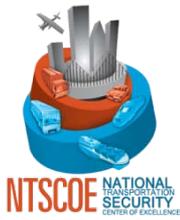
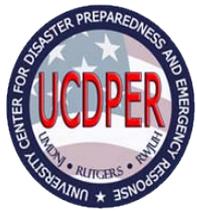


A Set of Blended Risk-Based Decision Support Tools

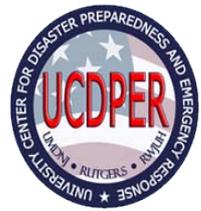
Michael Greenberg, spokesperson

April 1, 2011

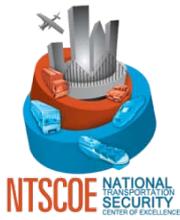


Objectives

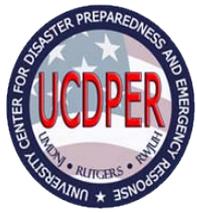
- Build three simulation models that can:
 - Follow normal activity on a rail corridor
 - Follow impacts of disrupting rail corridor activity
 - Estimate health, environmental & economic impacts of disruptions
 - Follow cascading impacts on other transport systems
 - Estimate impacts on regional economy
 - Estimate benefits of investing in mitigation & resilience



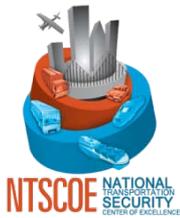
Industrial systems model



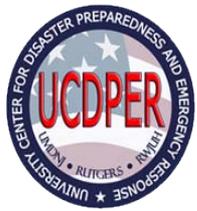
- Model existing rail network so that it closely replicates normal operations.
- Disrupt the normal function with high probability events such as minor power outages, snow storms, etc.
- Disrupt the function with more serious events such as major natural hazard and terrorist events.
- Follow the disruption to connected light rail, bus and highway systems
- Identify key parts of the system where resilience an/or mitigation could reduce the cascading impacts



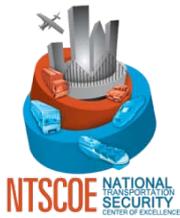
Plume models



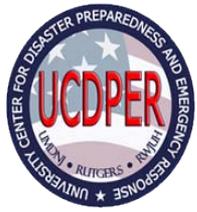
- Create several scenarios that involve multiple simultaneous attacks on rail system on the trains, in the stations and outside the stations
- Also create an event that disables a vital link in the system
- Estimate direct health, environmental and property impacts at the site in the surrounding environment
- Follow the disruption to connected light rail, bus and highway systems
- Identify key parts of the system where resilience an/or mitigation could reduce the cascading impacts



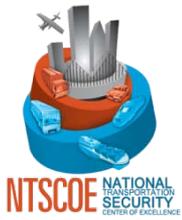
Economic models



- Build hybrid economic model that allows us to estimate:
 - Direct, indirect and induced impact of events on regional economy assuming the system resilience is not available
 - Re-estimate Impacts assuming current system resilience can be deployed. Calculate net difference.
 - Based on industrial systems and plume models choose key investments in system and make those investments, following them through the economy.
 - Redo several events with the new resilience in place and re-estimate the damage, thereby calculating net benefit of resilience.

