Washtenaw Avenue Corridor
Non-motorized Transportation Study

Appendix Items - DRAFT

September 30, 2010

List of Figures

Existing Non-motorized Conditions

This information is used to assess the state of the existing pedestrian and bicycle facilities. It is also used to help determine potential non-motorized facilities and to support recommendations.

- Project Overview
- General Land Use Context Map
- Bus Stop Locations
- Bus Stop Boarding's
- Bicycle and Pedestrian Crash Locations
- In-Road Bicycling Conditions Components:
    - Average Daily Traffic Volumes
    - Posted Speed Limit
    - Existing Road Cross-Section
    - Road Properties
- In-Road Bicycling Quality Assessment
- Road Crossing Difficulty Assessment
- Crosswalk Spacing Assessment
- Existing Sidewalk Level of Service Assessment
- Sidepath Suitability Assessment
- Potential Median Locations
- Block Size Analysis
- Non-motorized Intersection Deficiency Analysis

Non-motorized Demand Analysis

The relative demand analysis is a parcel based grid analysis that evaluates population density, land use diversity, activity generators, transit and connectivity. This analysis helps to identify where there is demand for pedestrian and bicycle use and is used to help prioritize improvements.

- Relative Demand Analysis Components :
    - Population Density
    - Land Use Diversity
    - Activity Generators
    - Transit Routes
    - Connectivity
- Composite Relative Demand Analysis
- Normalized Relative Demand Analysis

Potential Non-motorized Facility Analysis
This analysis evaluates what is possible or appropriate, but should be not confused with recommendations.

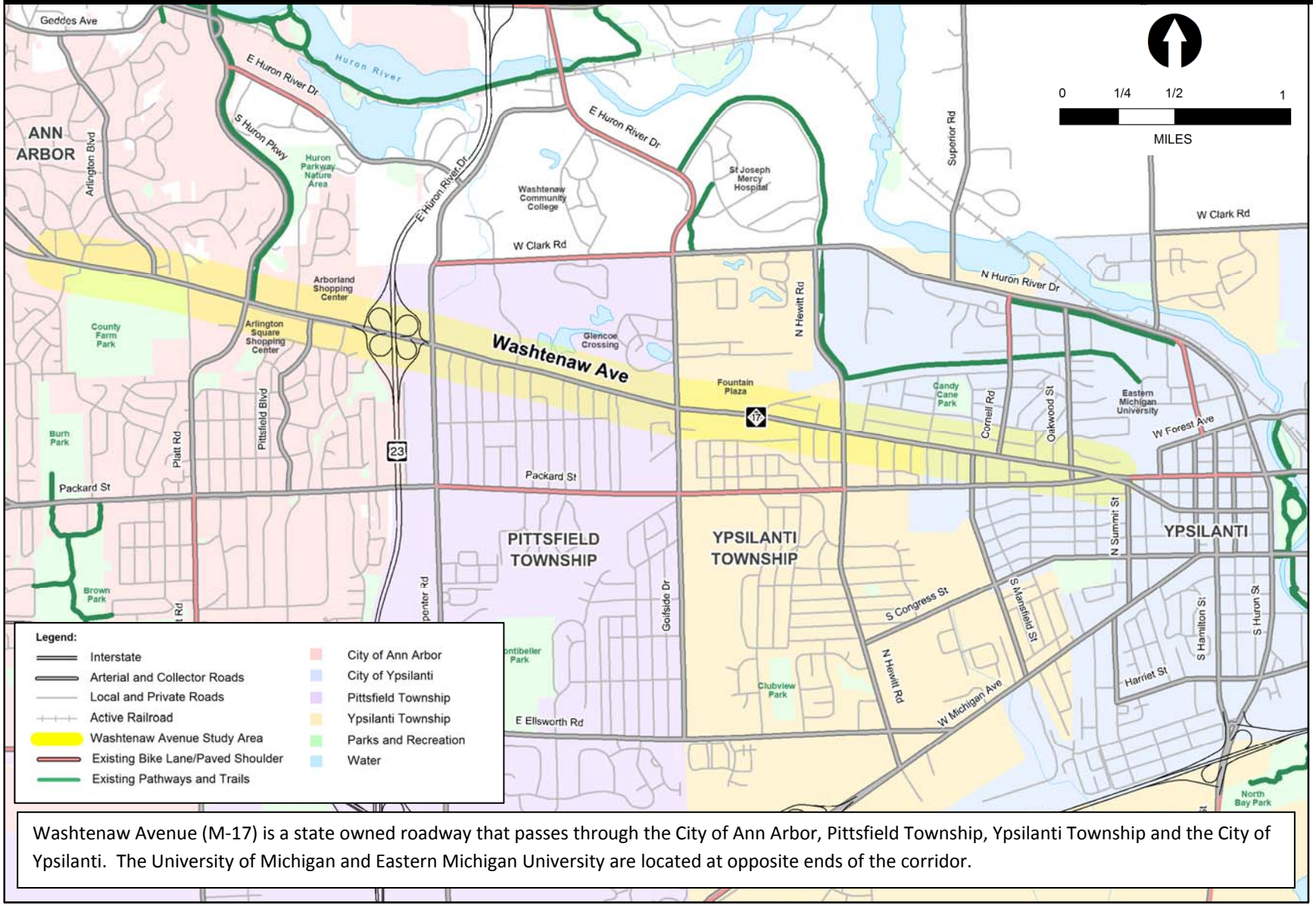
- Potential Near-term Road Conversions
- Potential Neighborhood Connector Routes
- Potential Road Crossing Improvements

Comparative Analysis

This analysis identify where there is demand and deficiency for pedestrian and bicycle facilities and is used to help prioritize improvements.

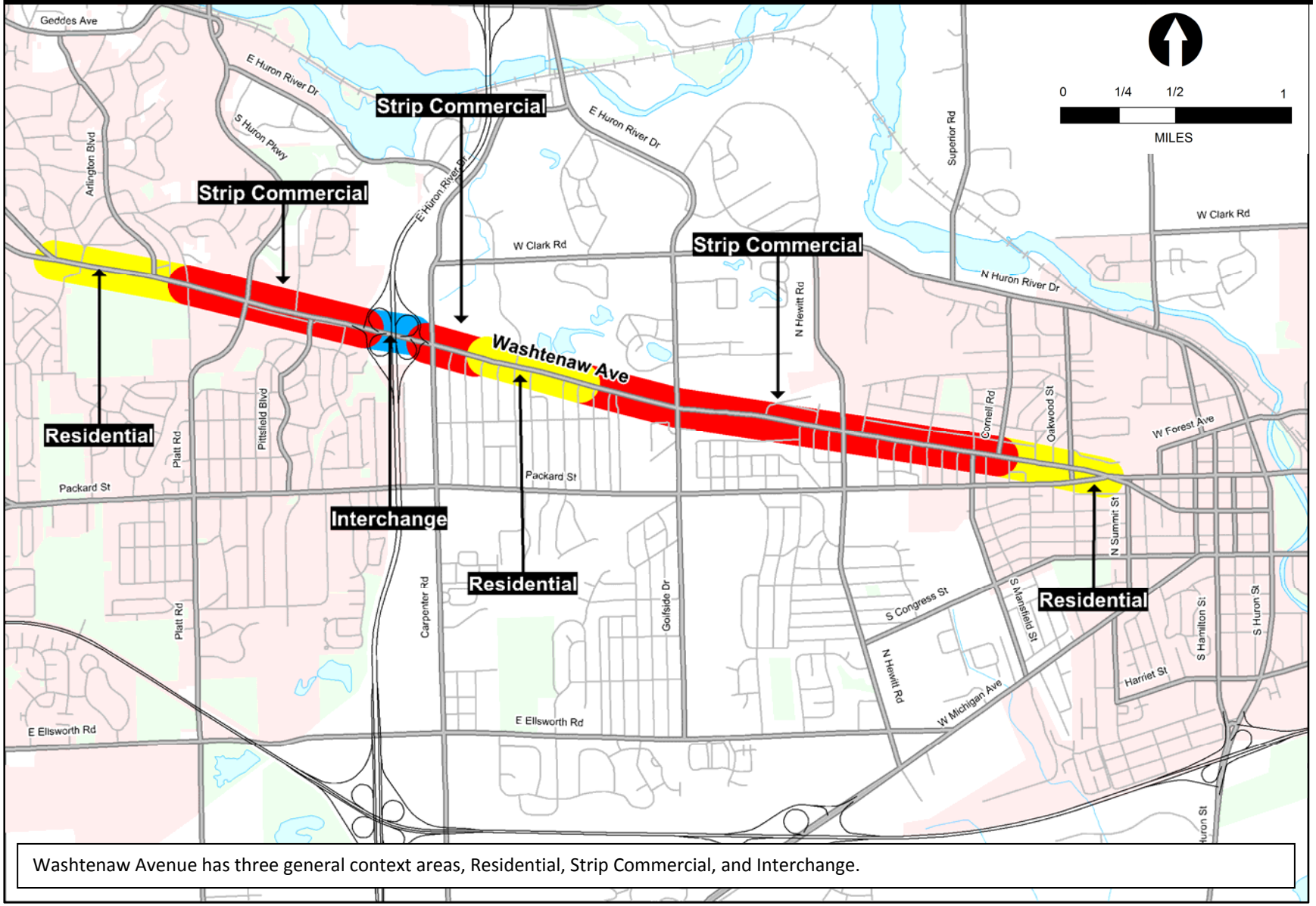
- Neighborhood Connectors Location Analysis (Potential Neighborhood Connector and Trails with Relative Demand Analysis)
- Neighborhood Connectors Impact on Large Blocks (Potential Neighborhood Connectors with Block Size Analysis)
- Demand for Road Crossing Improvements (Potential Road Crossing Improvements with Relative Demand Analysis)
- Non-motorized Intersection Deficiency Demand (Non-motorized Intersection Deficiency Analysis with Relative Demand Analysis)
- Demand for Safety Improvements at Intersections (Bicycle and Pedestrian Crash Analysis with Non-motorized Intersection Deficiency Analysis)

Project Overview Map



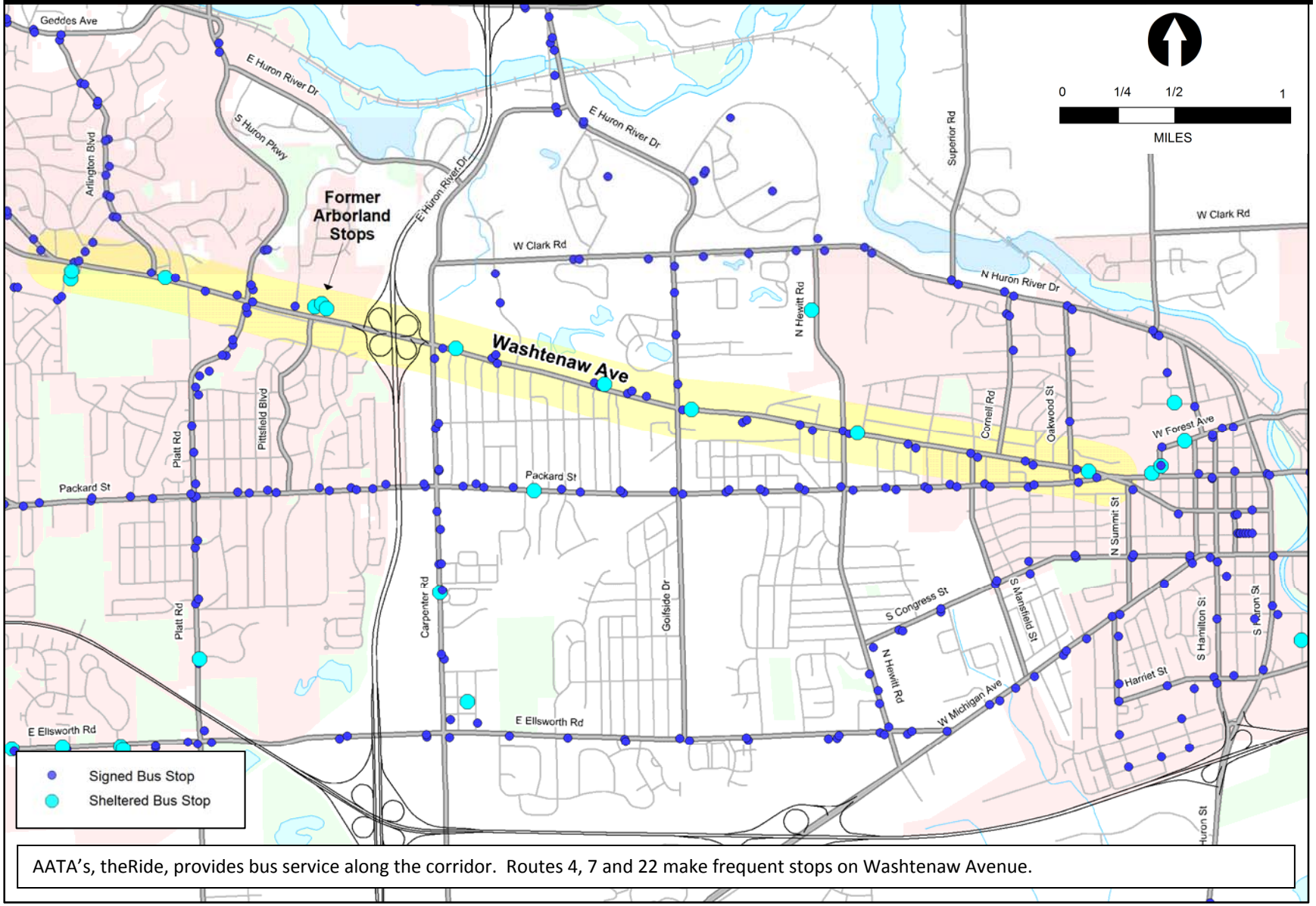
Washtenaw Avenue (M-17) is a state owned roadway that passes through the City of Ann Arbor, Pittsfield Township, Ypsilanti Township and the City of Ypsilanti. The University of Michigan and Eastern Michigan University are located at opposite ends of the corridor.

General Land Use Context Areas



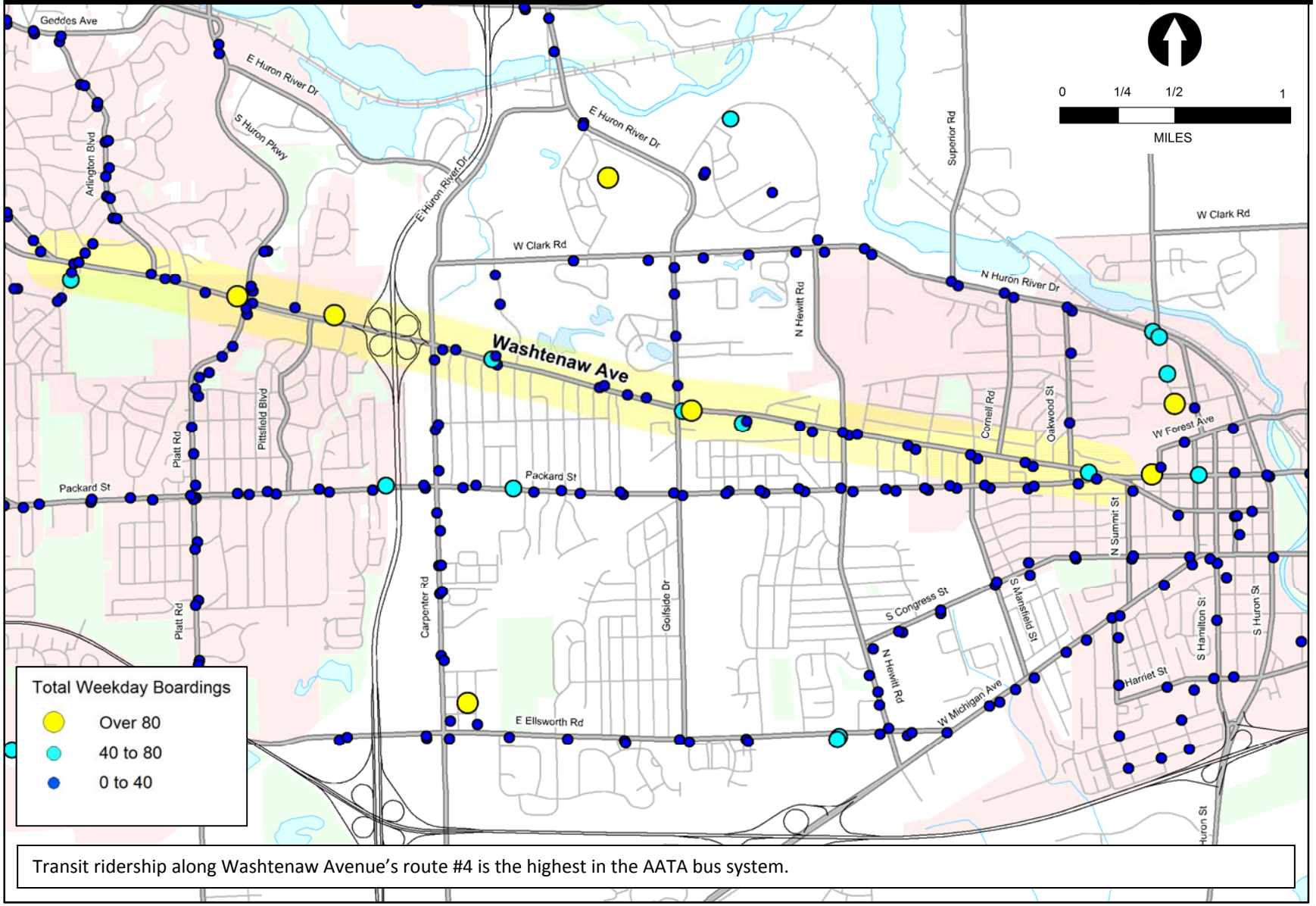
Washtenaw Avenue has three general context areas, Residential, Strip Commercial, and Interchange.

