

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:

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

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

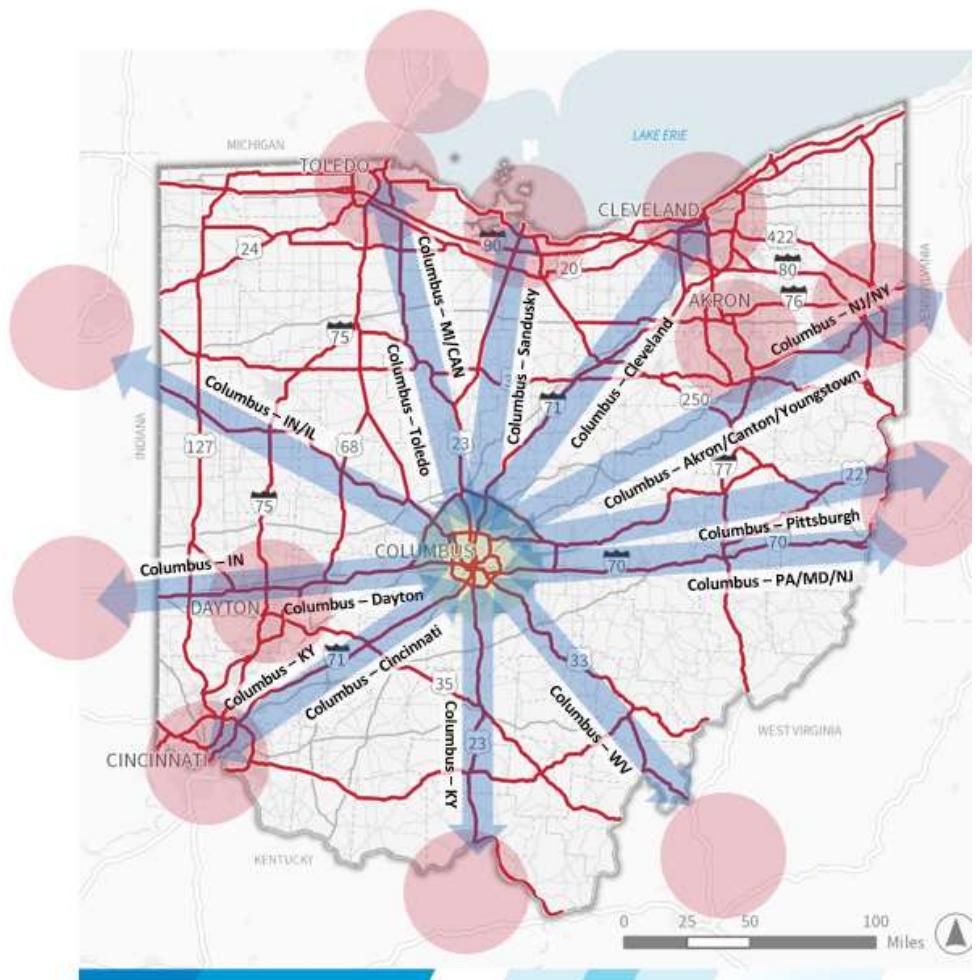
$$V(X_{TR}) = \gamma_1 \times TT_{TR} + \gamma_2 \times TC_{TR} + \gamma_3 \times FREQ_{TR}$$

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

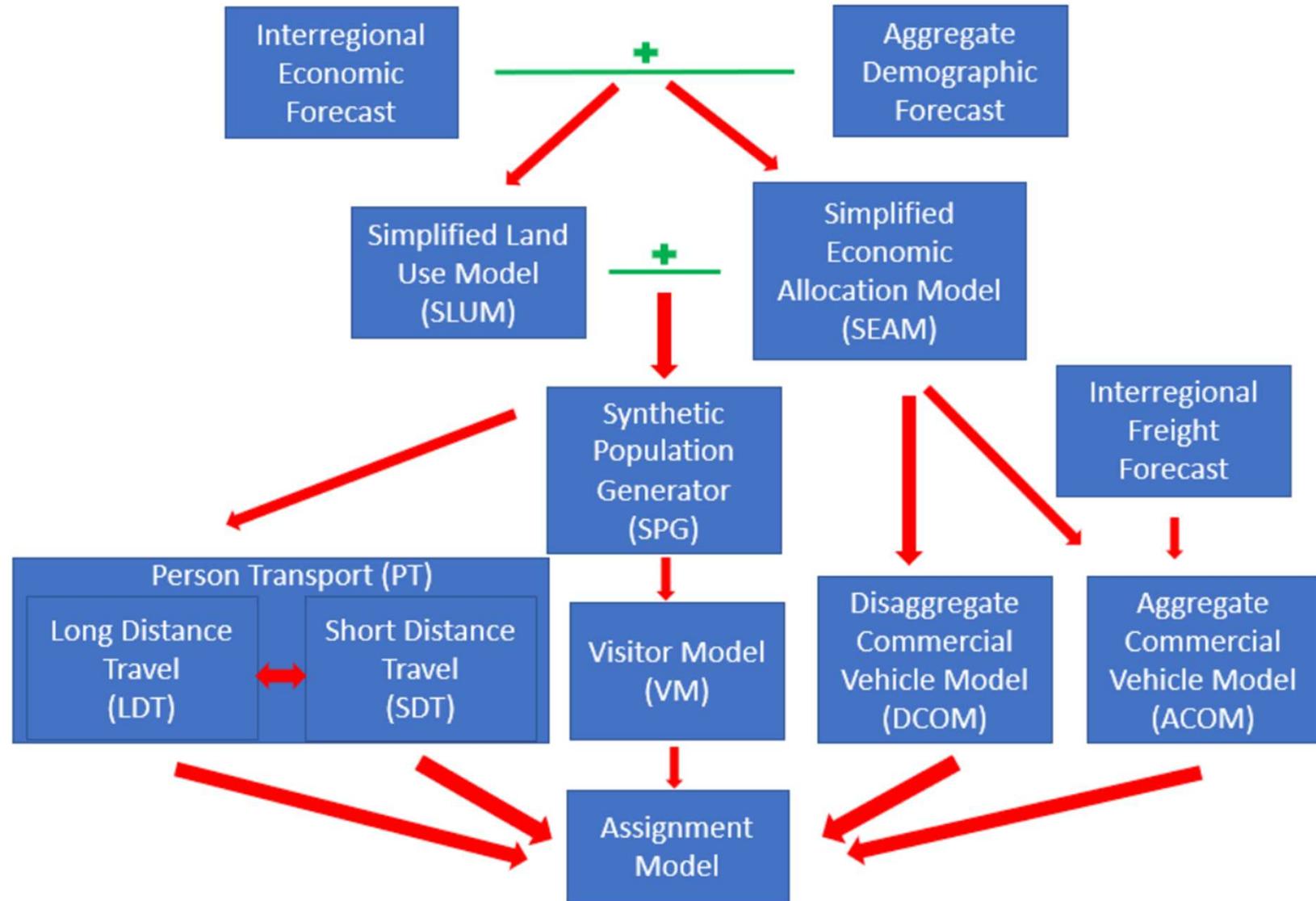
$$V(S_{DA}) = \beta_{DA,0} \times 1 + \beta_{DA,1} \times Inc_t + \beta_{DA,2} \times NCar_t$$