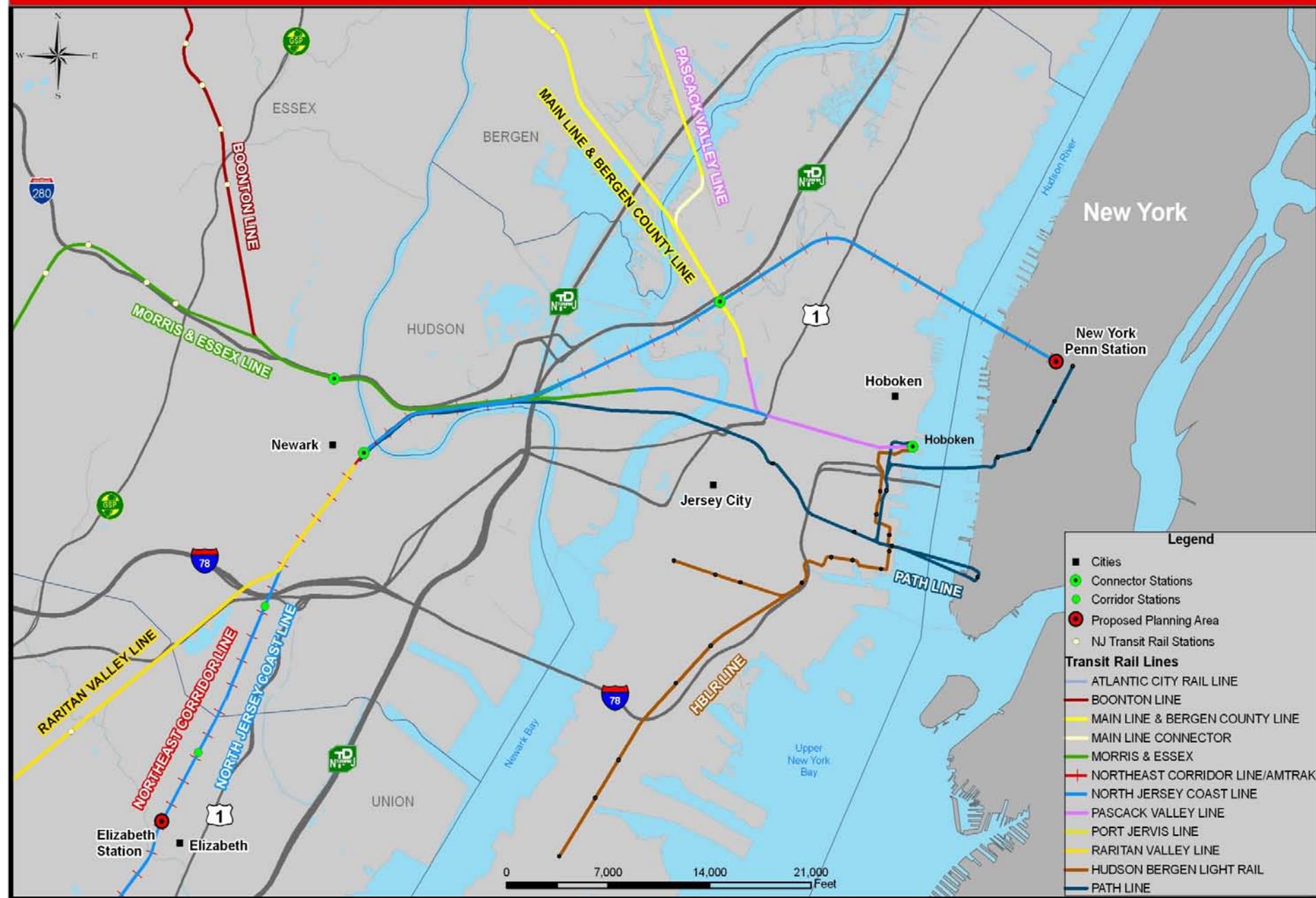


Test Area



- Northeast corridor in NJ from Trenton to NY Penn Station focusing on Newark Station
- Attributes: 5 track, multi-level station, key transfer point for Amtrak, NE corridor lines that serve three parts of NJ; linked directly to PATH rail to NYC, Newark Subway; bus systems that leave from the station; link to Newark Liberty International Airport; and nearby major road networks

Northeast Corridor Elizabeth Station to New York Penn Station



Legend

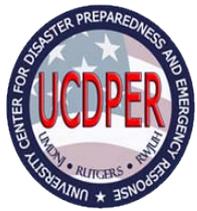
- Cities
- Connector Stations
- Corridor Stations
- Proposed Planning Area
- NJ Transit Rail Stations

Transit Rail Lines

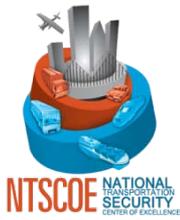
- ATLANTIC CITY RAIL LINE
- BOONTON LINE
- MAIN LINE & BERGEN COUNTY LINE
- MAIN LINE CONNECTOR
- MORRIS & ESSEX
- NORTHEAST CORRIDOR LINE/AMTRAK
- NORTH JERSEY COAST LINE
- PASCACK VALLEY LINE
- PORT JERVIS LINE
- RARITAN VALLEY LINE
- HUDSON BERGEN LIGHT RAIL
- PATH LINE