Bus Stop Locations



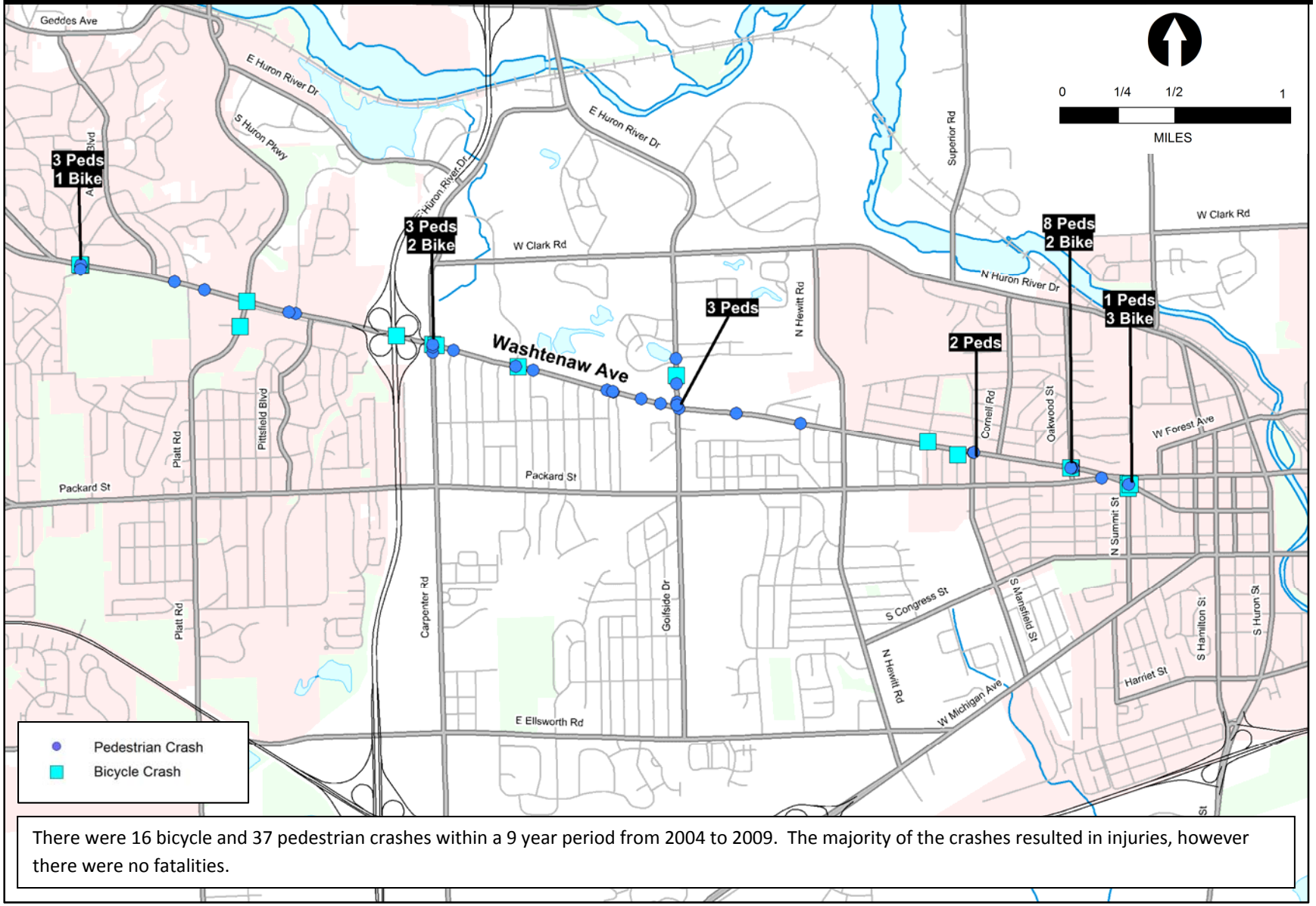
AATA's, theRide, provides bus service along the corridor. Routes 4, 7 and 22 make frequent stops on Washtenaw Avenue.

Bus Stop Boarding's



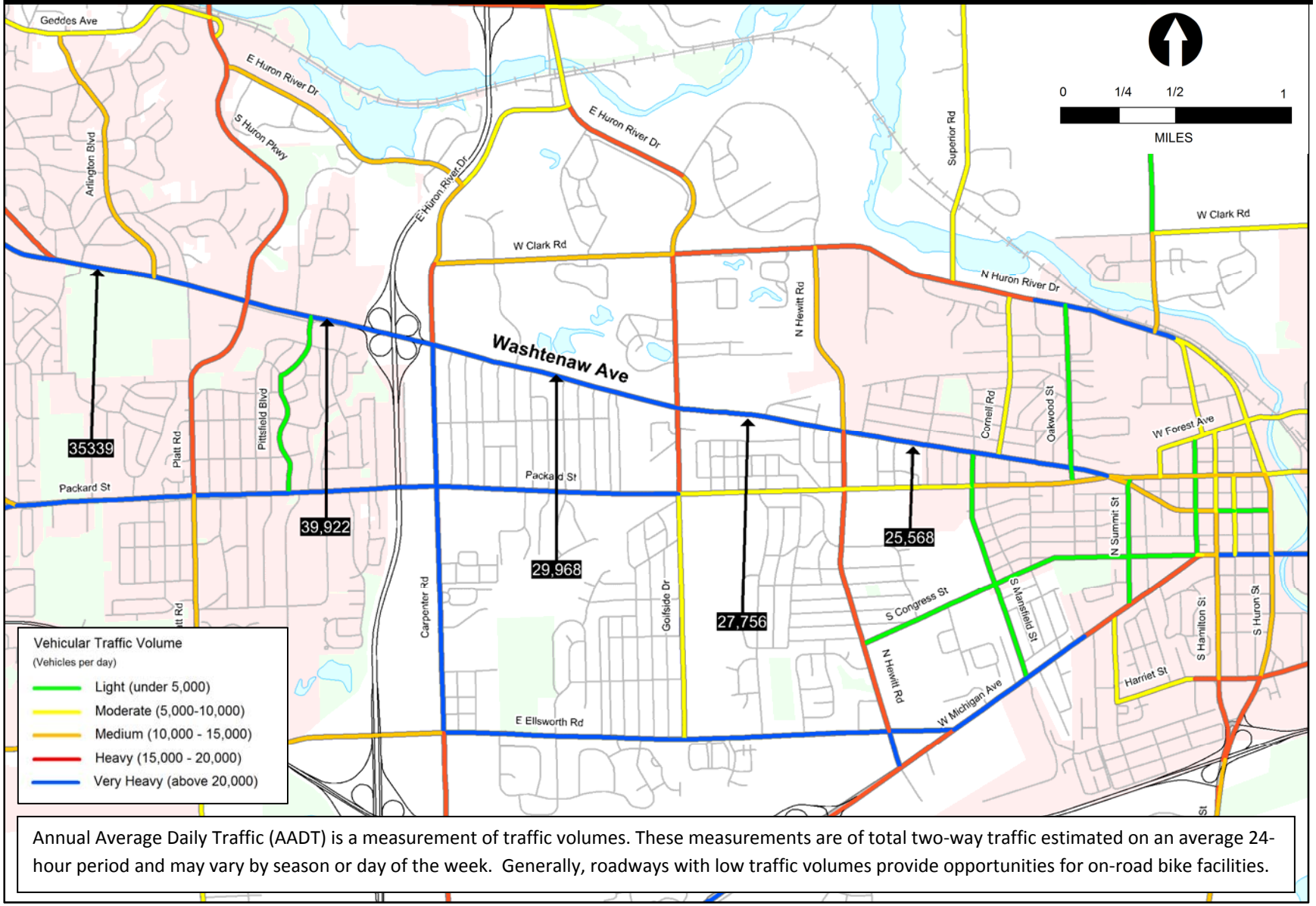
Transit ridership along Washtenaw Avenue's route #4 is the highest in the AATA bus system.

Bicycle and Pedestrian Crash Locations



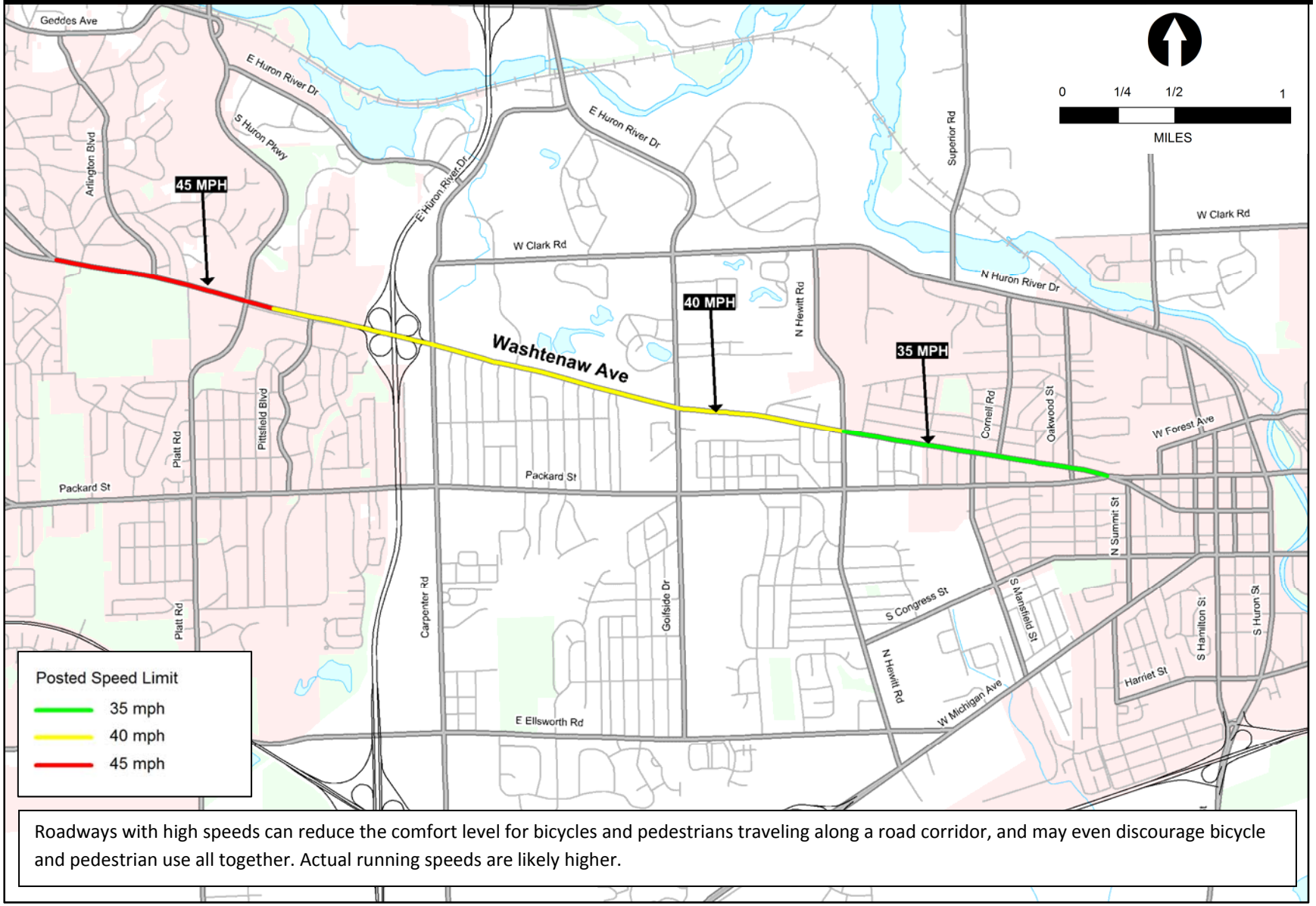
There were 16 bicycle and 37 pedestrian crashes within a 9 year period from 2004 to 2009. The majority of the crashes resulted in injuries, however there were no fatalities.

Average Daily Traffic Volumes



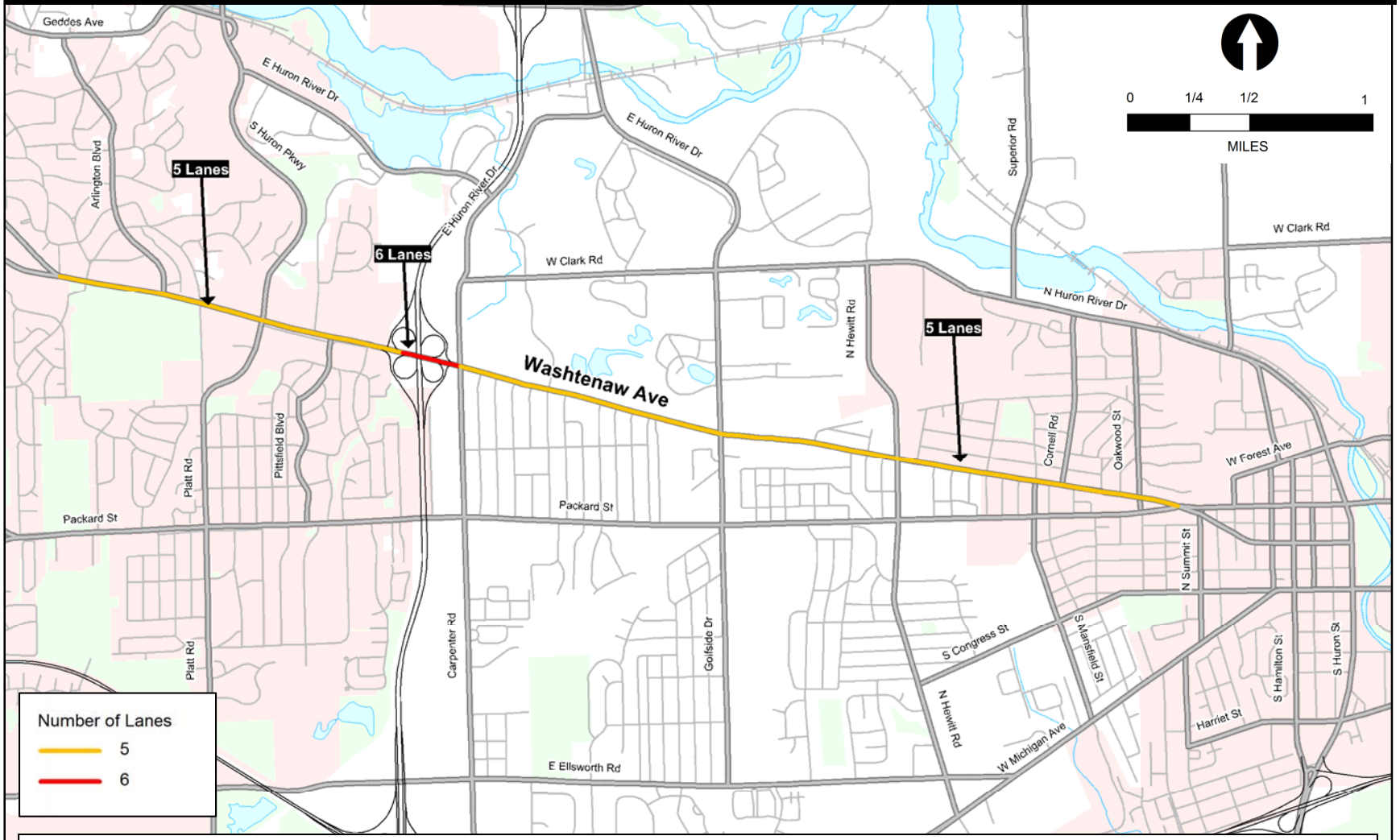
Annual Average Daily Traffic (AADT) is a measurement of traffic volumes. These measurements are of total two-way traffic estimated on an average 24-hour period and may vary by season or day of the week. Generally, roadways with low traffic volumes provide opportunities for on-road bike facilities.

