

# APPENDIX C:

## HIGH RISK NETWORK ANALYSIS

# MVRPC SS4A SAFETY ACTION PLAN

## HIGH RISK NETWORK ANALYSIS

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This document provides an overview of the technical approaches used to perform the High Risk Network (HRN) analysis in support of the Miami Valley Regional Planning Commission (MVRPC) Safer Streets and Roads for All (SS4A) Safety Action Plan. The High Risk Network identifies combinations of roadway characteristics that are associated with elevated serious crash frequencies.

## High Risk Network Methodology

The High Risk Network analysis is a systemic safety analysis, which was performed using the facility profile analysis (FPA) methodology. The FPA methodology identifies and screens for high risk roadway characteristics and geometry on the region's roadways, ultimately producing the High Risk Network for the region. The High Risk Network analysis provides a proactive approach to identifying safety needs regardless of a given facility's (roadway's) recent crash history. The FPA methodology identifies unique combinations of roadway design and contextual attributes associated with elevated potential for crashes. All roadway segments are scored in terms of average crash density among similar facilities and given a crash risk tier rating of critical, high, medium, low, or minimal based on these scores. Tiers are determined using the Natural Breaks method. The top scoring segments become the MVRPC MPO region's High Risk Network with the exclusion of the City of Dayton and City of Franklin as they are developing their own Safe Streets and Roads for All Safety Action Plans.

The facility profile analysis was conducted for a set of characteristics related to roadway attributes and again for a set of characteristics related to context-specific attributes. The purpose of the disaggregation of these characteristics into two separate subsets of the analysis was to allow different trends and interactions of characteristics to emerge as risk profiles, while still maintaining the priority of adequate coverage across contexts. Each of these subsets of the analysis were conducted separately by travel mode (modal crashes include motor vehicle, motorcycle, bicyclist, and pedestrian) and by context (urban and rural), resulting in models for all modal crashes in urban contexts, all modal crashes in rural contexts, and a model for crashes involving vulnerable road users.<sup>1</sup> This approach identified the key combinations of systemic screening factors most relevant to severe crash risk for each analyzed facility category. Facility profiles were then grouped into five risk tiers – critical, high, medium, low, and minimal – based on average crash density per mile and the proportion of fatal and serious injury (FSI) crashes relative to the total mileage of roads sharing that profile. Findings are summarized in the **High Risk Network Summary Tables** and **High Risk Network Maps** within this document.

For the HRN mapping, the mapped tiers were selected to represent approximately 50% of all FSI crashes.

- **Urban context:** tier selection for mapping was tailored to each model to best capture 50% of FSI crashes. Tiers included for each model are below:
  - » **Roadway model** included the critical, high, and medium tiers.
  - » **Context model** included the critical, high, and medium tiers.
- **Rural context:** tier selection for mapping was tailored to each model to best capture 50% of FSI crashes. Tiers included for each model are below:
  - » **Roadway model** included the critical, high, medium, and low tiers.
  - » **Context model** included only the critical and high tiers.
- **Vulnerable road user (VRU) modes:** tier selection for mapping was tailored to each model to best capture 50% of FSI crashes. Tiers included for each model are below:
  - » **Roadway model** included the critical, high, and medium tiers.
  - » **Context model** included the critical, high, and medium tiers.

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<sup>1</sup> Vulnerable road users include bicyclists and pedestrians.

## Systemic Screening Factors

One of the key outcomes of the FPA process is the identification of roadway facility attributes that correlate with high crash frequency. These attributes are known as systemic screening factors. Combinations of these factors can help flag roadway facility profiles associated with higher crash frequencies. Notably, the presence of these factors does not necessarily indicate a causal relationship, nor that individual factors must be the target of treatments. For example, though the presence of nearby vulnerable road user (VRU) generators may be a factor that correlates with elevated VRU crash frequencies, this does not mean that these generators should be removed. Instead, facilities near such generators may require additional support through safety investments and strategies.

Screening factors and roadway facility profiles should be studied from a practical and policy-driven perspective to determine what components may be reasonable targets of safety improvements, and which should be viewed primarily as non-causal correlations.

**Table 1** lists several roadway segment attributes that are identified as candidate factors for consideration in each of the “roadway” and “context” analyses, noting which analysis the characteristic was considered for.

**Table 1: Selection of Systemic Screening Factors**

Screening Factor	Description	Analysis
Rural or Urban Classification	Rural, Urban (ODOT Adjusted Urban Areas)	Roadway, Context
Lane Configuration	Two-lane, Multilane	Roadway
Lane Width	Wide (Over 11 Feet), Narrow (11 feet and under)	Roadway
Shoulder Width	Has Recoverable Shoulder (width of 6 feet and over), Does Not Have Recoverable Shoulder (width under 6 feet)	Roadway
Median	Has Median, Does not have median	Roadway
Functional Classification	Higher Functional Classification (other principal arterials, minor arterials, major collectors), Lower Functional Classification (minor collectors and local roads)	Roadway
Land Use Context	Agricultural, Commercial, Industrial, Residential, Open Space, Other	Context
Transit Stops	Within 500 feet, Not within 500 feet	Context
Trail Access Points	Within 500 feet, Not within 500 feet	Context
Intersection Density	Intersection Dense (15 or more intersections per mile), Not Intersection Dense <i>*Not included for rural models</i>	Roadway
Traffic Volume Range (Average Annual Daily Traffic)	0 – 1,000, 1,000 – 10,000, 10,000+	Roadway
Speed Limit	Categorized as ≤30 MPH, 35-45 MPH, or 50+ MPH	Roadway
Proximity to a School	Within ¼ Mile, Not Within ¼ Mile	Context

Screening Factor	Description	Analysis
Proximity to a Public Park	Within ¼ Mile, Not Within ¼ Mile	Context
Percent of Population with Income Below 2x of the Poverty Level	Under 20%, 20-40%, Over 40%	Context
Percent of Households with Zero Vehicles	Below 10%, 10-20%, Over 20%	Context
Percent of Population Aged 65 or Older	Below 10%, 10-20%, Over 20%	Context
Percent of Population Aged Below 18	Below 10%, 10-20%, Over 20%	Context
ODOT Active Transportation Demand <sup>2</sup>	High Active Transportation Demand (scores three and above), Low Active Transportation Demand (scores under three)	Context

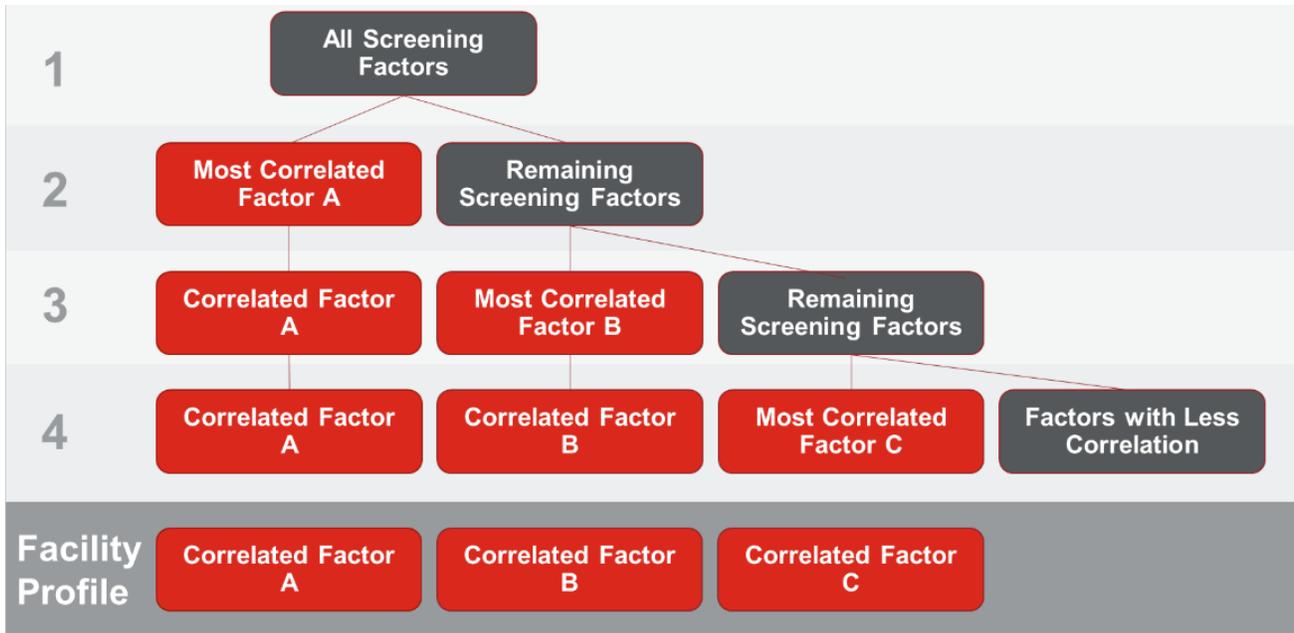
### Analysis Process

The facility profile analysis for the “All Modes” models focused on the five-year study period of 2020 to 2024, using a selection of crash severities. The vulnerable road user model (crashes including bicyclists or pedestrians) used a 10-year study period of 2015 to 2024. This expanded data set for pedestrian and bicyclist crashes is due to the relatively low frequency of these crashes, providing a larger data set for the models to be based on. The target study roadway facilities will include all public roadways except for interstates, interstate ramps, and freeway-like roads within the study area.

The systemic analysis screening process is based on a decision tree machine learning algorithm in which each factor is screened individually to determine whether it can distinguish between locations with relatively high or low average crash densities per mile. For categorical factors such as roadway jurisdiction, the algorithm considers each unique classification individually. The algorithm screens all factors recursively to identify the most correlated, mutually exclusive sets of risk factors, resulting in several decision tree leaves, known in this analysis as facility profiles. **Figure 1** illustrates the decision tree algorithm where multiple correlated factors define a facility profile.

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<sup>2</sup> ODOT Active Transportation Demand



**Figure 1: Illustration of the Decision Tree Process for Screening Combinations of Risk Factors**

### Crash Data Limitations

Local law enforcement agencies submit crash reports that provide raw crash data. While crash reports are currently the best way to obtain information about a large number of crashes, they have limitations. Crash severity may have limited accuracy because those completing reports typically don't have medical training, and victims of crashes may be unaware of internal injuries that may manifest or become apparent at a later time. The total number of crashes may be underreported due to fears, language barriers, financial concern, and more. Crash reports may not capture the effects of speed in crashes, as the first responders are typically on the scene after the crash has occurred and witnesses outside a crash are not typically interviewed about operator speed. Crashes involving motorists are more likely to be reported for insurance purposes, but crashes involving pedestrians or bicyclists only (e.g., a bicyclist hitting a fixed object) are less likely to be reported. Even when crash reports are perfect, they do not record near misses or the self-limiting behavior of travelers who don't feel safe in currently configured networks. It is useful to keep these limitations in mind when using crash data and to vet data with priority populations as part of the planning process.

## High Risk Network Summary Tables

The following pages include High Risk Network summary tables for the MVRPC MRPO region. These summary tables outline the definition of the facility profiles that emerged for each risk network, as well as the metrics for the facilities that match these profiles.

### Roadway Model – All-Modes in Urban Areas

**Table 2: Facility Profile Definition - All Modes in Urban Areas, Roadway Model**

Facility Profile Tier	Facility Profile Definition						
	Traffic Volume Range	Lane Configuration	Median Status	Lane Width	Functional Class	Speed Limit	Intersection Density
Critical	10,000+	Multi-Lane	No Median			> 30 MPH	
High	10,000+					≤ 30 MPH	Intersection Dense
Medium	10,000+	Two-Lane	Has Median			> 30 MPH	
	10,000+					> 30 MPH	
	10,000+					≤ 30 MPH	Not Intersection Dense
	< 10,000				Higher Functional Class	> 30 MPH	Intersection Dense
Low	< 10,000			Wide	Higher Functional Class		Not Intersection Dense
	< 10,000				Higher Functional Class	≤ 30 MPH	Intersection Dense
Minimal	< 10,000			Narrow	Higher Functional Class		Not Intersection Dense
	< 10,000				Lower Functional Class		

**Table 3: Facility Profile Metrics - All Modes in Urban Areas, Roadway Model**

Facility Profile Tier	Facility Profile Metrics				
	Avg. FSI Crashes per Mile	Miles	FSI Crashes	Miles Share	FSI Crashes Share
Critical	64.27	67.8	4,356.0	7.1%	26.6%
High	35.36	24.7	874.0	2.6%	5.3%
Medium	25.93	162.7	4,218.0	17.0%	25.8%
Low	17.12	103.7	1,776.0	10.9%	10.8%
Minimal	8.63	596.9	5,152.0	62.4%	31.5%
<b>Total</b>		<b>955.8</b>	<b>16,376.0</b>		

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*Roadway Model – All-Modes in Rural Areas*

**Table 4: Facility Profile Definition – All Modes in Rural Areas, Roadway Model**

Facility Profile Tier	Facility Profile Definition			
	Functional Class	Recoverable Shoulder	Speed Limit	Lane Width
<b>Critical</b>	Higher Functional Class	Does Not Have Recoverable Shoulder	≤ 30 MPH	
<b>High</b>	Higher Functional Class	Does Not Have Recoverable Shoulder	> 30 MPH	Wide
<b>Medium</b>	Higher Functional Class	Does Not Have Recoverable Shoulder	> 30 MPH	Narrow
<b>Low</b>	Higher Functional Class	Has Recoverable Shoulder		
<b>Minimal</b>	Lower Functional Class			