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

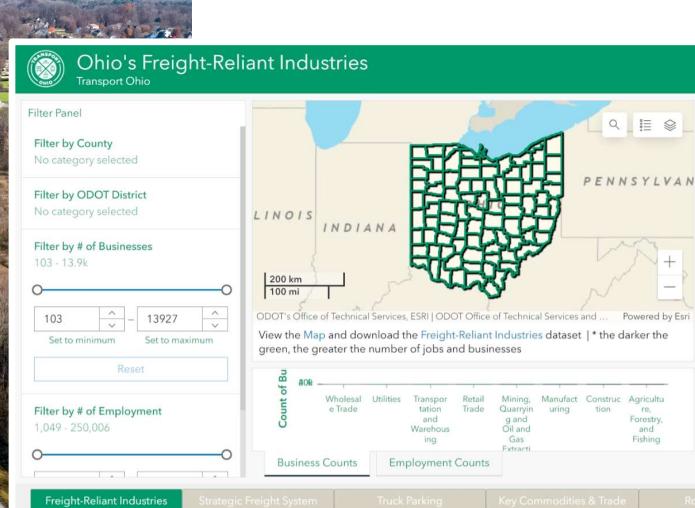
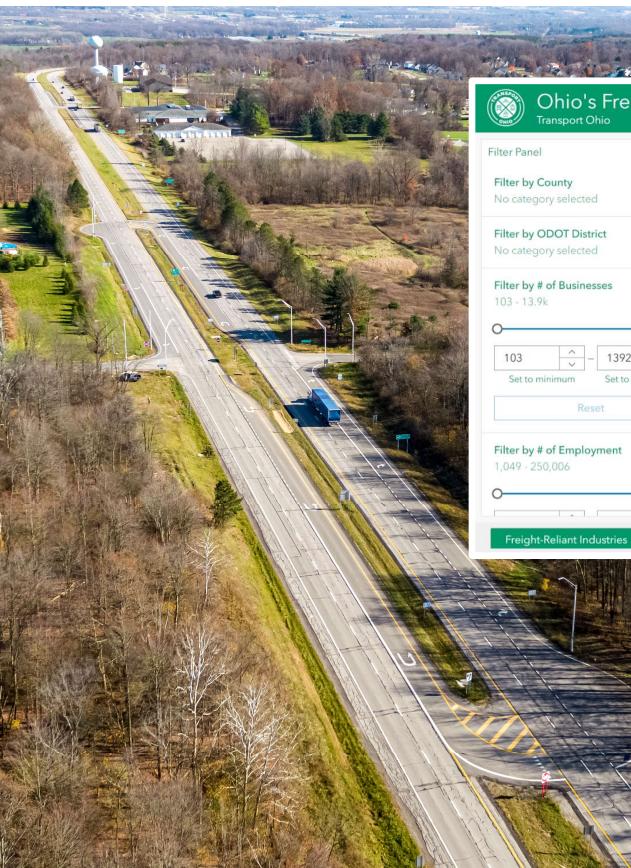
$$V(S_{TR}) = \beta_{TR,0} \times 1 + \beta_{TR,1} \times Inc_t + \beta_{TR,2} \times NCar_t$$



Ohio Statewide Model (OSWM)

