MEMORANDUM

April 7, 2023 (originally submitted December 21, 2022)

To: Yixuan Lin
Organization: Monroe County Department of Planning & Development
From: Wendell Joseph, Michael Blau, and Adam Wood
Project: Monroe County Countywide Active Transportation Plan

RE: Task 5.1: Update to Network Development - FINAL

Introduction

This memo presents Toole Design's recommendations for a countywide active transportation network for Monroe County, which are intended to both fill gaps in and expand the existing network. The Project Team developed the network based on information gathered from a series of sources and analyses, including existing conditions, crash analysis, Bicycle Network Analysis (BNA), Trip Potential Analysis (TPA), and public input from Monroe County residents and stakeholders. The Project Team then overlaid these analyses to manually develop the countywide active transportation network through city and town centers to ensure connectivity between communities as an essential part of this network.

The network is aspirational in scope, envisioning Monroe County's ideal active transportation system – unconstrained by fiscal and other limitations – and does not delve into the particulars of facility types and locations. The network also focuses on accommodating bicycle travel, acknowledging that walking trips tend to be short distances. However, as both pedestrians and cyclists are vulnerable road users, it is important to ensure that low-stress bicycle corridors are similarly accessible for pedestrians and equipped with ADA-compliant surfaces, sidewalks, and crossing treatments. Pedestrian recommendations are included in other plan elements, such as the Pedestrian Accessibility Scan and non-infrastructure recommendations. Countywide bicycle routes are meant to serve people of all ages and abilities who bike for day-to-day needs like commuting or errands, as well as recreational cyclists.

Proposed Network Recommendations

Overview of Conceptual Network

Toole Design and Monroe County agreed that a high-level, conceptual active transportation network would be the most useful starting point to expand walking and bicycling opportunities throughout the county. Because local jurisdictions are responsible for building and maintaining[1] off-road active transportation infrastructure, Monroe County plays a limited role in the facility selection and design of particular routes. For example, the City of Rochester is developing its own active transportation plan concurrently with the Monroe County Countywide Active Transportation Plan, which will provide more detailed analysis and recommendations for the expansion and/or improvement of active transportation infrastructure in Rochester.

Recommendations for the Monroe County Countywide Active Transportation Plan are not tied to particular facility types.[2] Rather, the proposed network seeks to accomplish the following:

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1. Winter maintenance is an important component of creating a comfortable environment for walking and bicycling year-round. This area of practice is unique, requiring specific legal, technical, and design considerations to operate successfully. For detailed guidance on winter maintenance, refer to the Program and Policy Recommendations memo.
2. For guidance on facility selection, see the Facility Toolkit.

- *Leverage the county's existing active transportation infrastructure by filling in gaps and making connections to regional trails – Genesee Riverway Trail, Erie Canalway Trail, Lehigh Valley Trail.*
- *Connect town and village centers outside of Rochester to each other, with a special focus on high trip potential and low connectivity in rural and suburban communities – areas of high density that feature many core services and employment/education opportunities, and/or areas with high-stress routes and less bike/ped infrastructure that limit access to key destinations and services.*
- *Respond to potential barriers created by interstate highways in high trip potential and low connectivity areas through key transition points in/out of Rochester.*

Monroe County will work with local jurisdictions and other stakeholders to identify the most appropriate treatments as projects are selected for funding and implementation. This conceptual network also helps the County make the financial and political case for the type of local-level interventions that will be needed from one jurisdiction to the next. Building consensus around a shared vision for active transportation in Monroe County will lay the groundwork for productive conversations about facility selection and other implementation details in the future.

Network Building Blocks

To envision a countywide network that connects communities to each other, the proposed network went through three levels of development:

- *Level 1 – The Project Team identified population centers and how the county's existing network connects to these areas. This led to a focus on the regional trail system (filling in gaps and expanding into abutting communities) and key connections into Rochester.*
- *Level 2 – The Trip Potential and Bicycle Network analyses were the most foundational in identifying how and where proposed segments should be adjusted to create a continuous countywide network, by highlighting areas of high trip potential for biking but low connectivity areas that require infrastructure improvements.*
- *Level 3 – Crash data and public feedback were considered, but were less critical than other inputs in network development. Crash history information can be challenging to work with and does not provide a comprehensive understanding of safety challenges, given the limited reliability of crash data. Also, the countywide nature of the proposed network requires a greater emphasis on corridors that create higher level connections, rather than granular, hyper-local connections through specific road segments. The public feedback provided important qualitative insight on existing conditions and opportunities, however, this data is also biased since it is largely associated with where people currently walk and bike.*

Figure 1 illustrates how the TPA and BNA results came together to form a comprehensive active transportation network for Monroe County. The base layer is the TPA results, with darker colors indicating the higher trip potential (i.e. demand). The second layer shows the BNA scores, specifically areas that were identified as having a higher level of connectivity. Combined, these analyses show areas of high trip potential and high connectivity – usually in/around town and village centers, especially in rural communities – but also areas of high trip potential with no/low connectivity, mainly along major corridors in suburban communities.

Network Rationale
Connectivity

The proposed network seeks to establish a balance between routes that connect surrounding cities, towns, and village centers to Rochester and routes that connect communities outside of Rochester to each other. Rochester is the economic hub of the county, so major active transportation corridors into the city will serve commuters and other users; however, connectivity outside of Rochester is also important. **The proposed network connects outlying communities to each other, especially on the west side of the county, which is farther from Rochester and where the road network is less dense. Due to the scale of this plan, the focus is on cross-county connectivity, rather than local routes within communities.** Local jurisdictions are encouraged to develop or update their own ATPs to connect to the proposed countywide network.
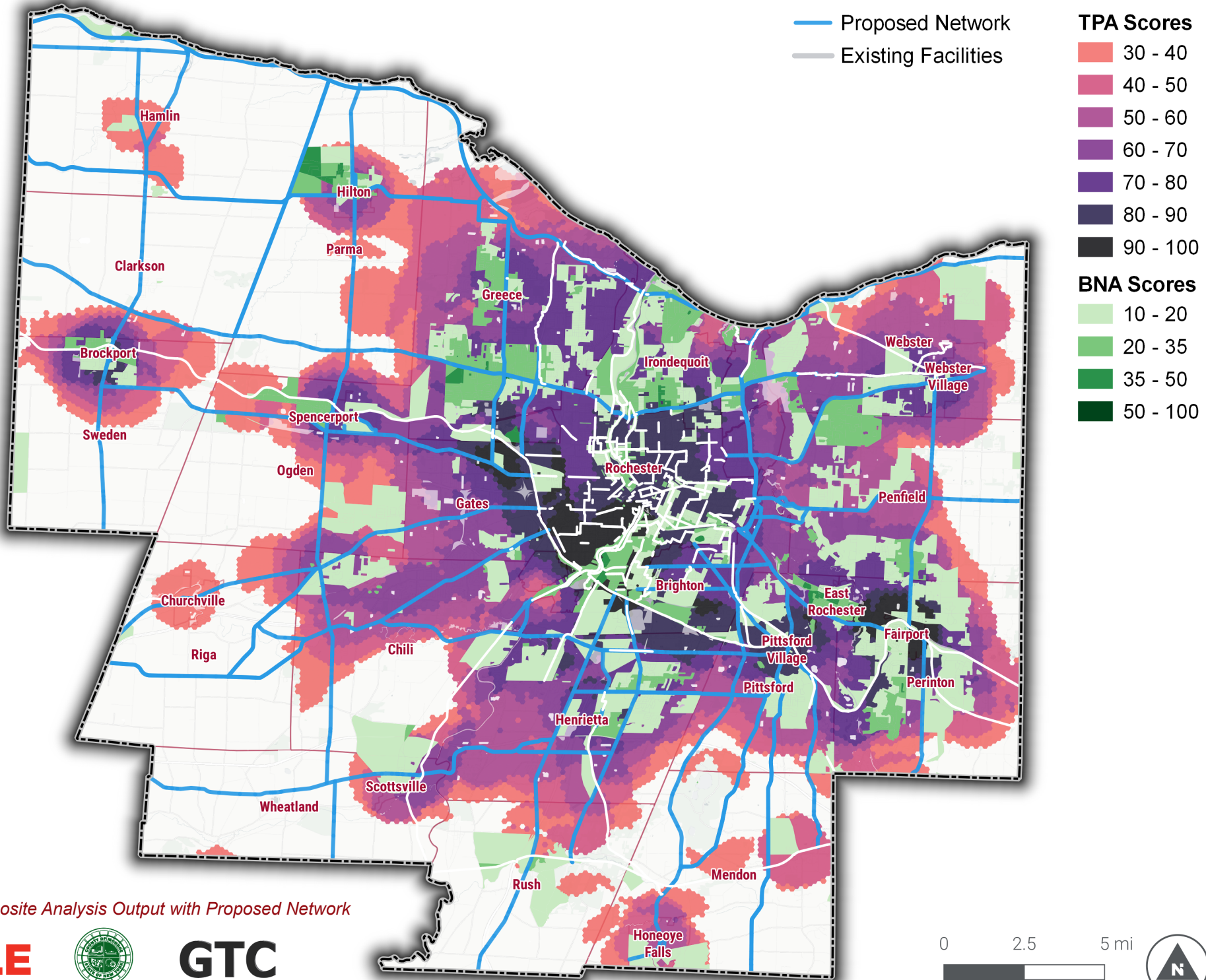
Figure 1: Composite Analysis Output with Proposed Network