**Table 5: Facility Profile Metrics - All Modes in Rural Areas, Roadway Model**

Facility Profile Tier	Facility Profile Metrics				
	Avg. FSI Crashes per Mile	Miles	FSI Crashes	Miles Share	FSI Crashes Share
<b>Critical</b>	6.85	5.8	40.0	1.5%	2.7%
<b>High</b>	5.69	23.9	136.0	6.0%	9.2%
<b>Medium</b>	5.23	92.0	481.0	22.9%	32.6%
<b>Low</b>	3.84	10.7	41.0	2.7%	2.8%
<b>Minimal</b>	2.89	269.2	779.0	67.0%	52.7%
<b>Total</b>		401.6	1,477.0		

Roadway Model – Vulnerable Road Users (VRU) Modes

Table 6: Facility Profile Definition - VRU Modes, Roadway Model

Facility Profile Tier	Facility Profile Definition					
	Traffic Volume Range	Lane Configuration	Median Status	Functional Class	Speed Limit	Intersection Density
Critical	10,000+	Multi-Lane	No Median		> 30 MPH	
High	10,000+	Multi-Lane	No Median		≤ 30 MPH	
	10,000+	Multi-Lane	Has Median			Intersection Dense
	10,000+	Two-Lane				Intersection Dense
Medium	< 10,000			Higher Functional Class		Intersection Dense
Low	10,000+	Two-Lane				Not Intersection Dense
	10,000+	Multi-Lane	Has Median			Not Intersection Dense
	< 10,000				≤ 30 MPH	Not Intersection Dense
	< 10,000			Lower Functional Class		Intersection Dense
Minimal	< 10,000				> 30 MPH	Not Intersection Dense

Table 7: Facility Profile Metrics - VRU Modes, Roadway Model

Facility Profile Tier	Facility Profile Metrics				
	Avg. FSI Crashes per Mile	Miles	FSI Crashes	Miles Share	FSI Crashes Share
Critical	8.26	68.0	561.0	5.0%	26.7%
High	4.91	69.0	339.0	5.1%	16.1%
Medium	3.11	97.9	304.0	7.2%	14.5%
Low	1.35	458.2	620.0	33.8%	29.5%
Minimal	0.42	664.3	278.0	48.9%	13.2%
<b>Total</b>		<b>1,357.4</b>	<b>2,102.0</b>		

Context Model – All Modes in Urban Areas

Table 8: Facility Profile Definition - All Modes in Urban Areas, Context Model

Facility Profile Tier	Facility Profile Definition					
	Transit Proximity	Park Proximity	ODOT Active Transportation Demand	Income below 2x poverty level	Land Use Category	Population over 64
<b>Critical</b>	Near Transit	Not Near a Park	High AT Demand			
<b>High</b>	Not Near Transit		High AT Demand		Commercial	
	Near Transit	Near a Park		> 35%		≤ 25%
	Near Transit	Not Near a Park	Low AT Demand			
<b>Medium</b>	Not Near Transit		Low AT Demand		Commercial	
	Near Transit	Near a Park		> 35%		> 25%
	Near Transit	Near a Park		≤ 35%		
<b>Low</b>	Not Near Transit		Low AT Demand		Non-Commercial, Residential, or Agricultural	
	Not Near Transit		High AT Demand		Non-Commercial	
<b>Minimal</b>	Not Near Transit		Low AT Demand		Residential or Agricultural	

Table 9: Facility Profile Metrics - All Modes in Urban Areas, Context Model

Facility Profile Tier	Facility Profile Metrics				
	Avg. FSI Crashes per Mile	Miles	FSI Crashes	Miles Share	FSI Crashes Share
<b>Critical</b>	45.93	41.4	1,902.0	4.3%	11.6%
<b>High</b>	37.29	90.0	3,358.0	9.4%	20.5%
<b>Medium</b>	22.63	180.7	4,089.0	18.9%	25.0%
<b>Low</b>	17.90	143.0	2,559.0	15.0%	15.6%
<b>Minimal</b>	8.92	500.7	4,468.0	52.4%	27.3%
<b>Total</b>		955.8	16,376.0		

*Context Model – All Modes in Rural Areas*

**Table 10: Facility Profile Definition - All Modes in Rural Areas, Context Model**

Facility Profile Tier	Facility Profile Definition			
	<i>Park Proximity</i>	<i>Income below 2x poverty level</i>	<i>Land Use Category</i>	<i>Population over 64</i>
<b>Critical</b>	Near a Park		Residential	> 5%
<b>High</b>	Near a Park		Non-Residential	>5%
	Not Near a Park	≤ 15%		
<b>Medium</b>	Not Near a Park	15-25%		> 5%
<b>Low</b>	Not Near a Park	> 25%		> 5%
<b>Minimal</b>				≤ 5%

**Table 11: Facility Profile Metrics - All Modes in Rural Areas, Context Model**

Facility Profile Tier	Facility Profile Metrics				
	<i>Avg. FSI Crashes per Mile</i>	<i>Miles</i>	<i>FSI Crashes</i>	<i>Miles Share</i>	<i>FSI Crashes Share</i>
<b>Critical</b>	6.15	17.7	109.0	4.4%	7.4%
<b>High</b>	5.18	144.6	749.0	36.0%	50.7%
<b>Medium</b>	3.58	99.1	355.0	24.7%	24.0%
<b>Low</b>	2.79	70.0	195.0	17.4%	13.2%
<b>Minimal</b>	0.98	70.3	69.0	17.5%	4.7%
<b>Total</b>		401.6	1,477.0		

Context Model – Vulnerable Road Users (VRU) Modes

Table 12: Facility Profile Definition - VRU Modes, Context Model

Facility Profile Tier	Facility Profile Definition					
	Transit Proximity	School Proximity	ODOT Active Transportation Demand	Income below 2x poverty level	Zero Vehicle Households	Land Use Category
<b>Critical</b>	Near Transit			> 35%	> 5%	Residential
<b>High</b>	Not Near Transit		High AT Demand	> 45%		
<b>Medium</b>	Near Transit			15 - 35%		Residential
	Near Transit			> 35%	≤ 5%	Residential
<b>Low</b>	Not Near Transit	Near a School	Low AT Demand			Non-Agricultural
	Near Transit					Non-Residential
	Not Near Transit		High AT Demand	≤ 45%		
	Near Transit			≤ 15%		Residential
<b>Minimal</b>	Not Near Transit	Not Near a School	Low AT Demand			Non-Agricultural
	Not Near Transit		Low AT Demand			Agricultural

Table 13: Facility Profile Metrics - VRU Modes, Context Model

Facility Profile Tier	Facility Profile Metrics				
	Avg. FSI Crashes per Mile	Miles	FSI Crashes	Miles Share	FSI Crashes Share
<b>Critical</b>	7.79	52.2	407.0	3.8%	19.4%
<b>High</b>	5.20	36.1	188.0	2.7%	8.9%
<b>Medium</b>	4.12	132.9	547.0	9.8%	26.0%
<b>Low</b>	2.08	290.5	604.0	21.4%	28.7%
<b>Minimal</b>	0.42	845.5	356.0	62.3%	16.9%
<b>Total</b>		1,357.4	2,102.0		

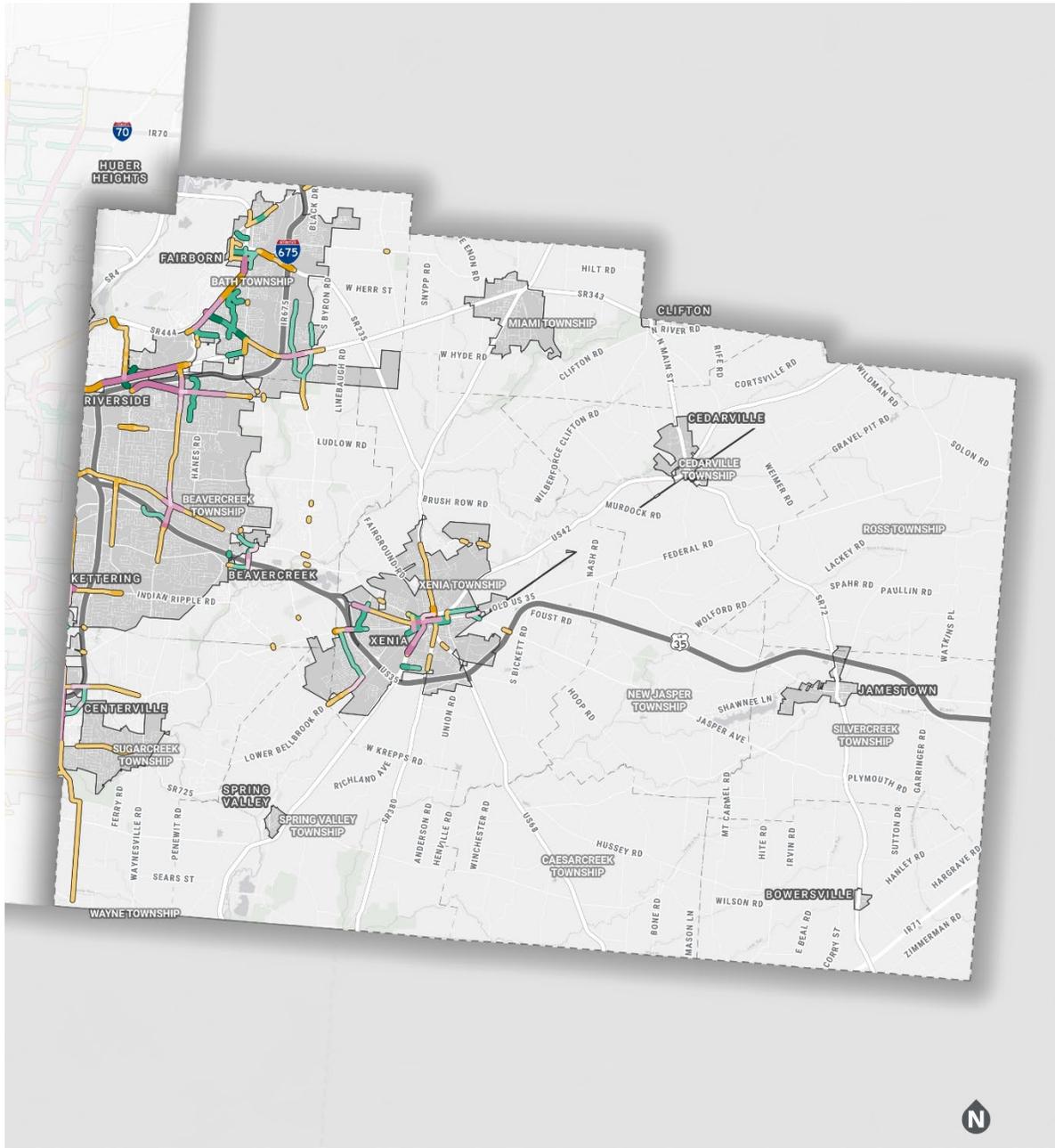
## High Risk Network Maps

The following pages include High Risk Network maps for the region as well as zoomed-in county-level maps for Miami County, Montgomery County (excluding the city of Dayton), Greene County, and part of Northern Warren County (excluding the city of Franklin). The county-level maps represent the same data as their region-level counterparts. As such, some county maps may not have any High Risk Network segments and were included for completeness. Each map includes a network for the roadway model, the context model, and where the two networks overlap. In cases of overlap, the higher tier of the overlapping segments was chosen for symbolization.