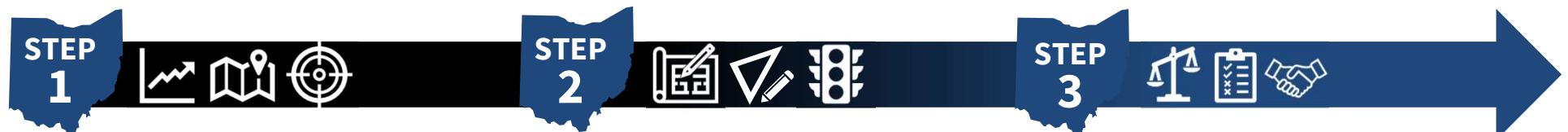


Strategic Transportation & Development Analysis



- 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

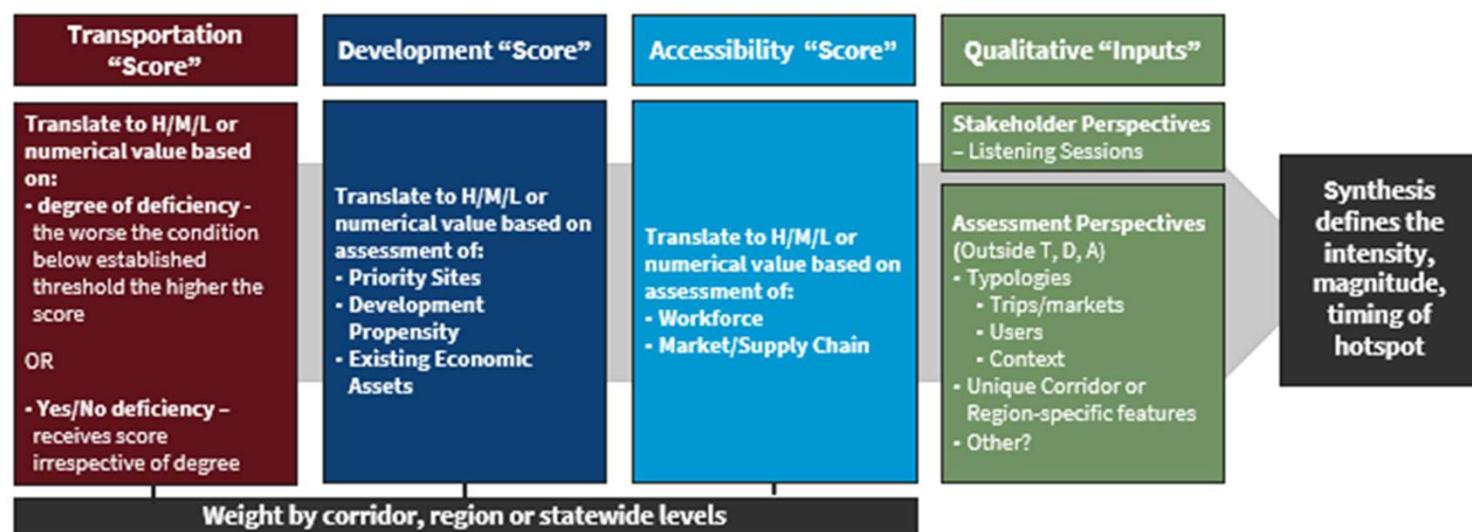
Analyze Benefits & Prepare to Implement

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

OSWM to Assess Future Risk

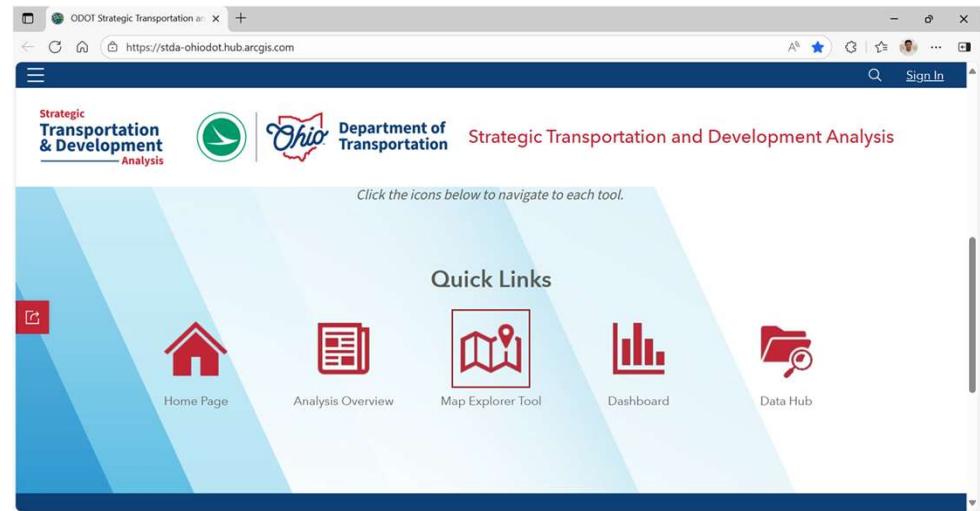
Statewide model runs by scenario through 2035, 2045, 2055

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



- AGOL: Sarah Windmiller, Jack Glodek
- Metric Development: Navnit Sourirajan, Dan Tempesta, Rich Margiotta



Transportation

ODOT Strategic Transportation an X | Strategic Transportation and Deve X +

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Map Explorer Tool

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Congestion Hotspots

- (Workforce Access Loss)
- Congestion Risk (Truck Bottlenecks)
- Congestion Risk (Access Control and Growth)
- Congestion Risk (Composite)
- Partial or No Access Control

Workforce Access (within 40mins)

TAZ Traffic Analysis Zones

Lansing Detroit Lake Erie

Indiana

INDIANA

Ohio

Pittsburgh

Study Network

Ohio Counties

Change in Population by TAZ (2025 to 2055)

Percent Change in Population

- Increase (More than 30%)
- Increase (16% to 30%)

Data Download

The map displays a complex network of roads and highways across several states, primarily Ohio, Indiana, Michigan, and West Virginia. The traffic analysis zones are color-coded based on their risk levels. Most areas are shaded grey, indicating 0 Risk Types. There are significant clusters of higher-risk areas, particularly in the central and southern parts of the study network, where many roads are colored yellow, orange, or red, representing 1, 2, or 3 Risk Types respectively. Major metropolitan areas like Columbus, Cincinnati, and Cleveland are densely networked with roads, while more rural areas appear as smaller, less interconnected zones.