As individual municipalities complete and update their own ATPs, connections between communities should be a central focus. According to the Level of Traffic Stress (LTS) Analysis, many of the proposed routes between communities are on high-stress roads that would need substantial improvements to convert them to low-stress routes that are comfortable for people of all ages and abilities. However, walk/bike potential does exist in these areas, and more suitable parallel routing could be explored, such as sidepaths, trails, and other separated facilities, as well as improved transit service for longer distance connections. In some cases, existing parallel low-stress routes could serve as main active transportation corridors, and would require fewer changes. Many areas of the county lack denser street grids, resulting in fewer alternative low-speed, continuous, and convenient routes that can connect users to destinations. For example, a cyclist traveling between Rochester and Gates may not have any meaningful alternatives to Chili Avenue and Buffalo Road. However, areas with denser street grids could consider parallel routes which can better accommodate users of all ages and abilities.

Whenever feasible, proposed routes should take the form of shared use paths and trails that are comfortable for users of all ages and abilities, or separated facilities that follow existing roads – such as separated bike lanes, sidepaths, and sidewalks – and provide a high degree of comfort to users as well as direct access to important destinations. In cases where traffic volumes and speeds are low, paved shoulders or signed routes may provide enough accommodation for most riders. More details on facility selection and design users is available in the Facility Toolkit.

The City of Rochester is developing its own active transportation plan concurrently with the Monroe County Countywide Active Transportation Plan. Connecting the proposed networks from each plan is critical to the successful implementation of a cohesive network that provides a seamless experience for active transportation users traveling between the city and the county. The Rochester Outer Loop, comprised of NY-390/I-390 and NY-590/I-590, is a major barrier between Rochester and its inner ring suburbs, and the rest of Monroe County. ***Providing safe, convenient, and comfortable crossings over the Outer Loop should be a key focal point of both the County and City plans; bridging that barrier will substantially increase connectivity between Rochester and the rest of the county.***[3] Potential crossings are

3. Detailed recommendations for these highway crossings require a more focused

highlighted in *Figure 2.*

The proposed network would dramatically expand Monroe County's active transportation accommodations. It would also connect to existing facilities and fill gaps in the county's current active transportation network, for example by connecting the Route 390 Trail and the Erie Canal Trail.
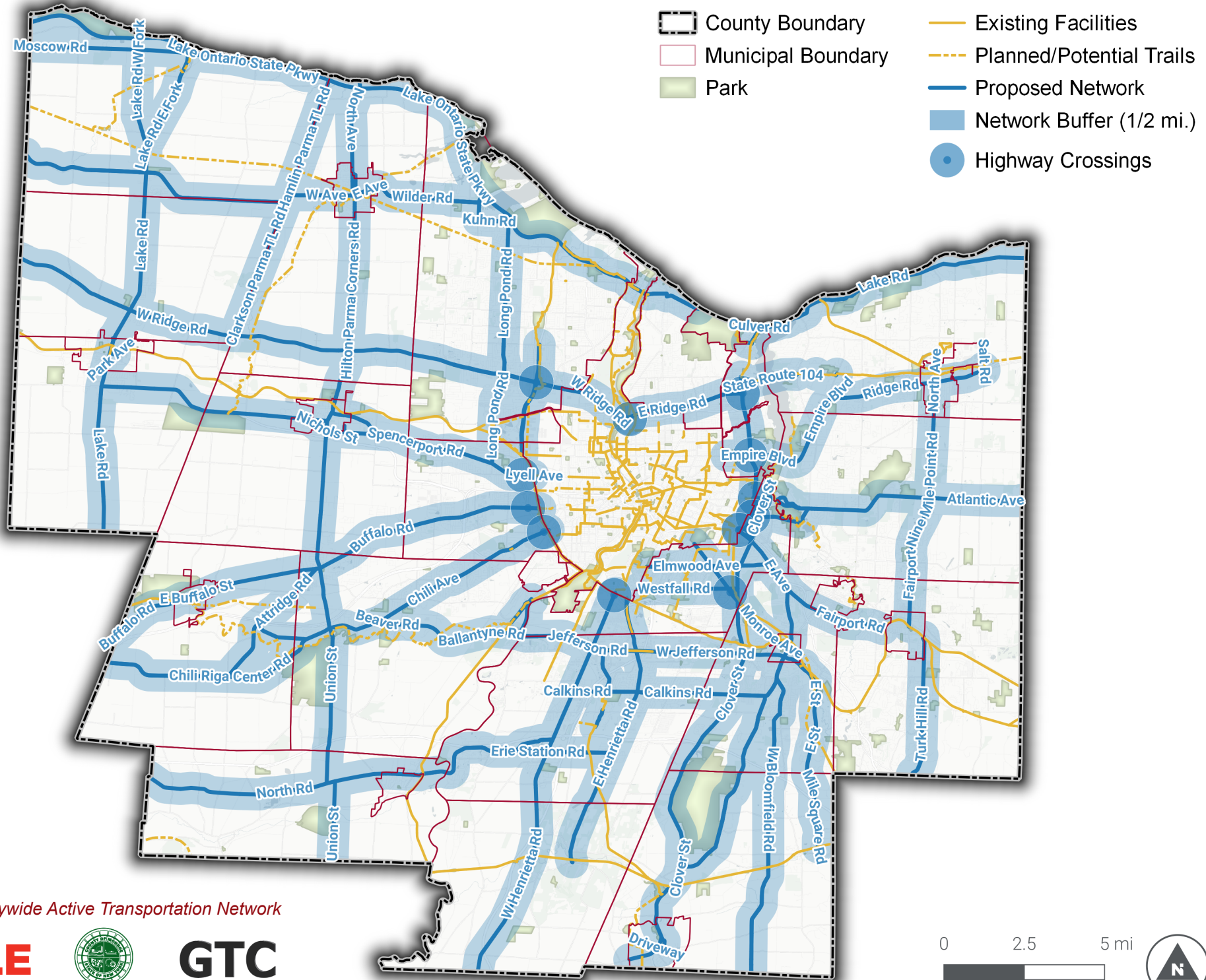
Trip Potential

