CHAPTER 2 OUTLINE:

CHAPTER 2: EXISTING CONDITIONS

OVERVIEW

In order to propose a comprehensive bicycle system for the City of Raleigh, it is critical to examine the existing environment. The area's geographic and population characteristics significantly affect transportation, the environment, and everyday decisions by bicyclist, pedestrians, and motorists.

A comprehensive approach consisting of intensive research, analysis, fieldwork, GIS analysis, existing plan review, and Committee meeting discussion was conduct-ed to examine existing conditions. This work lays the foundation for the recom-mendations found later in this Plan. The findings are presented below.

HISTORY OF BICYCLING IN RALEIGH

The City of Raleigh has studied bicycle issues and worked to promote bicycling and facility construction since the late 1960s with the City Council appointment of bicycle committees. The Raleigh Bicycle and Bikeway Ordinance of 1974 was the first effort to produce policies and procedures for designing and constructing bicycle facilities. Three bicycle plans, as elements of comprehensive plans, were generated in 1979, 1983, and 1991. The 1983 plan was not adopted, but citizen interest continued to increase during that time.

The 1991 Raleigh Bicycle Plan is the most recent bicycle plan which is being superseded by this Plan. The plan sought to increase ridership, provide facilities, enhance the greenway system, provide a safer bicycling environment, and put forward basic standards for bicycle facilities. This plan focused on developing bicycle systems for both transportation and recreation.

Since 1991, the City of Raleigh has been slowly pursuing the goals of the last Bicycle Plan. The greenway system has developed dramatically increasing the opportunities for bicycling in the off-road environment. A number of roadways were constructed with wide outside lanes to provide additional space for bicyclists. In 2008, three stretches of bicycle lanes can be found in the entire City.

During the time of this planning process, the City of Raleigh is facing a number of challenges with rapid population and development increases, rising costs including gas prices, and a transportation system that is overburdened. The

Raleigh Comprehensive Plan update is occurring simultaneously with this Plan and is focused on sustainable development, which includes a focus on bicycle transportation. With rising gas prices, more and more bicyclists can be found throughout Raleigh for transportation, utilitarian, and recreational purposes. A summary of existing bicycling conditions is provided in the remainder of this chapter.

BICYCLING CONDITIONS

Friendliness

While the majority of the City of Raleigh is not bicycle-friendly today, the City does feature a number of areas and corridors that are somewhat bicycle-friendly. Generally speaking, these friendly corridors are greenways and streets featuring wide outside lanes. A map of existing facilities can be found in Map 2.1.

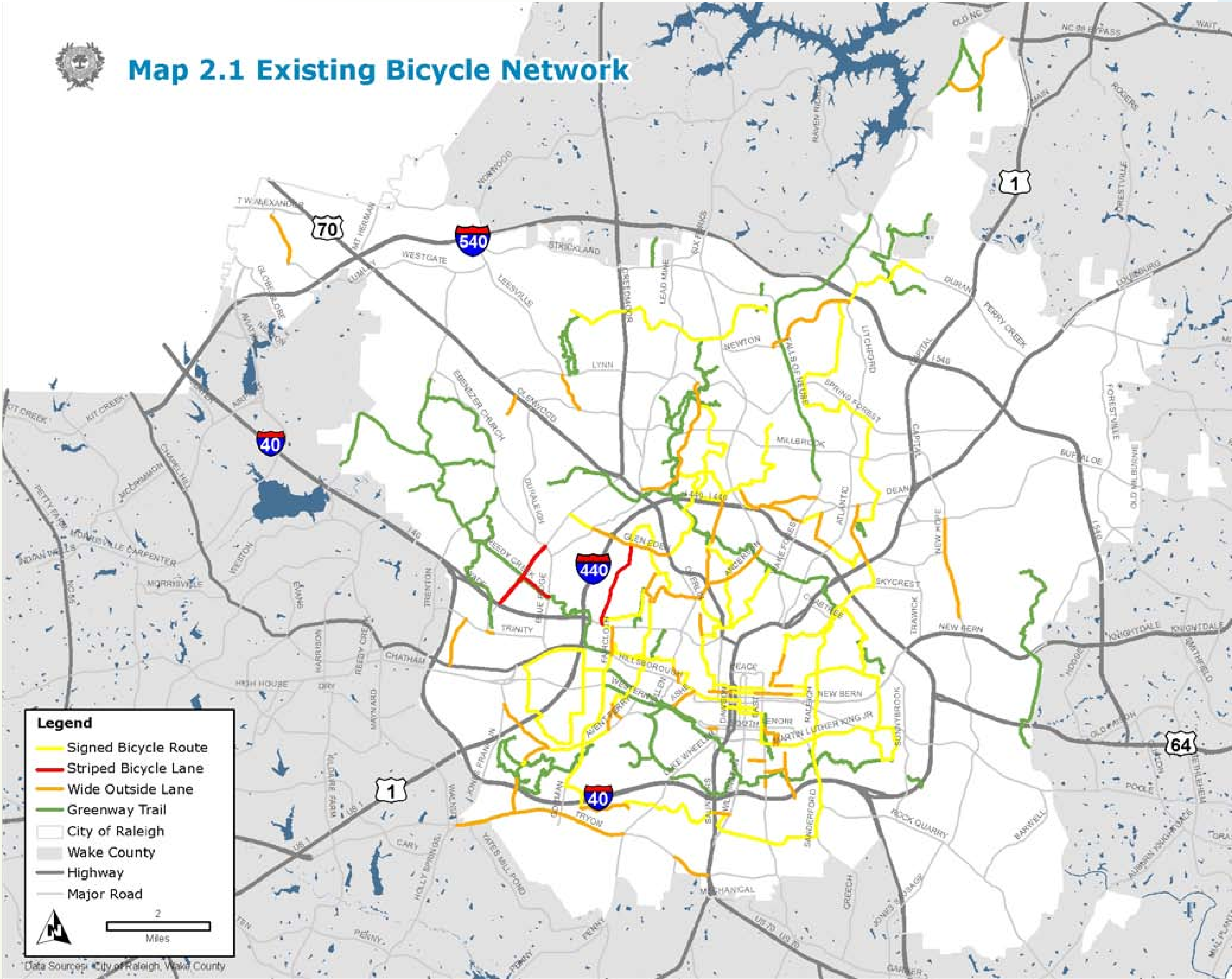
Above: Signs along trails in Raleigh indicate which ones are part of the Capital Area Greenway network.