Transportation

The screenshot displays the Map Explorer Tool interface for Strategic Transportation Analysis. The top navigation bar shows tabs for "ODOT Strategic Transportation an" and "Strategic Transportation and Deve". The URL in the address bar is <https://experience.arcgis.com/experience/37e4eb9c19d74b6ca0dfc7f54d0df5d7/>. The main title is "Map Explorer Tool". On the left, a sidebar titled "Roadway Information" lists several metrics: Average Annual Daily Traffic (AADT), Cost of Delay, Vehicle Miles Traveled (VMT), Travel Time Index (TTI), Volume-to-Capacity Ratio (V/C), Congestion Hotspots, Workforce Access (within 40mins), Demographics, and TAZ Traffic Analysis Zones. The "Travel Time Index (TTI)" option is selected, indicated by a checked blue box. The central map shows the study network across the Ohio region, including major cities like Columbus, Cincinnati, Cleveland, and Pittsburgh. The map uses a color-coded legend for Travel Time Index (TTI) values: red for "More than 1.50", yellow for "1.25 - 1.50", and grey for "Less than 1.25". The map also includes labels for Indiana, Michigan, and West Virginia. On the right side, there are sections for "Travel Time Index (TTI)", "Travel Time Index in 2025", "Study Network", "Ohio Counties", and a "Data Download" button.

Accessibility

Accessibility

The figure is a screenshot of the Map Explorer Tool interface, showing a map of the Great Lakes region focusing on Ohio, Indiana, Michigan, and surrounding areas. The map displays traffic analysis zones (TAZ) with varying colors representing different levels of congestion risk. Major cities like Columbus, Cincinnati, Detroit, and Cleveland are labeled. A legend on the right titled "Congestion Risk (Composite)" shows four categories: 3 Risk Types (dark red), 2 Risk Types (orange), 1 Risk Type (light green), and 0 Risk Types (gray). On the left, a sidebar menu lists several analysis categories: "Workforce Access (within 40mins)", "Demographics", "Economics", "Development", and "Boundaries". Under "Workforce Access", two items are selected: "Access to Workers by TAZ in 2025 (Drive)" and "Access to Workers by TAZ in 2055 (Drive)". Other items in this category include "Change in Workforce" and "Access between 2025 to 2035 (Drive)". Below these are sections for "Demographics", "Economics", "Development", and "Boundaries". At the bottom of the sidebar, there is a "TAZ Traffic Analysis Zones" section. On the right side of the map, there are additional sections for "Study Network" and "Ohio Counties", along with a "Data Download" button.



Intraregional / Interregional

Intraregional

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

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

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Regional Networks (Intraregional)

Main Menu | ⓘ

Geographic Filters

Region Filter: 0 Selected

District Filter: 0 Selected

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

Map View: A map of the Great Lakes region showing Ohio, Indiana, Michigan, and parts of Illinois, Pennsylvania, and New York. Major cities like Chicago, Indianapolis, Detroit, Cleveland, Columbus, and Pittsburgh are labeled. A central inset map shows the Ohio River Valley with Cincinnati, Louisville, and St. Louis. A legend indicates risk types: blue dots for 1 Risk Type, red dots for 2 Risk Types, and yellow dots for 3 or More Risk Types. A legend also shows the ODOT District layer.

Hotspot Groupings: 72 Hotspot Groupings

Filter Groupings:

By Intensity:

- 1 Risk Type: 23 grouping(s)
- 2 Risk Types: 24 grouping(s)
- 3 or More Risk Types: 25 grouping(s)

By Status:

- Addressed: 7 grouping(s)
- Partially Addressed:

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: 72 | Selection: 0



Intraregional

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

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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

Muncie, Mansfield, Dayton, Columbus

Map showing regional networks in Ohio, highlighting Columbus and surrounding areas with various risk types and intensities.

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)