As Trip Potential Analysis (TPA) results confirmed, city and town centers have the most demand for walking and biking trips due to a mix of destinations and land uses, and high population, employment, and intersection density. While high-stress routes still exist in these communities (especially in suburban and rural areas), they act as convergence points for various modes, users, and destinations. As a result, the proposed network seeks to connect these centers to each other.

Safety

As part of the Bicycle and Pedestrian Crash Analysis, the project team completed a sliding windows analysis. This exercise helps us understand crashes throughout a transportation network and identify segments with the highest crash density, weighted by crash severity. The analysis is done by determining the number and severity of crashes in a half-mile "window" on a roadway and shifting that window along the roadway 1/10 mile at a time. The sliding windows analysis reveals that several segments with the highest crash densities and severities occur on streets that already have active transportation infrastructure.

While the Bicycle and Pedestrian Crash Analysis provided important insight on crash trends, further analysis is required to determine contributing factors to crashes and whether infrastructure improvements are necessary. In some cases, active transportation infrastructure can increase crash rates because more users are expected at those locations. To mitigate this risk, public awareness campaigns, maintenance plans, and other program and policy

study and should be pursued during joint planning initiatives between city and county agencies. For general design guidance on accommodating bicyclists at highway crossings, refer to the AASHTO Guide for the Development of Bicycle Facilities.

Figure 2: Countywide Active Transportation Network

Legend:

- County Boundary
- Municipal Boundary
- Park
- Existing Facilities
- Planned/Potential Trails
- Proposed Network
- Network Buffer (1/2 mi.)
- Highway Crossings

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initiatives should accompany new infrastructure projects.

Regardless, well designed facilities still provide more safety enhancements and comfort than no facilities at all.

Summary of Network Development

The proposed countywide network aims to provide the backbone for inter-municipal connections. To this end, it is meant to supplement – not supersede – recommendations for active transportation infrastructure from local active transportation plans.

Additionally, the county should also consider routes that have wide rights-of-way that could accommodate high-comfort facilities through communities in Monroe County. When possible, priority routes with sufficient rights-of-way should be considered for sidewalks, shared use paths, separated bike lanes, low-stress bicycle boulevards, and other high-comfort treatments. Constrained rights-of-way often make multimodal transportation facilities more challenging to install. This issue can complicate networks in urban communities where dense built environments require creative approaches to reallocating space for active transportation, and in rural environments where topography,[4] agricultural land use, and natural features may limit rights-of-way. In highly-constrained conditions where preferred accommodations or widths are not feasible, it is better to provide narrower facilities rather than none.

The findings from the following analyses were used as the building blocks for network development.

Trip Potential Analysis

Toole Design performed a Trip Potential Analysis (TPA) to determine where people would be most likely to walk and bike in Monroe County, based on factors that are positively associated with active transportation trip attraction or generation. A combination of factors related to development patterns and socioeconomic characteristics were selected as the primary elements to estimate a location's trip potential:

- *Population Density*
- *Lower-Income Families*
- *Employment Density*
- *Destination Density*
- *Multi-Use Trails*

Figure 3 shows where biking trips are most likely to occur. Areas with higher population densities, more lower-income families, employment, bikeable destinations, and multi-use trails tend to have higher trip potential scores due to their development patterns that support bike travel.

Areas of high bike trip potential (scored 80 - 100) include most of Rochester, and parts of Gates, Brighton, and Perinton in addition to Pittsford Village, Fairport, and Brockport. Areas of relatively high bike trip potential (scored 50 – 80) include Hilton, Spencerport, Scottsville, Honeoye Falls, Webster Village, Irondequoit, the outskirt of Brockport, most parts of Greece, Webster Penfield, Perinton, Pittsford, Henrietta, and parts of Chili and Ogden. Low bike trip potential area are scattered across the peripheral of the County, including parts of Hamlin, Parma, Clarkson, Sweden, Ogden, Rush, Mendon, Perinton, Penfield and Webster, as well as most parts of Riga, and Wheatland.

The results of this analysis highlight areas where enhanced pedestrian and bicycle infrastructure may potentially serve more users. It identified populations centers as areas of high trip potential, but also highlighted areas in between these nodes where there are opportunities for active
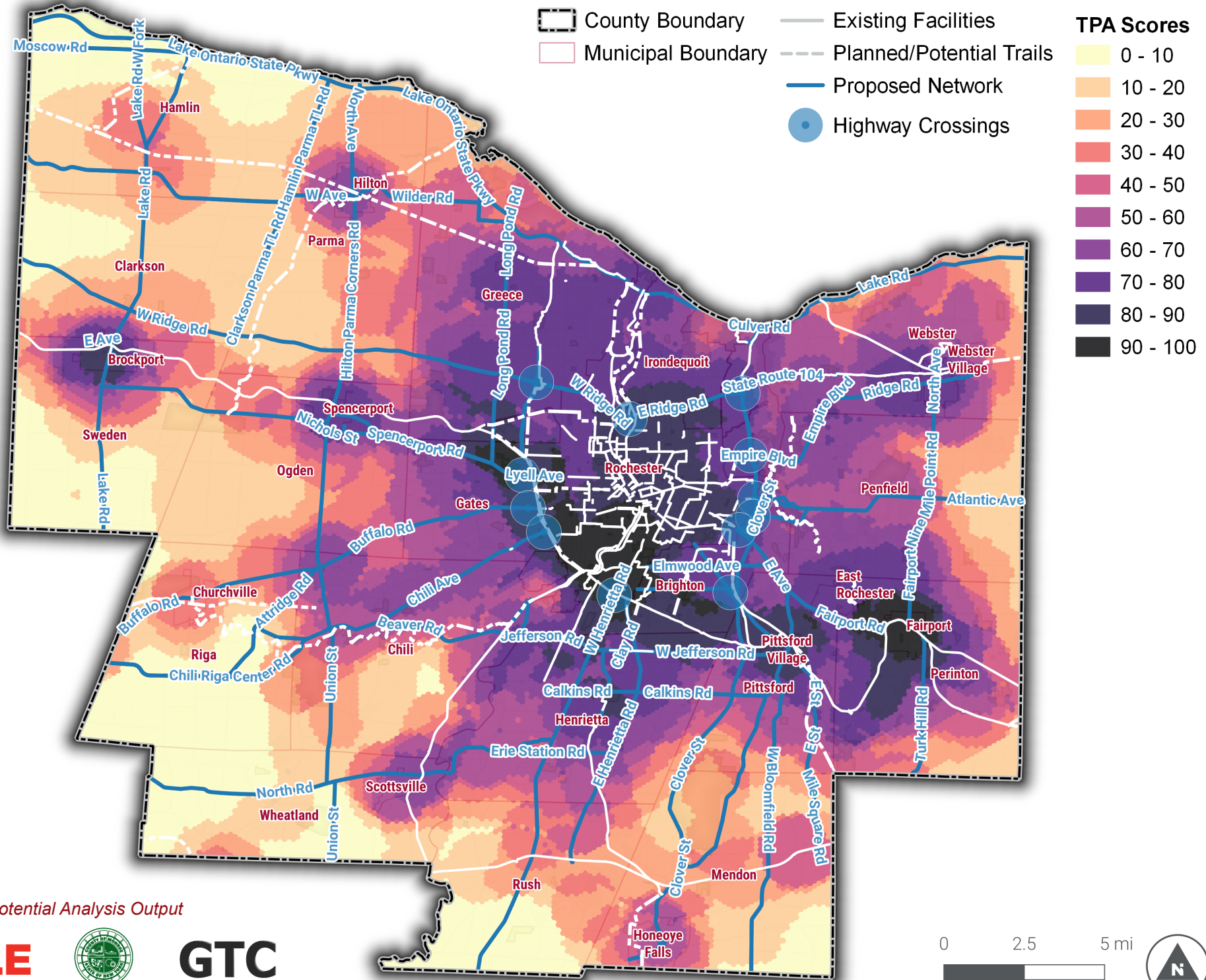
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4. While topography can be a deterrent for many interested but concerned bicyclists, the growing popularity of e-bikes will allow a broader range of users to travel through hilly terrain.

