose
- Contacts
- Facility type and capacity
- Temporary Storage Potential?
- What can be handled?
- Handling Equipment
- Active? How Often?
- Rail Facilities
- How Fast?
- Commodities
  - Bulkhead Length
  - Construction Type
  - Draft
Emergency Response Decisions and Metrics

- Funds are limited: How can we leverage the data we have already?
  - Users familiar with data
  - Processes in place for collection
- Current economics of shippers and carriers suggest offloading may not be an effective strategy given current traffic
  - Would this change based on future waterway transportation development?
- Leveraging data and metrics: other uses for information?
  - Economic development resources
  - Asset management
- Effectiveness of metrics determined by capability to utilize in decision making, not just capability to measure accurately
- Common standards and capability to audit are critical for data sharing and understanding
Research Team

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