MAP PREPARED: 4/19/2010
 DATA SOURCES: NJDOT, NJDEP

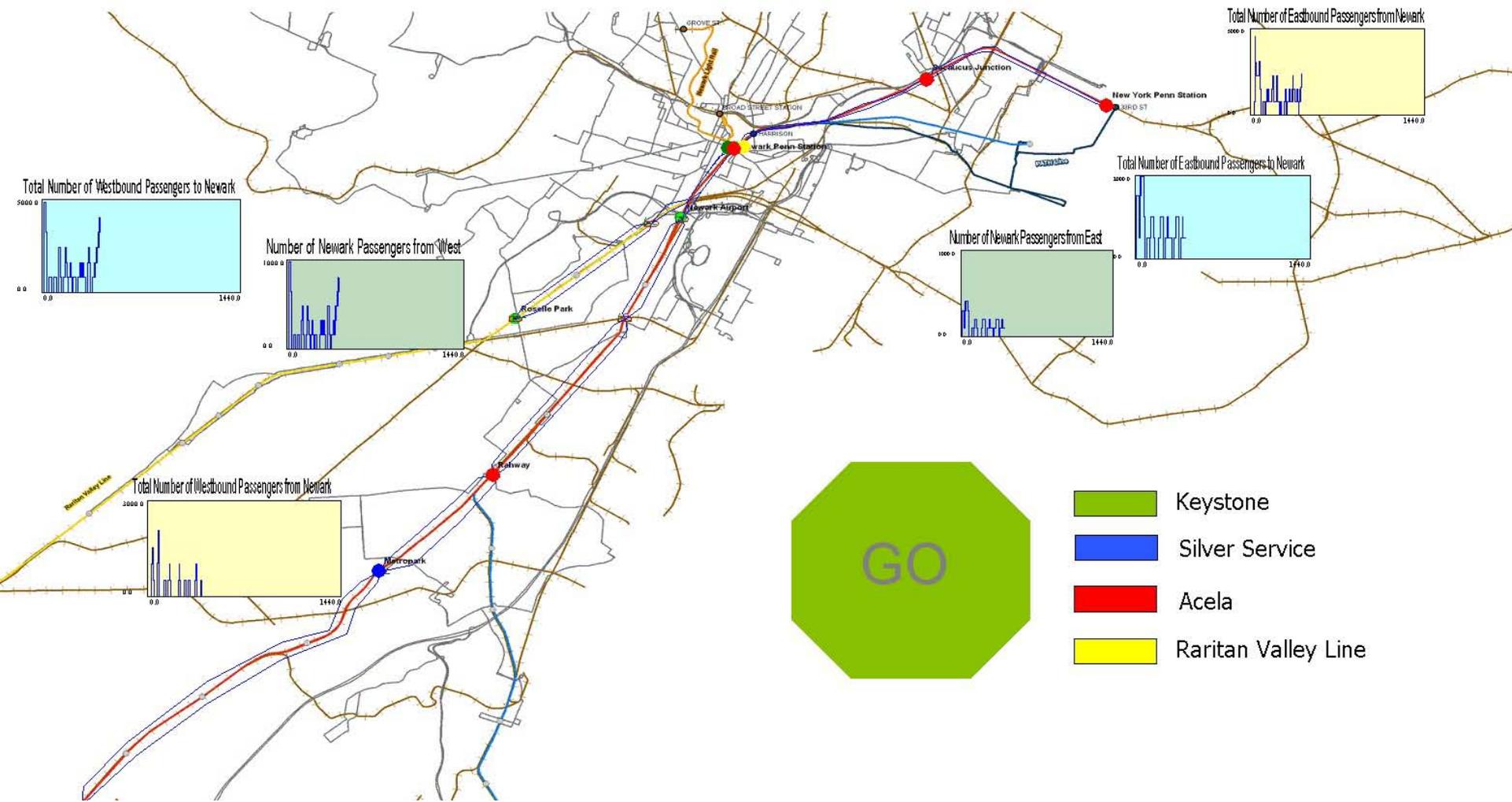
This map was developed using NJDOT Geographic Information System digital data, but this secondary product has not been verified by the NJDOT and is not state-authorized. This map is to be used solely for planning purposes.