Posted Speed Limit



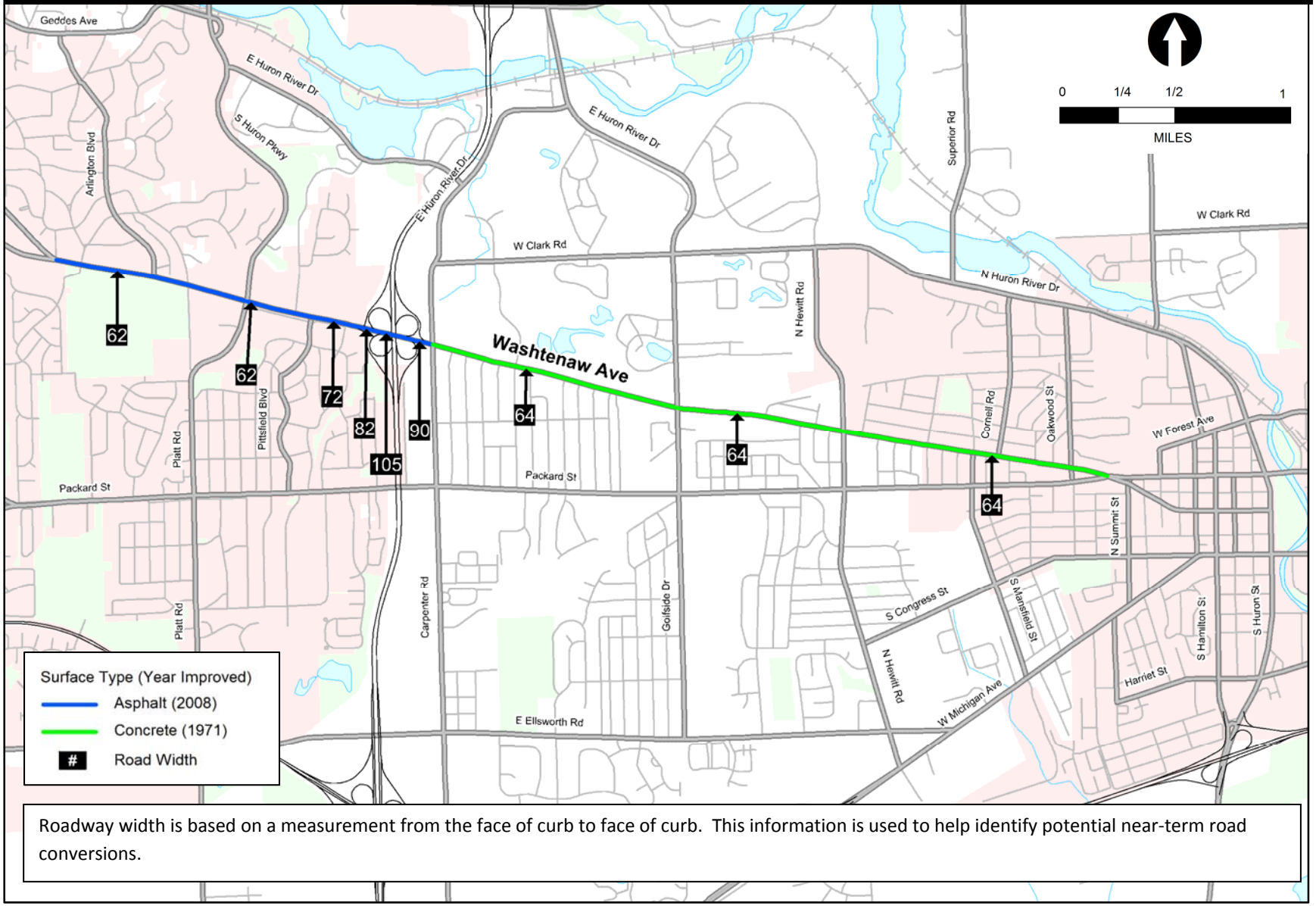
Roadways with high speeds can reduce the comfort level for bicycles and pedestrians traveling along a road corridor, and may even discourage bicycle and pedestrian use all together. Actual running speeds are likely higher.

Existing Road Cross Section



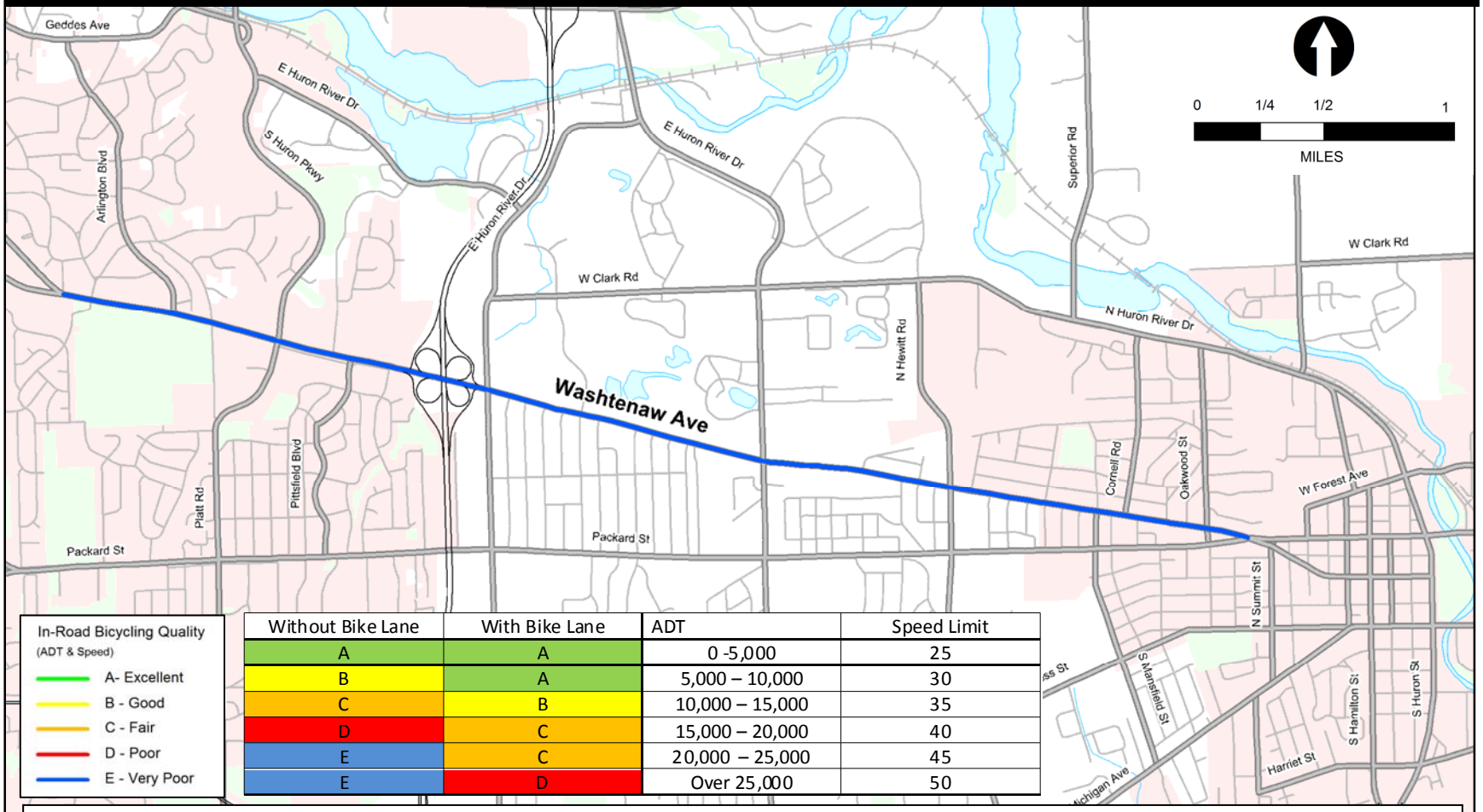
The majority of the corridor has a five lane cross section, consisting of two lanes in each direction and a center turning lane in the middle. In combination with the high speeds of the roadway it presents a challenging environment for on-road bicycle travel as well of pedestrians wishing to cross the roadway.

Road Properties



Roadway width is based on a measurement from the face of curb to face of curb. This information is used to help identify potential near-term road conversions.

In-Road Bicycling Quality Assessment



In-Road Bicycling Quality
(ADT & Speed)

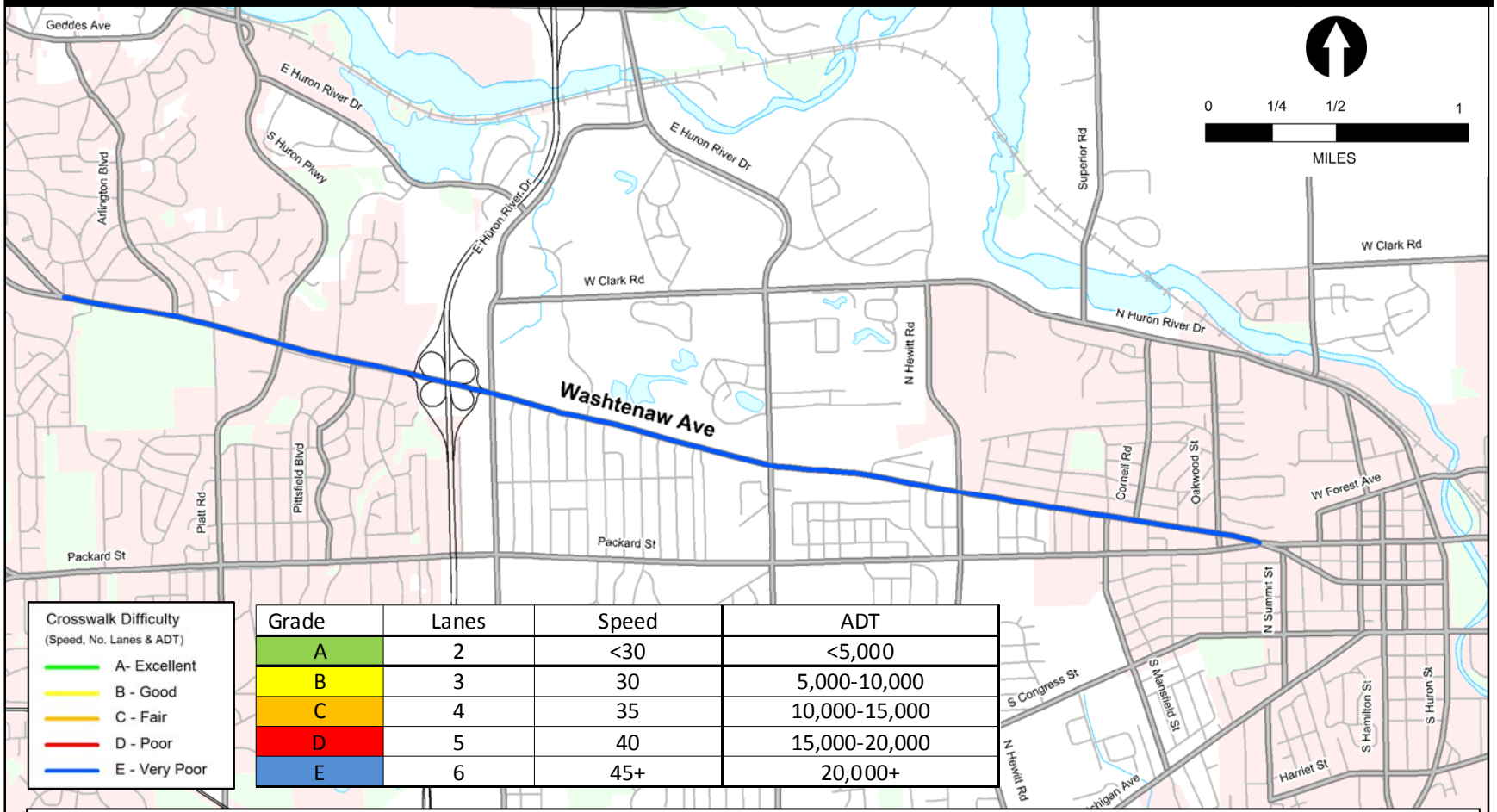
- A- Excellent
- B - Good
- C - Fair
- D - Poor
- E - Very Poor

Without Bike Lane	With Bike Lane	ADT	Speed Limit
A	A	0 -5,000	25
B	A	5,000 – 10,000	30
C	B	10,000 – 15,000	35
D	C	15,000 – 20,000	40
E	C	20,000 – 25,000	45
E	D	Over 25,000	50

In-road bicycling facilities improve the quality of the bicycling experience on busy roads. This analysis is based on existing conditions. A road with an existing bike lane has a higher quality; however, there are no existing bike lanes within this corridor.

Quality of the in-road bike facilities is based on speed limit and daily traffic volumes. For example a road that has 12,000ADT and a posted speed limit of 40mph with no existing bike lane would get a D rating. An ADT of 12,000 puts the road in the C range, however the 40mph speed limit makes it a D rating because the most restrictive rating is applied (please refer to the chart above).

Road Crossing Difficulty Assessment



Crosswalk Difficulty
(Speed, No. Lanes & ADT)

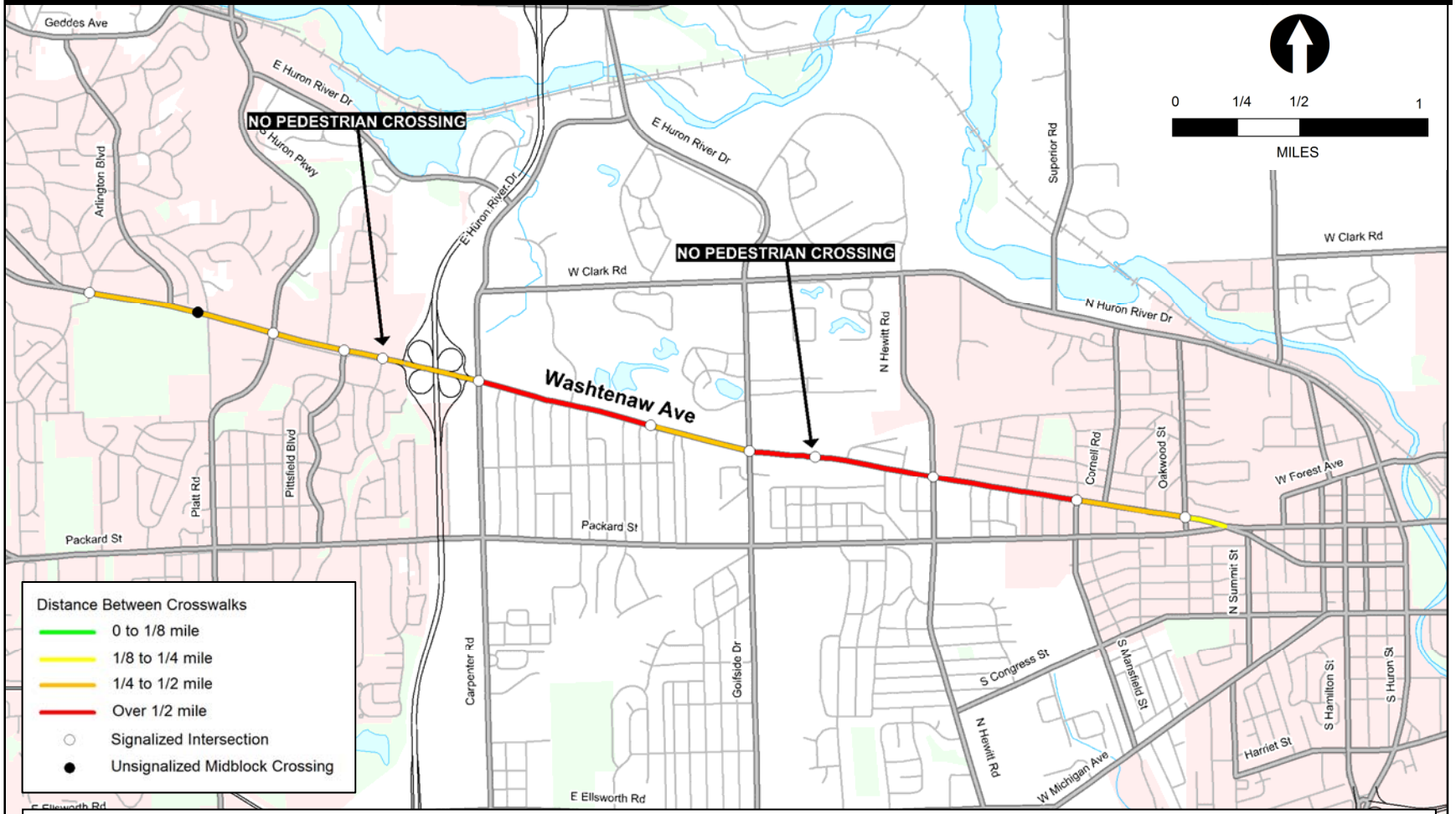
- A- Excellent
- B - Good
- C - Fair
- D - Poor
- E - Very Poor

Grade	Lanes	Speed	ADT
A	2	<30	<5,000
B	3	30	5,000-10,000
C	4	35	10,000-15,000
D	5	40	15,000-20,000
E	6	45+	20,000+

Road crossing difficulty is a measurement of how difficult a person would typically find it to cross a road at an unmarked mid-block crosswalk. This analysis is based on existing conditions. Overall, this corridor is generally difficult to cross with ADT being the most restrictive factor.