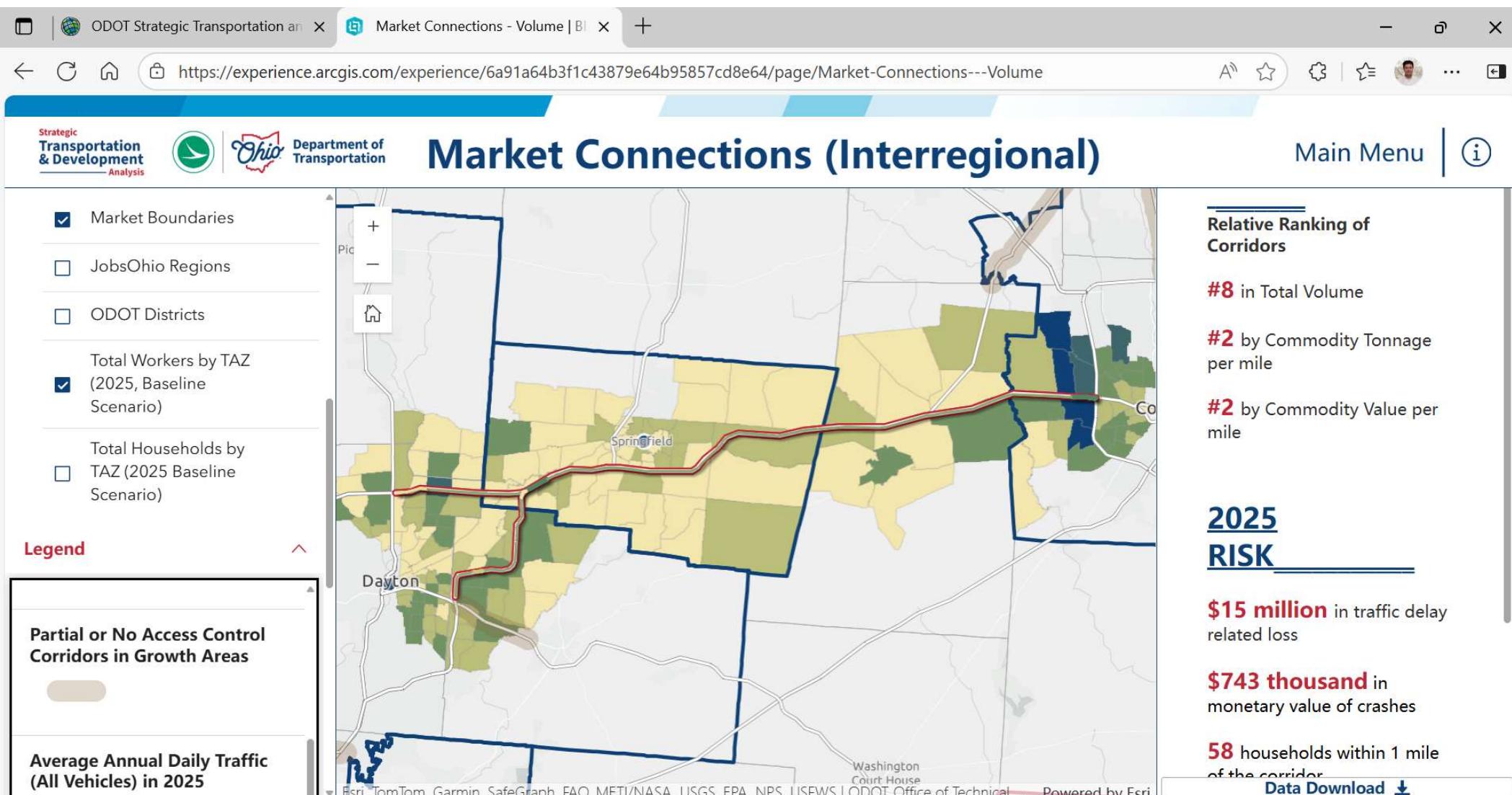
Data Download

Hotspot Groupings

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Interregional



Interregional

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

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Market Connections (Interregional)

Main Menu | ⓘ

Filters

Select Corridor: Cincinnati-Dayton

Corridor Layers

Contextual Layers

Legend

Partial or No Access Control Corridors in Growth Areas

Average Annual Daily Traffic (All Vehicles) in 2025

Average Annual Daily Traffic (AADT)

Relative Ranking of Corridors

#1 in Total Volume

#18 by Commodity Tonnage per mile

#20 by Commodity Value per mile

2025 RISK

\$44 million in traffic delay related loss

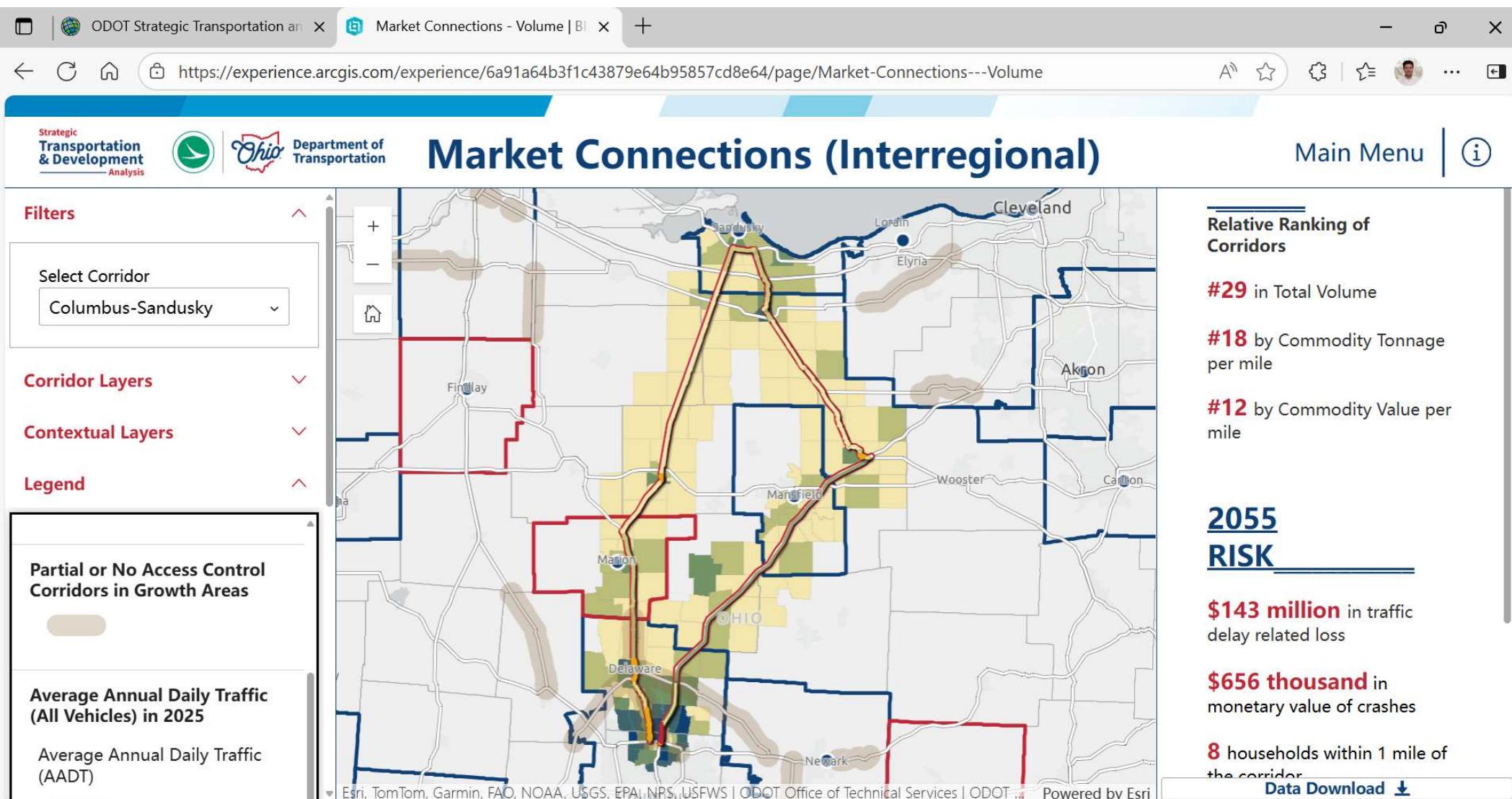
\$1941 thousand in monetary value of crashes