The Raleigh greenway system is a tremendous resource, covering dozens of miles throughout the City. During the time of this planning effort, additional greenways are proposed and being developed.

Greenways in Raleigh (as of Fall 2008):

Alleghany Trail
Baileywick Trail
Beaver Dam Trail
Bent Creek Trail
Brentwood Trail
Buckeye Trail
Chavis Way
Crabtree-Oak Park Trail
Crabtree Creek - Umstead Trail
Crabtree Valley Trail
Durant Connector Trail
Durant Trail
Fallon Creek Trail
Falls River Connector trail
Falls River Trail
Gardner Street Trail
Glen Eden Park Trail
Honeycutt Creek Trail
Inman Connector Trail
Ironwood Trail
Lake Johnson Trail
Lake Lynn Trail
Lake Park Trail
Little Rock Trail
Loblolly Trail
Lower Walnut - Walnut Creek Park Trail
Lower Walnut - Worthdale Trail
Lower Walnut Creek Trail
Middle Crabtree Creek Trail
Neuse River Trail
North Hills Trail
Reedy Creek Trail
Rocky Branch Trail
Sawmill Trail
Shelly Lake Trail
Umstead Trails
Upper Walnut Trail
Wakefield Trail
Wes Millbrook Trail

Map 2.1 Existing Bicycle Network



Bicycle Lanes in Raleigh (as of Fall 2008):

Edwards Mill Road (Wade Ave to Duraleigh)
Reedy Creek Road (Edwards Mill Road to Blue Ridge Road)
Ridge Road (Wade to Blenheim)

The bicycle lanes have minimal bicycle lane markings and Ridge Road, because of on-street parking issues, has no bicycle lane marking at all.

Wide outside lanes are commonplace across the City of Raleigh, offering opportunities for striping for bicycle lanes. Wide outside lanes are lanes considered wide enough for bicyclists to ride outside the flow of automobile traffic. These are typically 13-14 feet wide. The following roadways contain segments of *wide outside lanes*:

Tryon Road
Faircloth Street
North Hills Drive
New Hope Road
Gorman Street
Garner Road
Lassiter Mill Road
Edwards Mill Road
Glen Eden
Leesville Road
Durant Road
Glascock Street
Highwoods Boulevard
St. Mary's Street

Deficiencies

Overall, conditions for bicycling have been negatively affected by the sprawling nature of development in Raleigh. The prevalence of service-oriented commercial development along nearly all of the major roadway corridors has produced an environment that is inconvenient and in many cases dangerous for cyclists. While the county roads and rural areas surrounding Raleigh serve as routes for some experienced cyclists, most cyclists and 'would-be' cyclists are not comfortable on the roadways, particularly in more developed areas. Even more experienced cyclists express safety concerns as traffic volumes and speeds increase with the growth and development of Raleigh and the surrounding region.

The main problems with the current roadway environment for cyclists in this area stem from four main sources:

- *The lack of on-road bicycle facilities:* When busy roadways are designed for cars only, cyclists are subject to automobiles passing too closely, and many times at higher speeds. Roadway corridors such as Six Forks Road, Wade Avenue, Capital Boulevard and Western Boulevard, are exclusively designed for the automobile. Only three bicycle lanes, totaling 5 miles in distance, can be found in the City of Raleigh. Otherwise, wide outside lanes and paved shoulders are a minority in the overall roadway system.

Above, from top: Bicycle lanes along Edwards Mill Road; bicycle lane and route along Ridge Road; and a bicyle lane and sidepath along Reedy Creek Road.

Above, from top: Connectivity of greenways and bicycle facilities is an important goal of this plan; Hillsborough Street is an example of a high-volume roadway that makes cycling in traffic difficult.

• *The high frequency of driveways and parking lot curb-cuts:* When automobiles are frequently entering and exiting the roadway, they present repeated hazards to cyclists as the automobile crosses the cyclists' path of travel. Regardless of whether or not a roadway has bicycle facilities, constantly turning vehicles will present dangers. Hazards are limited by diverting access points to side streets, combining them for adjacent businesses, and closing all redundant access points. Roadway segments with particularly high numbers of curb-cuts include Glenwood Avenue (US Hwy 70), Six Forks Road, and New Bern Avenue.

• *Improve bicycle access to greenways:* The City of Raleigh has an excellent greenway network, with all greenways eventually connecting into the street network. However, at public workshops, many greenway users noted that they could not ride their bicycle to nearby greenways because of unsafe on-road bicycling conditions. Improving on-road connections to greenways is especially important for less experienced cyclists, who prefer places to ride that are completely separated from automobile traffic, but need to be able to access the greenway network in the first place. Wayfinding signage to and from the greenway system are also in need of improvement.

• *Automobile traffic:* With rapidly increasing population and multiple-lane arterials serving a number of land uses, automobile traffic poses significant issues for bicyclists. High volumes and high speeds make bicycling in the on-road environment difficult on many roadways. Also, the mentality of motorists is one against bicyclists in the roadway. Education is a key issue for motorists who often do not realize that a bicycle is a legal roadway vehicle and the safety hazards that are created.

The Bicycle Level of Service (BLOS) Model

Note: For information on the background, development, and validity of the BLOS model, see Appendix F: Bicycle Level of Service Analysis (BLOS) →

The BLOS Model was used to evaluate bicycle suitability on roadways in the Raleigh area. The BLOS is a scientifically-calibrated method of evaluating the comfort level of bicyclists on a roadway segment, given existing bicycling conditions in relation to motor vehicle traffic. It uses objective, quantitative data to produce a measure of the level of service perceived by a typical bicyclist. Model inputs include measurable traffic and standard roadway factors such as:

- Lateral separation between bicyclists and adjacent motor vehicle traffic
- Presence and width of a paved shoulder or bicycle lane
- Volume and speed of motor vehicle traffic
- Percentage of heavy trucks
- Number of travel lanes
- Presence of on-street parking
- Pavement condition

The BLOS model should be used with the following considerations in mind:

- BLOS grades represent the perceived level of comfort experienced by a typical bicyclist.
- BLOS grades are not associated with safety or reported crashes.
- The BLOS model is a roadway segment analysis; it does not apply to intersections.
- Errors are inherent with data inputs and changing roadway and traffic characteristics.