Road crossing difficulty is based on the number of lanes, speed limit and daily traffic volumes. For example a road that has 25,000ADT, 4 lanes and a posted speed limit of 40mph with no existing bike lane would get a E rating. A 5 lane road with a speed limit of 40mph receives a D rating, however the 25,000ADT makes it a E rating because the most restrictive rating is applied (please refer to the chart above).

Crosswalk Spacing Assessment



Crosswalk spacing is a key factor in directness of travel. Most pedestrian trips for personal business (like walking to the store) are about ½ mile long. Where there is demand to cross the road and crosswalk spacing is over 1/8 of a mile apart, midblock crossings are likely to occur.

This analysis was based on existing conditions and signalized intersections without pedestrian crossings were not used in this calculation because they do not provide a safe crossing.

Sidewalk Level of Service Assessment

A key factor to a pedestrians comfort level on a sidewalk is the degree of separation from the roadway. Elements such as lawn buffers and vertical elements tend to make a pedestrian feel more separated from the roadway, increasing the pedestrian's level of comfort when on a sidewalk.

The sidewalk quality rating system is designed to help identify a pedestrian's level of comfort when on a sidewalk based on the amount of separation from the roadway. The rating system is broken up into five categories A, B, C, D and E. A sidewalk with a rating of "A" has the best pedestrian comfort level and a sidewalk with a rating of "E" has the worst pedestrian comfort level.

A – Rating
Sidewalk is setback from roadway and contains vertical elements such as closely spaced trees and/or light poles.

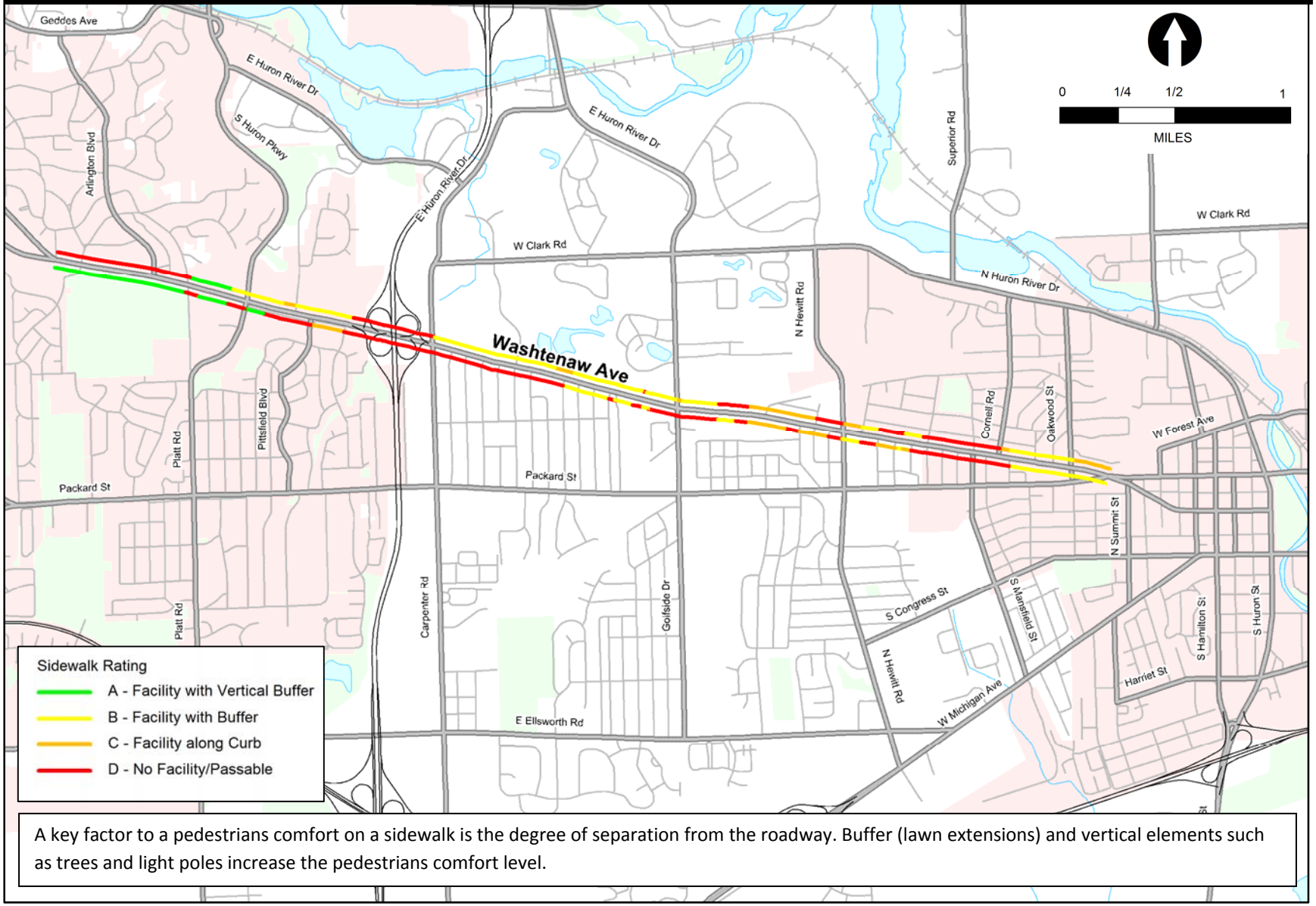
B – Rating
Sidewalk is setback from roadway but contains no vertical elements.

C – Rating
Sidewalk is directly adjacent to the roadway along the curb and has no buffer space or vertical elements.

D – Rating
No sidewalk facility is built, but the area is physically passable by foot.

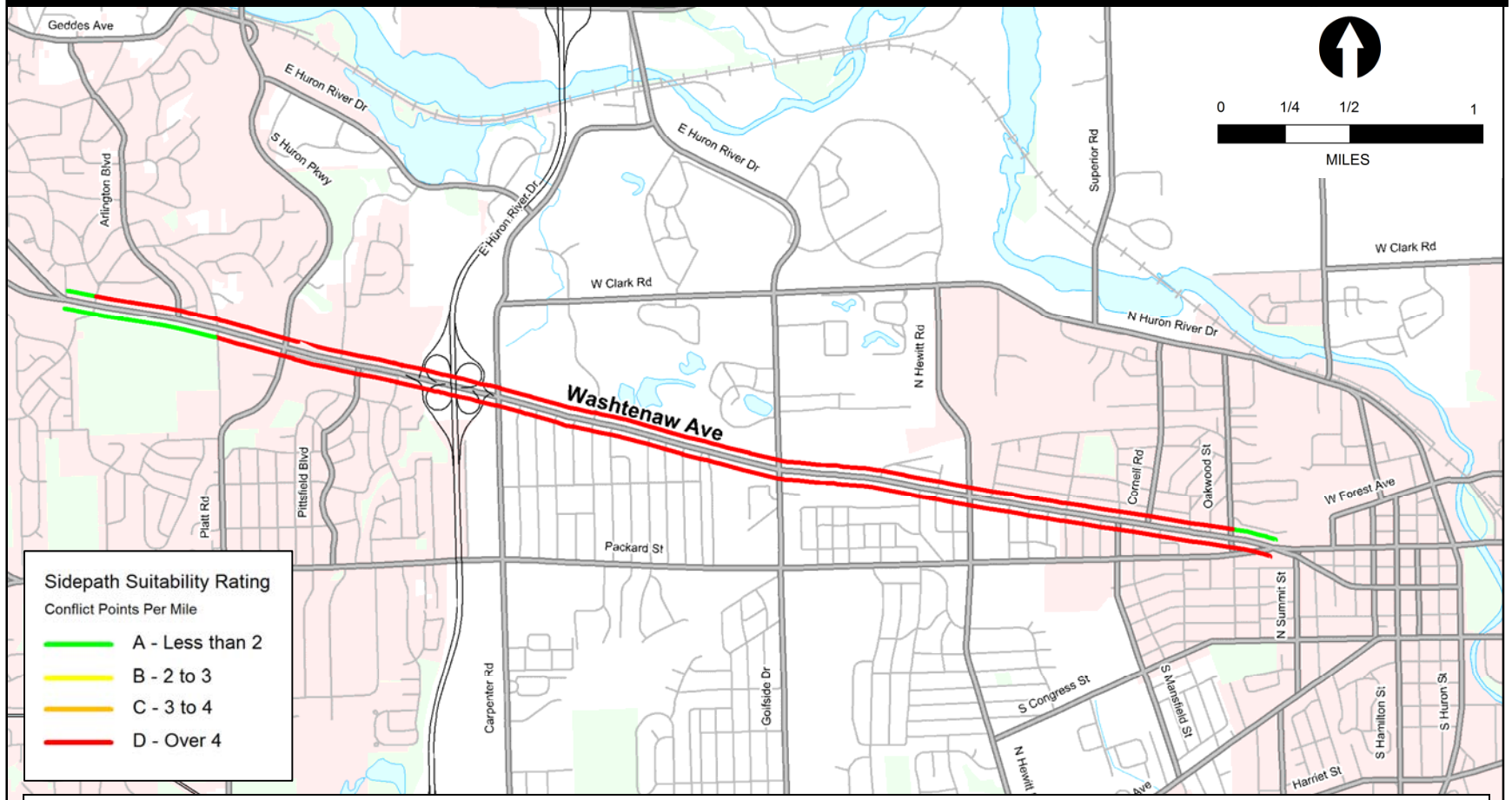
E– Rating
No sidewalk facility is built and the area is not physically passable by foot. Physical barriers such as streams or expressway overpasses usually contribute to this type of situation.

Existing Sidewalk Level of Service Assessment



A key factor to a pedestrians comfort on a sidewalk is the degree of separation from the roadway. Buffer (lawn extensions) and vertical elements such as trees and light poles increase the pedestrians comfort level.

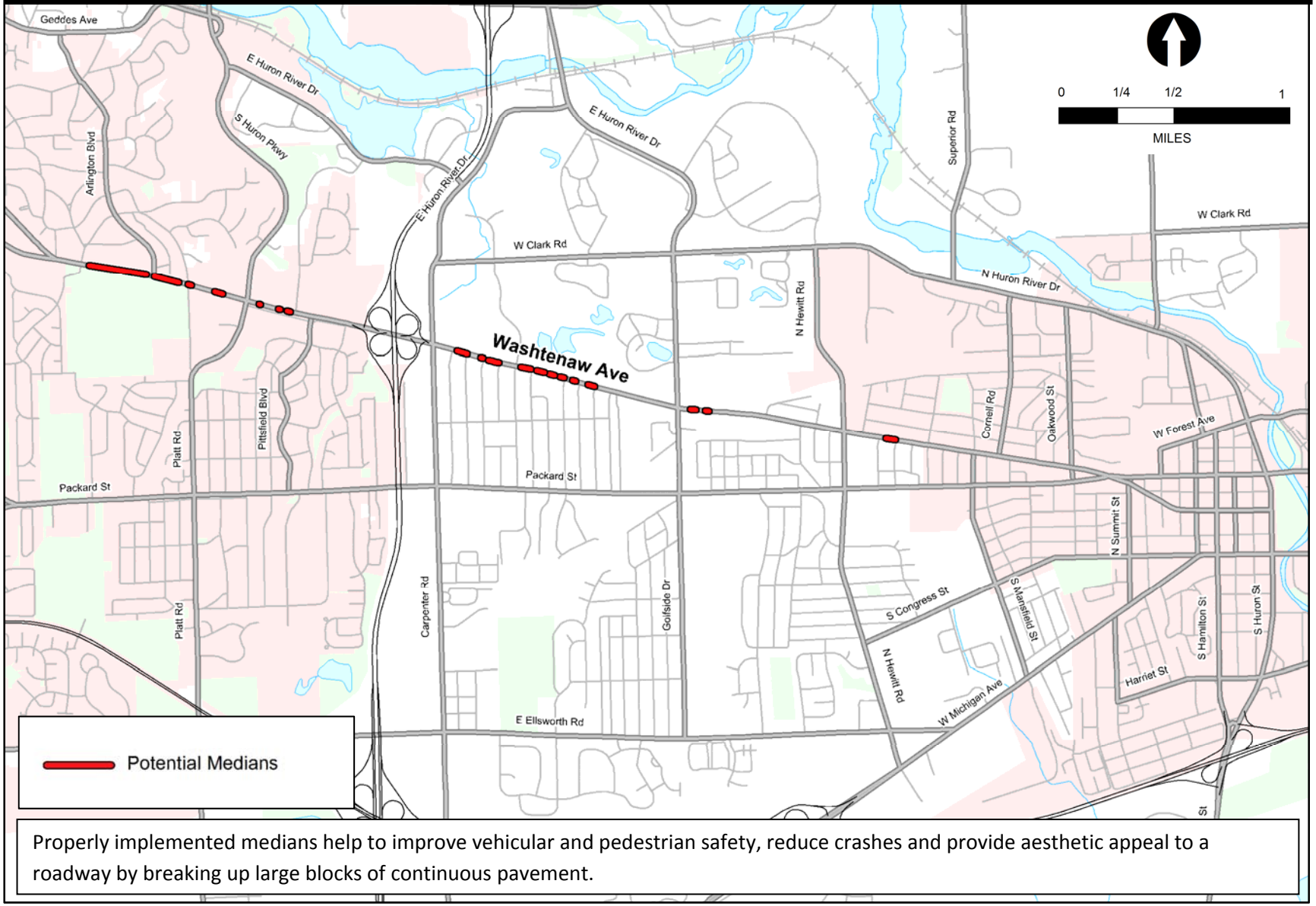
Sidepath Suitabilty Assessment



A conflict point is a local road or high traffic volume commercial driveway. For this analysis, each segment of sidewalk between two major roadways was given a rating from A to E based on the number of conflict points (see legend). Ten minor/residential driveways or one local road or high volume driveway was considered equal to one conflict point.