227 households within 1 mile of the corridor

Data Download ↴

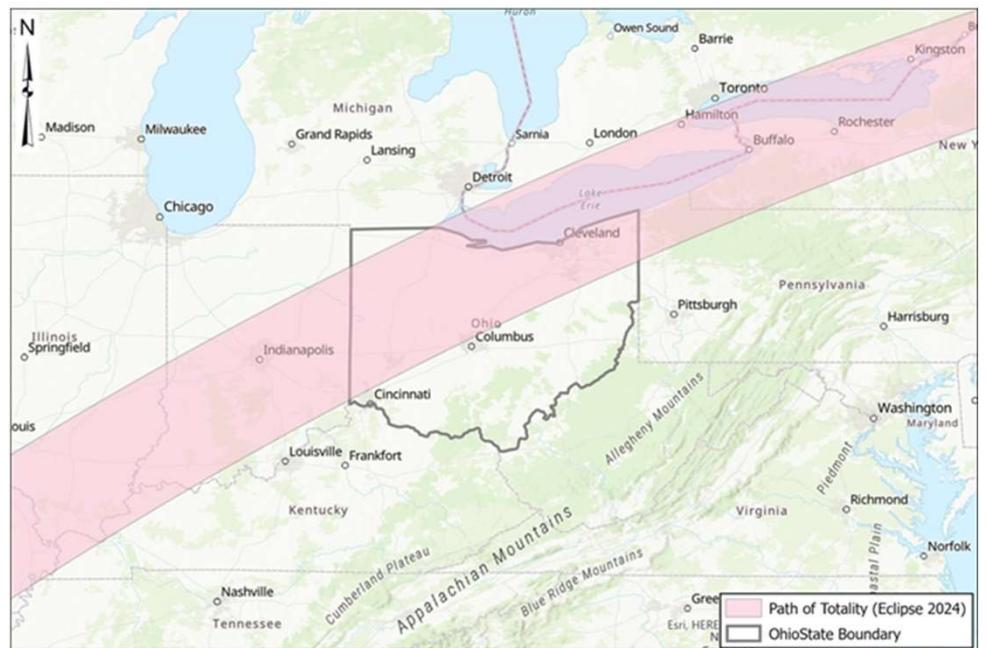
Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS | ODOT Office of Technical ... Powered by Esri