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Greene County

All Modes in Urban Areas



High Risk Network - All Modes (Urban) - Greene County

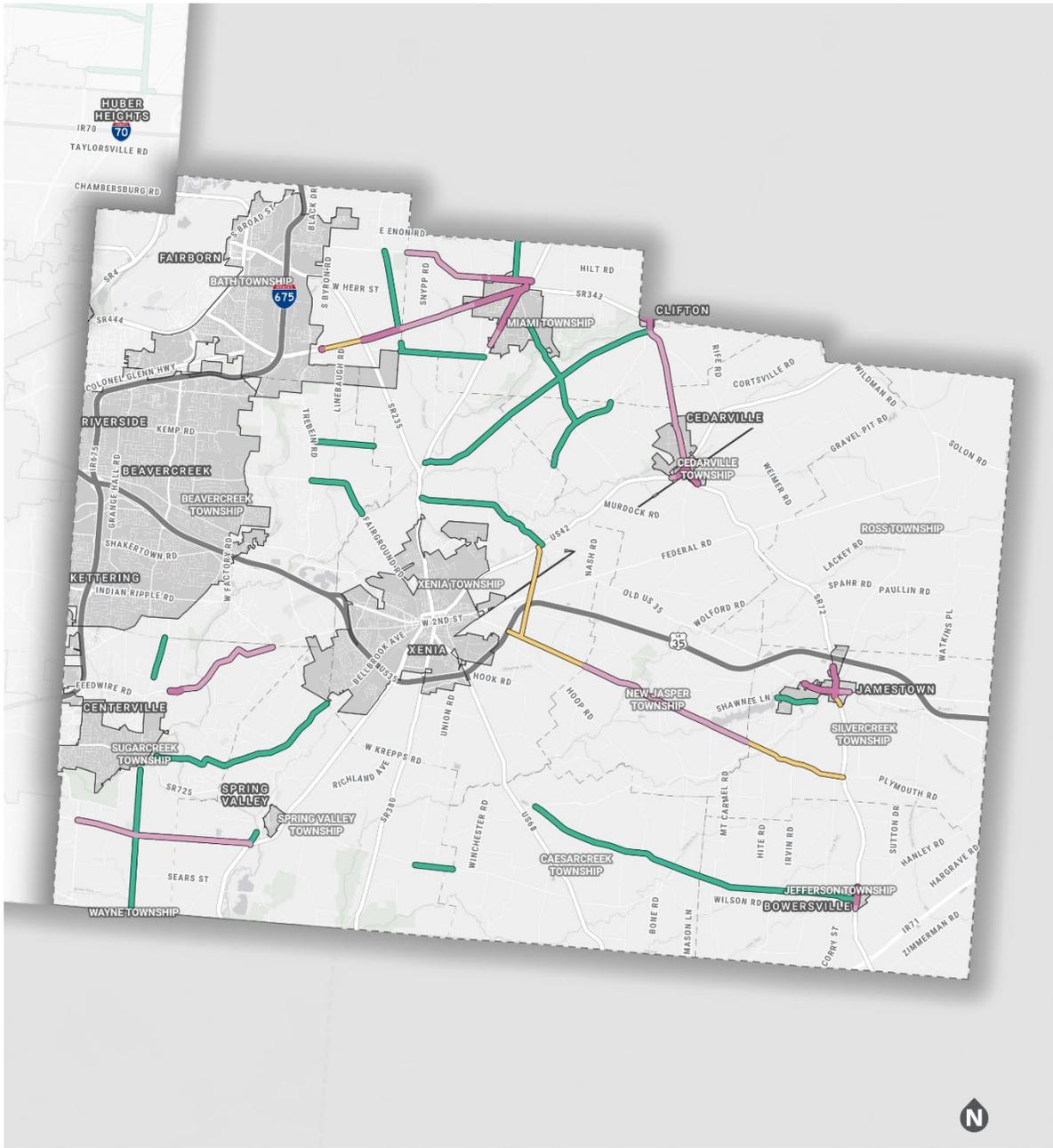
- | Both Risk Factor Networks | Roadway Risk Factor Network | Context Risk Factor Network |
|---------------------------|-----------------------------|-----------------------------|
| Critical                  | Critical                    | Critical                    |
| High                      | High                        | High                        |
| Medium                    | Medium                      | Medium                      |

\*Excludes interstate-style roadways (freeways & freeway look-alikes)

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Figure 2: All Modes in Urban Areas High Risk Network (Greene County)

# All Modes in Rural Areas



## High Risk Network - All Modes (Rural) - Greene County

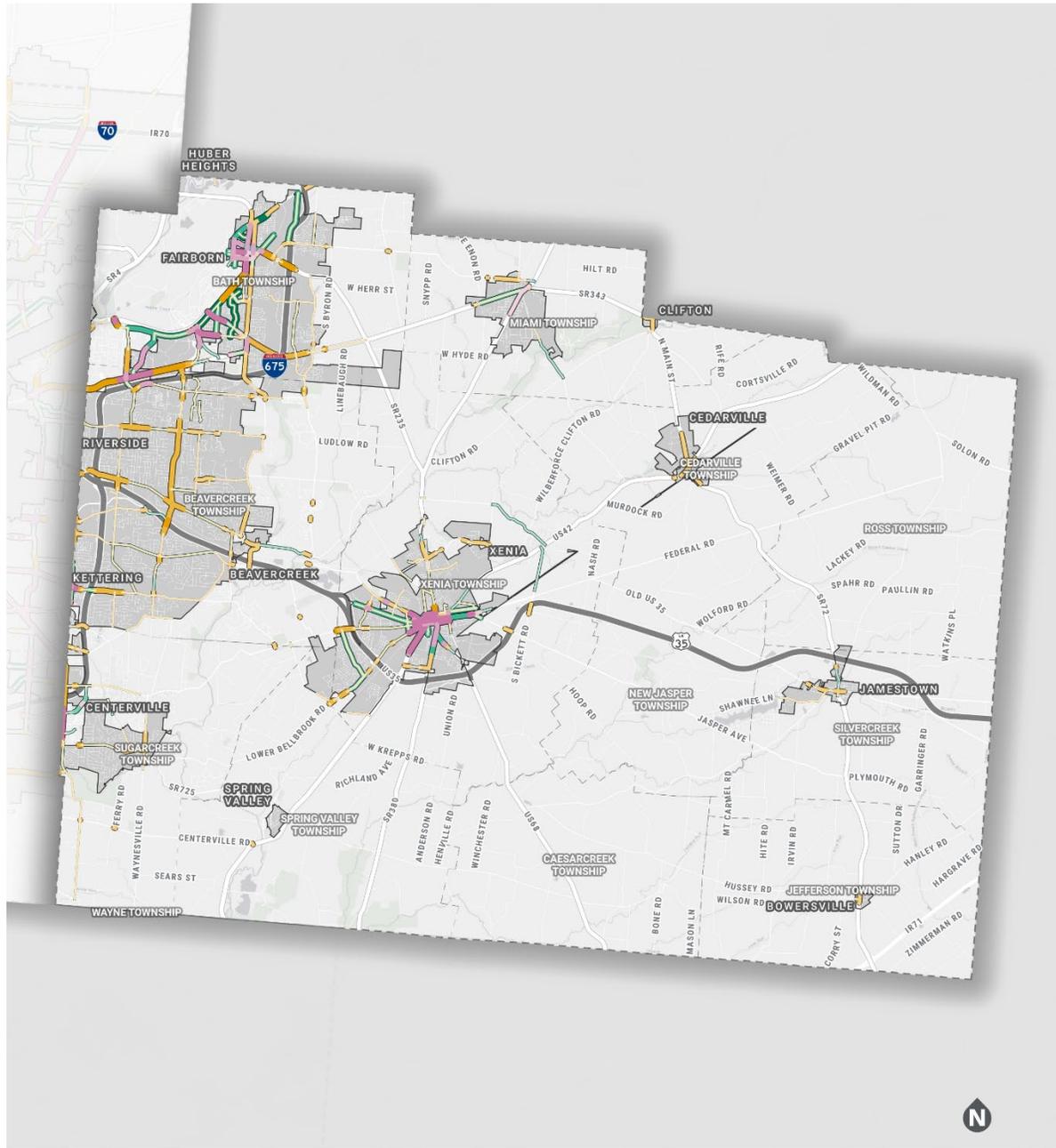
Both Risk Factor Networks		Roadway Risk Factor Network		Context Risk Factor Network	
	Critical		Critical		Critical
	High		High		High
	Medium		Medium		Medium
			Low		

\*Excludes interstate-style roadways (freeways & freeway look-alikes)

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Figure 3: All Modes in Rural Areas High Risk Network (Greene County)

# Vulnerable Road User Modes



## High Risk Network - Vulnerable Road Users - Greene County

Both Risk Factor Networks	Roadway Risk Factor Network	Context Risk Factor Network
<span style="color: #C00000;">—</span> Critical	<span style="color: #FFA500;">—</span> Critical	<span style="color: #008000;">—</span> Critical
<span style="color: #FF0000;">—</span> High	<span style="color: #FFD700;">—</span> High	<span style="color: #00CD00;">—</span> High
<span style="color: #FF69B4;">—</span> Medium	<span style="color: #FFD700;">—</span> Medium	<span style="color: #008000;">—</span> Medium
	<span style="color: #FFA500;">—</span> Low	<span style="color: #008000;">—</span> Low

\*Excludes interstate-style roadways (freeways & freeway look-alikes)

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Figure 4: VRU High Risk Network (Greene County)

All Modes in Urban Areas



High Risk Network - All Modes (Urban) - Miami County

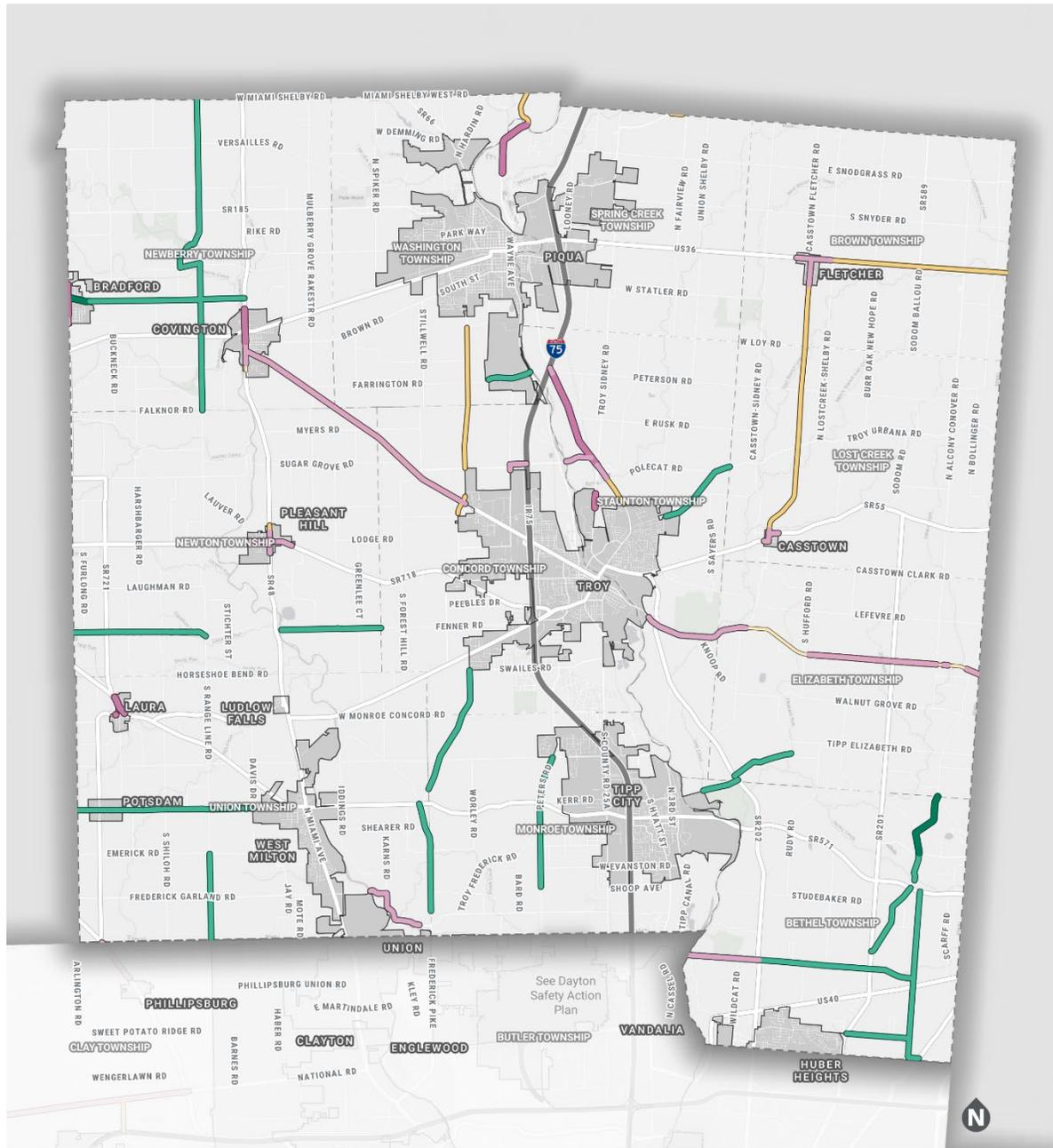
Both Risk Factor Networks	Roadway Risk Factor Network	Context Risk Factor Network
Critical	Critical	Critical
High	High	High
Medium	Medium	Medium

\*Excludes interstate-style roadways (freeways & freeway look-alikes)

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Figure 5: All Modes in Urban Areas High Risk Network (Miami County)

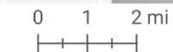
# All Modes in Rural Areas



## High Risk Network - All Modes (Rural) - Miami County

Both Risk Factor Networks	Roadway Risk Factor Network	Context Risk Factor Network
<span style="color: #800000;">—</span> Critical	<span style="color: #FFA500;">—</span> Critical	<span style="color: #008000;">—</span> Critical
<span style="color: #FF0000;">—</span> High	<span style="color: #FF8C00;">—</span> High	<span style="color: #008000;">—</span> High
<span style="color: #FF4500;">—</span> Medium	<span style="color: #FFD700;">—</span> Medium	<span style="color: #008000;">—</span> Medium
	<span style="color: #FFD700;">—</span> Low	