Figure 3: Trip Potential Analysis Output

transportation infrastructure, particularly in suburban communities.
This analysis may also assist Monroe County and partner agencies when prioritizing projects by identifying locations that have the greatest potential for increased walking and biking.

Bicycle Network Analysis

The Bicycle Network Analysis (BNA) aims to capture the importance of the interconnectedness of bicycle routes by measuring access to destinations via low-stress routes. By analyzing census blocks throughout Monroe County, based on whether people can ride their bicycles to important destinations on comfortable bicycling facilities, the project team can identify areas where there is a high demand for bicycle infrastructure but poor low-stress access.

Many of the busier roads in Monroe County are high-stress – unless they have a high-quality bike facility along them – which leads to a disconnected network, since low-stress residential roads do not form longer continuous routes across the county. The BNA examined the number of destinations that could be reached by low- and high-stress networks at the census block level, then filtered for any block without overall network access to a given destination type. This measure is a useful way to combine the effect of both the low-stress network and proximity to destinations. As a result, destination-rich areas get higher scores than the outlying areas if those destinations are accessible using the low-stress network *(Figure 4)*.

Because the BNA factored for the number of destinations that are accessible within census blocks via low-stress routes, the results highlight areas that are in need of better bicycling connectivity so that people can bike to schools, shops, workplaces, medical care, and other important destinations. More specifically, the BNA reveals the following for Monroe County:

1. The least connected areas (0-10) are located outside of city and town centers where density (population, intersection, land use, etc.) is likely to be lower.
2. In urban and suburban communities, where density tends to be higher, there are larger (spatially) and more areas of connectivity in and around population centers, but there are still major gaps in connectivity.

In conceptualizing a county network, major corridors are better positioned to form a continuous network that provides coverage throughout and across the county. **By leveraging existing infrastructure, the proposed network focuses on these corridors as links between high connectivity areas in urban, suburban, and rural communities.**
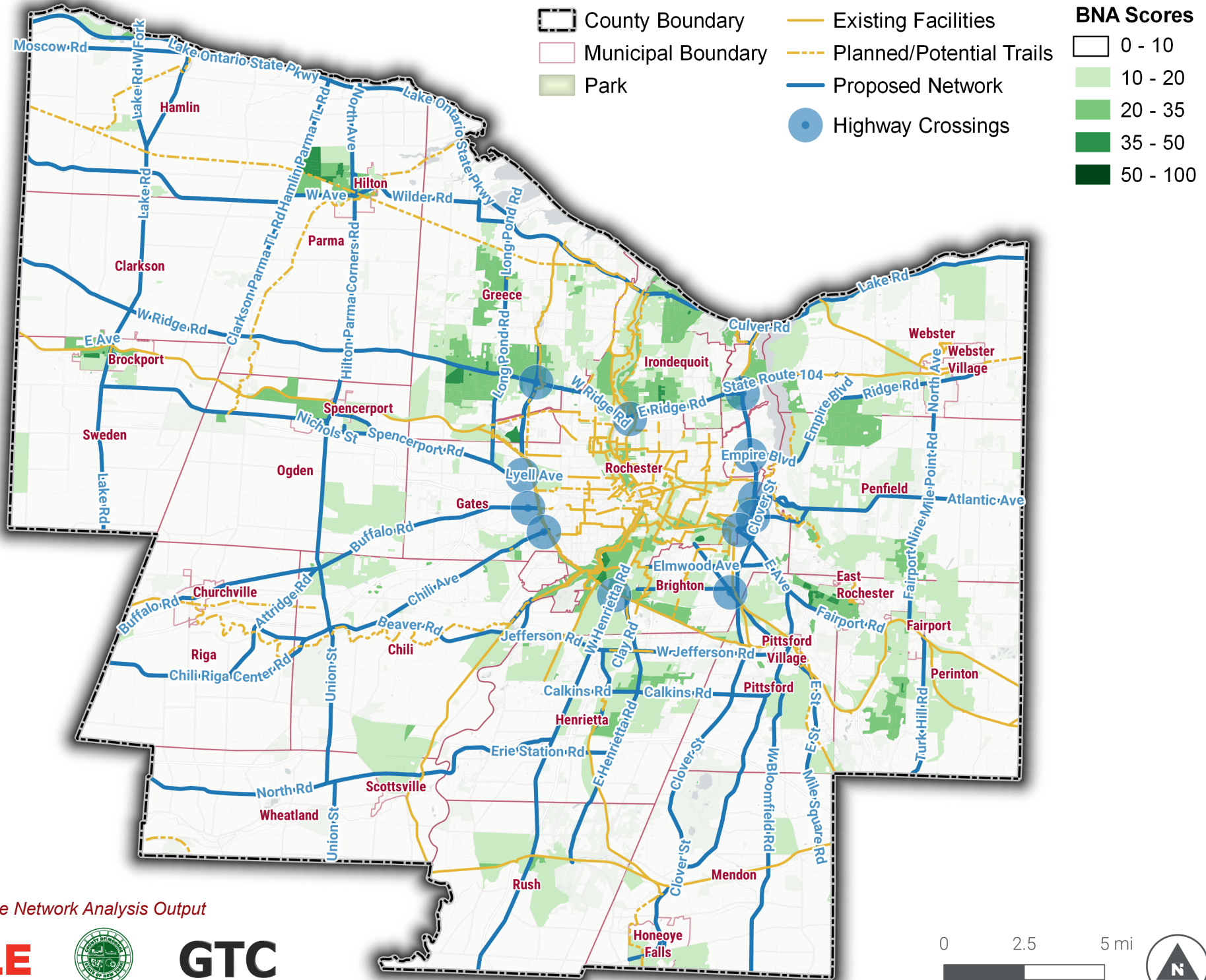
Figure 4: Bicycle Network Analysis Output

