

Ohio Statewide Model Applications

Information Forward



Tell Me a Story by Copilot

Once upon a time, in the bustling city of Metropolis, travel demand models played a pivotal role in shaping the city's transportation infrastructure. These models, like mystical crystal balls, attempted to predict how people would move about the city. Let me take you on a journey through the four-step travel demand modeling process:

1. **Trip Generation:** The first step was akin to summoning spirits from thin air. Planners conjured data on households, jobs, and other land uses. They asked questions like, "How many trips will the factory workers make?" or "Will the wizards living in the enchanted forest travel to the city center?" The answers materialized as trip rates, revealing the number of trips each land use generated.
2. **Trip Distribution:** Next, the city's sages pondered the great question: "Where shall these travelers roam?" They consulted ancient scrolls (okay, maybe just spreadsheets) to determine the likelihood of trips between different zones. Would the sorcerers prefer teleporting to the market square or riding their broomsticks to the library? The distribution matrix revealed their mystical preferences.
3. **Mode Choice:** The third step involved unraveling the secrets of transportation modes. Would the knights ride their trusty steeds, or opt for the magical teleportation network? The model considered factors like travel time, cost, and the allure of dragon sightings along the way. The result? A glimpse into the future—how many travelers would choose each mode.
4. **Trip Assignment:** Finally, the city's cartographers mapped out the actual routes. They assigned travelers to roads, bridges, and secret tunnels. The highways hummed with carriages, while the bike lanes sparkled with fairy dust. The model revealed congestion spots, guiding the construction of new roads and enchanting bike paths.

And so, Metropolis flourished. Its citizens moved harmoniously, thanks to the wisdom of travel demand models. But remember, dear reader, even the most powerful models had their limitations—like predicting sudden unicorn parades or rogue spell-casting traffic jams. Yet, they remained essential tools, weaving the fabric of urban mobility.

Would you rather...

- Utility associated with the Attributes of the Alternative:

$$V(X_i) = \gamma_1 \times X_{i1} + \gamma_2 \times X_{i2} + \cdots + \gamma_k \times X_{ik} \quad 3.4$$

where γ_k is the parameter which defines the direction and importance of the effect of attribute k on the utility of an alternative and X_{ik} is the value of attribute k for alternative i .

- An example for three different travel modes (Drive Alone (DA), Shared Ride (SR) and Transit (TR) alternatives is:

$$V(X_{DA}) = \gamma_1 \times TT_{DA} + \gamma_2 \times TC_{DA}$$

$$V(X_{SR}) = \gamma_1 \times TT_{SR} + \gamma_2 \times TC_{SR}$$

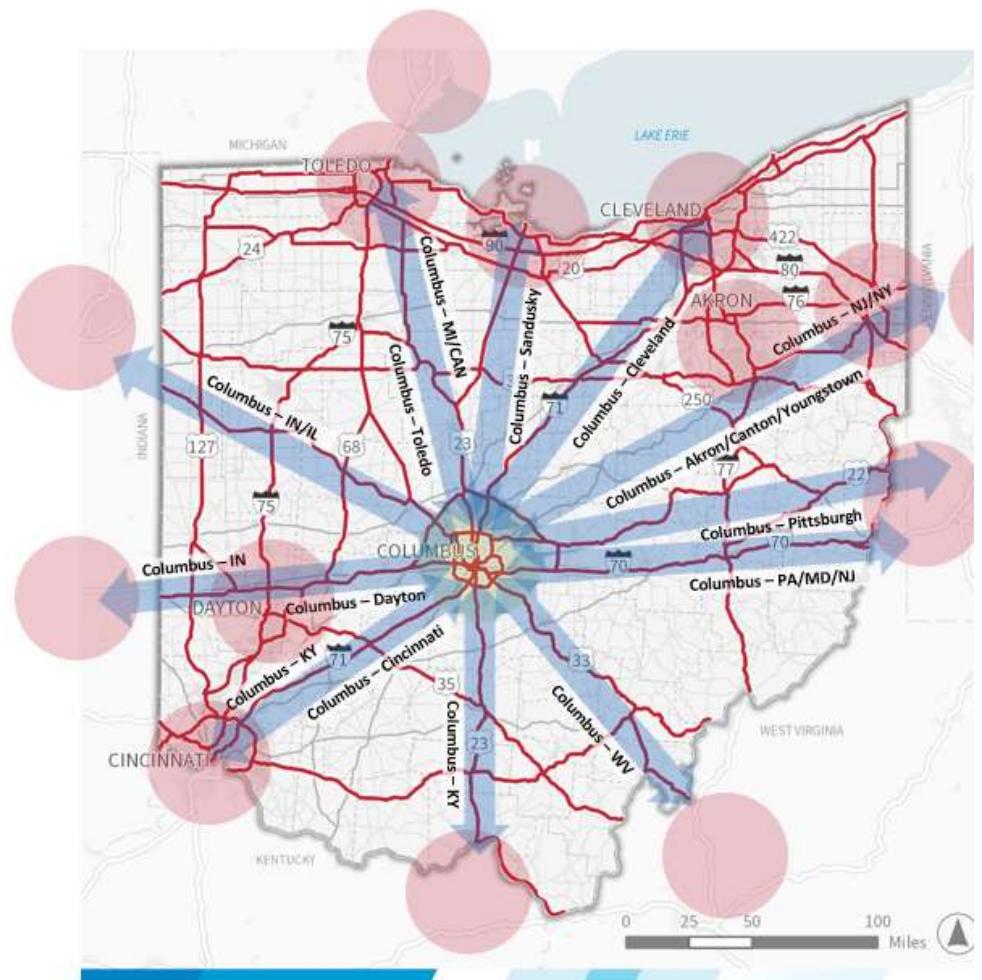
$$V(X_{TR}) = \gamma_1 \times TT_{TR} + \gamma_2 \times TC_{TR} + \gamma_3 \times FREQ_{TR}$$

- The Utility associated to the characteristics of the Decision Maker, in the specific example above would be:

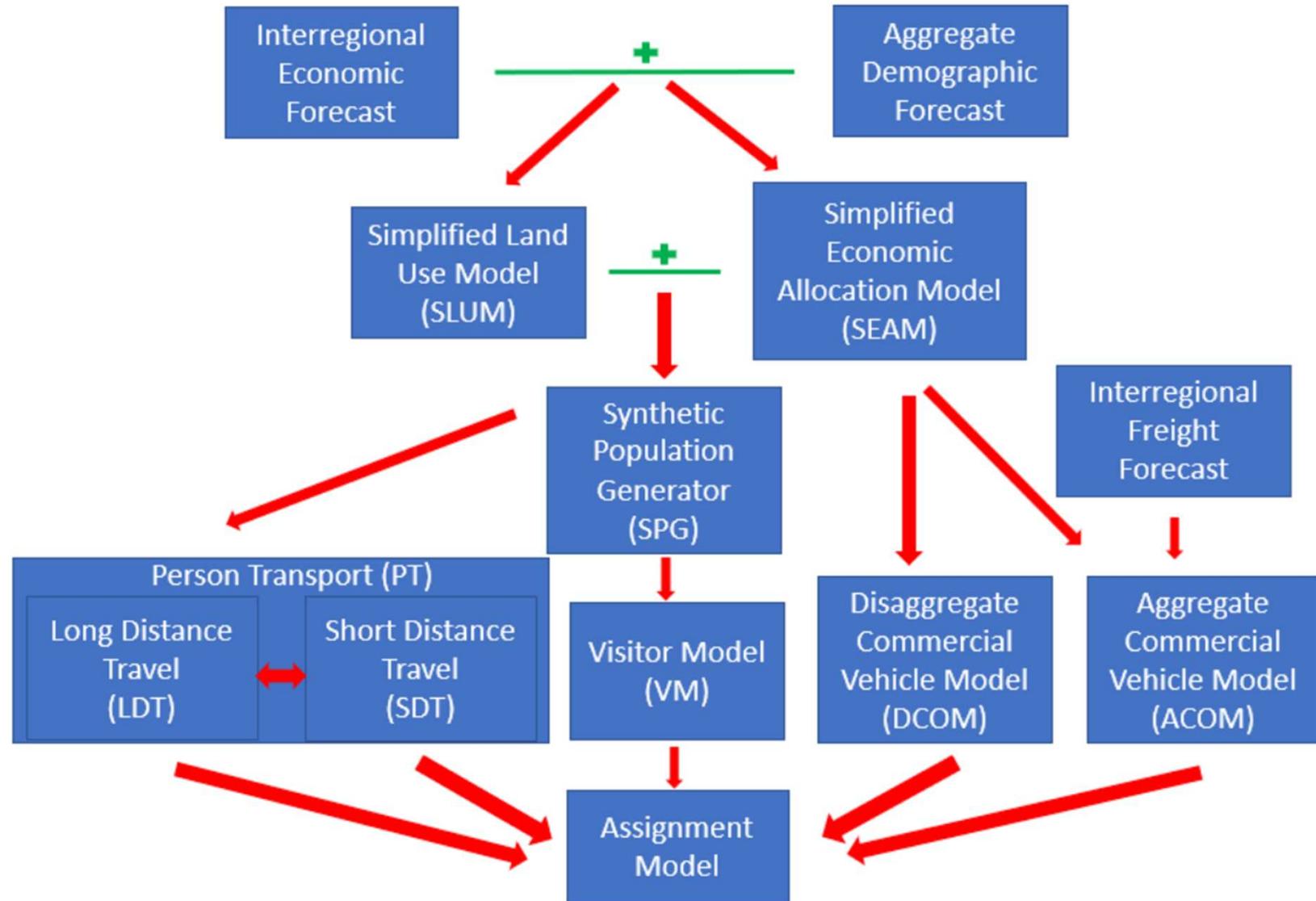
$$V(S_{DA}) = \beta_{DA,0} \times 1 + \beta_{DA,1} \times Inc_i + \beta_{DA,2} \times NCar_i$$

$$V(S_{SR}) = \beta_{SR,0} \times 1 + \beta_{SR,1} \times Inc_i + \beta_{SR,2} \times NCar_i$$

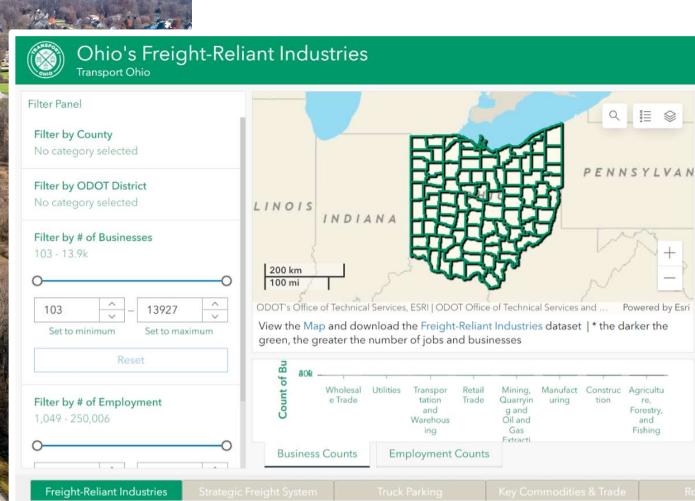
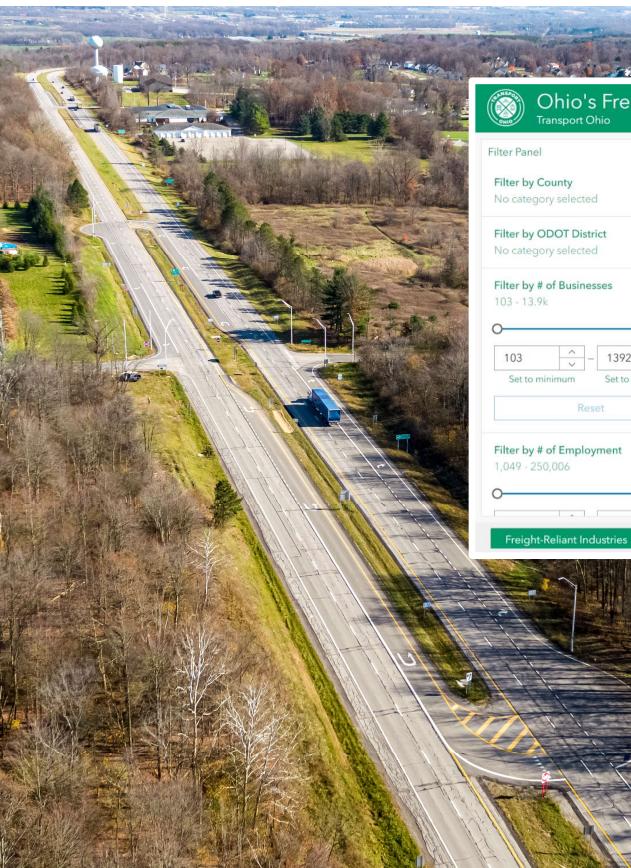
$$V(S_{TR}) = \beta_{TR,0} \times 1 + \beta_{TR,1} \times Inc_i + \beta_{TR,2} \times NCar_i$$