For Raleigh, the BLOS model was used for most major arterial and collector roadways and encompassed 425 miles. These roadways were chosen because they serve the most traffic and provide the best connectivity between neighborhoods and destinations such as shopping centers, offices, and schools. Many of the minor roadways, including residential streets, that were not included in the analysis are more conducive to bicycling (and would likely have higher BLOS grades) because of lighter traffic volumes and speeds. Also, controlled access highways and interstates were not included because bicycling is illegal on these roadways. Appendix C provides a detailed description of the BLOS model used for Raleigh. The existing data and new measurements for the model are described in Appendix C.

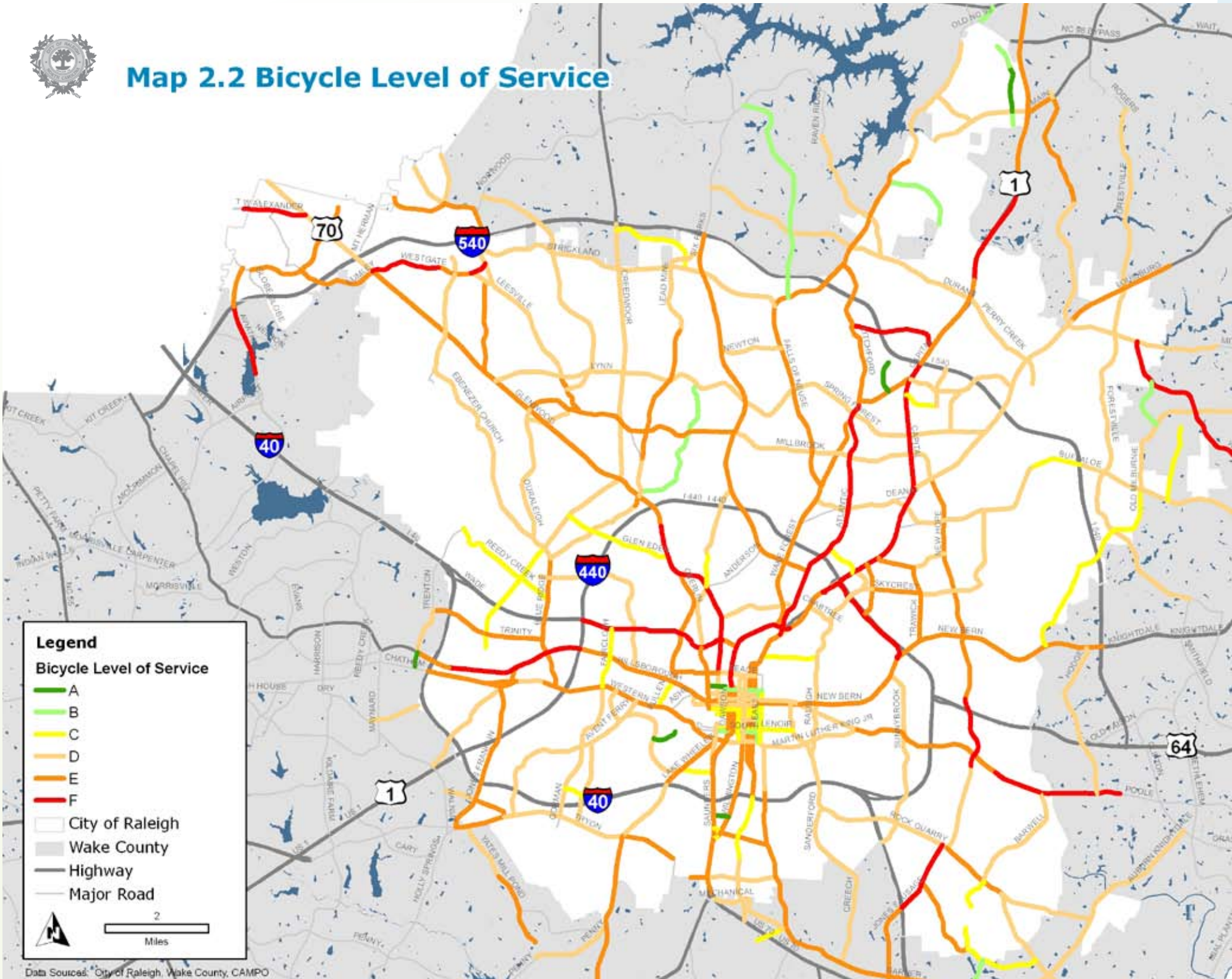
The BLOS model uses letter grades to describe existing conditions. Level "A" reflects the best conditions for bicyclists. This was a rare case for Raleigh roadways. Level "F" represents the worst conditions. The most common letter grade for Raleigh's arterials and major collectors was a "D." 89% of the measured roadways received a BLOS score of "D" or below. Only 0.7% received a score of "A." See Map 2.2 for the BLOS mapping, Chart 2.1 for the BLOS graph, and Table 2.1 for the BLOS summary.

Table 2.1 Raleigh Bicycle Level of Service (BLOS) Summary for Study Network Roadways

BLOS Grade	Miles	% Measured Miles	Segments
A	3.0	0.7%	11
B	14.0	3.3%	11
C	30.5	7.2%	34
D	198.5	46.7%	129
E	138.5	32.6%	106
F	40.5	9.5%	27
No grade*	184.2	N/A	131
Total	425.0	100.0%	449

**Segments with no grade include controlled access highways, interstates, and certain roadways lacking sufficient data at the time of this study.*

Map 2.2 Bicycle Level of Service



One application of BLOS is to test alternative roadway cross-sections and traffic scenarios. The example of the Hillsborough Street redesign project is utilized here. Currently, the section of Hillsborough Street between Horne Street and Logan Court is four lanes, no center turn lane, with on-street parking on one side. The new design features two lanes of travel, on-street parking on both sides, with a center median. This new design will likely divert traffic, thus reducing traffic volume and speeds. The graphic below shows the improvement in BLOS grade as these changes occur.