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

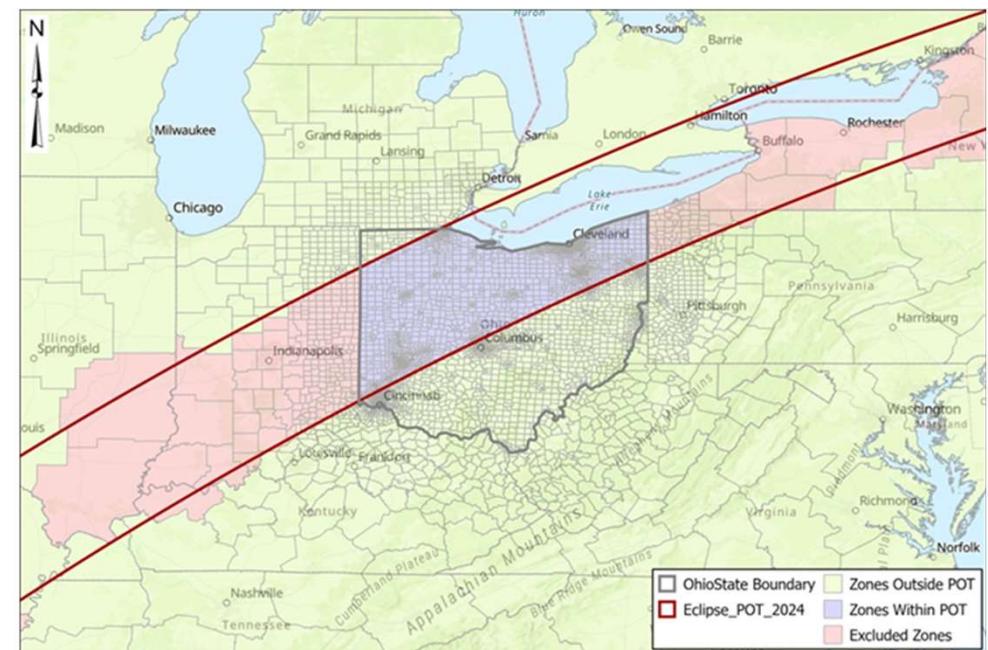
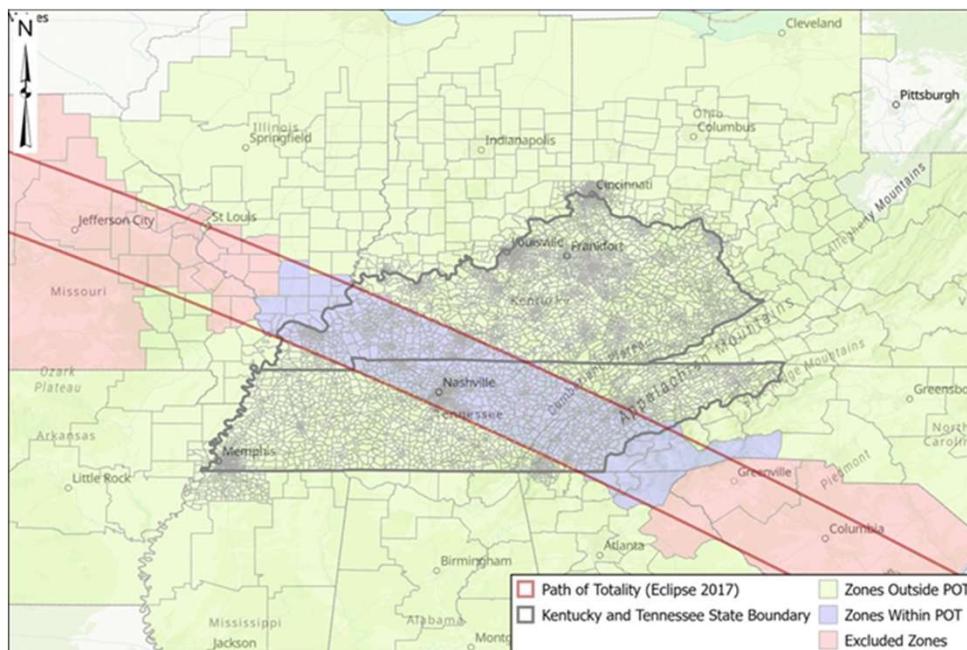
Statewide Event Modeling