Bicycle and Pedestrian Crash Analysis

The aim of the crash analysis was to understand the patterns of bicycle and pedestrian crashes in Monroe County. Crashes can be over reported on highway segments that are adjacent to large commercial areas as crashes within parking lots are often coded to the adjacent roadway. Within the last 10 years (2012-2021) in Monroe County, 58% of total crashes in the dataset involved people walking, and 42% involved people on bicycles. However, the total number of overall crashes seems to be on a downward trend in the last ten years. While the City of Rochester, an urban setting with a larger population, has a higher number of countywide crashes involving pedestrians, the probability of crashes resulting in severe injuries or fatalities are higher in the rural areas of Monroe County. The sliding window analysis for bicycles (Figure 2) shows similar results, where the highest density of crashes are located in Rochester, but with additional segments in Henrietta and Brighton. Overall, suburban areas had a higher share of crashes involving people on bicycles than crashes involving people walking *(Figure 5)*.

While helpful in a number of ways, there are limits to this analysis. First, because so much of the data in the crash analysis focuses on Rochester, the ensuing "masking" effect makes it difficult to observe crash patterns in other communities in the county. Secondly, crash history can be a challenge because the crash inputs used were historic and provided limited insight. Third, crash data is much more granular in detail than the proposed network since the latter focuses on longer corridors – and not specific intersections – for active transportation infrastructure.
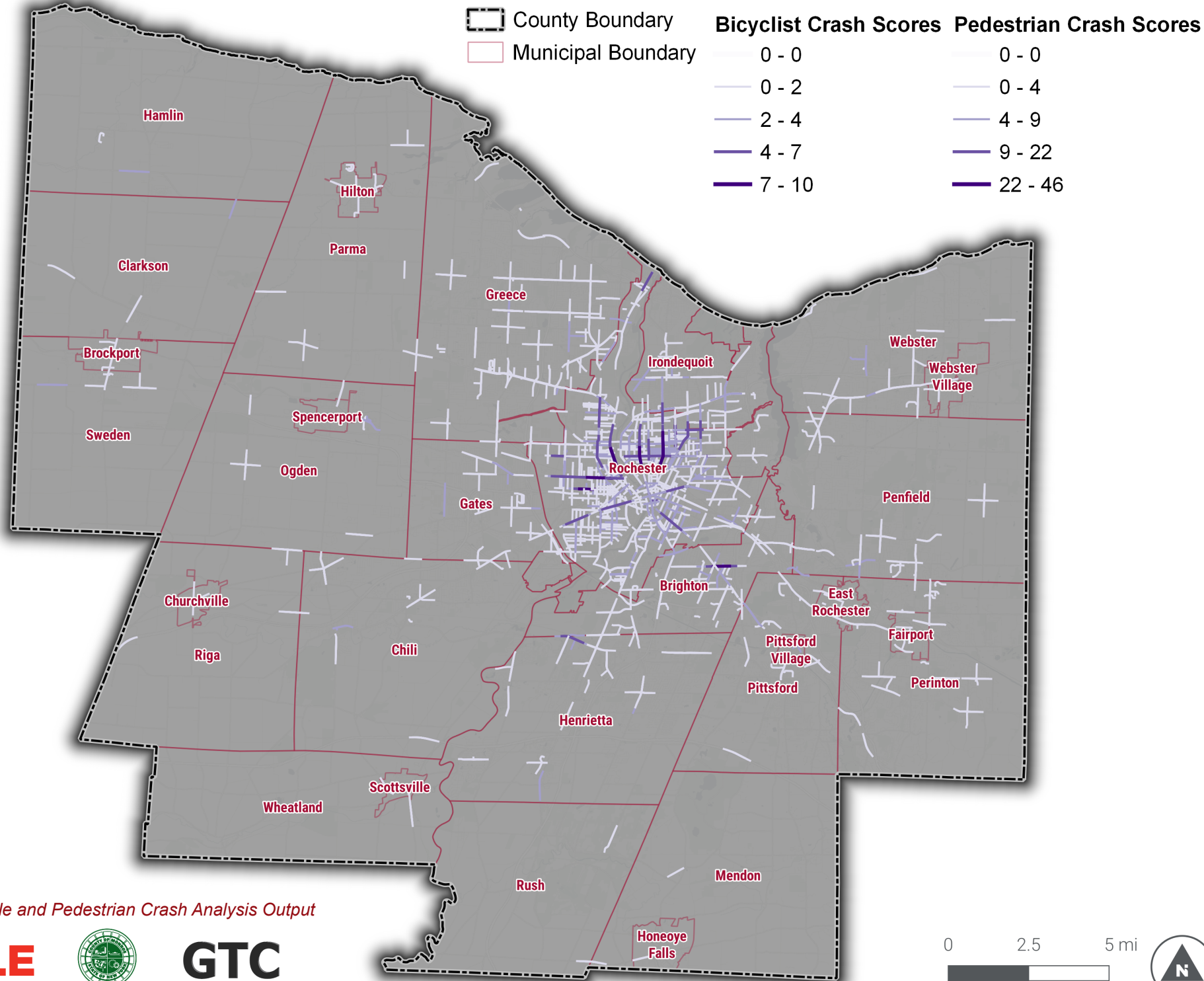
Figure 5: Bicycle and Pedestrian Crash Analysis Output

Public Input

There were three categories of comments submitted via the public input webmap: assets, concerns, and opportunities. The overwhelming majority of comments are located in Rochester, particularly around the downtown area.

Outside of Rochester, comments are concentrated along north-south corridors leading into the city: Mount Hope Avenue/Henrietta Road, Monroe Avenue, East Avenue, Culver Road and the Genesee River Trail – and along some east-west corridors: Elmwood Avenue, Westfall Road, Brighton/Henrietta Town Line Road, Browncroft Boulevard, and Empire Boulevard. Many of the proposed routes follow these roads, in response to public demand for safer active transportation facilities *(Figure 6)*.