Ohio Statewide Model (OSWM)



Strategic Transportation & Development Analysis



- **Outcomes**
 - **Investment Opportunities:** Identify investment opportunities that will enhance Ohio's economy and support communities
 - **Decision Making Tools:** Leverage dynamic data and insights for informed decisions with private sector partners
 - **Partnerships & Collaboration:** Prepare ODOT and partners to secure funding and efficiently deliver the right investments

Technical Approach



Existing Conditions & Stress Test

- Assess existing and future congestion, reliability, safety, asset condition, resilience
- Compile current development trends, opportunities, and risks
- Identify hotspots for assessment in Step 2

Identify Improvements

- Identify concepts to address existing and potential system hotspots
- Determine triggers that initiate concept implementation
- Screen concept feasibility, assess costs, consider impacts

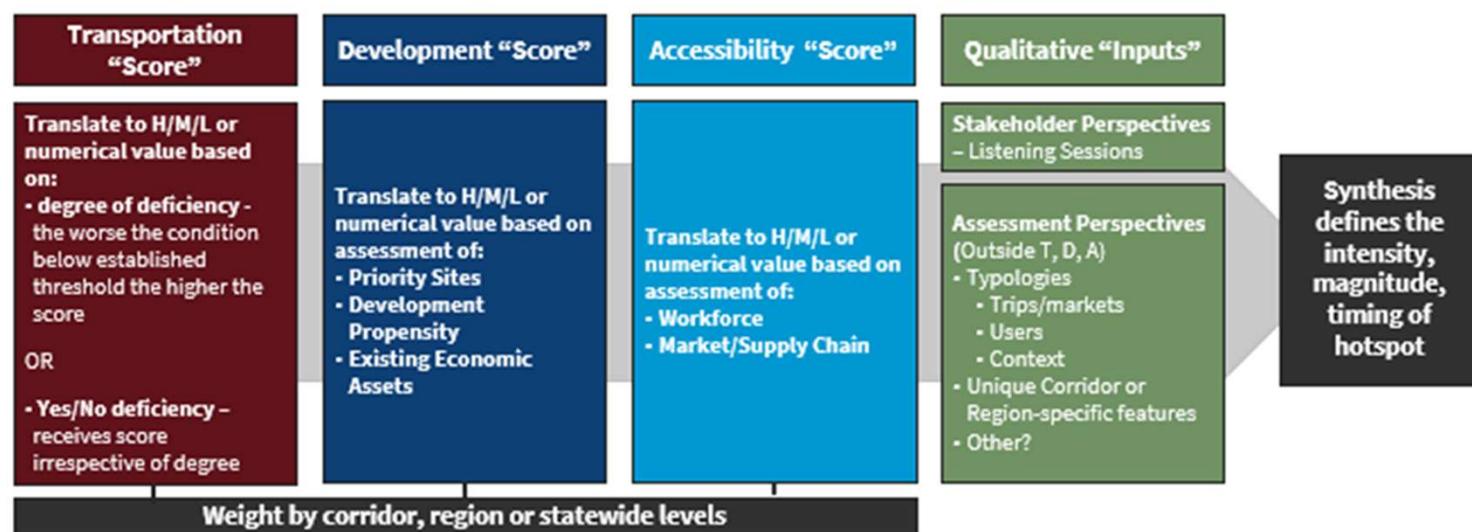
Analyze Benefits & Prepare to Implement

- Monetize potential benefits and refine costs
- Determine funding eligibility and potential
- Advance partnerships, confirm project readiness

OSWM to Assess Future Risk

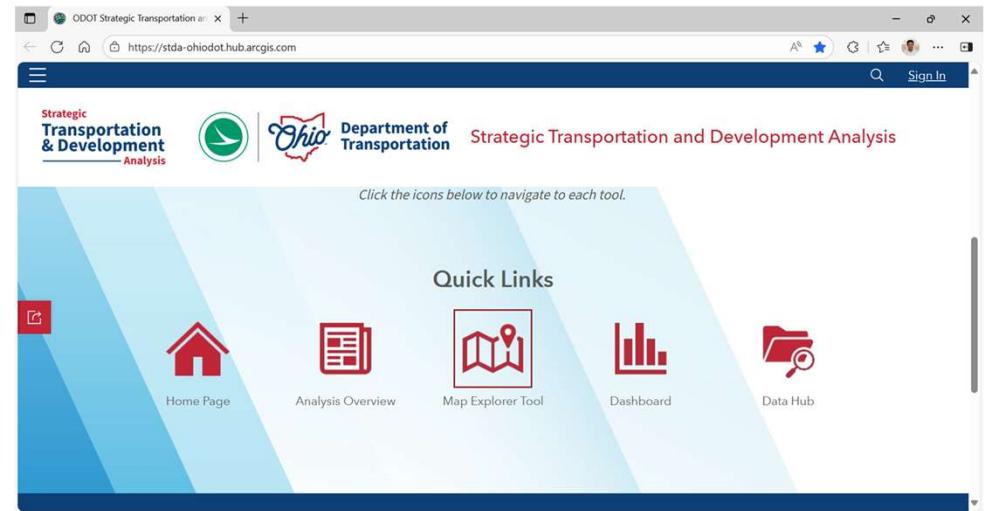
Statewide model runs by scenario through 2035, 2045, 2055

Households and employment by zone, travel demand and travel time zone to zone, network volumes and speeds by trip type, vehicle type, and time-of-day



Visualization of Information

- Finding effective way to communicate information is the biggest challenge
- Requirements
 - User Specific
 - Easy to Navigate
 - Informational
 - Support Decision Making



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- Metric Development: Navnit Sourirajan, Dan Tempesta, Rich Margiotta



Transportation

The figure is a screenshot of the Map Explorer Tool interface. The main area is a map of the Great Lakes region, including parts of Indiana, Ohio, and West Virginia. The map shows a network of roads and TAZ (Traffic Analysis Zones) colored according to risk types. A legend on the right side defines four categories: 0 Risk Types (grey), 1 Risk Type (yellow), 2 Risk Types (orange), and 3 Risk Types (red). A sidebar on the left contains a 'Congestion Hotspots' section with checkboxes for various risk factors, with 'Congestion Risk (Composite)' checked. Other sections in the sidebar include 'Workforce Access (within 40mins)', 'Access to', and 'Change in Population by TAZ (2025 to 2055)'. The top of the screen shows browser tabs for 'ODOT Strategic Transportation an' and 'Strategic Transportation and Deve', and a URL bar with the address <https://experience.arcgis.com/experience/37e4eb9c19d74b6ca0dfc7f54d0df5d7/>.