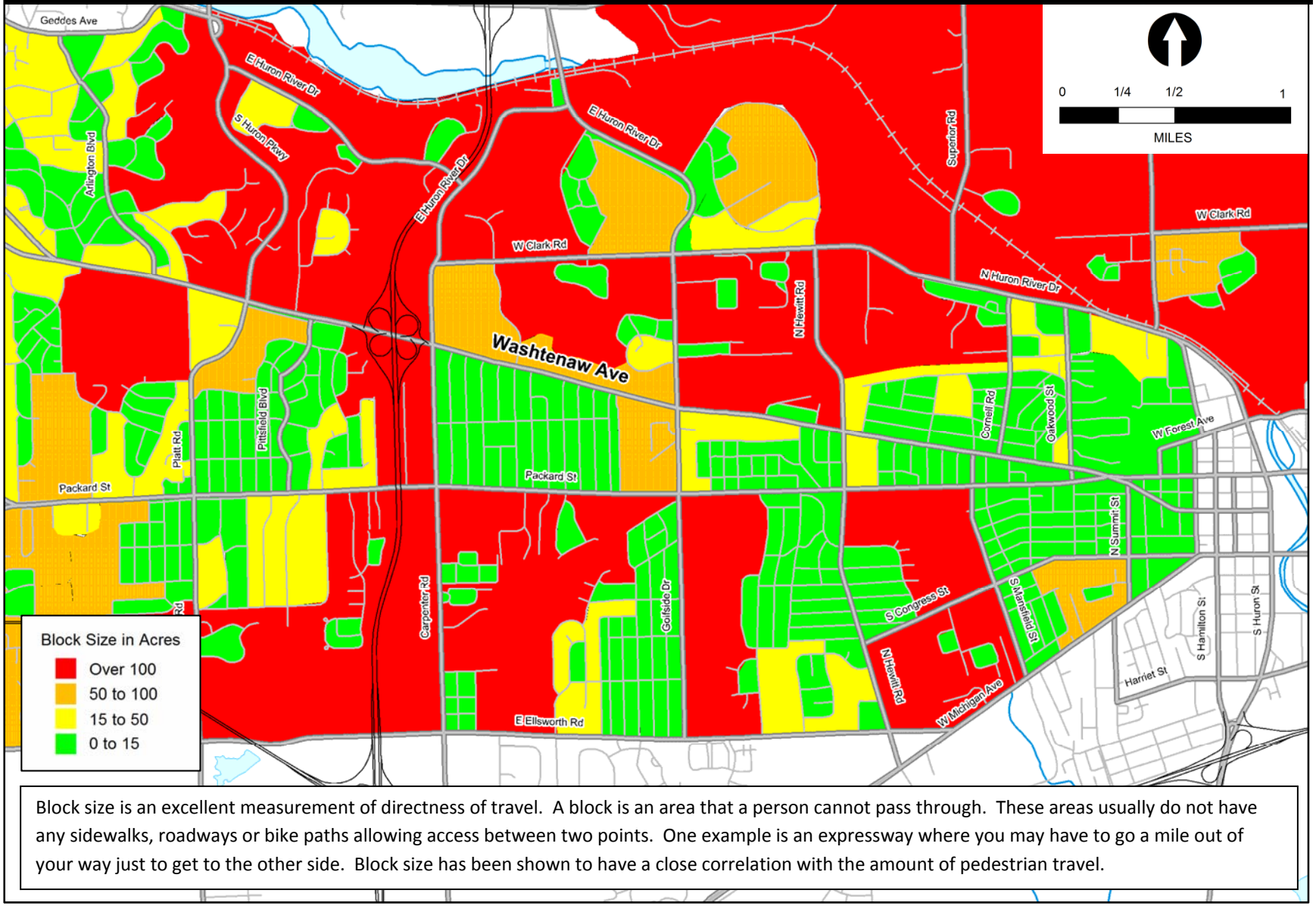
The AASHTO Guide for the Development of Bicycle Facilities generally considers sidewalks undesirable as shared-use paths. This is due to the inherent conflicts between bicycles and motorists where a pathway intersects with driveways and roads. Suitable sidepath locations are uninterrupted by driveways and roadways for long distances and provide safe and convenient road crossing opportunities to destinations on the other side of the road.

Potential Median Locations



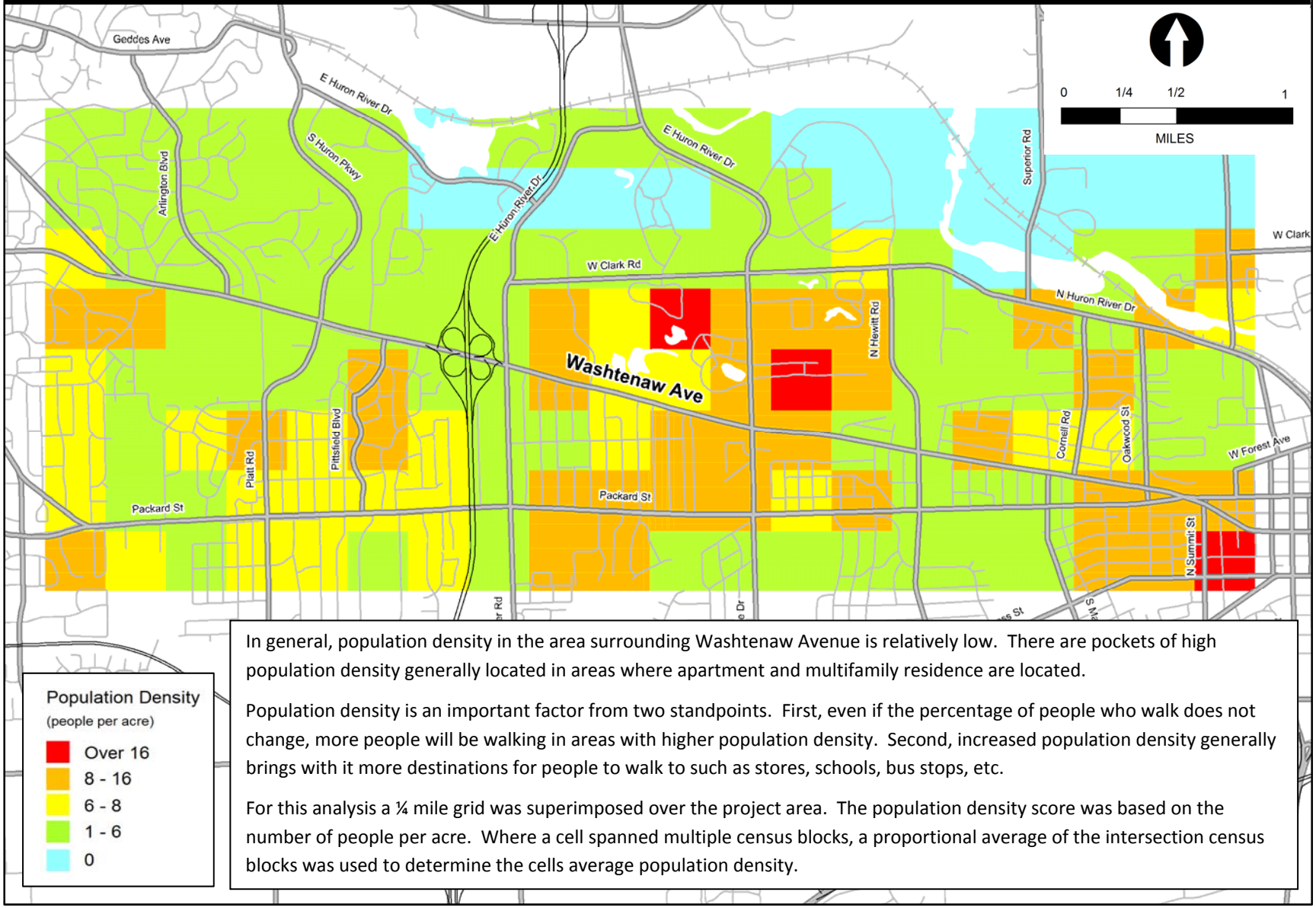
Properly implemented medians help to improve vehicular and pedestrian safety, reduce crashes and provide aesthetic appeal to a roadway by breaking up large blocks of continuous pavement.

Block Size Analysis



Block size is an excellent measurement of directness of travel. A block is an area that a person cannot pass through. These areas usually do not have any sidewalks, roadways or bike paths allowing access between two points. One example is an expressway where you may have to go a mile out of your way just to get to the other side. Block size has been shown to have a close correlation with the amount of pedestrian travel.

Demand Analysis - Population Density

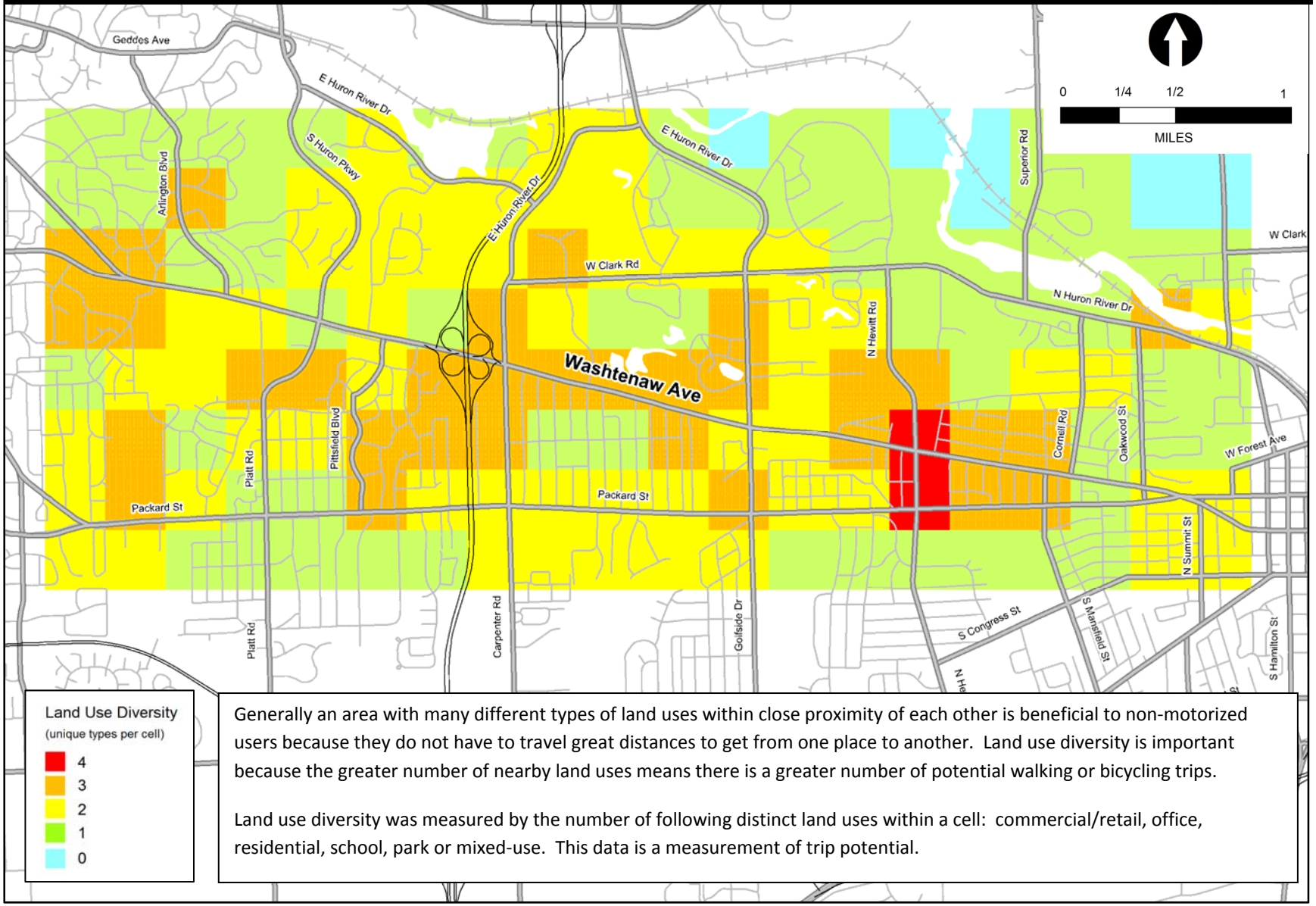


In general, population density in the area surrounding Washtenaw Avenue is relatively low. There are pockets of high population density generally located in areas where apartment and multifamily residence are located.

Population density is an important factor from two standpoints. First, even if the percentage of people who walk does not change, more people will be walking in areas with higher population density. Second, increased population density generally brings with it more destinations for people to walk to such as stores, schools, bus stops, etc.

For this analysis a ¼ mile grid was superimposed over the project area. The population density score was based on the number of people per acre. Where a cell spanned multiple census blocks, a proportional average of the intersection census blocks was used to determine the cells average population density.

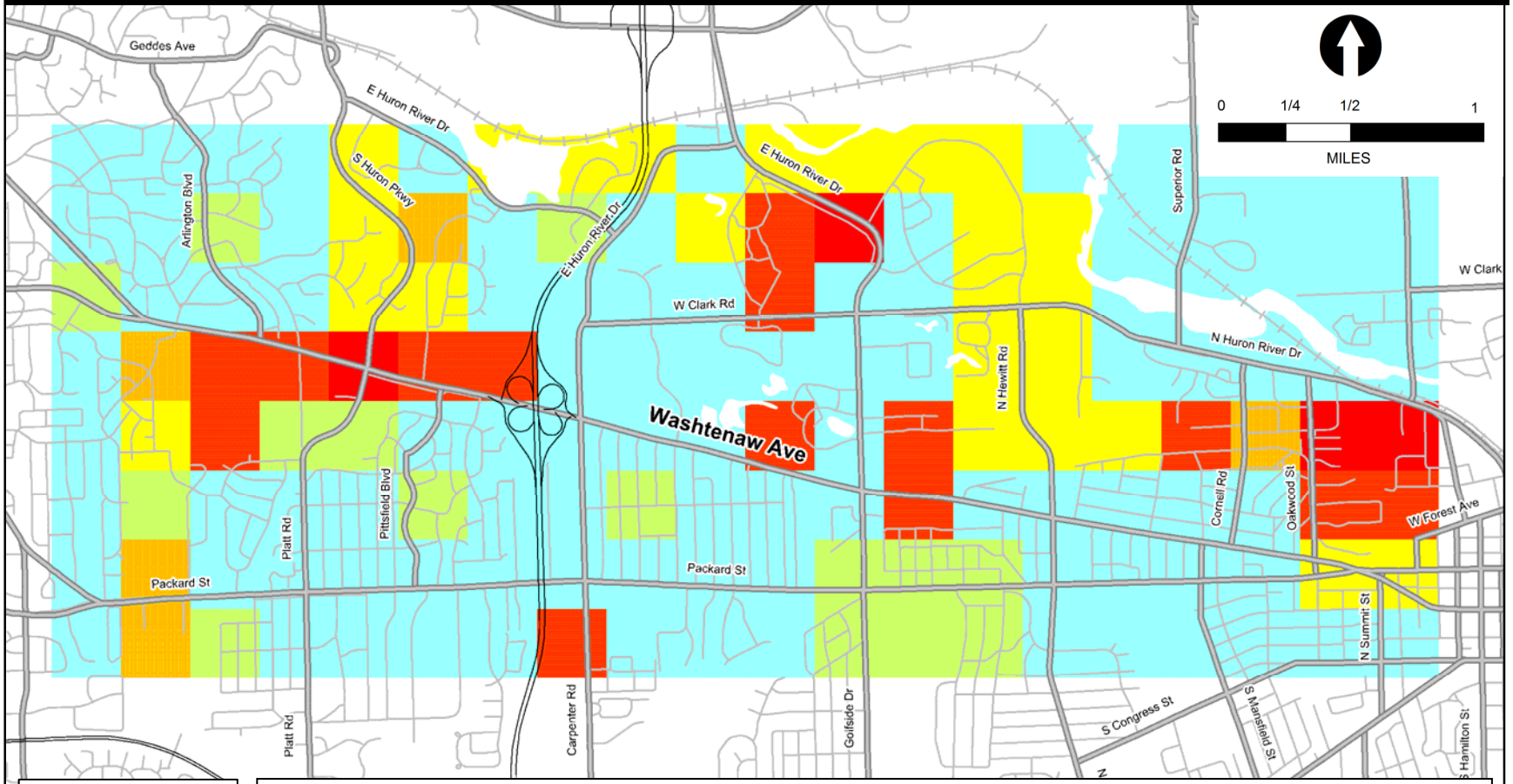
Demand Analysis - Land Use Diversity



Generally an area with many different types of land uses within close proximity of each other is beneficial to non-motorized users because they do not have to travel great distances to get from one place to another. Land use diversity is important because the greater number of nearby land uses means there is a greater number of potential walking or bicycling trips.

Land use diversity was measured by the number of following distinct land uses within a cell: commercial/retail, office, residential, school, park or mixed-use. This data is a measurement of trip potential.