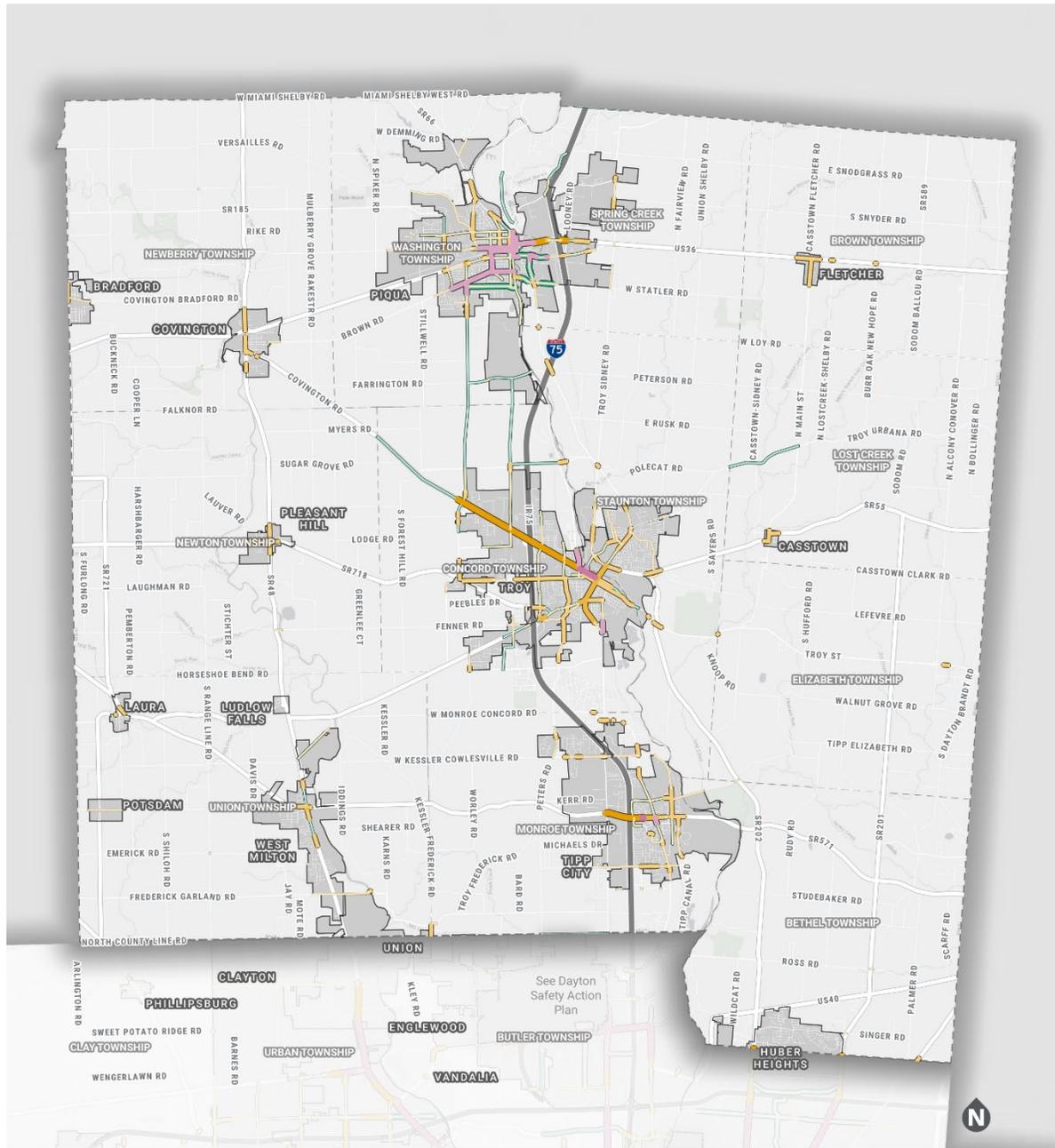
\*Excludes interstate-style roadways (freeways & freeway look-alikes)



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Figure 6: All Modes in Rural Areas High Risk Network (Miami County)

# Vulnerable Road User Modes



## High Risk Network - Vulnerable Road Users - Miami County

Both Risk Factor Networks	Roadway Risk Factor Network	Context Risk Factor Network
<span style="color: purple;">█</span> Critical	<span style="color: orange;">█</span> Critical	<span style="color: green;">█</span> Critical
<span style="color: purple;">█</span> High	<span style="color: orange;">█</span> High	<span style="color: green;">█</span> High
<span style="color: purple;">█</span> Medium	<span style="color: orange;">█</span> Medium	<span style="color: green;">█</span> Medium
	<span style="color: yellow;">█</span> Low	<span style="color: green;">█</span> Low

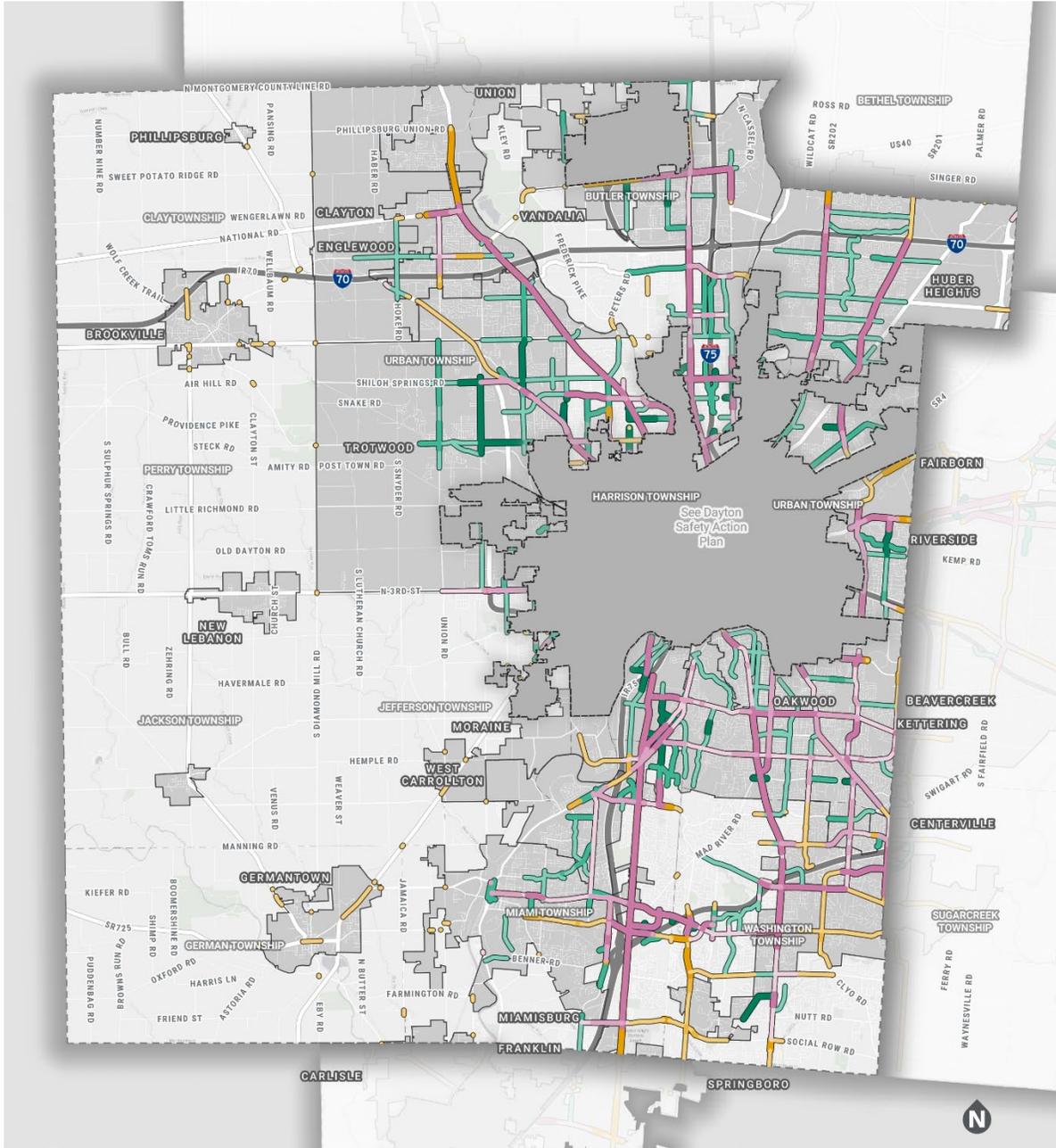
\*Excludes interstate-style roadways (freeways & freeway look-alikes)

0 1 2 mi

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Figure 7: VRU High Risk Network (Miami County)

Montgomery County  
 All Modes in Urban Areas



High Risk Network - All Modes (Urban) - Montgomery County

Both Risk Factor Networks	Roadway Risk Factor Network	Context Risk Factor Network
Critical	Critical	Critical
High	High	High
Medium	Medium	Medium

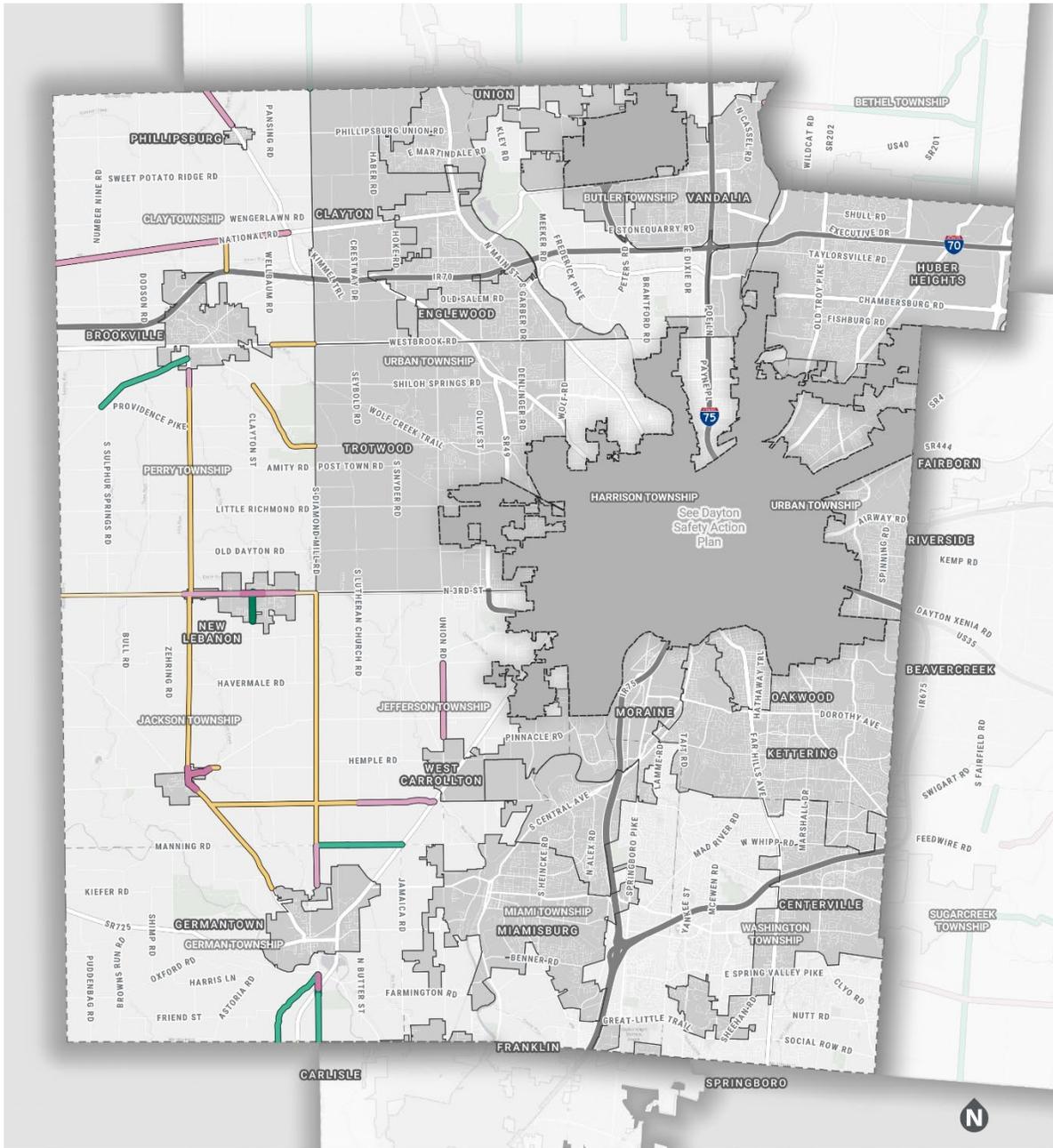
\*Excludes interstate-style roadways (freeways & freeway look-alikes)



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Figure 8: All Modes in Urban Areas High Risk Network (Montgomery County)

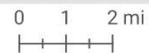
# All Modes in Rural Areas



## High Risk Network - All Modes (Rural) - Montgomery County

Both Risk Factor Networks		Roadway Risk Factor Network	Context Risk Factor Network
	Critical		Critical
	High		High
	Medium		Medium
			Low