Transportation

The screenshot displays the Map Explorer Tool interface for Strategic Transportation Analysis. The top navigation bar includes the ODOT Strategic Transportation analysis and Strategic Transportation and Development tabs, along with a back, forward, and search function. The URL is https://experience.arcgis.com/experience/37e4eb9c19d74b6ca0dfc7f54d0df5d7/.

The main content area features the title "Map Explorer Tool" and a "Back to Hub Site" link. On the left, a sidebar titled "Roadway Information" lists several data layers: Average Annual Daily Traffic (AADT), Cost of Delay, Vehicle Miles Traveled (VMT), Travel Time Index (TTI), and Volume-to-Capacity Ratio (V/C). The "Travel Time Index (TTI)" layer is selected, indicated by a checked checkbox. Below this are sections for "Congestion Hotspots" and "Workforce Access (within 40mins)".

The central part of the interface is a map of the Ohio region, showing major cities like Columbus, Cincinnati, and Cleveland, as well as surrounding states Indiana, Michigan, and West Virginia. The map uses color coding to represent Travel Time Index (TTI) values: red for "More than 1.50", yellow for "1.25 - 1.50", and grey for "Less than 1.25". Numerous red and yellow dots are scattered across the map, indicating high-congestion areas. The map also includes a legend for "Study Network" and "Ohio Counties".

On the right side, there are two sections: "Travel Time Index (TTI)" and "Travel Time Index in 2025". The "Travel Time Index (TTI)" section includes a legend for the TTI values. The "Travel Time Index in 2025" section includes a chart showing the projected TTI values for 2025 across Ohio counties. A "Data Download" button is located at the bottom right.

Accessibility

The screenshot displays the Map Explorer Tool interface for Strategic Transportation Analysis. The map shows the Great Lakes region, specifically focusing on Ohio, Indiana, Michigan, and surrounding areas. Key cities labeled include Lansing, Detroit, Cleveland, Columbus, Cincinnati, Indianapolis, Louisville, Frankfort, Pittsburgh, and Charleston. The map features a network of roads and traffic analysis zones, with specific points highlighted in yellow and orange. A legend on the right side, titled 'Congestion Risk (Workforce Access Loss)', indicates that red represents 'Highest Worker Access Risk' and yellow represents 'Lowest Worker Access Risk'. The 'Roadway Information' sidebar on the left lists various traffic metrics, with 'Average Annual Daily Traffic (AADT)' and 'Congestion Risk (Workforce Access Loss)' checked. The 'Congestion Hotspots' sidebar on the bottom left also lists 'Congestion Risk (Workforce Access Loss)' as checked. The top navigation bar shows the URL <https://experience.arcgis.com/experience/37e4eb9c19d74b6ca0dfc7f54d0df5d7/>.

Accessibility

Intraregional / Interregional

ODOT Strategic Transportation an X BI Tool Dashboard X

<https://experience.arcgis.com/experience/6a91a64b3f1c43879e64b95857cd8e64>

Regional Networks (Intraregional)

Roadways facilitating intraregional connections within markets enable safe and reliable access to job centers for workers and access for logistics and distribution networks for industries, warehousing, and retailers. This dashboard displays the roadway congestion risks, a composite of risks from excessive delays, anticipated development, workforce access, partial access control, and truck delays. These congestion risks are summarized by hotspot groupings, including the grouping's intensity, timing, and status of being addressed by existing, planned projects. Users can filter by JobsOhio region, ODOT district, and MPO/RTPO.

Market Connections (Interregional)

Roadways facilitating interregional connections enable efficient and reliable travel for all vehicles and include capacity and infrastructure to support commercial vehicles. Ohio's regions do not operate in isolation. Trade between regions, including other states and provinces, provides the lifeblood for Ohio's economies. This dashboard displays travel across key roadways and corridors, summarizing said corridor's traffic movement, surrounding development, and risk.

Intraregional

Intraregional

ODOT Strategic Transportation an X Regional Networks | BI Tool Dashl X

https://experience.arcgis.com/experience/6a91a64b3f1c43879e64b95857cd8e64/page/Regional-Networks

Strategic Transportation & Development Analysis

Ohio Department of Transportation

Regional Networks (Intraregional)

Main Menu | i

Geographic Filters

Region Filter: 1 Selected

District Filter: 0 Selected

Note: Turn on the "ODOT District" Layer in the Contextual Layers tab below for the boundary

Map View

Map showing regional networks in Ohio, centered on Columbus. The map displays a network of roads and highways, with specific segments highlighted in various colors (blue, red, yellow, green) and patterns (solid, dashed, dotted) to represent different risk types and intensities. Major cities labeled include Columbus, Dayton, and Mansfield. A legend on the right side of the map provides a key for these visual representations.