The following are select comments from the public on existing safety and infrastructure concerns (orange) and opportunities (green) on road segments that are part of the proposed network:

- *"Need a road diet on Elmwood Ave. It's a no-brainer and probably much easier and cheaper than a cycle track, which in the end probably won't happen sadly. This can be done right now."*

- *"Walking or biking from Perinton to Pittsford at the 490 interchange, is very dangerous and there's almost no way to stay safe. Westbound drivers are focused on getting onto 490 as quickly as possible, and those exiting and trying to make a difficult left hand turn onto 31 are distracted from looking for pedestrians or bicycles. The canal path is too far out of the way for a walk into the village."*

- *"I wish Chili Ave was more bicycle and pedestrian friendly. It is an essential route to/from the city, and currently very unpleasant for biking/walking."*

- *"Empire Blvd is a deathtrap and not just for people on bikes or walking. We need sidewalks, protected bike lanes (bicyclists will be going slow up those big hills!) and narrower travel lanes to slow down motorists."*

- *"Trails in Harris Whalen Park do not allow bikes. Harris Hill Elementary is near here making it harder for kids in nearby neighborhoods to bike to school."*

- *"There needs to be a safe, year-round, east-west connection between the city and Penfield/Webster for bikes. Either Empire Blvd or Browncroft Blvd need to have a good bike/ped infrastructure."*

- *"Chili Ave seriously needs sidewalks, even if just on one side. Several of us want to walk between neighborhoods. Go further east on Chili Ave, and you'll see sidewalks. I'm unclear why we just did a paving project and still have no formal pedestrian connection."*

- *"Hamlin Beach State Park is great to bike around but, in order to bike to it, you have to go on parkway ramps. It would be great if there was some alternate way to get to the park – a trail or protected bike lane – that uses the underpass under Lake Ontario St Pkwy."*

- *"It's not clear to many people that this stretch of sidewalk on Westfall Rd is a connection from the bike trail here to the river via Brighton Town Park. I don't see many people using this route to get to the river trail even though it is one of the few connections."*

- *"A protected, multi-use path or sidewalk connecting North Chili to Churchville along Buffalo Road would allow safe movement between these communities, and a safe travel path to the Churchville-Chili School District property."*

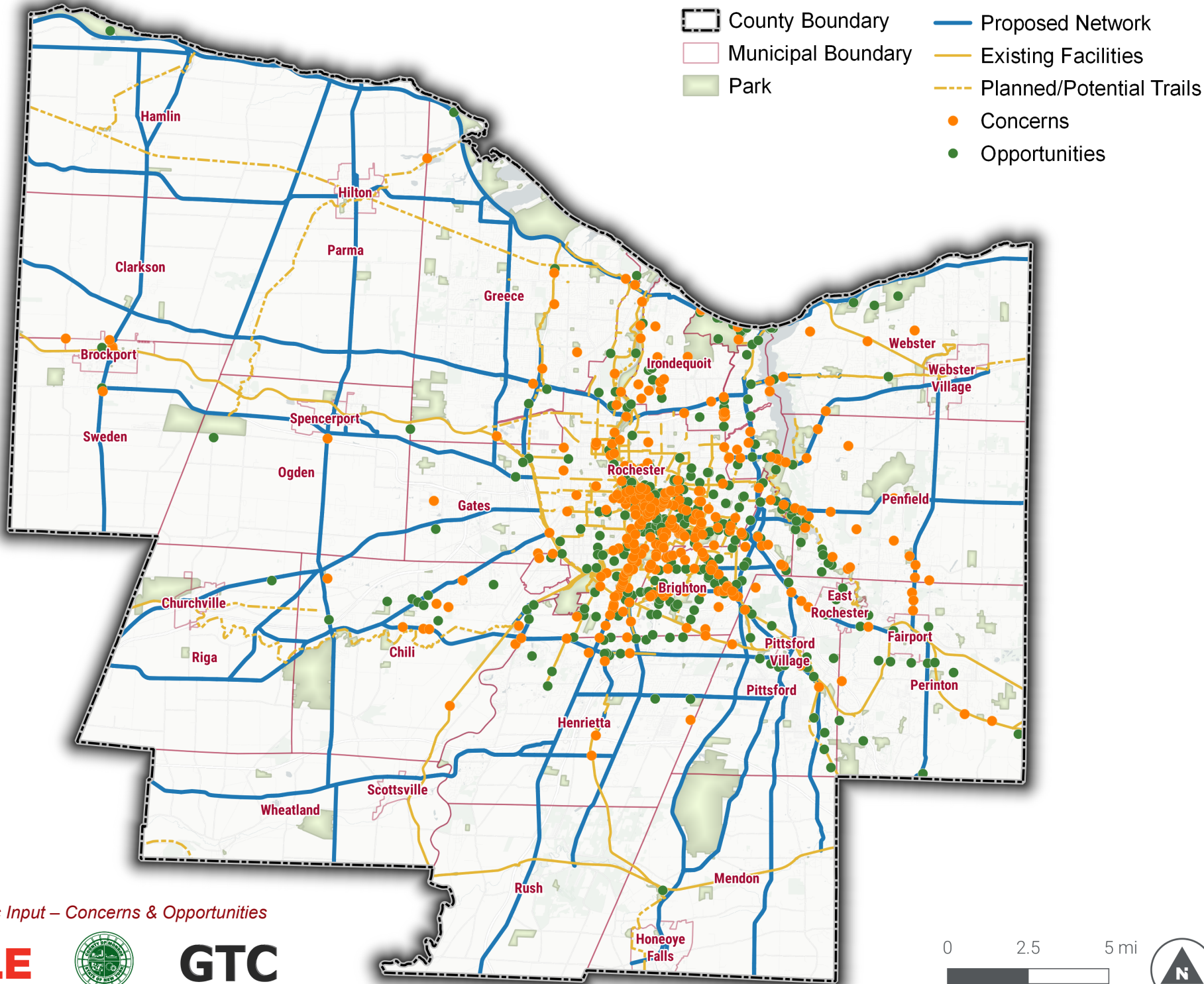Figure 6: Public Input – Concerns & Opportunities

Legend:
- County Boundary
- Municipal Boundary
- Park
- Proposed Network
- Existing Facilities
- Planned/Potential Trails
- Concerns
- Opportunities

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Scenario Development

Scenario planning is a well-known practice with which many elected officials and stakeholders are familiar. It allows the public to indicate their priorities in a fiscally constrained future, as opposed to the network, which represents Monroe County's ideal active transportation system and is unconstrained by fiscal limitations. Scenario development builds on the proposed network by identifying which corridors and routes should be prioritized based on certain criteria. The goal is twofold:

1. *Build a network that serves the broadest cross section of the population possible (coverage).*
2. *Emphasize connections to priority populations that rely on active transportation (need).*

Major roads serve the most people across various communities and can get people from Point A to Point B in a direct and efficient manner. The trip potential and bicycle network analyses were critical in helping us identify those major roads and corridors, and secondary roads that connect to them. Crash data and public comments helped identify communities in need that could enjoy a stronger benefit through connection to safe and comfortable active transportation facilities.

In coordination with Monroe County staff, the project team developed the following scenarios:

High Coverage Network

The project team developed the High Coverage Network through visual inspection of maps and datasets, seeking to connect large and mid-sized communities to each other and to important regional destinations.

This scenario focuses on cross-county corridors linking every corner of the county to provide a network that reaches the most people possible. It also completes the loop of trails surrounding Rochester and fills in connections to existing multi-use trails.

The High Coverage Network is guided by:
1. Connections between Rochester and the rest of the county.
2. Linkages to existing multi-use trails, including Erie Canalway Trail (part of Empire State Trail), Lehigh Valley Trail, Genesee Riverway, Genesee Valley Greenway, Auburn Trail, and Hojack Trail.
3. Key connections to/from the Erie Canalway Trail on the east and west sides of the county into nearby towns and villages.
4. North/south and east/west connections that begin to connect population centers, especially in more rural areas of Monroe County.

Figure 7 shows the High Coverage Network.