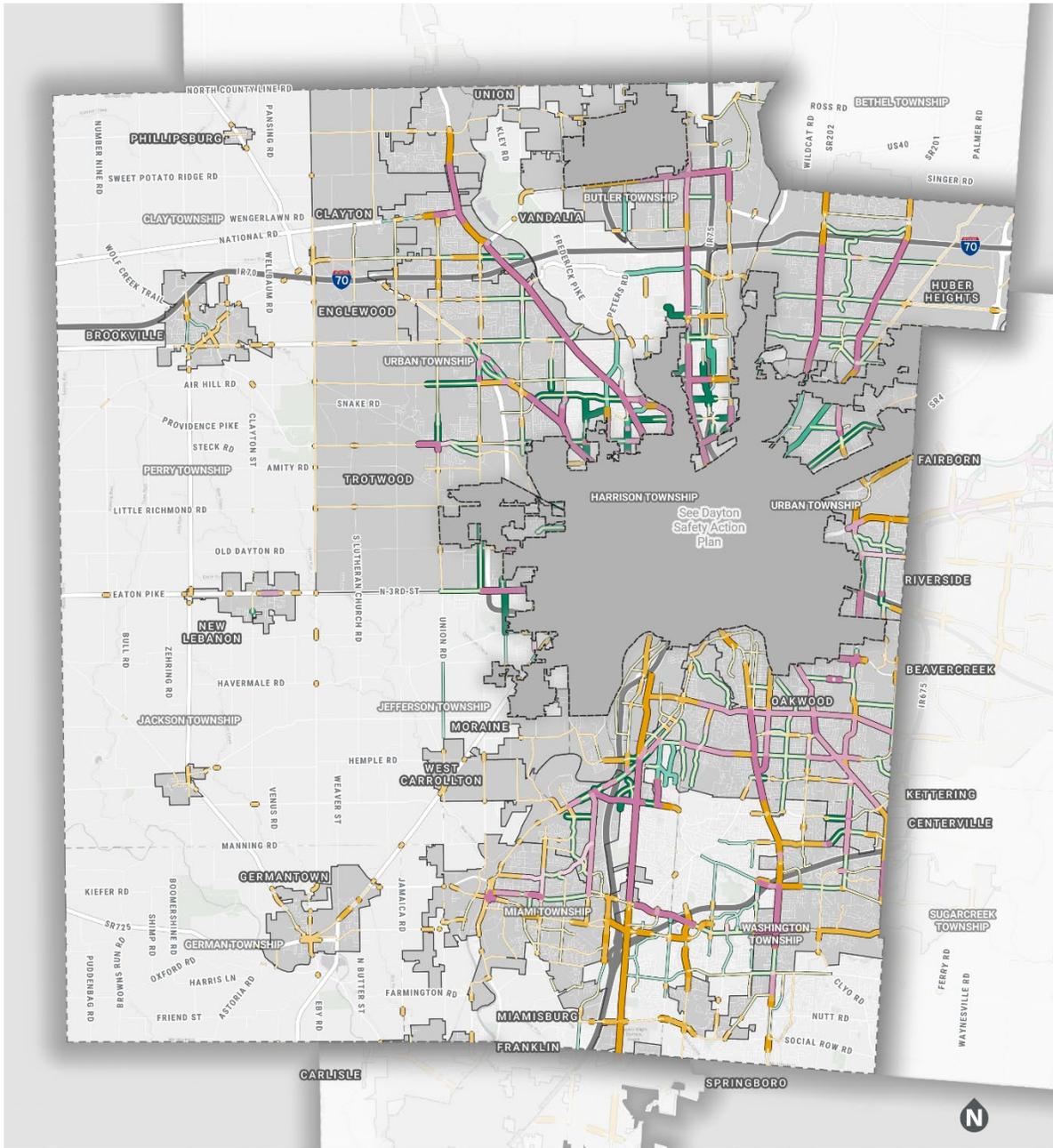
\*Excludes interstate-style roadways (freeways & freeway look-alikes)



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Figure 9: All Modes in Rural Areas High Risk Network (Montgomery County)

# Vulnerable Road User Modes



## High Risk Network - Vulnerable Road Users - Montgomery County

Both Risk Factor Networks	Roadway Risk Factor Network	Context Risk Factor Network
<span style="color: #800080;">█</span> Critical	<span style="color: #FFA500;">█</span> Critical	<span style="color: #008000;">█</span> Critical
<span style="color: #800080;">█</span> High	<span style="color: #FFD700;">█</span> High	<span style="color: #008000;">█</span> High
<span style="color: #800080;">█</span> Medium	<span style="color: #FFD700;">█</span> Medium	<span style="color: #008000;">█</span> Medium
	<span style="color: #FFD700;">█</span> Low	<span style="color: #008000;">█</span> Low

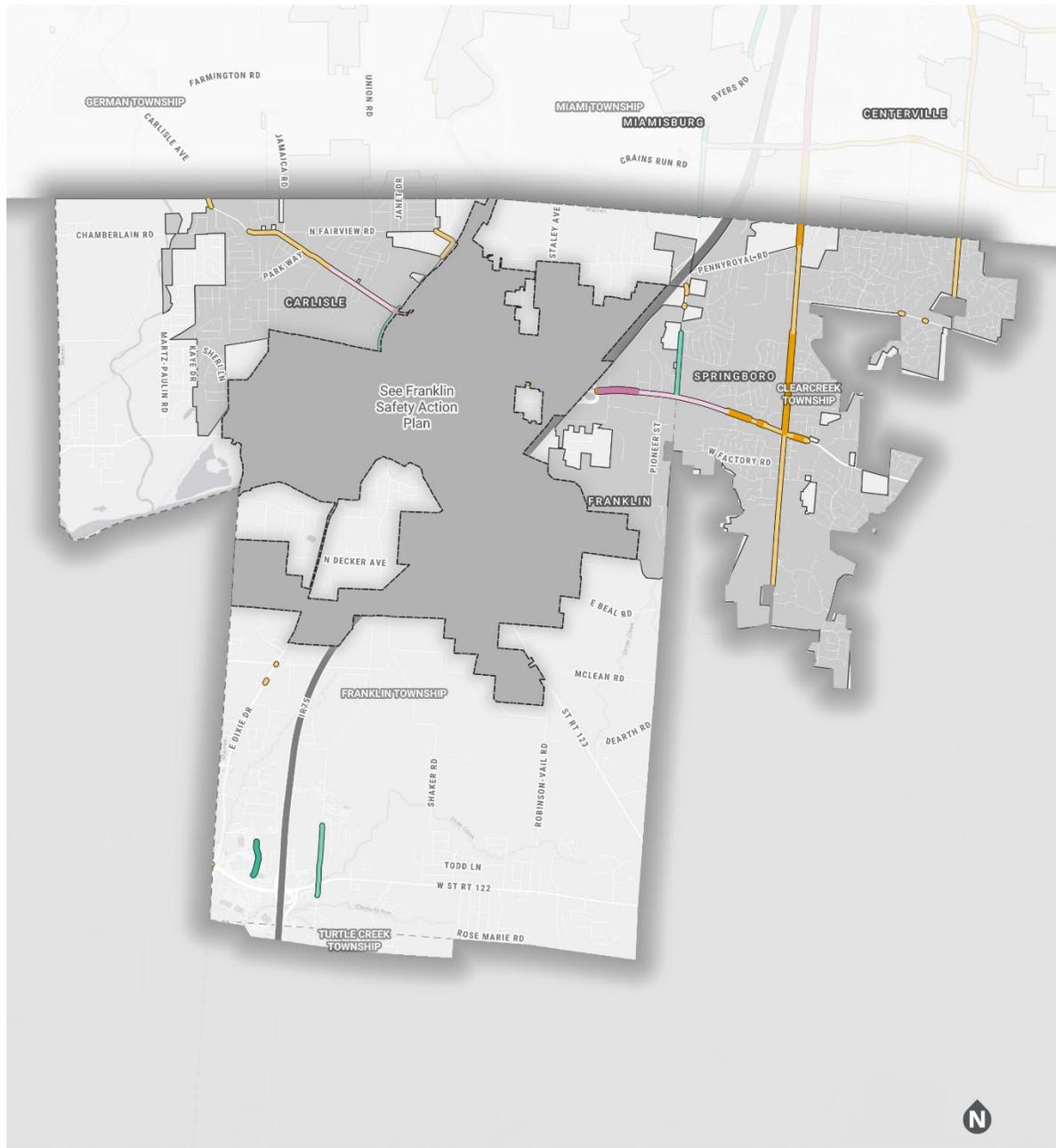
\*Excludes interstate-style roadways (freeways & freeway look-alikes)

0 1 2 mi  
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Figure 10: VRU High Risk Network (Montgomery County)

Warren County (northern area)

All Modes in Urban Areas



High Risk Network - All Modes (Urban) - Warren County (Partial)

Both Risk Factor Networks	Roadway Risk Factor Network	Context Risk Factor Network
Critical	Critical	Critical
High	High	High
Medium	Medium	Medium

\*Excludes interstate-style roadways (freeways & freeway look-alikes)

0 0.5 1 mi

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Figure 11: All Modes in Urban Areas High Risk Network (Warren County)

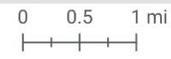
All Modes in Rural Areas (included for completeness, no rural high risk network segments were identified)



**High Risk Network - All Modes (Rural) - Warren County (Partial)**

Both Risk Factor Networks	Roadway Risk Factor Network	Context Risk Factor Network
Critical	Critical	Critical
High	High	High
Medium	Medium	Medium
	Low	

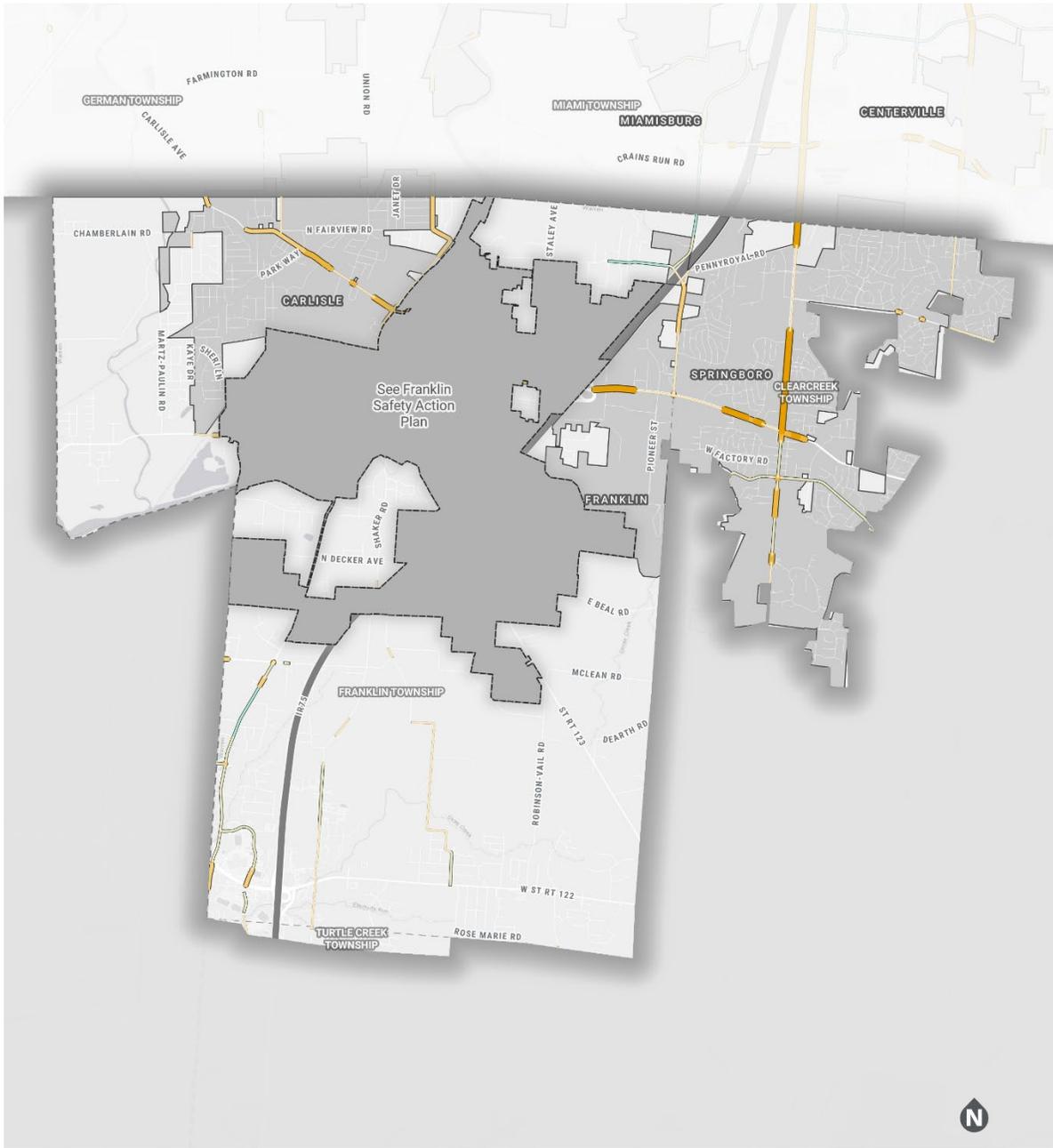
\*Excludes interstate-style roadways (freeways & freeway look-alikes)



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**Figure 12: All Modes in Rural Areas High Risk Network (Warren County)**

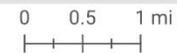
# Vulnerable Road User Modes



**High Risk Network - Vulnerable Road Users - Warren County (Partial)**

Both Risk Factor Networks	Roadway Risk Factor Network	Context Risk Factor Network
<span style="color: purple;">█</span> Critical	<span style="color: orange;">█</span> Critical	<span style="color: green;">█</span> Critical
<span style="color: purple;">█</span> High	<span style="color: orange;">█</span> High	<span style="color: green;">█</span> High
<span style="color: purple;">█</span> Medium	<span style="color: orange;">█</span> Medium	<span style="color: green;">█</span> Medium
	<span style="color: yellow;">█</span> Low	<span style="color: green;">█</span> Low

\*Excludes interstate-style roadways (freeways & freeway look-alikes)



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**Figure 13: VRU High Risk Network (Warren County)**