By Intensity:

- 1 Risk Type: 7 grouping(s)
- 2 Risk Types: 8 grouping(s)
- 3 or More Risk Types: 12 grouping(s)

By Status:

- Addressed: 2 grouping(s)
- Partially Addressed: 16 grouping(s)
- Planning Ongoing: 4 grouping(s)
- Planning Gap: 5 grouping(s)

By Risk Timing:

- 2025: 20 grouping(s)

Data Download 

Hotspot Groupings

ID	Description	Risk Timing	Risk Intensity (# of risks)	Congestion Description
C1	I-270E (I-70 to Obetz/Alum Creek Drive)	2025	3	Multiple congestion risks, including 3+ risks from I-70 to US33
C10	I-70W (I-270W to I-71S)	2025	2	Multiple congestion risks

Total: 27 | Selection: 0

Interregional

ODOT Strategic Transportation an X Market Connections - Volume | BI X

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Market Connections (Interregional)

Main Menu | ⓘ

Market Boundaries

JobsOhio Regions

ODOT Districts

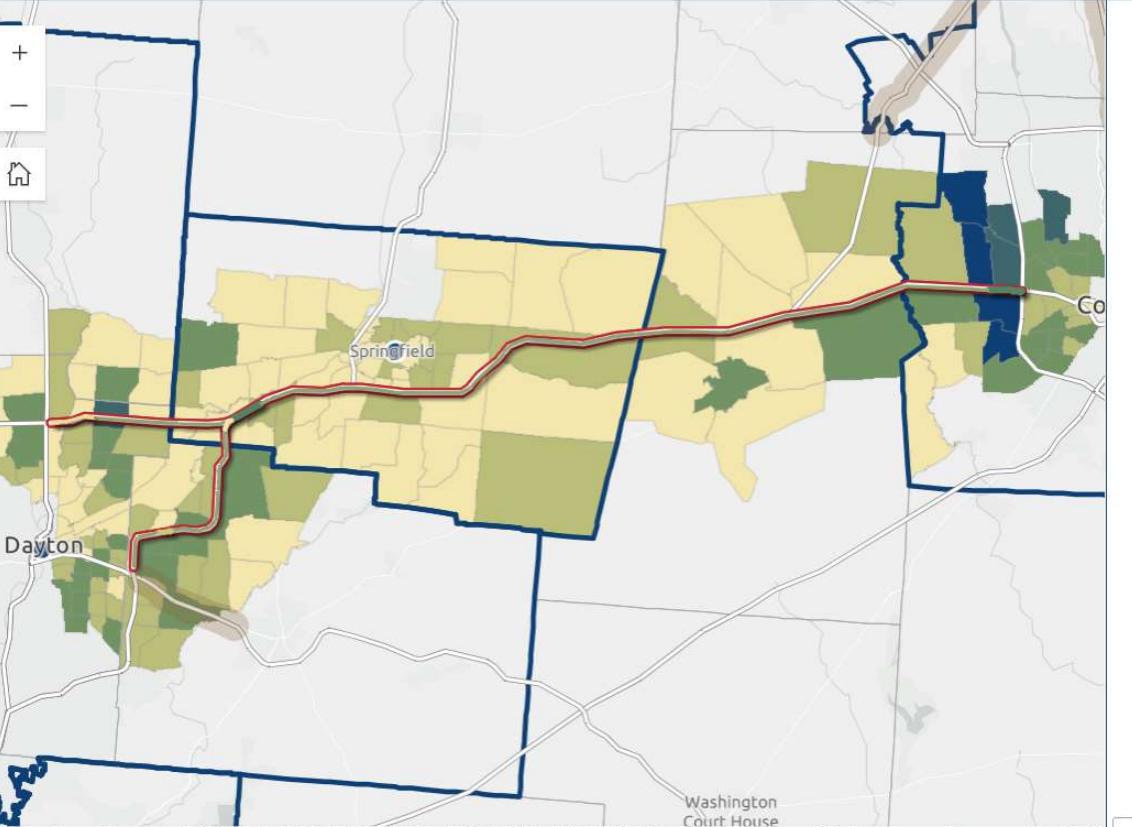
Total Workers by TAZ (2025, Baseline Scenario)

Total Households by TAZ (2025 Baseline Scenario)

Legend

Partial or No Access Control Corridors in Growth Areas

Average Annual Daily Traffic (All Vehicles) in 2025



Relative Ranking of Corridors

#8 in Total Volume

#2 by Commodity Tonnage per mile

#2 by Commodity Value per mile

2025 RISK

\$15 million in traffic delay related loss

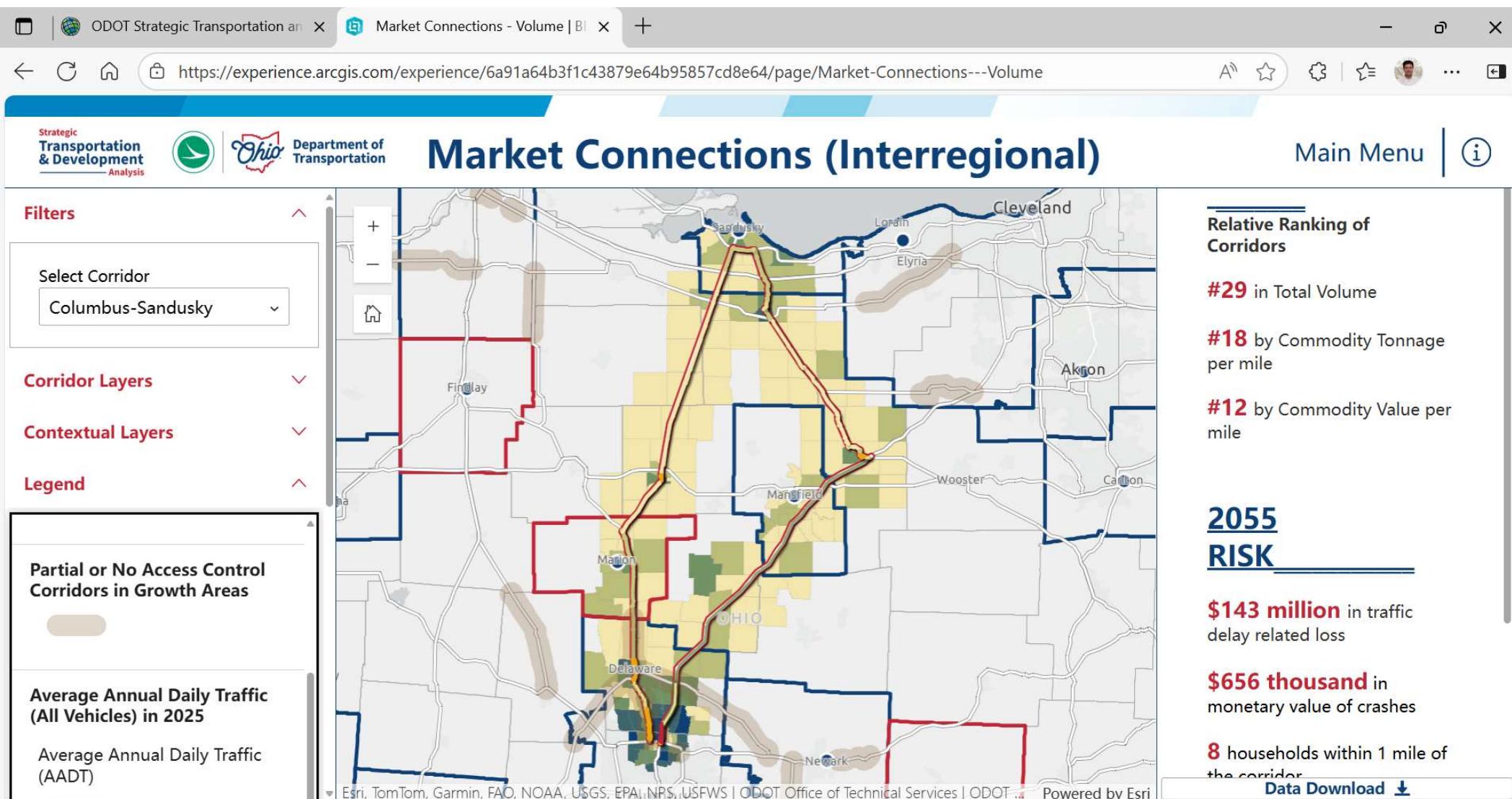
\$743 thousand in monetary value of crashes