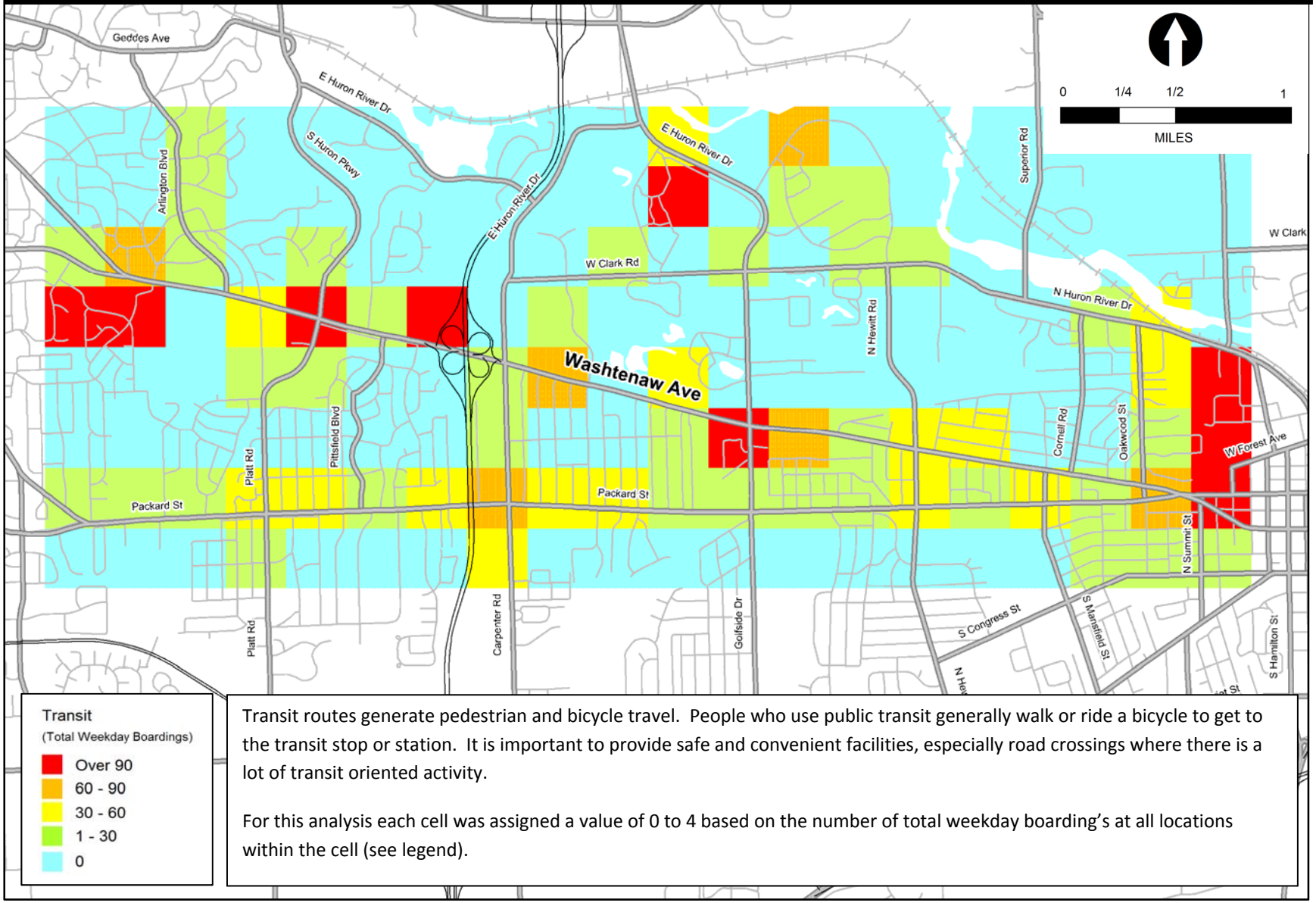
Demand Analysis - Activity Generators



Some land uses are even more likely to generate non-motorized travel than others. For this analysis activity generators included primary destinations for non-motorized user groups such as schools, parks, trails, recreation centers and regional shopping centers.

Each cell was given a score from 0 to 4 based on the number of concentration of special activity generators (see legend). One point was given for containing a school or park. A recreation center or a regional trail received an additional two points. Colleges, downtowns and regional shopping centers received 1 to 4 points based on the percentage of coverage within the cell.

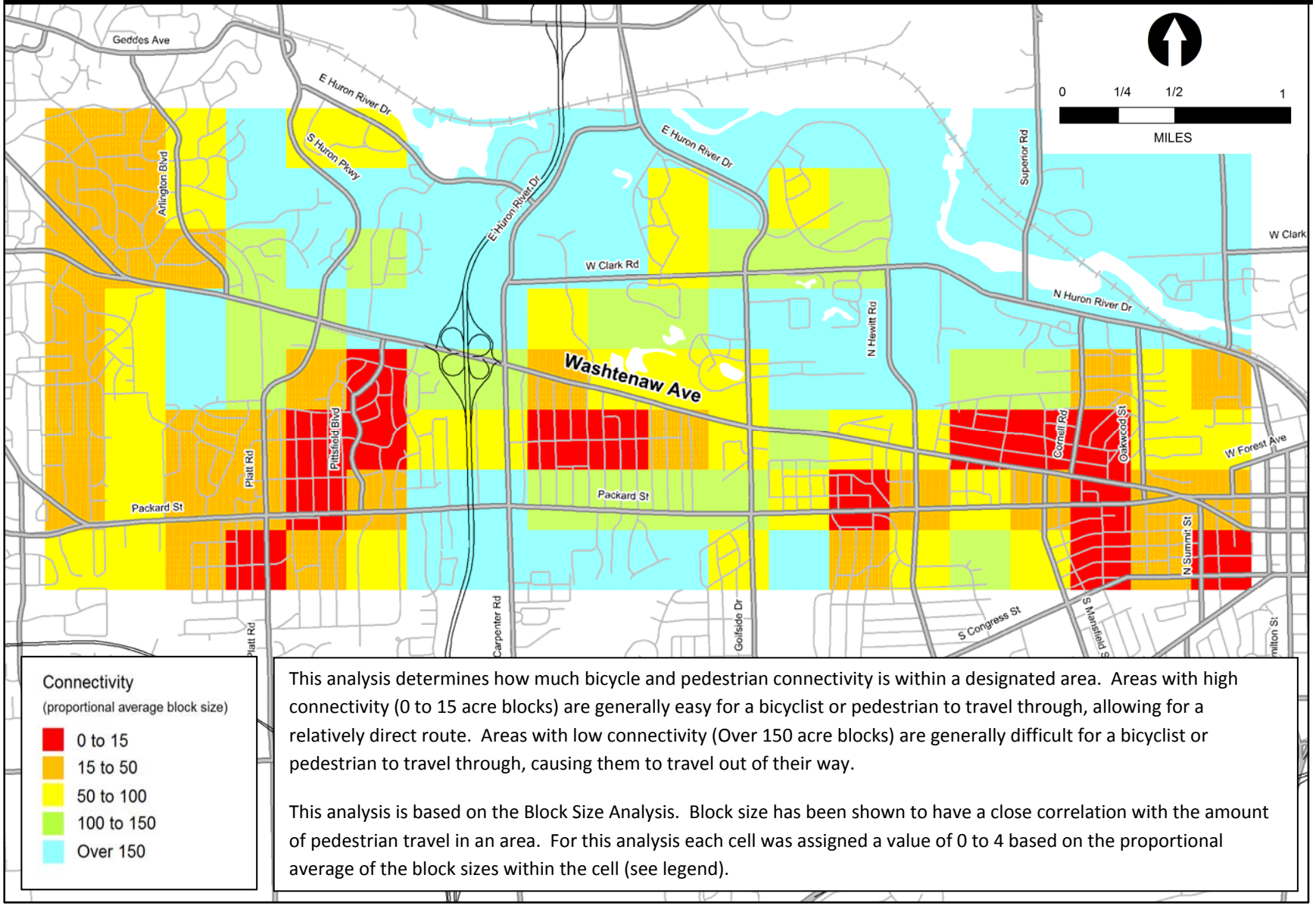
Demand Analysis - Transit Routes



Transit routes generate pedestrian and bicycle travel. People who use public transit generally walk or ride a bicycle to get to the transit stop or station. It is important to provide safe and convenient facilities, especially road crossings where there is a lot of transit oriented activity.

For this analysis each cell was assigned a value of 0 to 4 based on the number of total weekday boarding's at all locations within the cell (see legend).

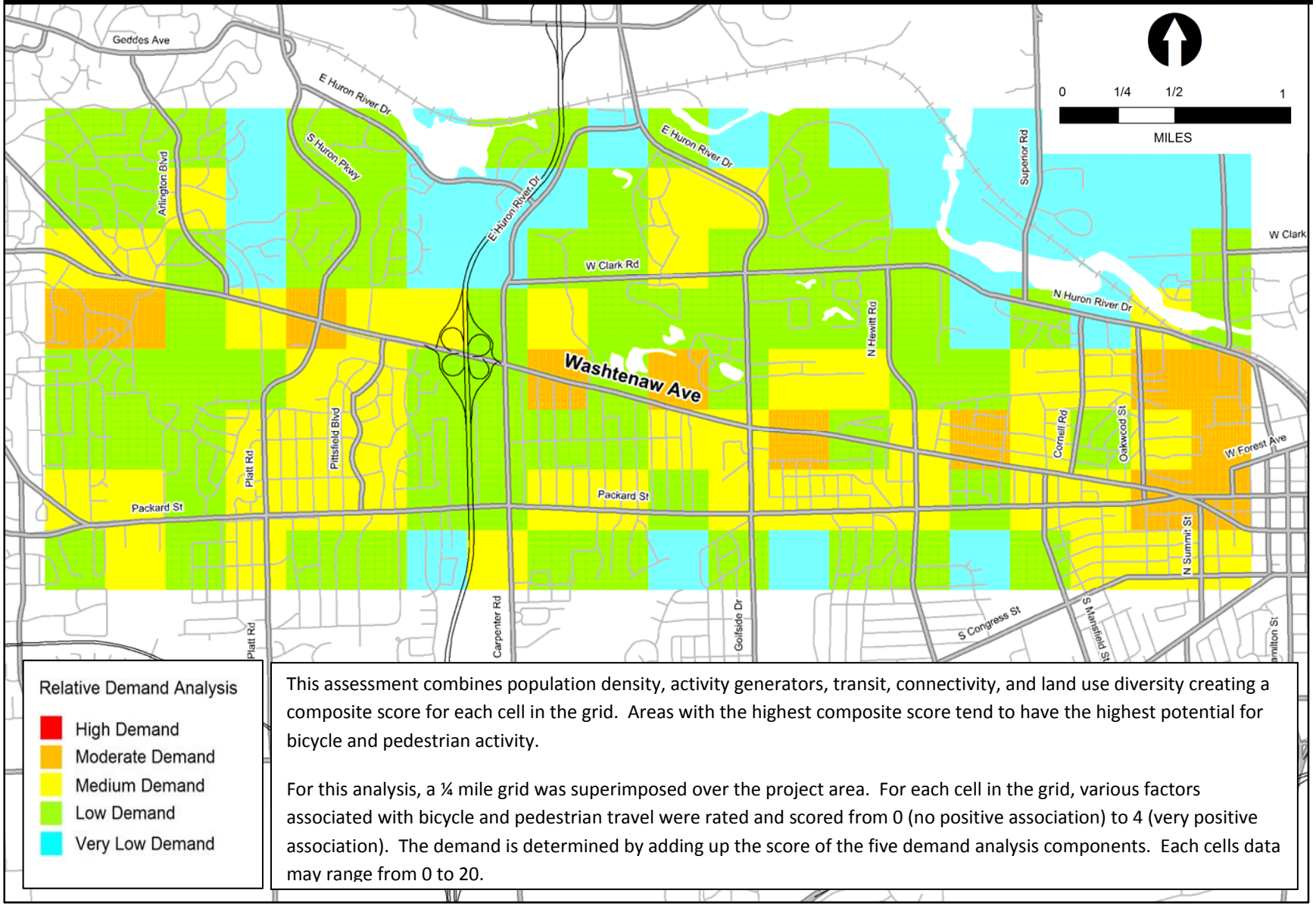
Demand Analysis - Connectivity



This analysis determines how much bicycle and pedestrian connectivity is within a designated area. Areas with high connectivity (0 to 15 acre blocks) are generally easy for a bicyclist or pedestrian to travel through, allowing for a relatively direct route. Areas with low connectivity (Over 150 acre blocks) are generally difficult for a bicyclist or pedestrian to travel through, causing them to travel out of their way.

This analysis is based on the Block Size Analysis. Block size has been shown to have a close correlation with the amount of pedestrian travel in an area. For this analysis each cell was assigned a value of 0 to 4 based on the proportional average of the block sizes within the cell (see legend).

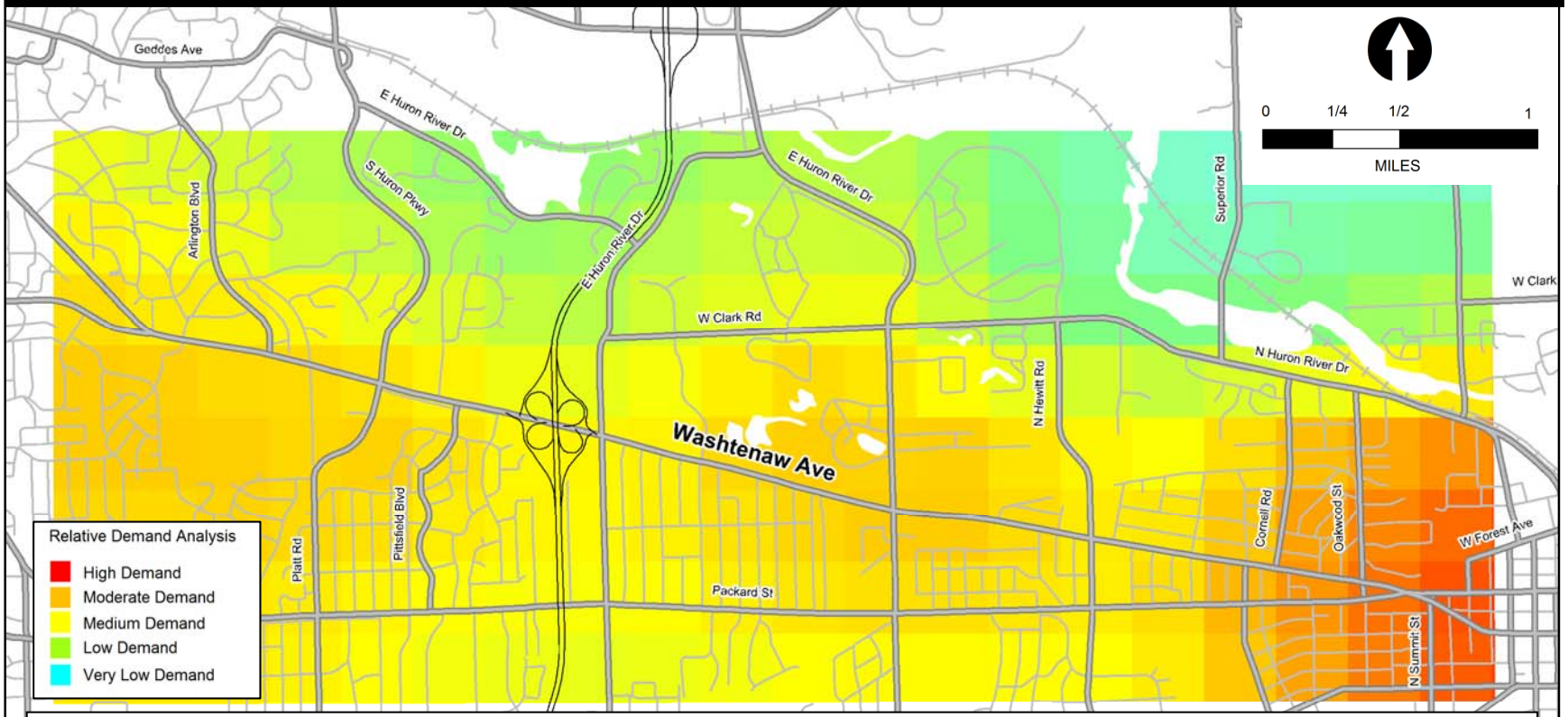
Composite Relative Demand Analysis



This assessment combines population density, activity generators, transit, connectivity, and land use diversity creating a composite score for each cell in the grid. Areas with the highest composite score tend to have the highest potential for bicycle and pedestrian activity.

For this analysis, a ¼ mile grid was superimposed over the project area. For each cell in the grid, various factors associated with bicycle and pedestrian travel were rated and scored from 0 (no positive association) to 4 (very positive association). The demand is determined by adding up the score of the five demand analysis components. Each cells data may range from 0 to 20.