BLOS Alternative Comparisons Example: Existing Conditions on Hillsborough St.

BLOS Alternative Comparisons Example: Proposed Redesign of Hillsborough St.

Table 2.2: Comparison of Existing Conditions and Redesign of Hillsborough St.

Scenario	Through Lane	ADT	%Heavy Vehicle	Posted Speed	Wt	WI	Wps	Parking Occ.	Pavement Rating	BLOS Score (Grade)
Existing Condition	4	24,000	5	35	14	0	0	25	3	4.92 (E)
Redesign Enhancements without traffic diversion	2	24,000	5	25	23.5	12.5	7.5	100	5	3.6 (D)
Redesign Enhancements with 30% traffic diversion	2	17,080	5	25	23.5	12.5	7.5	100	5	3.4 (C)

Table 2.3: Comparison of BLOS Score for Different Cross-sections on Westgate Road (from Glenwood Ave to Leesville Road)

Roadway Cross-section	Scenario	Through Lanes	ADT	% Heavy Vehicle	Posted Speed	W_t	W_l	BLOS Score (Grade)	% Improvement in BLOS Score (compared to Future No-Build)
Two-lane undivided 24-ft cross-section with 12-ft lanes	Existing	2	14,700	6%	45	12	0	5.40 (E)	N.A.
Two-lane undivided 24-ft cross-section with 12-ft lanes	2015 No-Build	2	19,000	6%	45	12	0	5.53 (F)	N.A.
Five-lane 60-ft cross-section with 12-ft lanes	2015 TIP*	4	19,000	6%	45	12	0	5.18 (E)	6%
Five-lane 64-ft cross-section with 14-ft wide outside lanes	2015 TIP*	4	19,000	6%	45	14	0	4.92 (E)	11%
Five-lane 60-ft cross-section with 11-ft/13-ft lanes	2015 TIP*	4	19,000	6%	45	13	0	5.05 (E)	9%
Five-lane 60-ft cross-section with 10-ft/14-ft lanes	2015 TIP*	4	19,000	6%	45	14	0	4.92 (E)	11%
Five-lane 60-ft cross-section with 10-ft lanes and 4-ft striped bike lanes	2015 TIP*	4	19,000	6%	45	14	4	4.28 (D)	23%
Five-lane 68-ft cross-section with 12-ft lanes and 4-ft striped bike lanes	2015 TIP*	4	19,000	6%	45	16	4	3.90 (D)	29%
Five-lane 68-ft cross-section with 12-ft lanes and 4-ft striped bike lanes	2015 TIP*	4	19,000	3%	45	16	4	3.09 (C)	44%
Five-lane 68-ft cross-section with 12-ft lanes and 4-ft striped bike lanes	2015 TIP*	4	19,000	3%	35	16	4	2.90 (C)	48%

** TIP U-2918: SR 1837 (Westgate Road) from East of US 70 to SR 1822 (Leesville Road), 2.8 Miles -Widen to Multi-Lanes (CAMPO 2009-2015 TIP)*

Note: BLOS analysis assumed a pavement condition rating of 4.5, no on-street parking, directional traffic factor (D) of 0.51, peaking factor (K) of 0.1, and peak hour factor (PHF) of 0.92 for all scenarios

Crash Data

A central goal of this plan is to increase the safety of bicycle activity in the Raleigh area. To assess the current level of safety for non-motorized transportation, information about bicyclist crashes was gathered for the City of Raleigh (Data from NCDOT Traffic Safety Unit). Bicycle crash reports were analyzed for a 7-year period, 2000-2006. A total of 365 bicycle crashes occurred during this time period. 356 of the 365 were accurately geocoded and mapped as part of this planning process. Key findings about bicycle crashes in Raleigh are listed below. It should be noted that not all bicycle crashes are reported.

Above: In addition to using crash data to determine dangerous locations for bicyclists, public workshops were also held to receive direct input from the public (see Appendix A for more information).

- Out of the 365 total crashes, 102 or 28% occurred in the overnight hours (6pm-6am). 263 total incidences (or 72% of the incidences) occurred during the daytime hours (6am-6pm).

- There was a yearly average of roughly 52 crashes in the City of Raleigh.

- There were 5 bicyclists killed on Raleigh streets during the time period. An additional 12 bicycle-related crashes resulted in a disabling injury.

Map 2.3 (page 2-11) displays sites of the bicycle crashes along with a density surface indicating clusters of incidences. In general, bicycle crashes were concentrated in parts of the City with higher levels of bicycle activity, such as the major roadway and commercial corridors, near NC State University (where a number of students travel by bicycle), and near lower-income areas

where fewer people have access to automobiles. More specifically, these non-motorized crashes tended to occur more often on multi-lane roadways with high volumes of traffic, especially at intersections. Therefore, many of the bicycle facility improvements listed in the recommendations chapter are for these roadway corridors.

The top nine locations of repeated bicycle crashes are shown in Table 2.3 on the following page. The top 20 corridors of repeated bicycle crashes are shown in the following table, Table 2.4. Clearly, the top crash corridor is Hillsborough Street, with a number of incidences occurring on major Raleigh arterials.