All Modes in Urban Areas

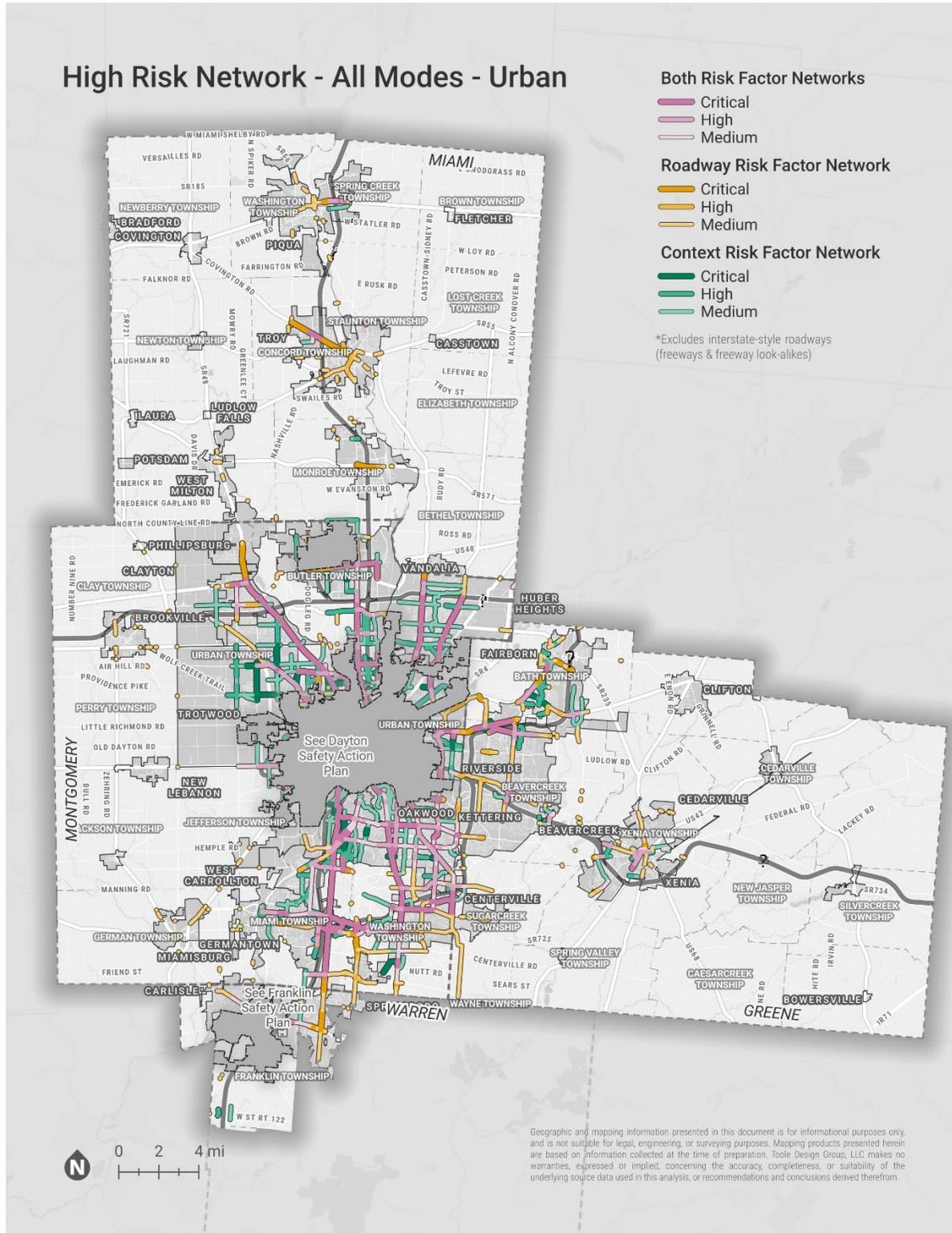


Figure 14: All Modes in Urban Areas High Risk Network (MVRPC Region)

All Modes in Rural Areas

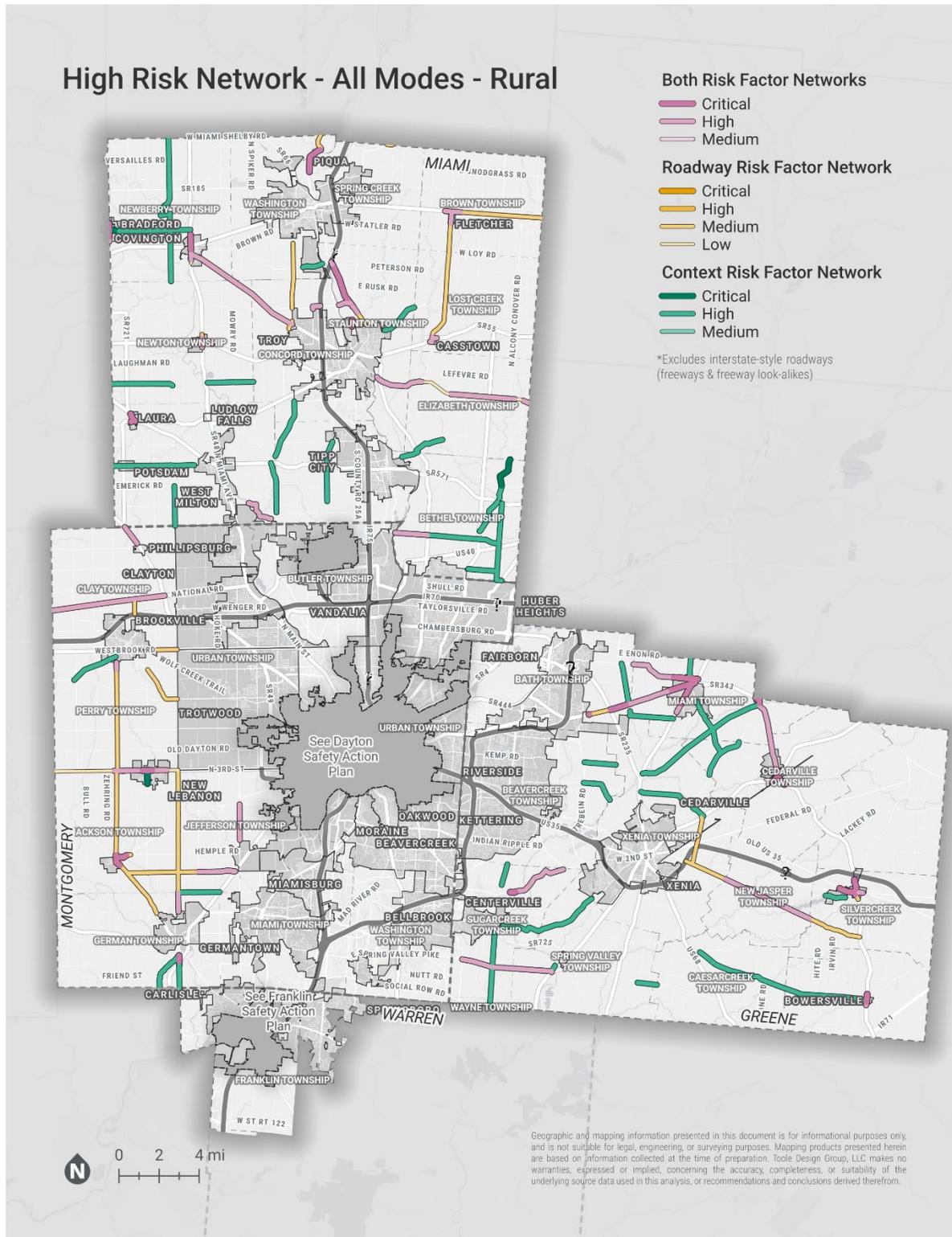


Figure 15: All Modes in Rural Areas High Risk Network (MVRPC Region)

## Vulnerable Road User Modes

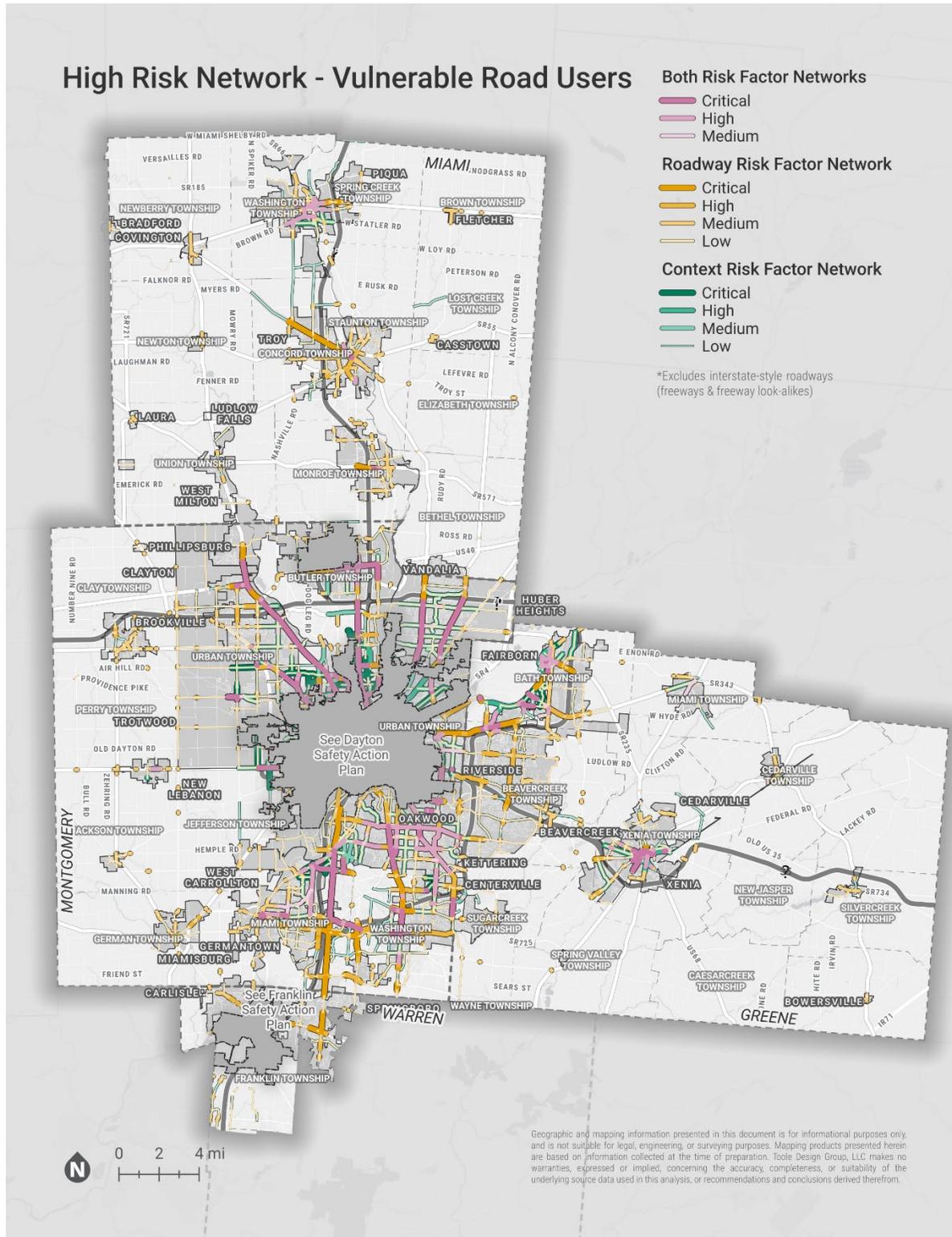


Figure 16: VRU High Risk Network (MVRPC Region)

## High Risk Intersection Analysis

The facility profile analysis process was repeated for the intersections within the MVRPC MPO region. The screening factors listed in Table 14 include attributes such as turn lanes, control type, and presence of crosswalks. Each screening factor was again separated into two analyses, labeled roadway and context. Each subset of the overall analysis was conducted for all modes collectively and not separated by urban and rural contexts. Differences between rural and urban intersections will be addressed at the strategy and recommendation stage. This approach identified key systemic screening factor combinations most relevant to assessing severe crash risk for each analyzed facility category. Findings are summarized in **the High Risk Intersections Summary Tables** and **High Risk Intersection Maps (All Modes)** within this document. All intersections that fall into the critical and high crash risk tiers are included in the maps.

**Table 14: Selection of Systemic Screening Factors for Intersections**

<i>Screening Factor</i>	<i>Description</i>	<i>Analysis</i>
<b>Rural or Urban Classification</b>	Rural, Urban (ODOT Adjusted Urban Areas)	Roadway, Context
<b>Maximum Lane Count</b>	Two-lane, Multilane	Roadway
<b>Highest Lane Width</b>	Wide (Over 11 Feet), Narrow (11 feet and under)	Roadway
<b>Shoulder Width</b>	Has Recoverable Shoulder (width of 6 feet and over), Does Not Have Recoverable Shoulder (width under 6 feet)	Roadway
<b>Turn Lanes</b>	Has Turn Lanes, Does not have Turn Lanes	Roadway
<b>Functional Classification</b>	Higher Functional Classification (other principal arterials, minor arterials, major collectors), Lower Functional Classification (minor collectors and local, lowest functional class, roads)	Roadway
<b>Land Use Context</b>	Agricultural, Commercial, Industrial, Residential, Open Space, Other	Context
<b>Crosswalks</b>	Has Crosswalks, Does not have crosswalks	Roadway
<b>Transit Stops</b>	Within 500 feet, Not within 500 feet	Context
<b>Trail Access Points</b>	Within 500 feet, Not within 500 feet	Context
<b>Traffic Control</b>	Signalized, All-Way Stop, Two-Way Stop	Roadway
<b>Traffic Volume Entering Range (Average Annual Daily Traffic)</b>	0 – 1,000, 1,000 – 10,000, 10,000+	Roadway
<b>Highest Speed Limit</b>	Categorized as ≤30 MPH, 35-45 MPH, or 50+ MPH	Roadway
<b>Proximity to a School</b>	Within ¼ Mile, Not Within ¼ Mile	Context

<b>Screening Factor</b>	<b>Description</b>	<b>Analysis</b>
<b>Proximity to a Public Park</b>	Within ¼ Mile, Not Within ¼ Mile	Context
<b>Percent of Population with Income Below 2x of the Poverty Level</b>	Under 20%, 20-40%, Over 40%	Context
<b>Percent of Households with Zero Vehicles</b>	Below 10%, 10-20%, Over 20%	Context
<b>Percent of Population Aged 65 or Older</b>	Below 10%, 10-20%, Over 20%	Context
<b>Percent of Population Aged Below 18</b>	Below 10%, 10-20%, Over 20%	Context
<b>ODOT Active Transportation Demand<sup>3</sup></b>	High Active Transportation Demand (scores three and above), Low Active Transportation Demand (scores under three)	Context

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<sup>3</sup> ODOT Active Transportation Demand

## High Risk Intersections Summary Tables

The following pages include High Risk Intersection summary tables for the MVRPC MPO region. These summary tables outline the definition of the facility profiles that emerged for each risk network of intersections, as well as the metrics for the facilities that match these profiles.