58 households within 1 mile of the corridor

Data Download

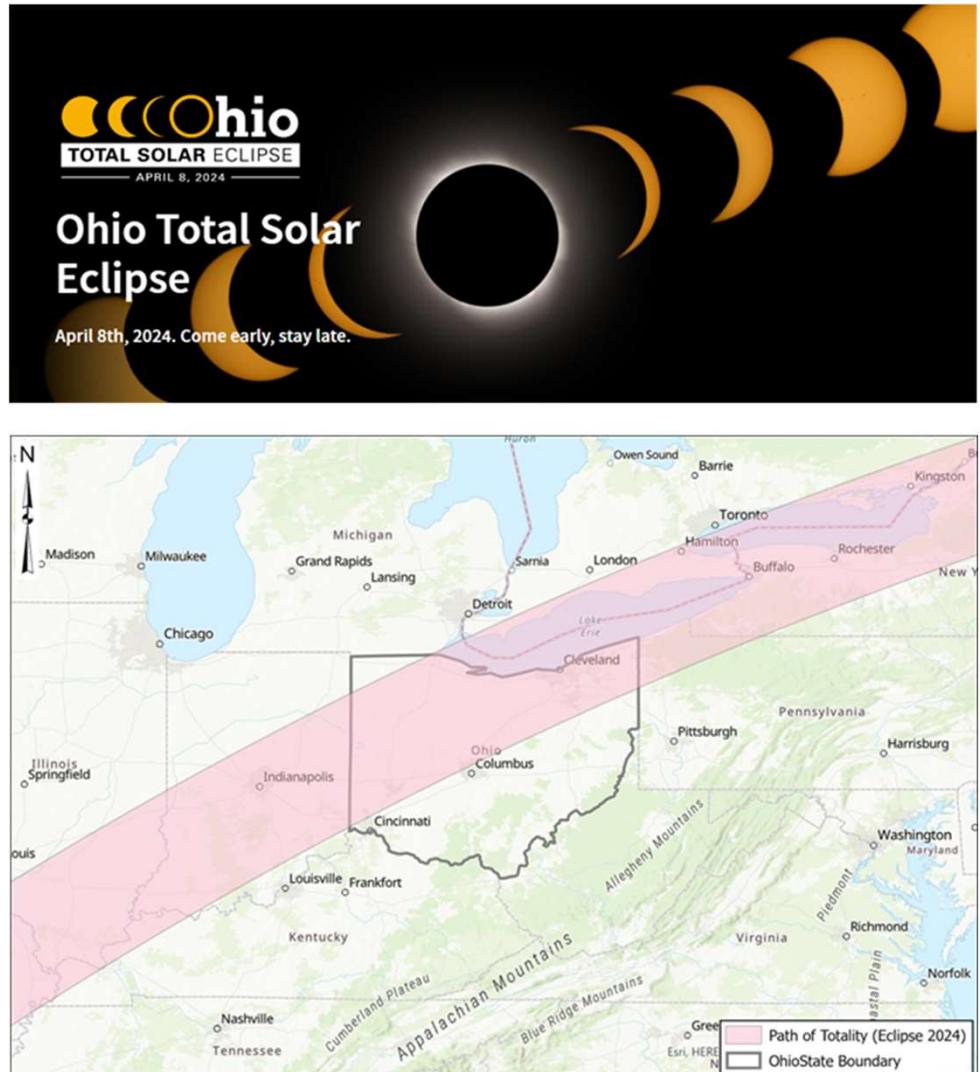
Interregional

Interregional



Ohio Total Solar Eclipse

- ODOT wanted to be able to be proactive in planning for and positioning resources on eclipse day to facilitate smooth traffic operations.
- Statewide in Scale – Statewide Model
- Goal
 - Create an Eclipse Day event model for Ohio
 - Big Data collected from the 2017 eclipse in Kentucky and Tennessee