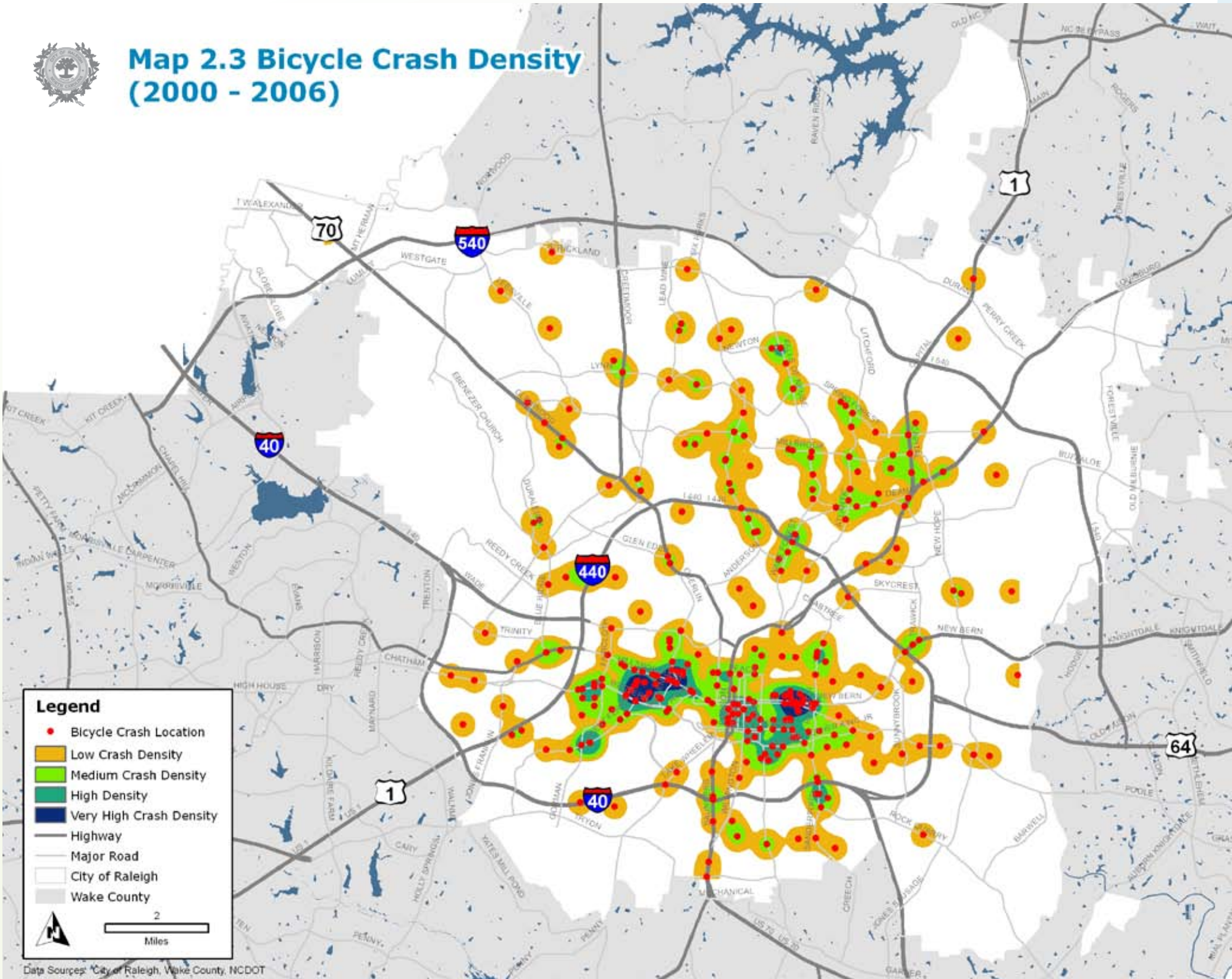
Table 2.4 Top Nine Locations of Repeated Bicycle Crashes, 2000-2006:

Road	*Cross Road*	*# of Crashes*
Avent Ferry Road	Trailwood Drive	6
Hillsborough Street	Enterprise Street	4
Dan Allen Drive	Cates Avenue	4
Avent Ferry Road	Western Blvd.	3
Hillsborough Street	Oberlin Road	3
Hillsborough Street	Blue Ridge Road	3
Edenton Street	Pettigrew Street	3
Falls of Neuse Road	Newton Road	3
Wake Forest Road	Navajo Drive	3

Table 2.5 Top Twenty Corridors of Repeated Bicycle Crashes, 2000-2006:

Corridor	*# of Crashes*	*Corridor*	*# of Crashes*
Hillsborough Street	26	Atlantic Avenue	9
New Bern Avenue	16	Cates Avenue	9
Avent Ferry Road	13	Glenwood Avenue	7
Dan Allen Drive	13	New Hope Church Rd	7
Falls of Neuse Road	12	Trailwood Drive	7
Six Forks Road	12	Wake Forest Road	7
Spring Forest Road	11	Jones Street	6
Capital Blvd	10	Oberlin Road	6
Rock Quarry Road	10	Leadmine Road	5
Western Blvd.	10	Lynn Road	5
		MLK Jr Blvd	5

Map 2.3 Bicycle Crash Density (2000 - 2006)



TRIP DESTINATIONS

People currently drive, walk, or bike to a variety of destinations across Raleigh for vari-ous purposes. These destination points are referred to in this document as trip attractors. Map 2.4 shows important trip attractors across the City. The most common categories of bicycle trip attractors in Raleigh include:

- Downtown
- Universities (NC State University, Meredith College, Shaw University, Peace College, Wake Technical Community College, St. Augustine's College)
- Shopping locations (grocery stores, shopping centers, restaurants, downtown)
- Parks and greenways
- Community and recreation centers
- Historic and other points of interest
- Places of employment (Downtown, office centers, hospitals, retail areas)

Each of these categories of bicycle trip attractors was considered when determining locations for the physical bicycle improvements recommended in Chapter 4. They represent important starting and ending points for bicycle travel and provide a good basis for planning ideal routes.