Normalized Relative Demand Analysis

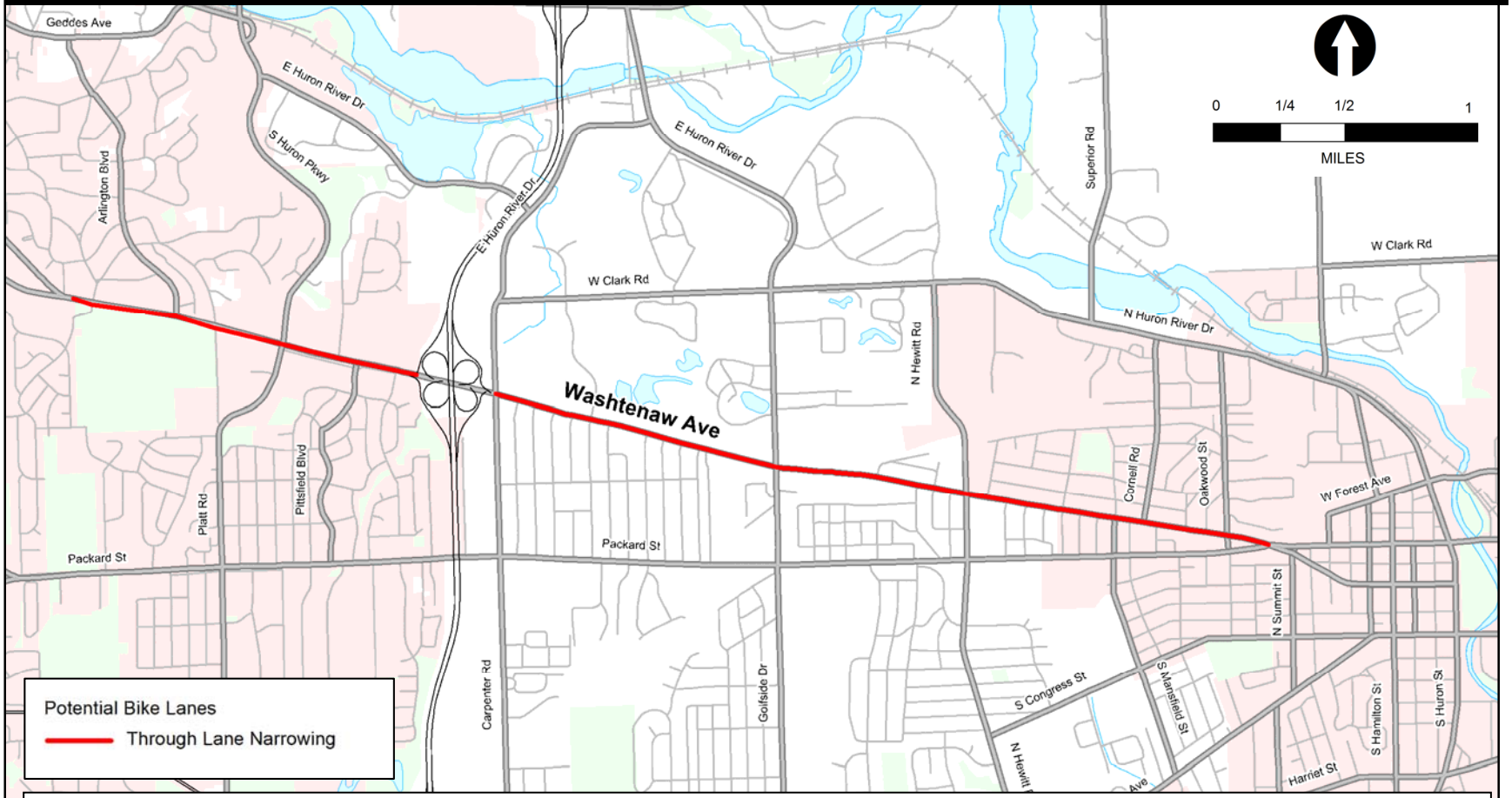


This assessment is a parcel based grid analysis that evaluates population density, activity generators, transit, connectivity and land use diversity. This analysis has been adjusted to highlight the areas where there is potential for the most bicycle and pedestrian activity. These are generally areas located where there is a combination of high population density, schools and parks, regional shopping and high connectivity.

The composite rating reflects an approximation of the latent demand for non-motorized travel in an area. Other factors may promote or inhibit actual non-motorized travel levels. The composite analysis is a useful tool to contrast with facility deficiencies, potential facilities and to prioritize improvements. This analysis is used to help prioritize improvements.

The demand is determined by adding up the score of the five demand analysis components. Then an inverse distance weighting calculation is performed where the value of all cells within 1.5 miles is used to determine the final value. The inverse distance calculation is a straight line weighting were the value of a cell at 1.5 miles has 0 influence.

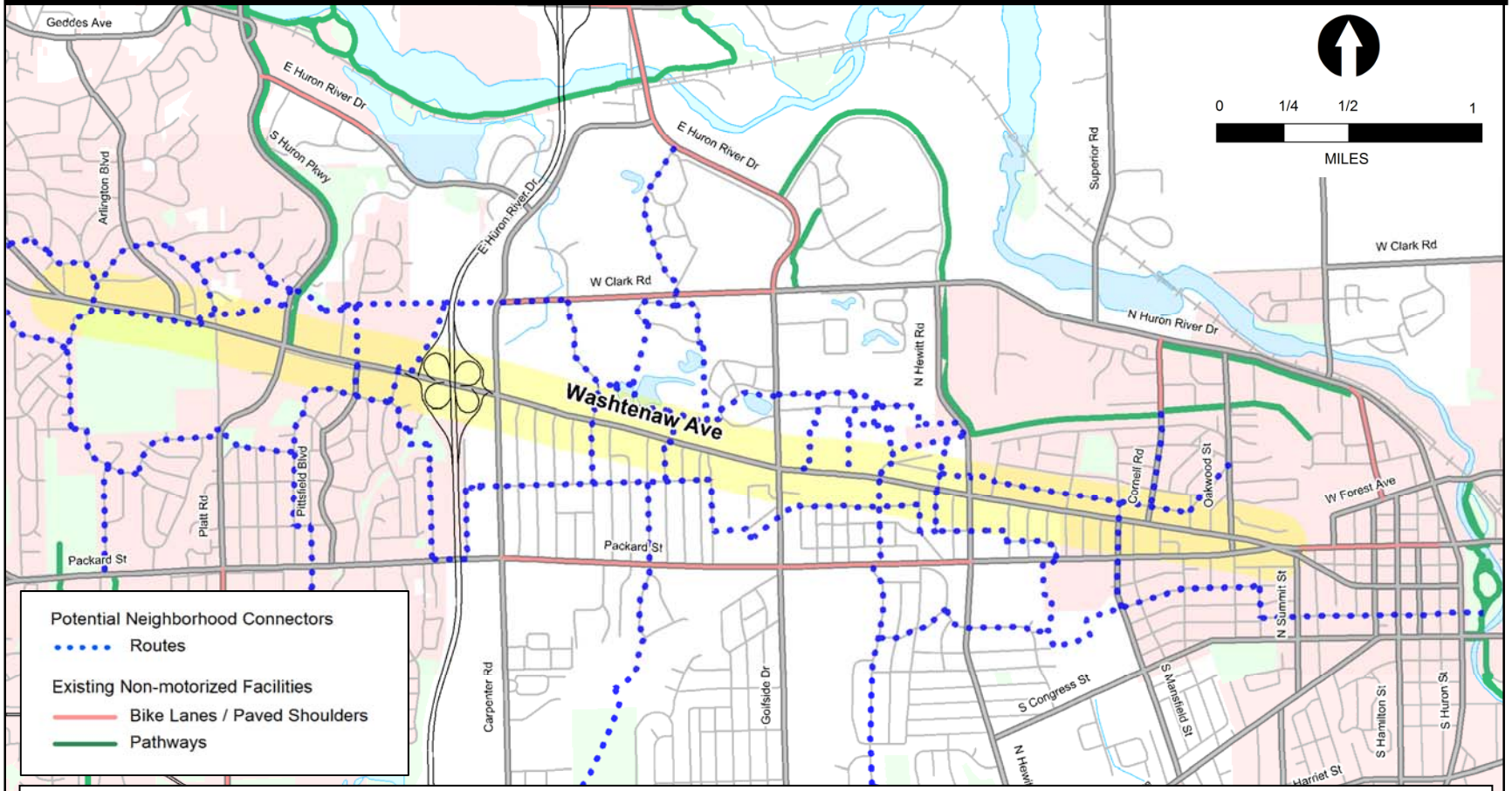
Potential Near-term Road Conversions



Based on the existing road width, there is potential to add bike lanes to Washtenaw Avenue along the entire corridor with exception of a short segment along the expressway interchange.

There is potential to add bike lanes east of Carpenter Road by restriping the existing travel lanes to 11’ with a 10’ center turn lane. However, this segment of road is concrete and existing seams can make it difficult to do lane redistribution. There is potential to add bike lanes west of the US-23 interchange by narrowing the travel lanes to 10.5’ with a 10’ center turn lane or median.

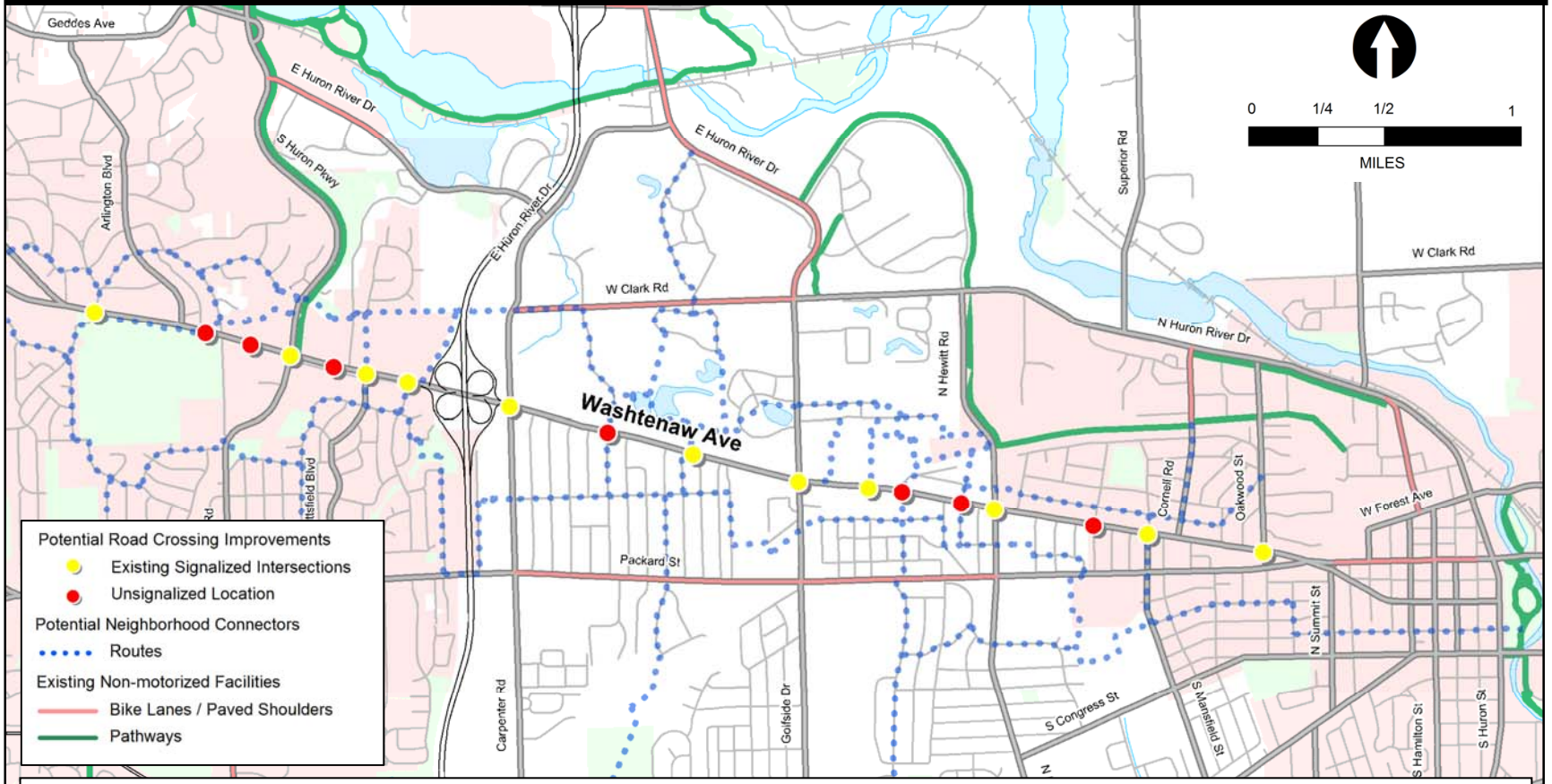
Potential Neighborhood Connector Routes



Neighborhood Connectors are non-motorized routes that help link pedestrians and bicyclist to primary destinations. These routes include both on-road and short off-road trails. They link neighborhoods and guide people to key destinations and major trails or recreation areas. These routes provide a great way to navigate through an area where arterial and collector roads may be undesirable.

Some of these routes may include traffic calming methods that slow and reduce the amount of motor vehicle traffic on the street. They may also incorporate sustainable design elements such as rain gardens and pedestrian amenities like art installations, benches and community gardens. They take on many different looks from avant-garde to traditional.

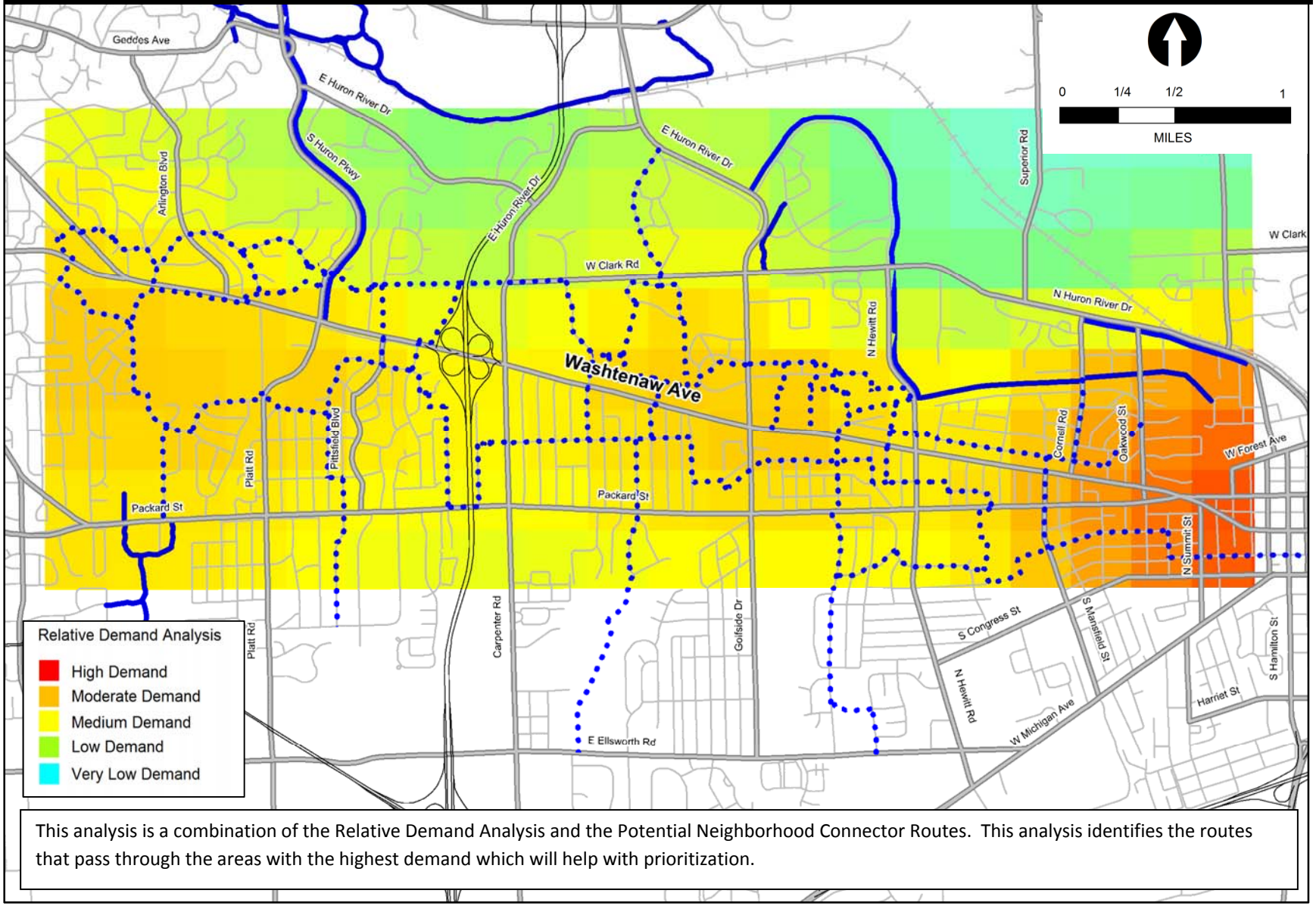
Potential Road Crossing Improvements



The majority of pedestrian trips are ¼ mile or less, or a five to ten minute walk at a comfortable pace. Any small forced detour in a pedestrian's path has the potential to cause significant time delays if not shift the trip to another mode (most likely motorized). Pedestrians will seek the most direct route possible and are not willing to go far out of their way. Thus, they will often cross the road whether there are crosswalks or not.