Status of Model Building

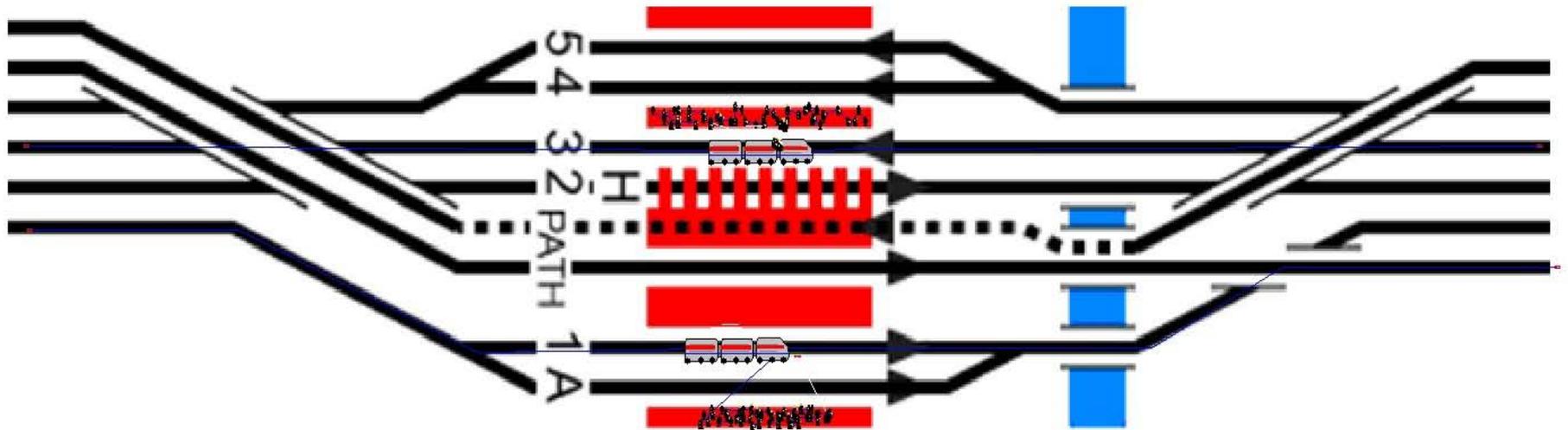


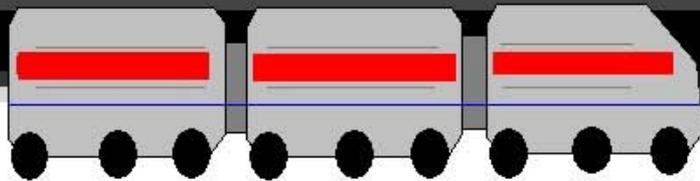
- Industrial Systems Model
- Have preliminary version 5-track at Newark and 4 tracks elsewhere
- Good deal of passenger use data entered and more being gathered and being operationalized for use in the model
- Good deal of existing resilience data gathered and being operationalized for the model
- Plume models to be designed
- Economic model prototype designed.



- Keystone
- Silver Service
- Acela
- Raritan Valley Line

NEWARK PENN STATION





To Newark		From Newark
Number of Westbound Newark Passengers 1 0 0	Total Number of Eastbound Passengers 5 0 0	Total Number of Eastbound Passengers 7 4 0
Number of Eastbound Newark Passengers 4 8 0	Total Number of Westbound Passengers 2 4 0 0	Total Number of Westbound Passengers 1 0 0 0

Penn Station		Total Number of Passengers in Penn Station
Passengers Waiting for Westbound SilverService 3 0	Passengers Waiting for Westbound Acela 0	<div style="display: flex; align-items: center;"> <div style="border: 1px solid gray; padding: 10px; margin-right: 20px;">6 4 8</div> </div>
Passengers Waiting for Eastbound SilverService 2 0	Passengers Waiting for Eastbound Acela 0	
Passengers Waiting for Westbound Keystone 1 5	Passengers Waiting for Westbound Northeast Corridor 1 0 0	
Passengers Waiting for Eastbound Keystone 3 3	Passengers Waiting for Eastbound Northeast Corridor 1 4 8	