Eclipse Model – Development and Application

Data

- 2017 Regular Day
- 2017 Eclipse Day

Difference

- Visitor Trip Behavior
- Changes to Resident Behavior

Model

- Apply Changes & Visitation
- Impact

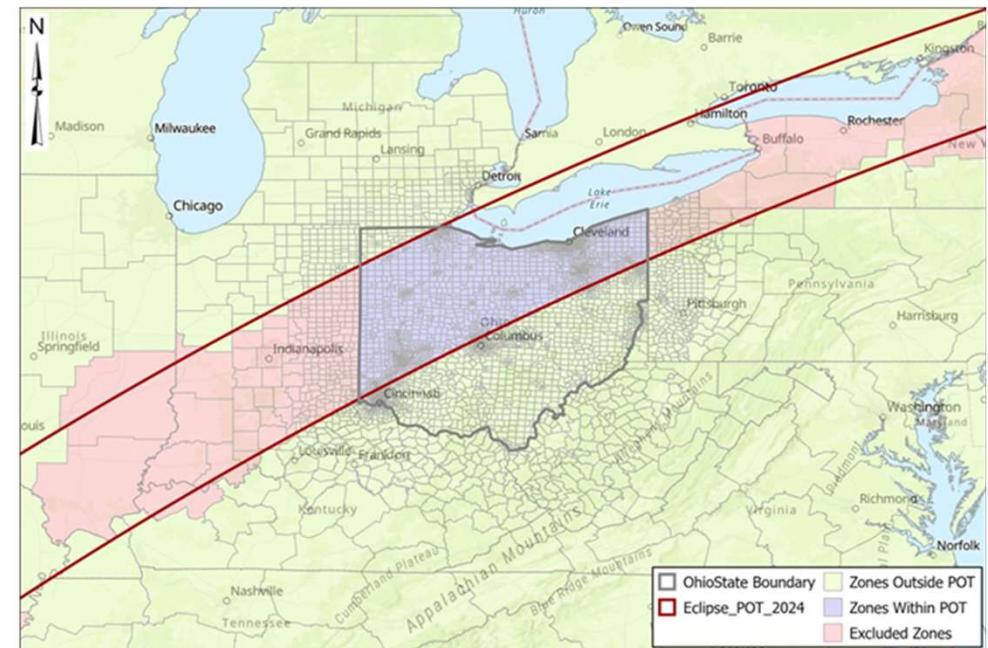
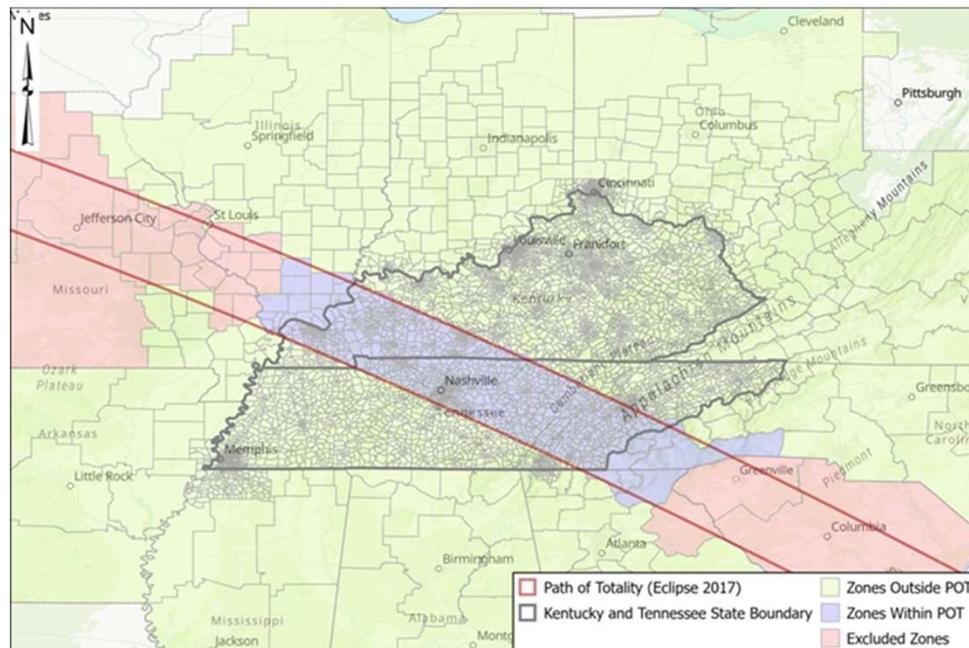
Statewide Event Modeling

- Classification of Trips
- Changes in Travel
 - Trip Length
 - Trip Making
- Diurnal Shifts
- Magnitude of Trips
- Traffic Assignment



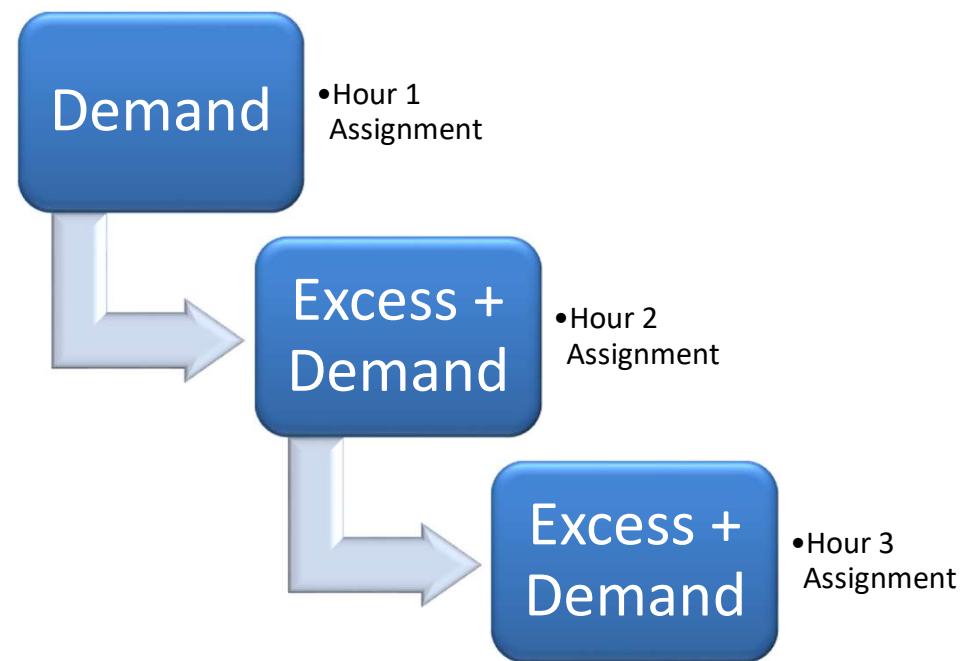
Classification of Trips

- II trips: Trips beginning and ending in the path of totality
- Visitor Trips
 - IE trips: Trips traveling from the path of totality
 - EI trips: Trips traveling to the path of totality
 - EE trips: Trips traveling through or avoiding the path of totality