### Roadway Model for Intersections – All-Modes

**Table 15: Facility Profile Definition - All Modes, Roadway Model**

Facility Profile Tier	Facility Profile Definition			
	Traffic Volume Range	Speed Limit	Lane Configuration	Functional Classification
Critical	10,000+	35-45 MPH	Multi-lane	
High	10,000+	≤ 30 MPH	Multi-lane	
	10,000+	50+ MPH	Two-Lane	
Medium	10,000+	50+ MPH	Multi-lane	
	10,000+	35-45 MPH	Two-Lane	
Low	10,000+	<35 MPH	Two-Lane	
	<10,000			Higher Functional Class
Minimal	1,000-10,000			Lower Functional Class
	<10,000			Higher Functional Class
	<1,000			Lower Functional Class

**Table 16: Facility Profile Metrics - All Modes, Roadway Model**

Facility Profile Tier	Facility Profile Metrics				
	Avg. Crashes per Intersection	Intersections	Crashes	Intersections Share	Crashes Share
Critical	6.65	1,011.0	6,724.0	3.1%	30.6%
High	3.92	991.0	3,888.0	3.1%	17.7%
Medium	3.12	1,033.0	3,227.0	3.2%	14.7%
Low	1.18	4,717.0	5,559.0	14.6%	25.3%
Minimal	0.10	24,575.0	2,568.0	76.0%	11.7%

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<b>Total</b>	32,327.0	21,966.0
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*Context Model for Intersections – All-Modes*

**Table 17: Facility Profile Definition - All Modes, Context Model**

<b>Facility Profile Tier</b>	<b>Facility Profile Definition</b>					
	<i>Transit Proximity</i>	<i>Trail Access Proximity</i>	<i>Population Under 18</i>	<i>Population Below 2X Poverty Level</i>	<i>Park Proximity</i>	<i>Zero Vehicle Households</i>
<b>Critical</b>	Near Transit	Near Trail Access				
<b>High</b>	Near Transit	Not Near Trail Access	≤ 25%		Not Near a Park	
	Near Transit	Not Near Trail Access	> 35%			
<b>Medium</b>	Near Transit	Not Near Trail Access	≤ 25%		Near a Park	
	Not Near Transit	Near Trail Access	> 25%			
	Near Transit	Not Near Trail Access	25% - 35%			
<b>Low</b>	Not Near Transit	Not Near Trail Access		> 35%		> 25%
	Not Near Transit	Near Trail Access	≤ 25%			
	Not Near Transit	Not Near Trail Access		> 35%		≤ 25%
<b>Minimal</b>	Not Near Transit	Not Near Trail Access		≤ 35%		

**Table 18: Facility Profile Metrics - All Modes, Context Model**

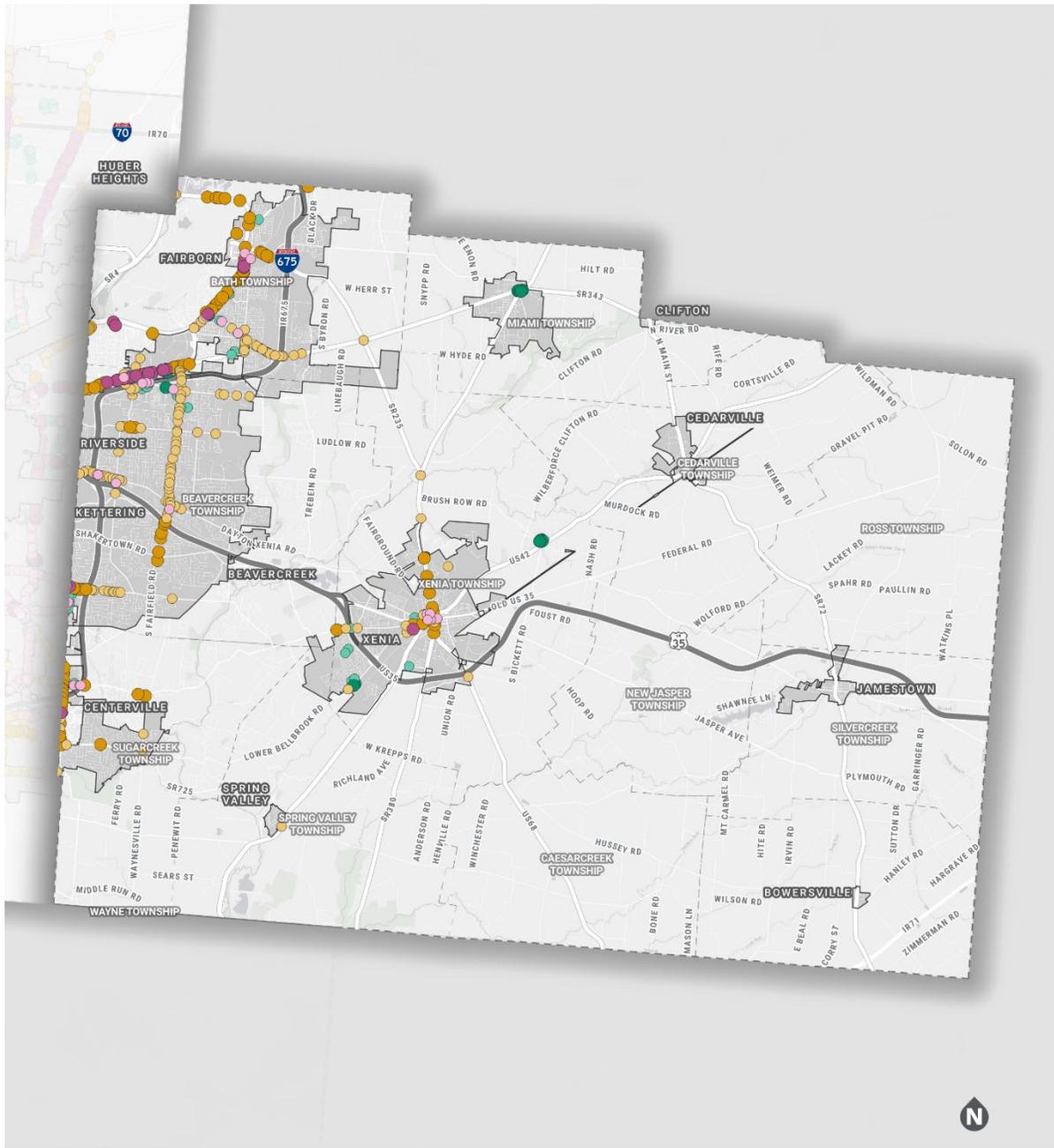
<b>Facility Profile Tier</b>	<b>Facility Profile Metrics</b>				
	<i>Avg. Crashes per</i>	<i>Intersections</i>	<i>Crashes</i>	<i>Intersections Share</i>	<i>Crashes Share</i>
<b>Critical</b>	7.44	57.0	424.0	0.2%	1.9%
<b>High</b>	3.83	1,059.0	4,056.0	3.3%	18.5%
<b>Medium</b>	2.29	1,829.0	4,183.0	5.7%	19.0%
<b>Low</b>	0.63	6,111.0	3,860.0	18.9%	17.6%
<b>Minimal</b>	0.41	23,271.0	9,443.0	72.0%	43.0%
<b>Total</b>		32,327.0	21,966.0		

### **High Risk Intersection Maps (All Modes)**

High risk intersection maps are provided on the following pages, including both regional and county level views. These maps highlight locations with elevated safety risk based on roadway, context, and combined risk factors, and categorize intersections into tiers of critical, high, medium, low, or minimal to support prioritization and further analysis.

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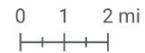
Greene County



High Risk Intersections - Greene County

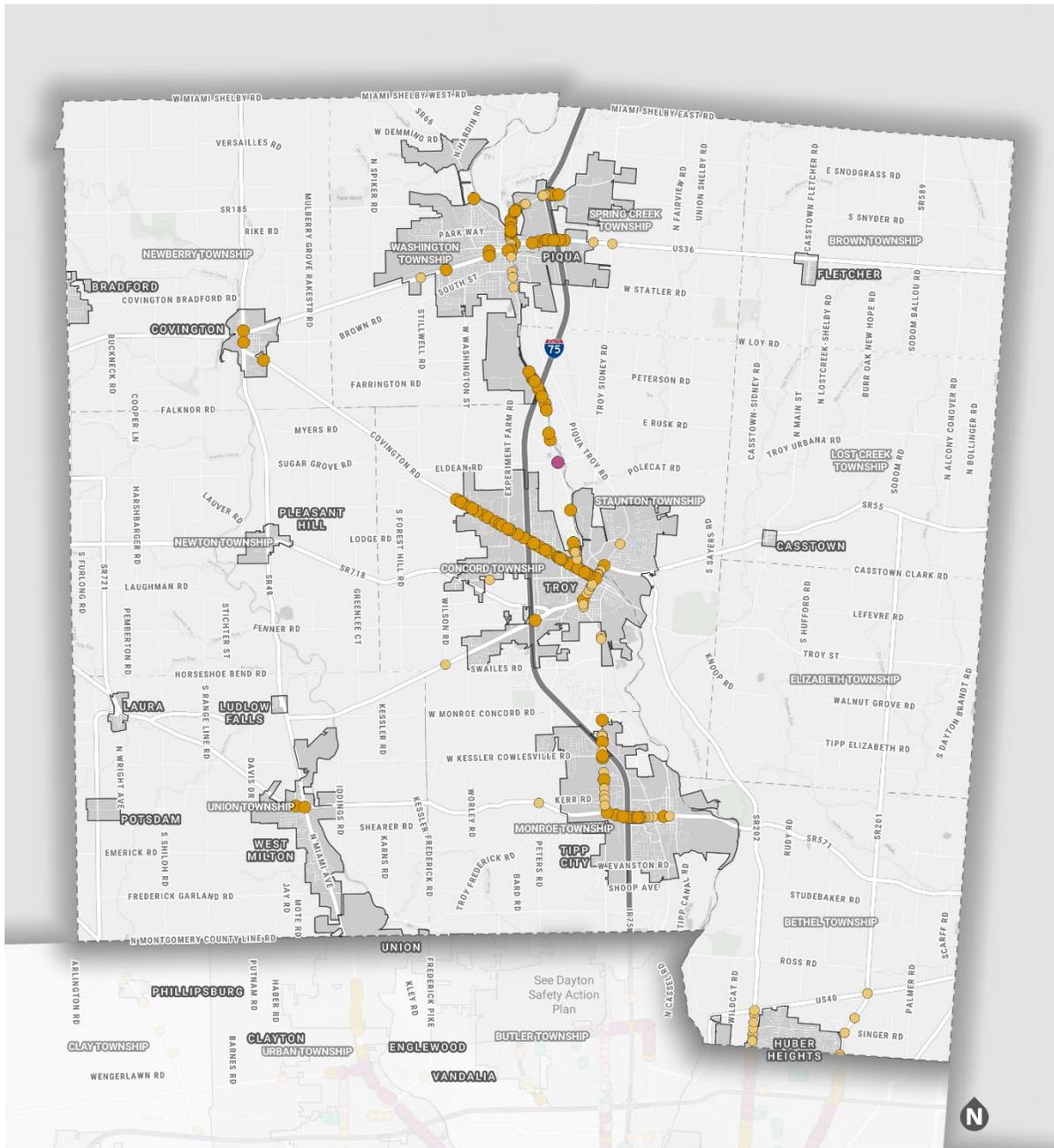
- |  |   |  |
|--|---|--|
| <p><b>Both Risk Factors</b></p> <ul style="list-style-type: none"> <li><span style="color: purple;">●</span> Critical</li> <li><span style="color: pink;">●</span> High</li> </ul> | <p><b>Roadway Risk Factors</b></p> <ul style="list-style-type: none"> <li><span style="color: orange;">●</span> Critical</li> <li><span style="color: yellow;">●</span> High</li> </ul> | <p><b>Context Risk Factors</b></p> <ul style="list-style-type: none"> <li><span style="color: green;">●</span> Critical</li> <li><span style="color: lightgreen;">●</span> High</li> </ul> |
|--|---|--|

\*Excludes interstate-style roadways (freeways & freeway look-alikes)