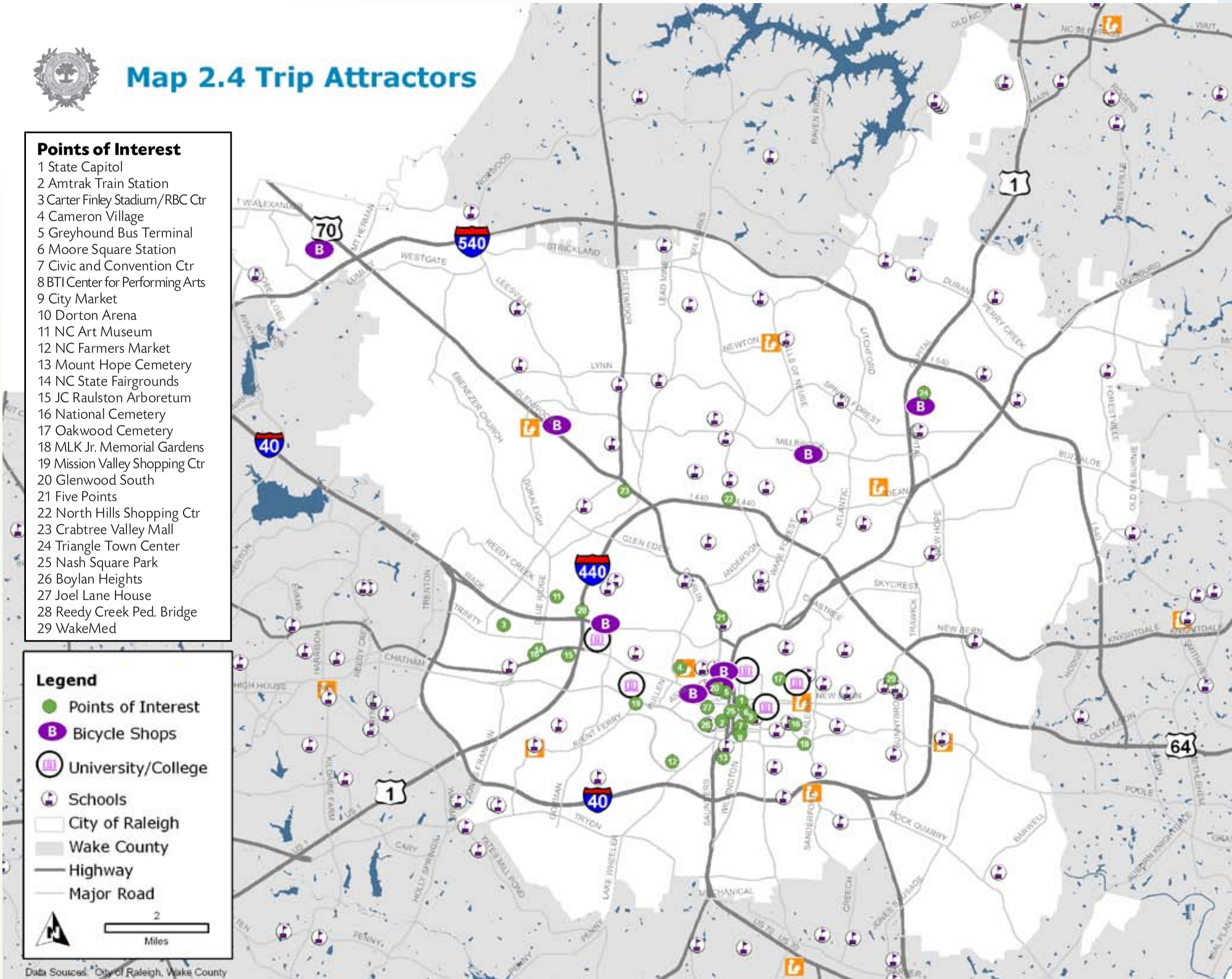
Bicycling Conditions at Destinations

As part of this planning process, major destinations in Raleigh were examined to determine both strengths and weaknesses of sites in terms of providing adequate end-trip facilities such as bicycle parking, storage facilities, and showers. Overall trends of these areas were examined.

Destinations studied were:

North Carolina State University
Peace College
Meredith College
Cameron Village
North Hills Shopping Center
Wake Medical Center
Raleigh Museums
Raleigh Convention Center
Shaw University
Saint Augustine's College
Wake Technical Community College
Ridgeway Shopping Center
Crabtree Valley Mall
Downtown Raleigh Districts
Pullen Park

Map 2.4 Trip Attractors



In general, additional bicycle parking is needed throughout the City of Raleigh, especially in the Downtown and NC State areas and at other destinations. A number of examined destinations featured bicycle racks and other amenities at sites including NC State University, Cameron Village, and the North Carolina Museum of Art. Destinations such as Ridgewood Shopping Center and Downtown Raleigh continue to draw bicycle riders despite a low number of bicycle facilities. One of the destinations observed with apparent deficiencies in the facilities offered to bicyclists was Downtown Raleigh, where many people resort to securing their bikes to tree grates or light poles due to insufficient and/or inconvenient bicycle racks.

For a complete summary report of bicycle facilities at major destinations, see Appendix G.

DEMOGRAPHICS

From 2000 to 2006, Wake County was the 14th fastest growing county in the United States. The population of the City of Raleigh in 2000 was 276,093 persons and the July 2008 estimate was 380,173. This tremendous growth presents need and opportunity for providing multi-modal transportation options to address smart growth and sustainability. While it is clear that population growth is a key issue that needs addressing, more specific census data allows for an analysis of population characteristics for the City of Raleigh as it portrays bicycling conditions and need.