High Need Segments

The High Need Segments scenario highlights segments with high trip potential and low connectivity scores while prioritizing underserved populations based on race, poverty, and vehicle access. The base network for this scenario is the same as the one used for the High Coverage Network scenario (that is, the entire network shown in *Figure 2*). To identify the High Need segments, the project team calculated the following attributes for all proposed network segments:

1. BNA score – The Bicycle Network Analysis (BNA) aims to capture the importance of the interconnectedness of bicycle routes by measuring access to destinations via low-stress routes. The High Need Segments scenario takes the average BNA value of census blocks that are within 50 meters of a given segment. This value is scaled value between zero and one based on the percentile of average BNA measure in decreasing order (i.e., the highest BNA value gets a percentile value of zero, lowest BNA value gets a percentile of one, and median BNA values gets a percentile value of 0.5).
2. Trip potential score – The average bicycle trip potential value from the trip potential hex cells that intersect with the segment. This value is scaled based on the percentile of average trip potential (i.e., the lowest trip potential value gets a percentile value of zero, highest trip potential value gets a percentile of one, and median trip potential values gets a percentile value of 0.5).
3. Equity score – The average values of percentage of BIPOC population, percentage of households below poverty, and percentage of households without vehicle access. Each of these equity measures is scaled between zero and one based on their percentile values like that of trip potential score. The final equity score is calculated as the average of the three percentile scaled equity measures.

The final High Need Segments scenario score was calculated for each segment by adding the BNA, trip potential, and equity scores calculated as described above. The final score can be a value between zero and three. Higher final scores indicate a greater need for active transportation facilities, based on the factors mentioned above. To compare High Coverage Network and High Need Segments segments, the project team selected highest scoring segments for the second scenario until the total mileage for that scenario was roughly equivalent to the total mileage for the High Coverage Network scenario.

Many of the High Need Segments center around the suburbs of Rochester and the more densely populated southeast part of Monroe County. It also connects to some communities in the west, such as Brockport, Hilton, and Spencerport.

It is important to note that this scenario is not a standalone network that could function on its own, but is meant to highlight priority segments of the complete Countywide Active Transportation Network. *Figure 8* shows the High Need Segments.

These scenarios provide two different approaches to network implementation that Monroe County and local partners can follow as they build out the countywide active transportation network. It is important to note that these approaches are not mutually exclusive, and ideally both would eventually come to fruition. Monroe County and other stakeholders will need to coordinate to determine whether coverage or need is a more immediate priority for network implementation. The preferred approach will vary between communities based on local goals and other considerations. *Figure 9* shows the High Coverage Network and High Need Segments combined.
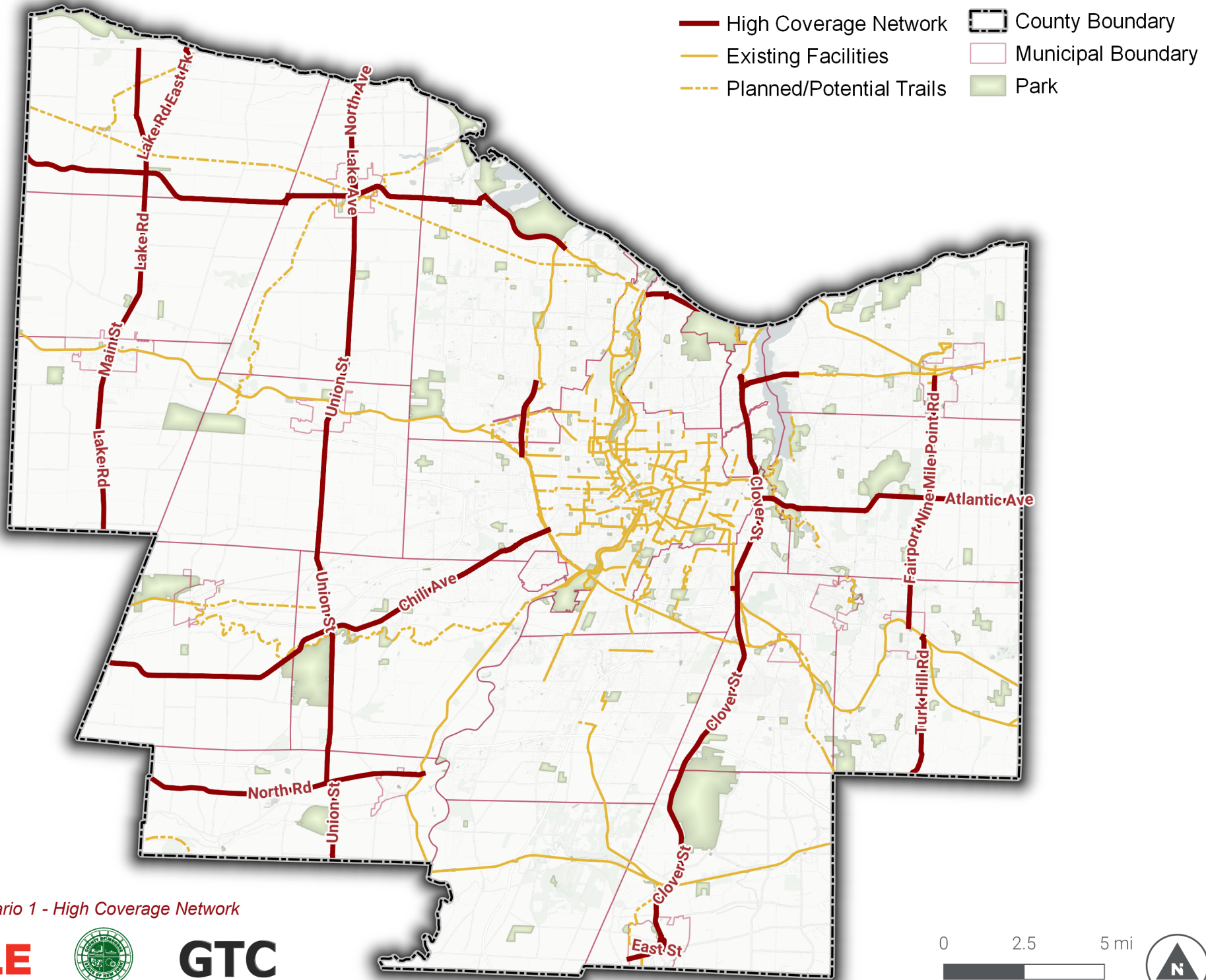
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- **High Coverage Network**
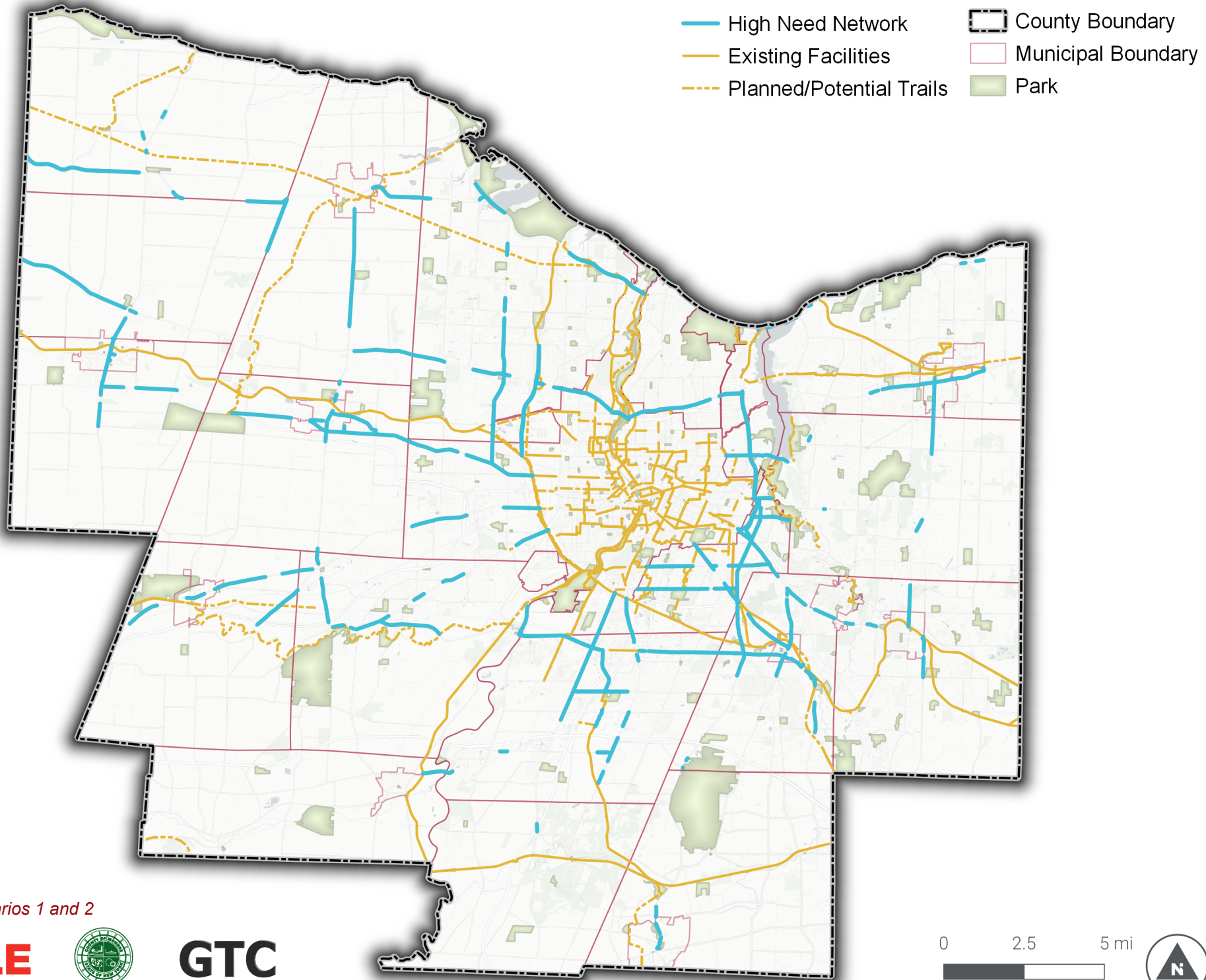- **Existing Facilities**
- **Planned/Potential Trails**
- **County Boundary**
- **Municipal Boundary**
- **Park**