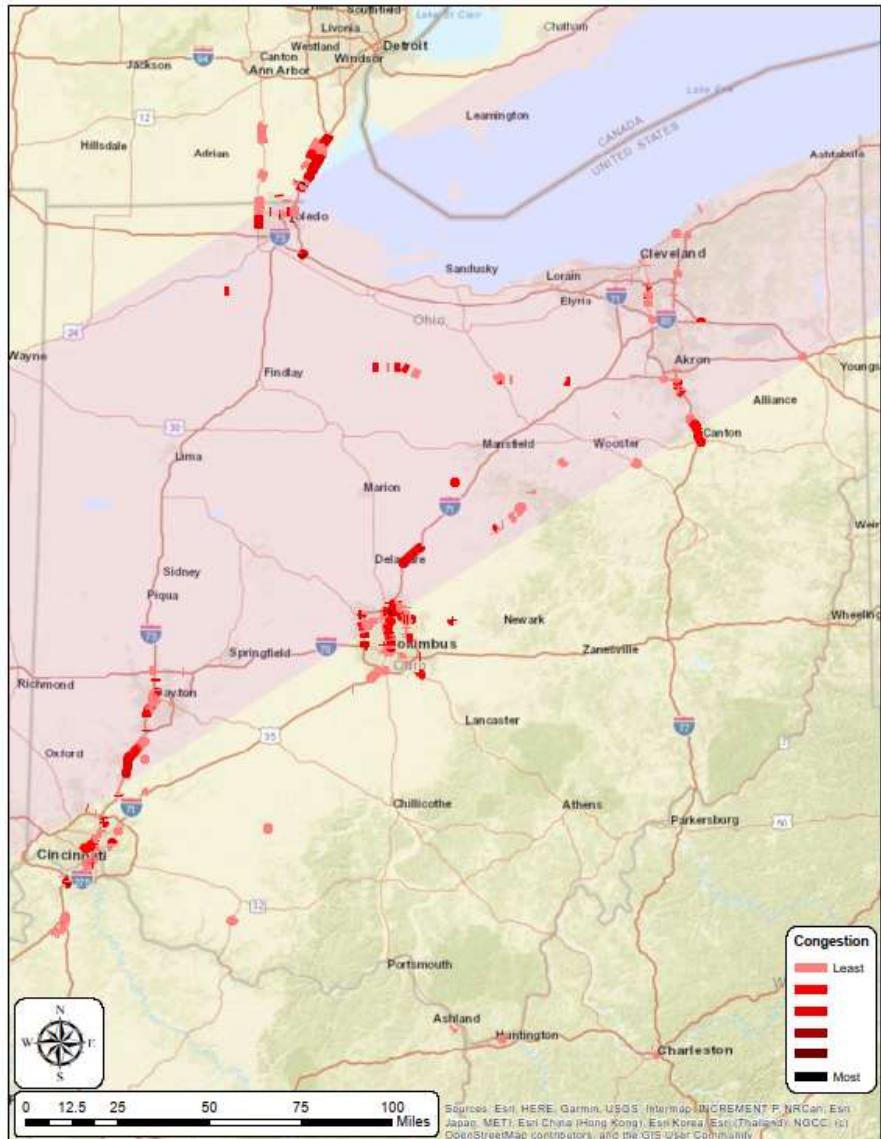


Eclipse Assignment

- Created a sequential static assignment.
 - 24 one-hour assignments
 - Volume in excess of capacity is carried over to the next hour
- Can measure anticipated congestion hot-spots, but cannot address operational elements such as queuing
- Best analyzed by comparing changes to congestion between a “regular” day and the eclipse scenario

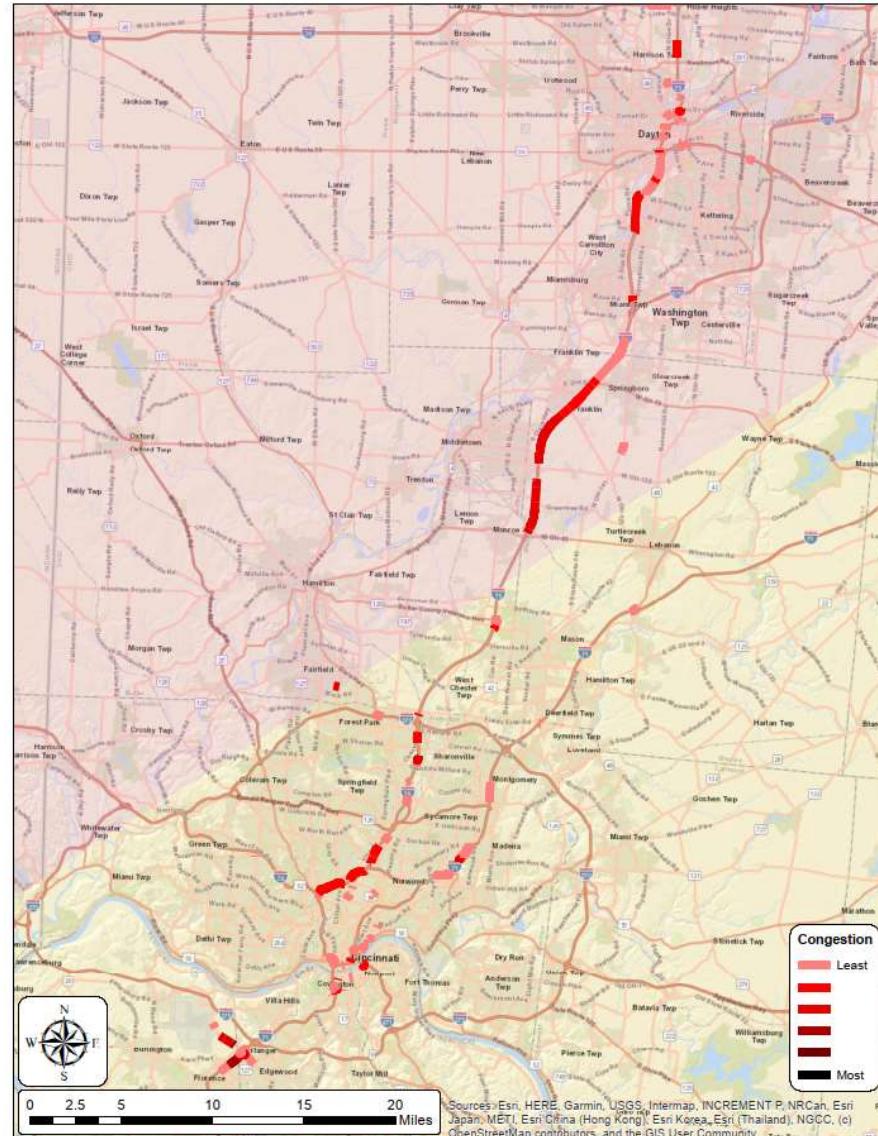


Findings



- Planning Mitigation Strategies
- Identification of potential bottlenecks in the system

Findings



Acknowledgments



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