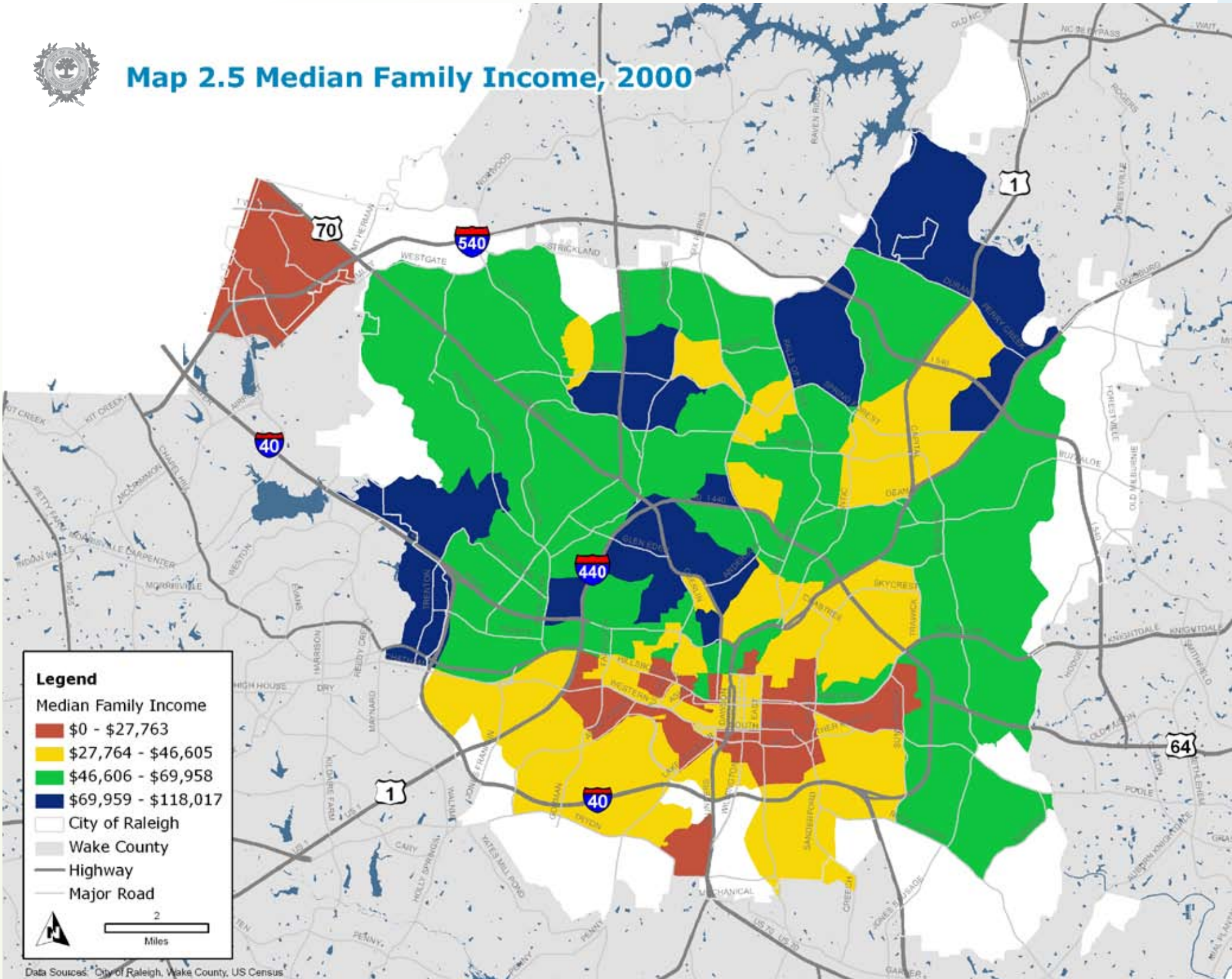
Considering more specific items such as population density, median family income, vehicle ownership, and bicycle mode share in a geographic framework provides a means for recommending facility and programmatic needs described later in this Plan.

Map 2.5 presents 2000 median familiy income by census block group. Areas of lower income may represent areas of increased need and dependence on a bicycle for transportation.

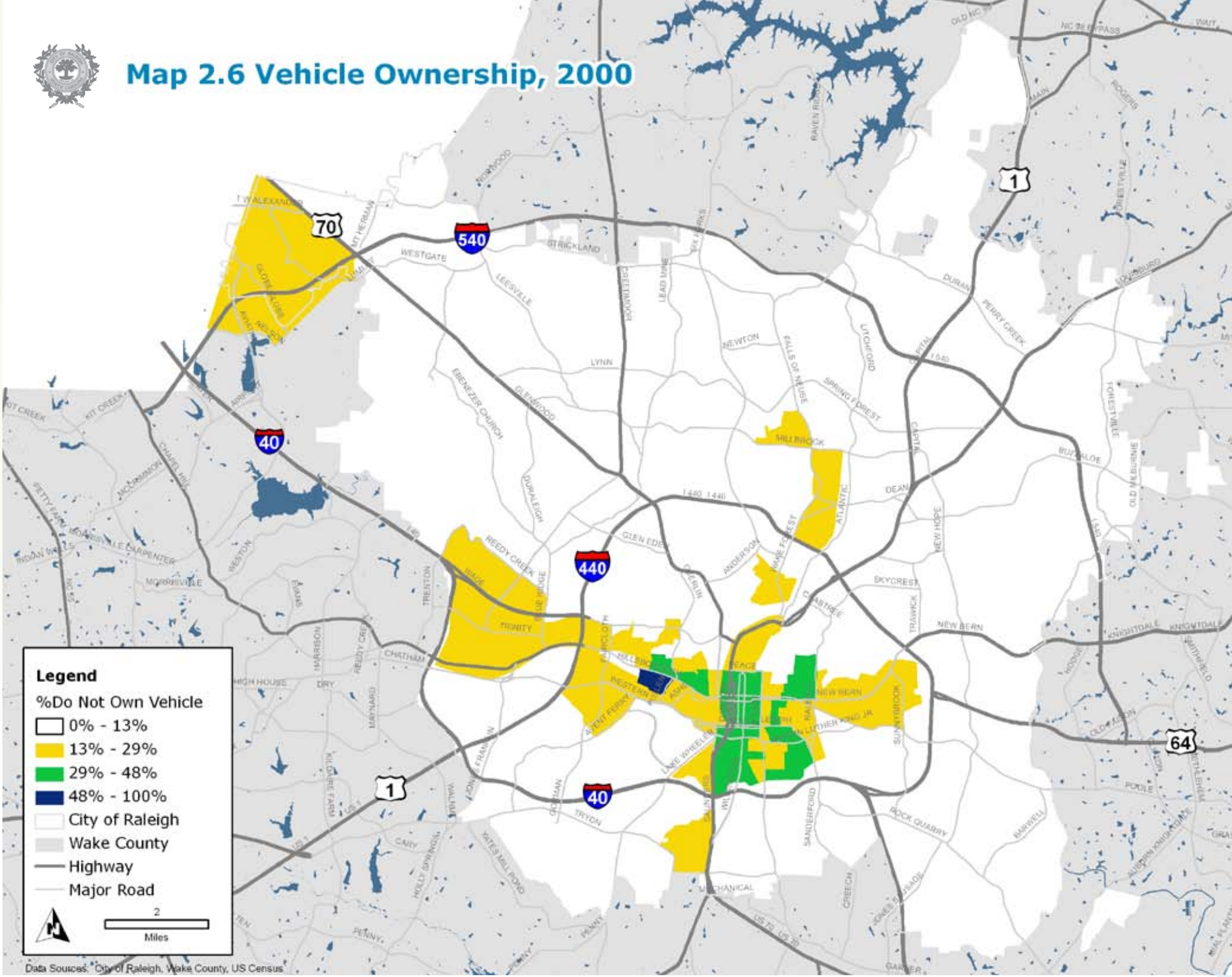
Map 2.6 shows 2000 vehicle ownership by census block group. This is another surrogate for locating lower-income areas, multi-use areas, and college populations and more specificically presents areas in greater need of bicycle facilities. Because of these economic circumstances , these groups are more likely to be in need of a modernized bicycle and pedestrian networks to access activities.