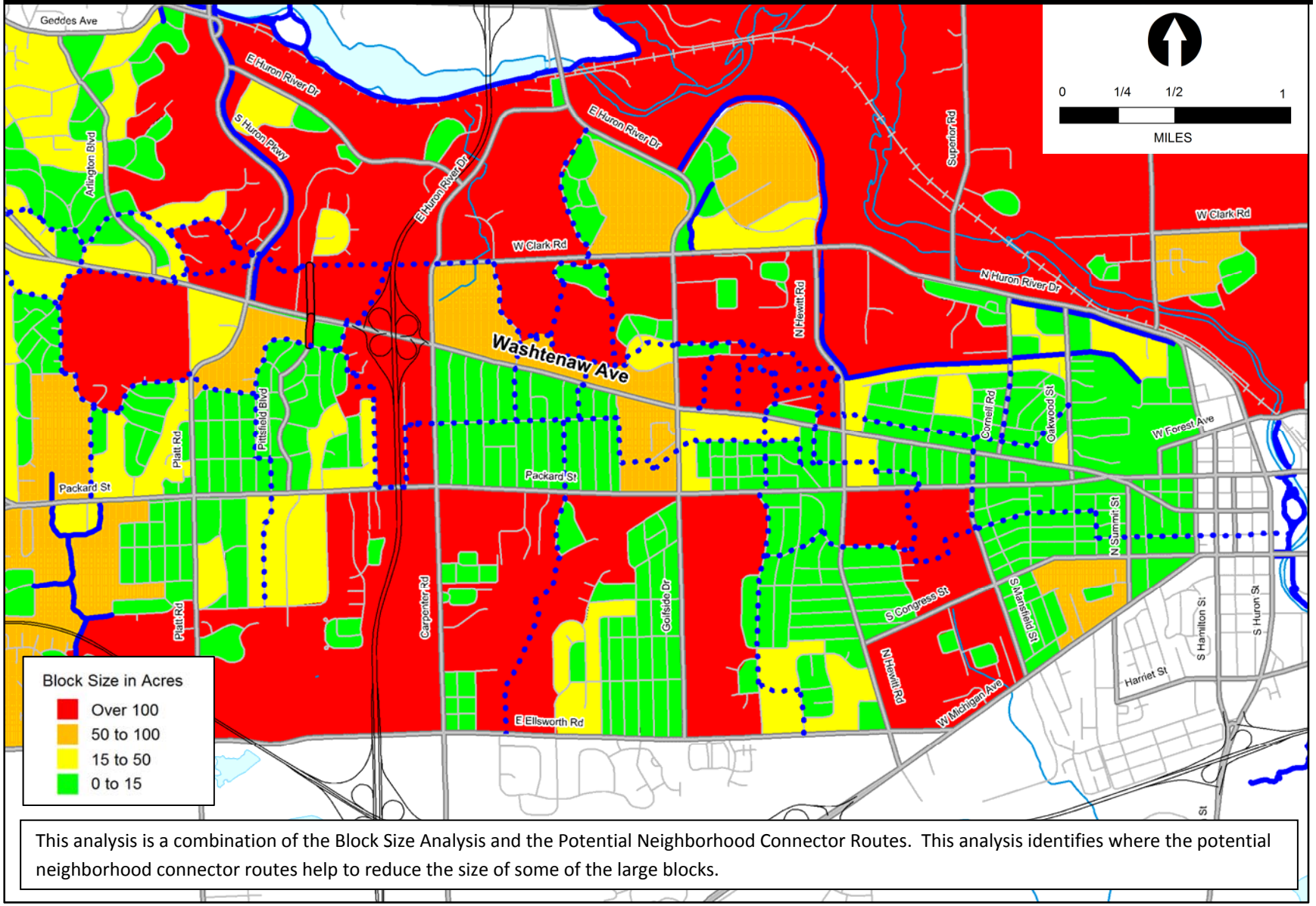
In order to encourage safe and legal pedestrian travel, well designed road crossings must be provided at the appropriate places. These places generally include areas where there is high pedestrian demand on both sides of the road, such as a business district or school zone. Road crossings should also be provided where a neighborhood connector or off-road trail crosses a major roadway.

Comparative Analysis – Neighborhood Connectors Location Analysis



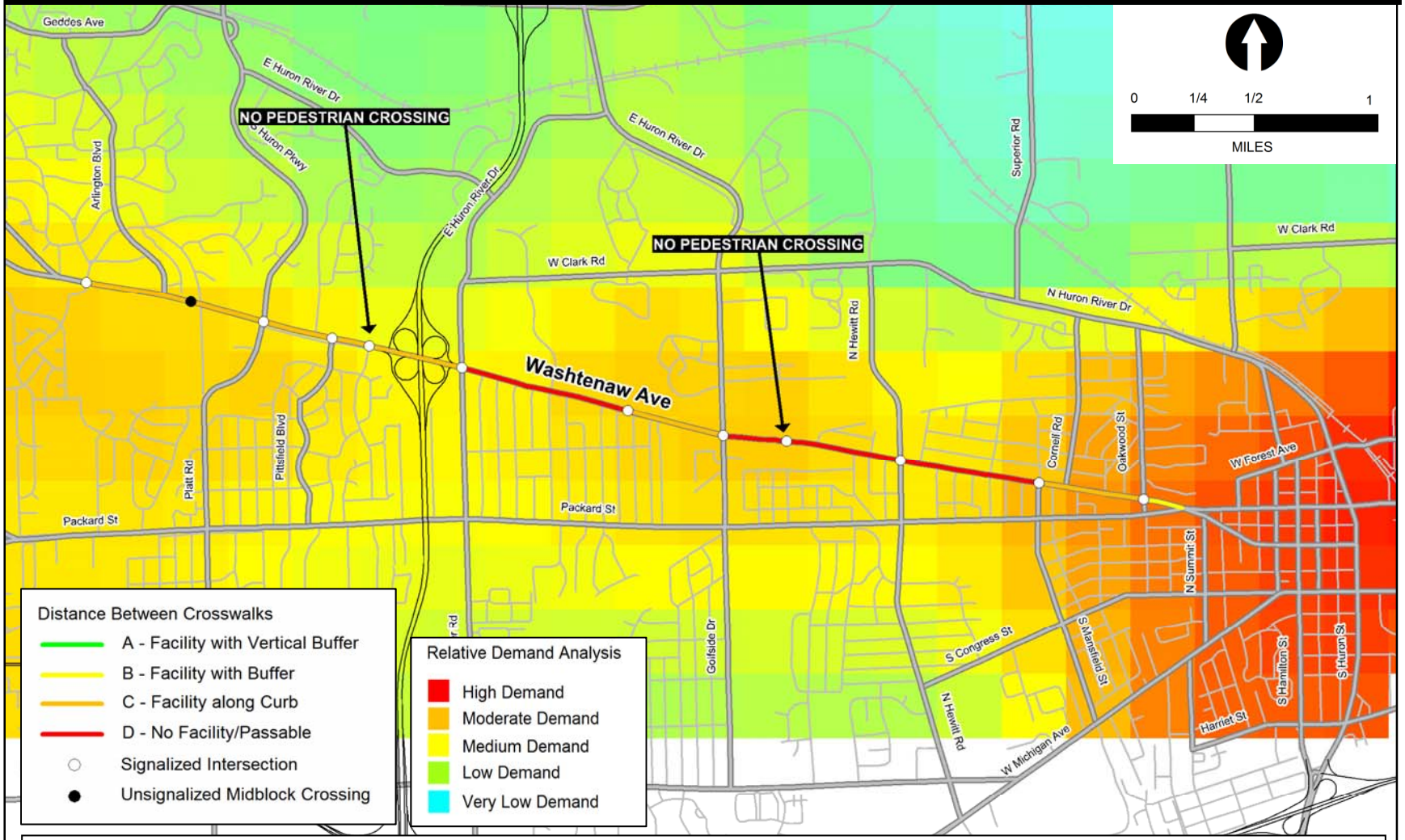
This analysis is a combination of the Relative Demand Analysis and the Potential Neighborhood Connector Routes. This analysis identifies the routes that pass through the areas with the highest demand which will help with prioritization.

Comparative Analysis – Neighborhood Connectors Impact on Large Blocks



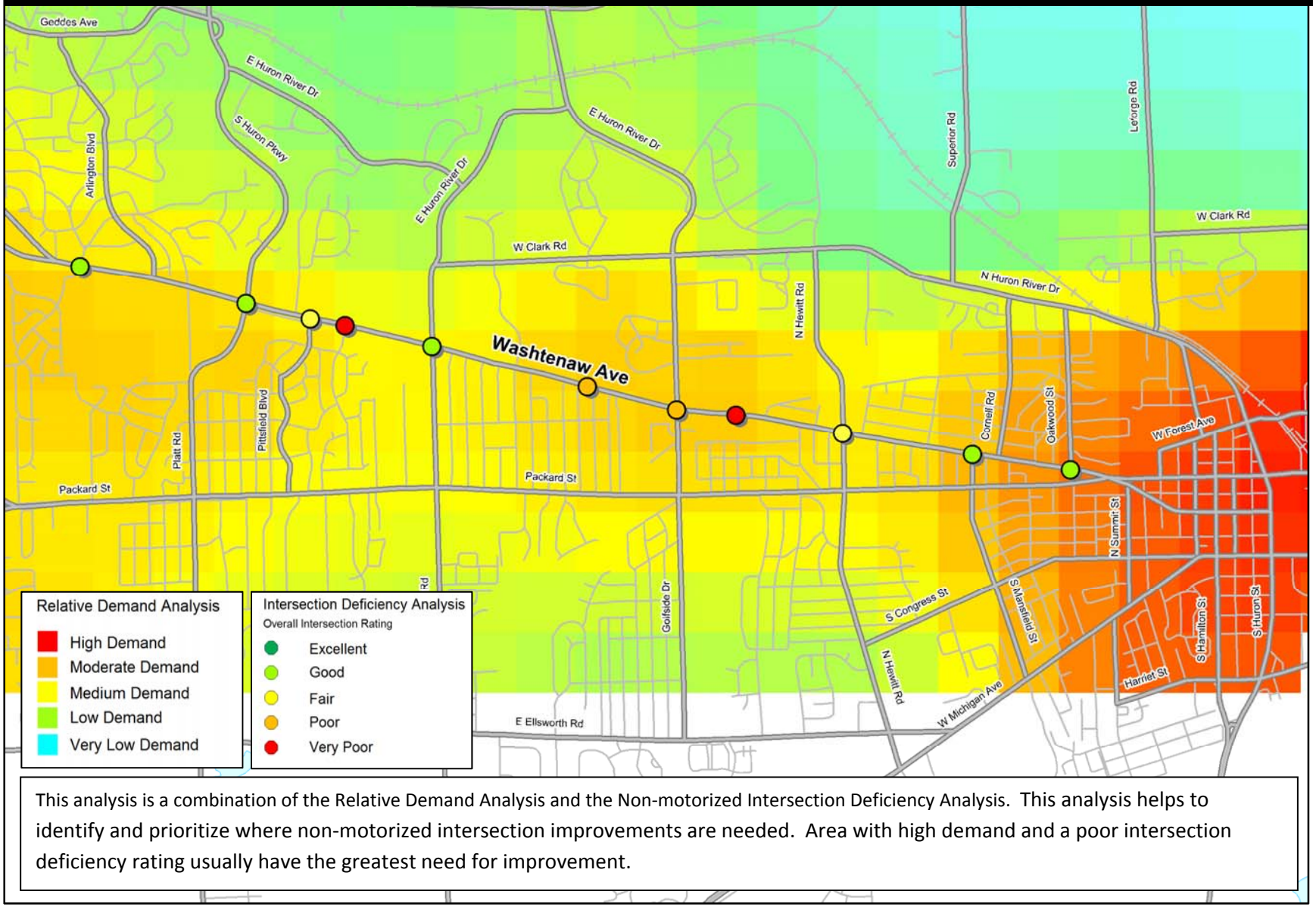
This analysis is a combination of the Block Size Analysis and the Potential Neighborhood Connector Routes. This analysis identifies where the potential neighborhood connector routes help to reduce the size of some of the large blocks.

Comparative Analysis – Demand for Road Crossing Improvements



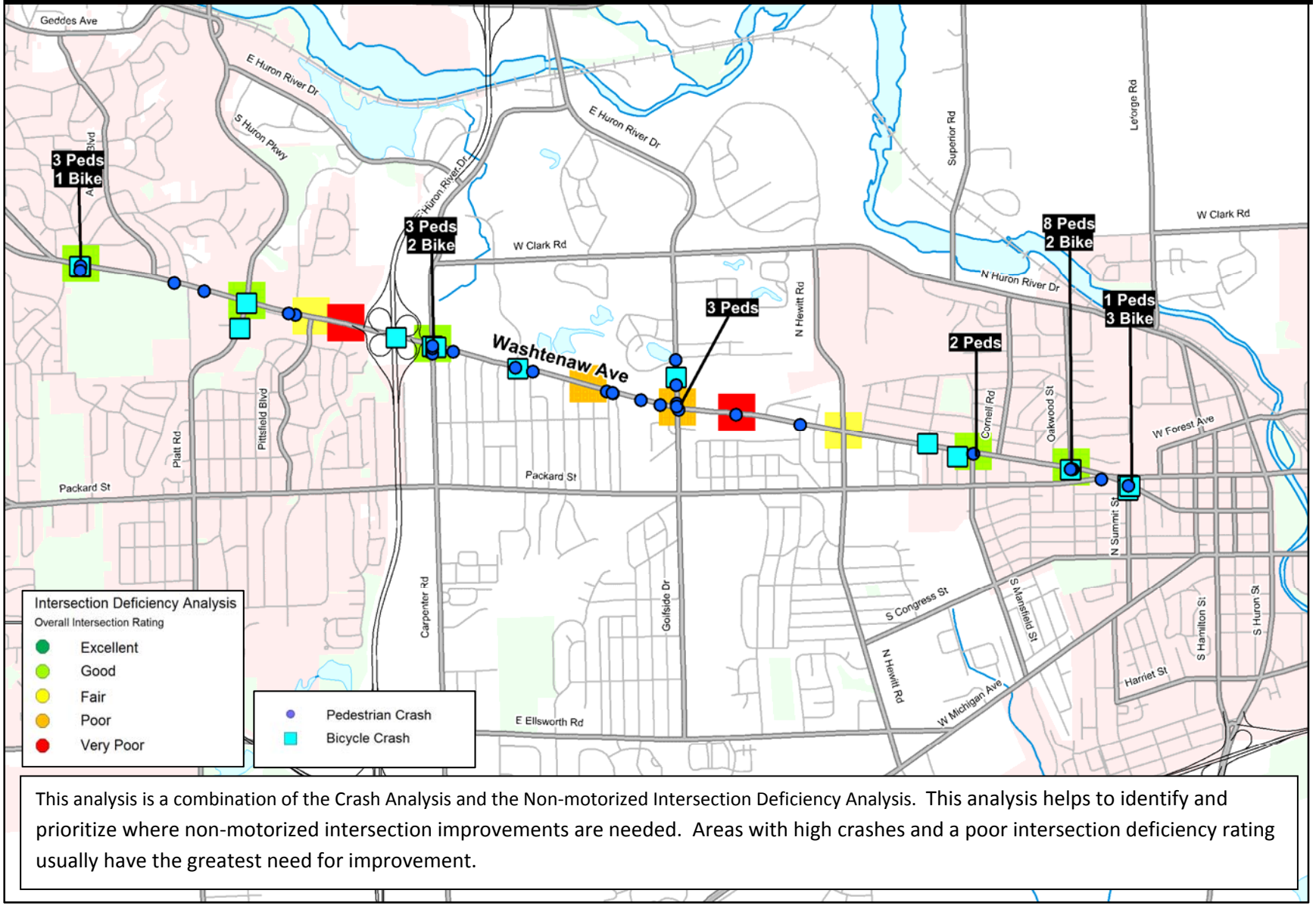
This analysis is a combination of the Relative Demand Analysis and the Crosswalk Spacing Analysis. This analysis helps to identify where additional road crossing improvements are needed. Midblock crossing improvements are needed where there is high demand on both sides of the road and long distances between crosswalks.

Comparative Analysis – Non-motorized Intersection Deficiency Demand



This analysis is a combination of the Relative Demand Analysis and the Non-motorized Intersection Deficiency Analysis. This analysis helps to identify and prioritize where non-motorized intersection improvements are needed. Area with high demand and a poor intersection deficiency rating usually have the greatest need for improvement.

Comparative Analysis – Demand for Safety Improvements at Signalized Intersections



This analysis is a combination of the Crash Analysis and the Non-motorized Intersection Deficiency Analysis. This analysis helps to identify and prioritize where non-motorized intersection improvements are needed. Areas with high crashes and a poor intersection deficiency rating usually have the greatest need for improvement.