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Figure 17: High Injury Intersections (Greene County)



**High Risk Intersections - Miami County**

- |  |   |   |
|--|---|---|
| <p><b>Both Risk Factors</b></p> <ul style="list-style-type: none"> <li>● Critical</li> <li>● High</li> </ul> | <p><b>Roadway Risk Factors</b></p> <ul style="list-style-type: none"> <li>● Critical</li> <li>● High</li> </ul> | <p><b>Context Risk Factors</b></p> <ul style="list-style-type: none"> <li>● Critical</li> <li>● High</li> </ul> |
|--|---|---|

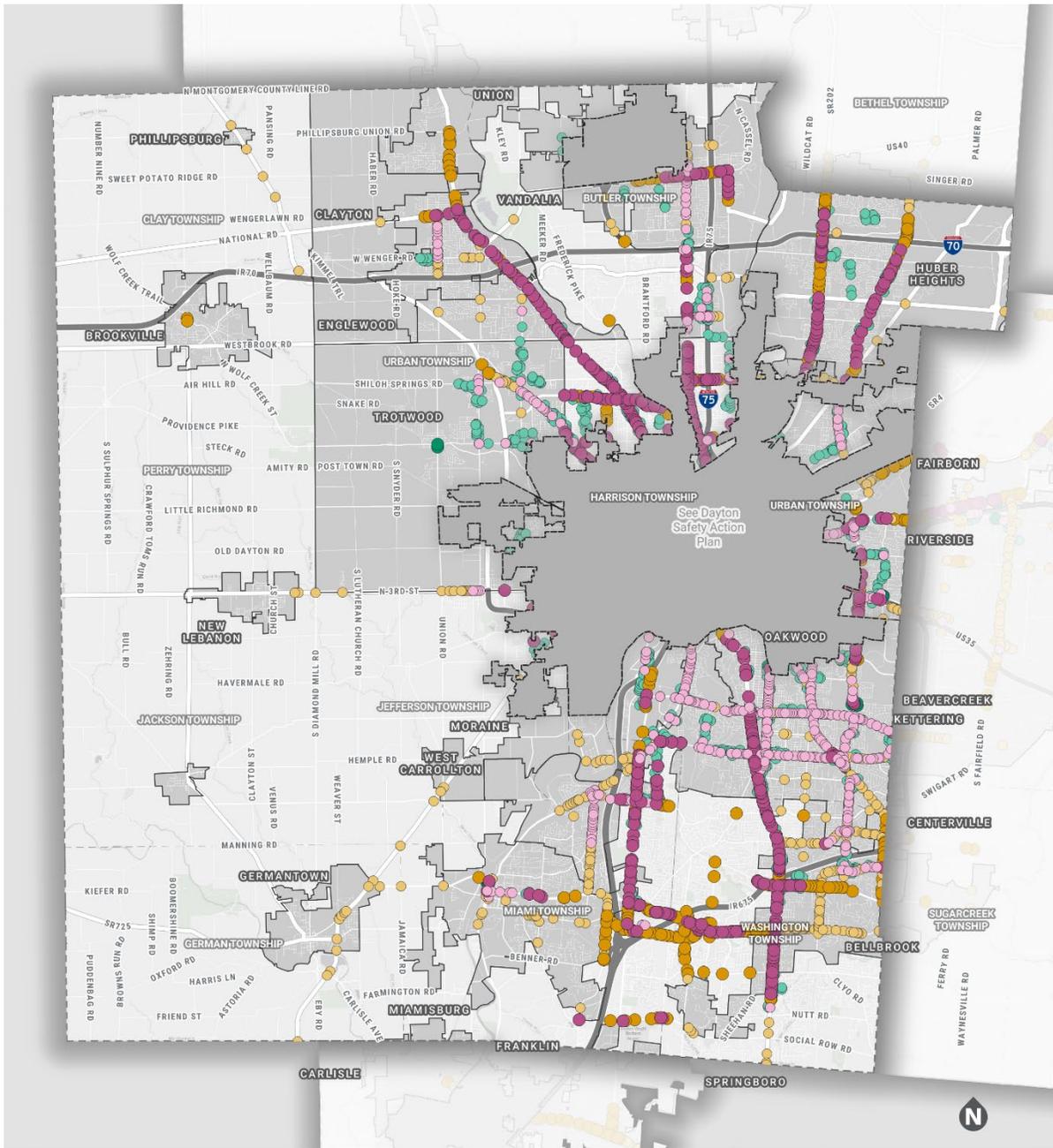
\*Excludes interstate-style roadways (freeways & freeway look-alikes)



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**Figure 18: High Injury Intersections (Miami County)**

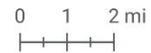
Montgomery County



High Risk Intersections - Montgomery County

- |                          |                             |                             |
|--------------------------|-----------------------------|-----------------------------|
| <b>Both Risk Factors</b> | <b>Roadway Risk Factors</b> | <b>Context Risk Factors</b> |
| ● Critical               | ● Critical                  | ● Critical                  |
| ● High                   | ● High                      | ● High                      |

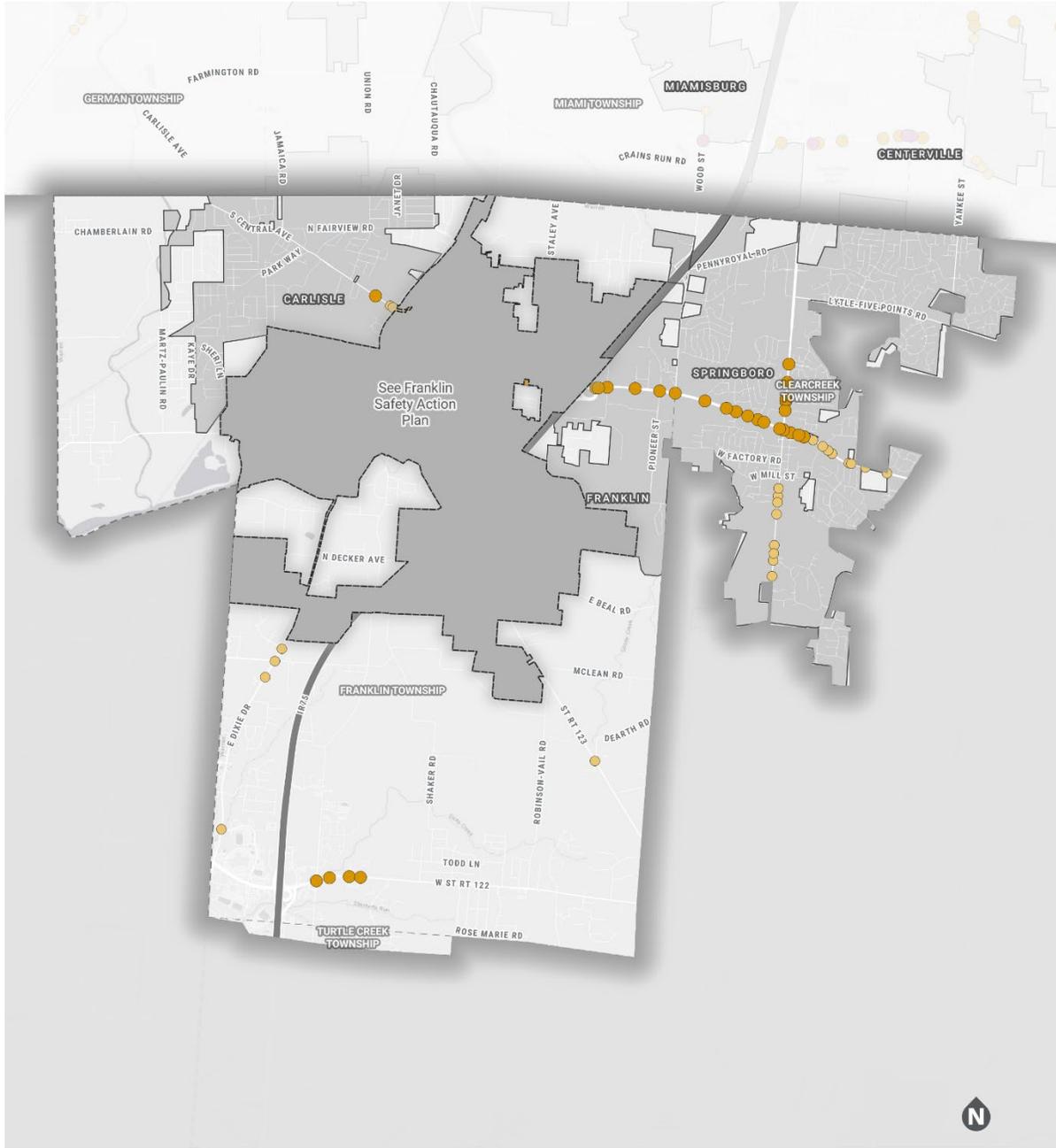
\*Excludes interstate-style roadways (freeways & freeway look-alikes)



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Figure 19: High Injury Intersections (Montgomery County)

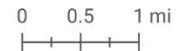
Warren County



High Risk Intersections - Warren County (Partial)

- |  |  |   |
|--|--|---|
| <b>Both Risk Factors</b>   | <b>Roadway Risk Factors</b>  | <b>Context Risk Factors</b>   |
| <ul style="list-style-type: none"> <li><span style="color: purple;">●</span> Critical</li> <li><span style="color: pink;">●</span> High</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: orange;">●</span> Critical</li> <li><span style="color: yellow;">●</span> High</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: green;">●</span> Critical</li> <li><span style="color: lightgreen;">●</span> High</li> </ul> |

\*Excludes interstate-style roadways (freeways & freeway look-alikes)



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Figure 20: High Injury Intersections (Warren County)

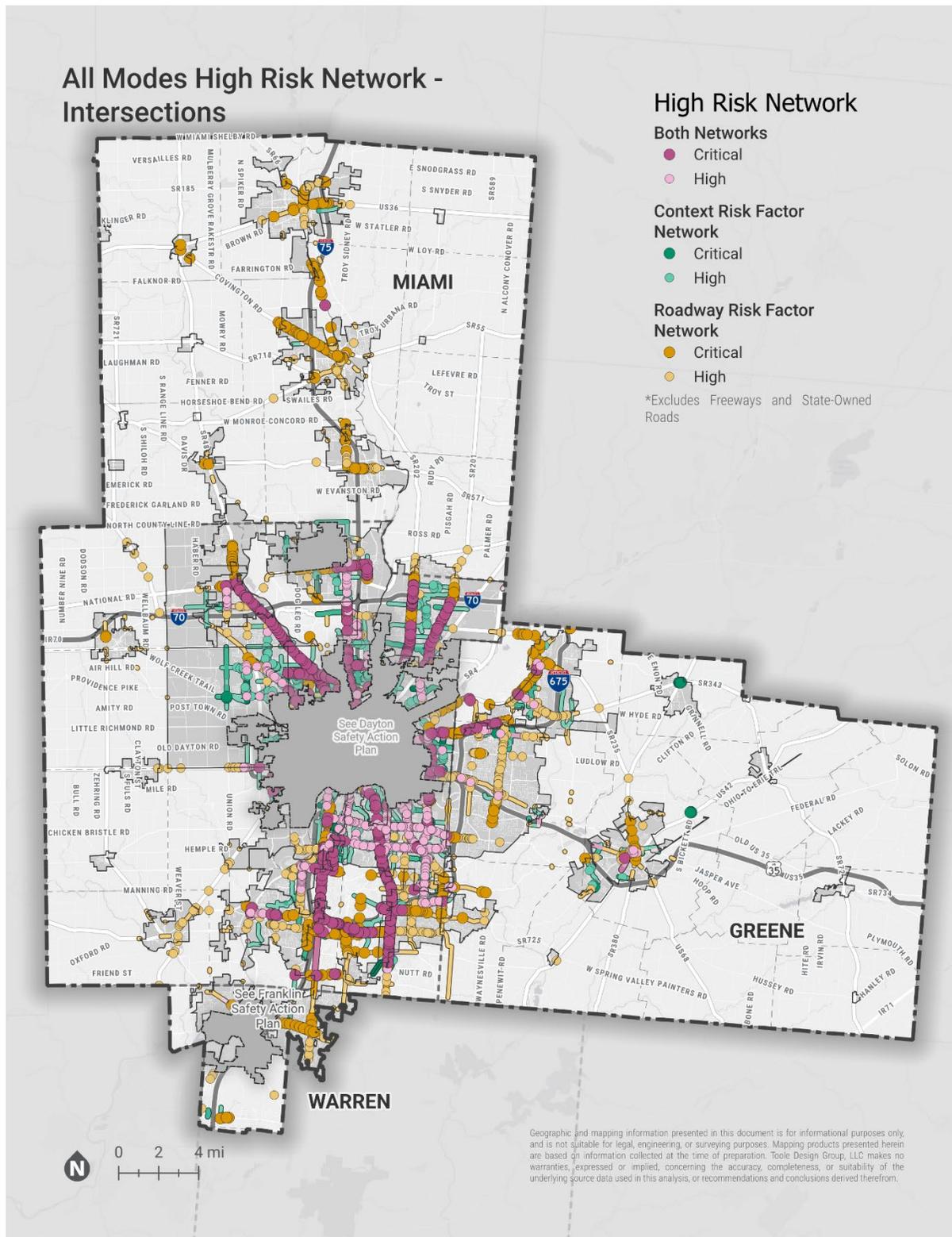


Figure 21: High Injury Intersections (MVRPC MPO Region)