Map 2.7 shows 2000 bicycle mode share by census block group. While the City of Raleigh as a whole has a low bicycle mode share (0.3%), there are locations in which bicycle commuting is more commonplace. These areas may again present greater demand and need for bicycle facilities.

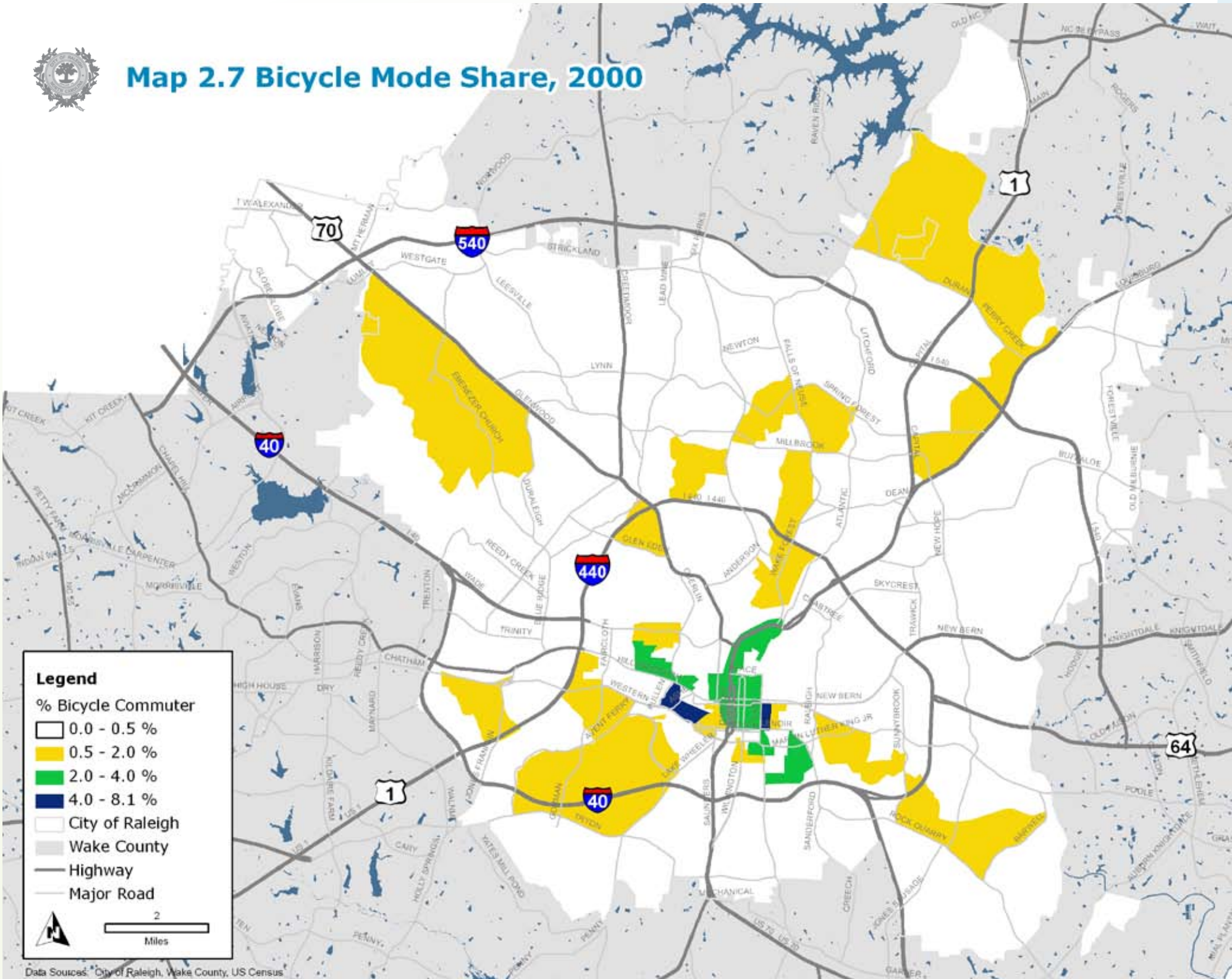
Map 2.5 Median Family Income, 2000



Map 2.6 Vehicle Ownership, 2000



Map 2.7 Bicycle Mode Share, 2000



LAND USE AND DEVELOPMENT PATTERNS

Current land use and zoning (zoning shown in Map 2.8) is a result of development activity over the past few decades. Multiple land uses can be found throughout Raleigh with distinct patterns emerging, especially along roadways. These patterns and characteristics have a major influence on bicycle transportation. Proximity of uses and types of uses matter in a person's choice to bicycle, along with the quality of environment, ease of access, and safety.

Land use was considered and analyzed during this process to determine bicycle connectivity needs between multiple land uses, and to establish bicycle network priorities.

Map 2.8 Zoning