Figure 7: Scenario 1 - High Coverage Network

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Legend:
- High Need Network
- Existing Facilities
- Planned/Potential Trails
- County Boundary
- Municipal Boundary
- Park

Figure 8: Scenarios 1 and 2

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Legend:
- High Need Network
- High Coverage Network
- Existing Facilities
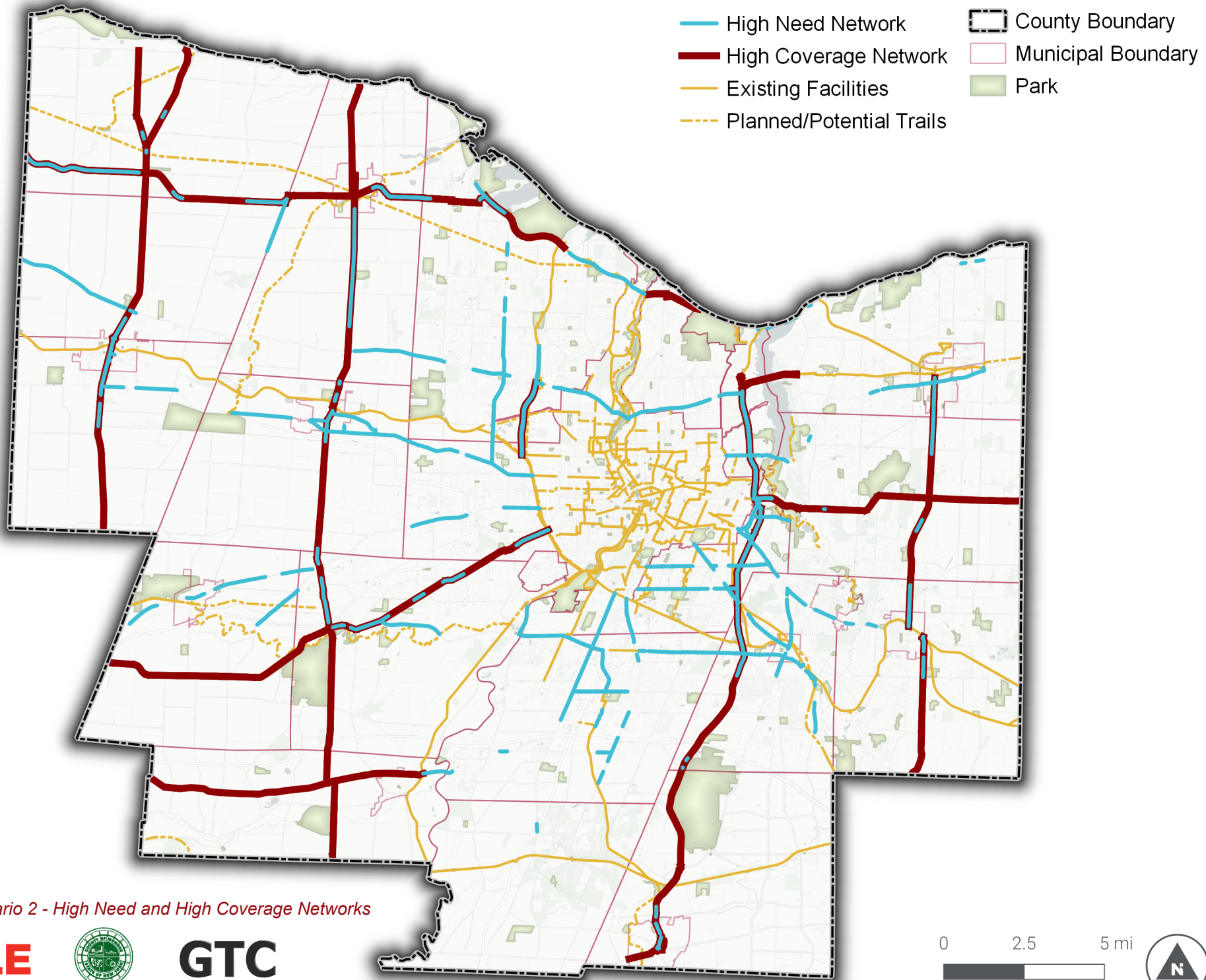- Planned/Potential Trails
- County Boundary
- Municipal Boundary
- Park

Figure 9: Scenario 2 - High Need and High Coverage Networks

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