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



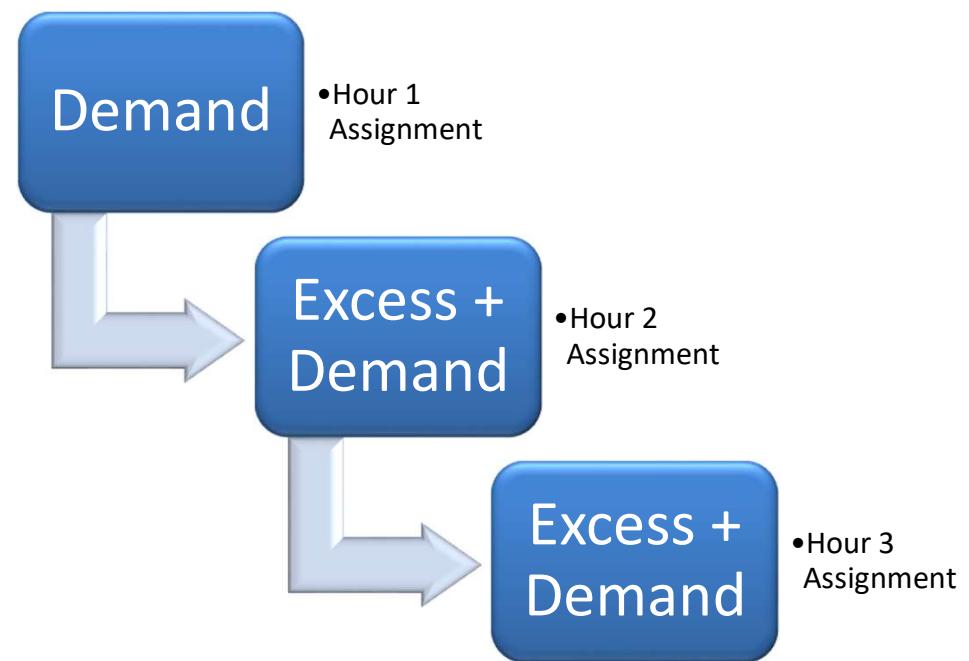
Classification of Trips

- 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

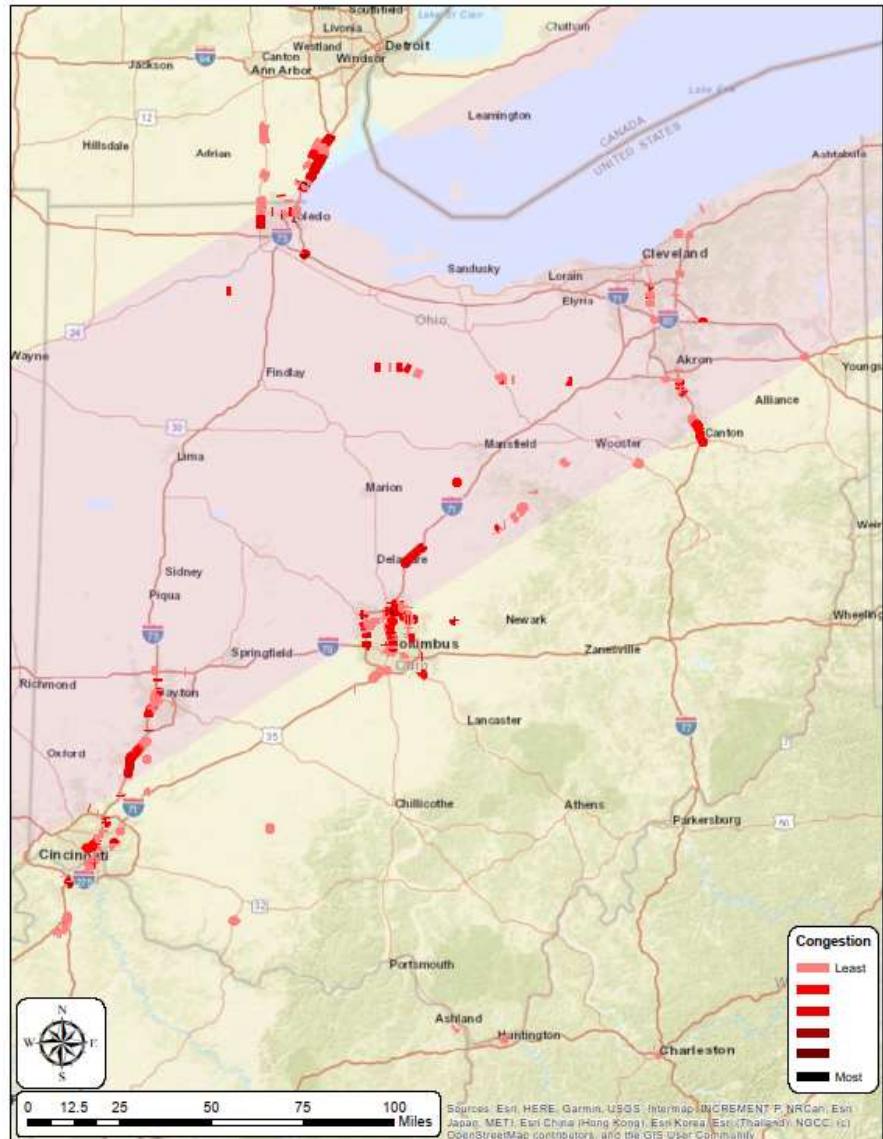


Eclipse Assignment

- 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

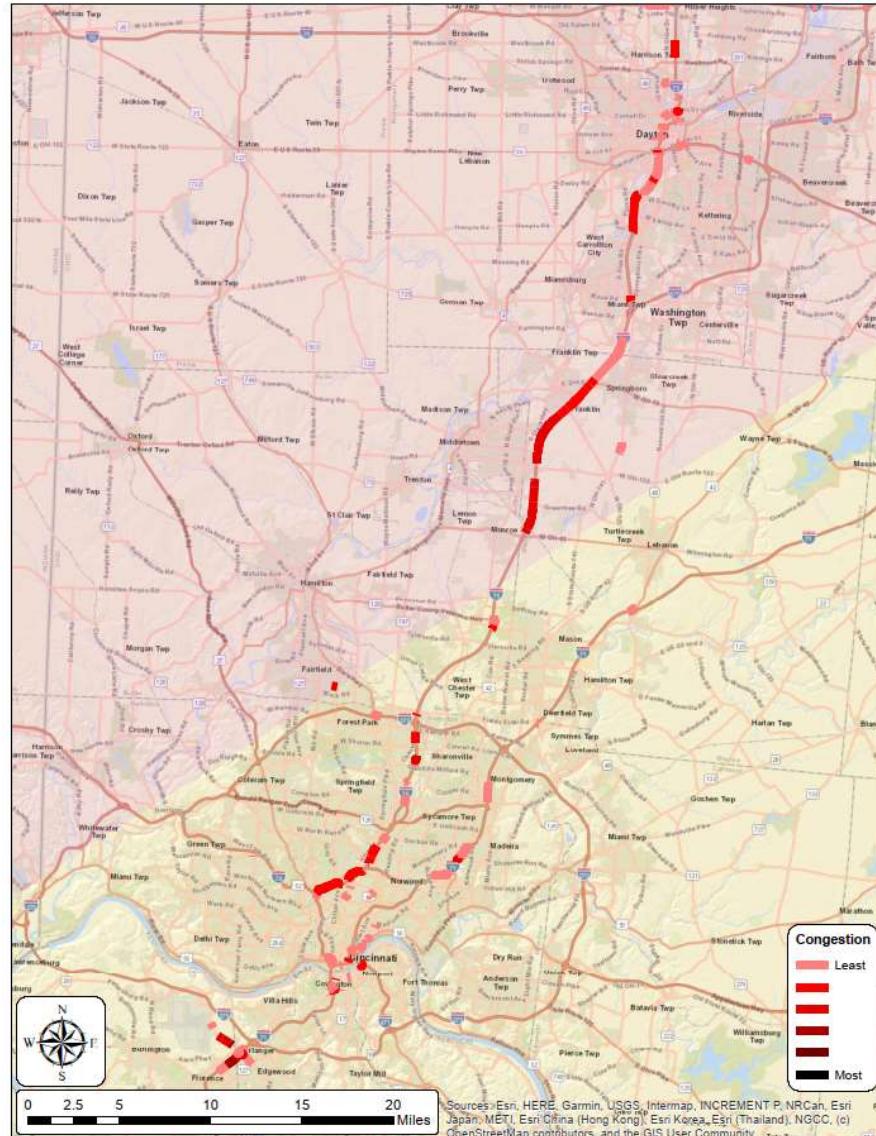


Findings



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

Findings



Acknowledgments



Department of
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- Jordan Whisler, AICP: ODOT Project Manager
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