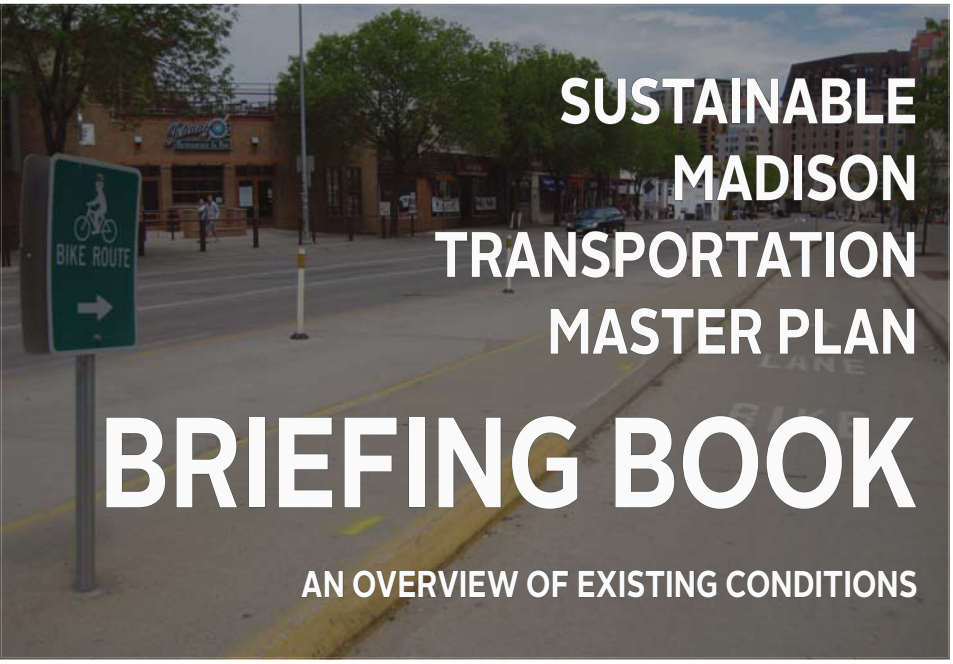

SUSTAINABLE MADISON TRANSPORTATION MASTER PLAN

BRIEFING BOOK

AN OVERVIEW OF EXISTING CONDITIONS

MADISON IN MOTION

Prepared for the

City of Madison

Department of Planning and Community and Economic Development

September 2014

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Contents

BRIEFING BOOK

INTRODUCTION

The Madison in Motion: Sustainable Madison Transportation Master Plan is a citywide policy and capital improvement project plan that will prepare Madison's transportation system to support the way the city grows and evolves. It is intended to cover a 25- to 30-year horizon and will address all travel modes in Madison. The plan will tie into current visioning and land use planning efforts that are defining the form that Madison wants to take into the future, and it will emphasize opportunities to use transportation projects and maintenance of the system to serve a broader range of travel options, to connect key destinations in the city, and to contribute to Madison's quality of life.

What the Briefing Book is

Planning efforts such as Madison in Motion usually include a study and documentation of existing conditions and an assessment of transportation needs in their early stages. The Madison in Motion team has undertaken these parts of the plan but understands that they need to be communicated in a way that captures Madison's day-to-day community issues and that appeals to a wide audience, especially members of the Madison community who may not be familiar with local plans and policies or how transportation decisions are often made.

MADISON IN MOTION

BRIEFING BOOK

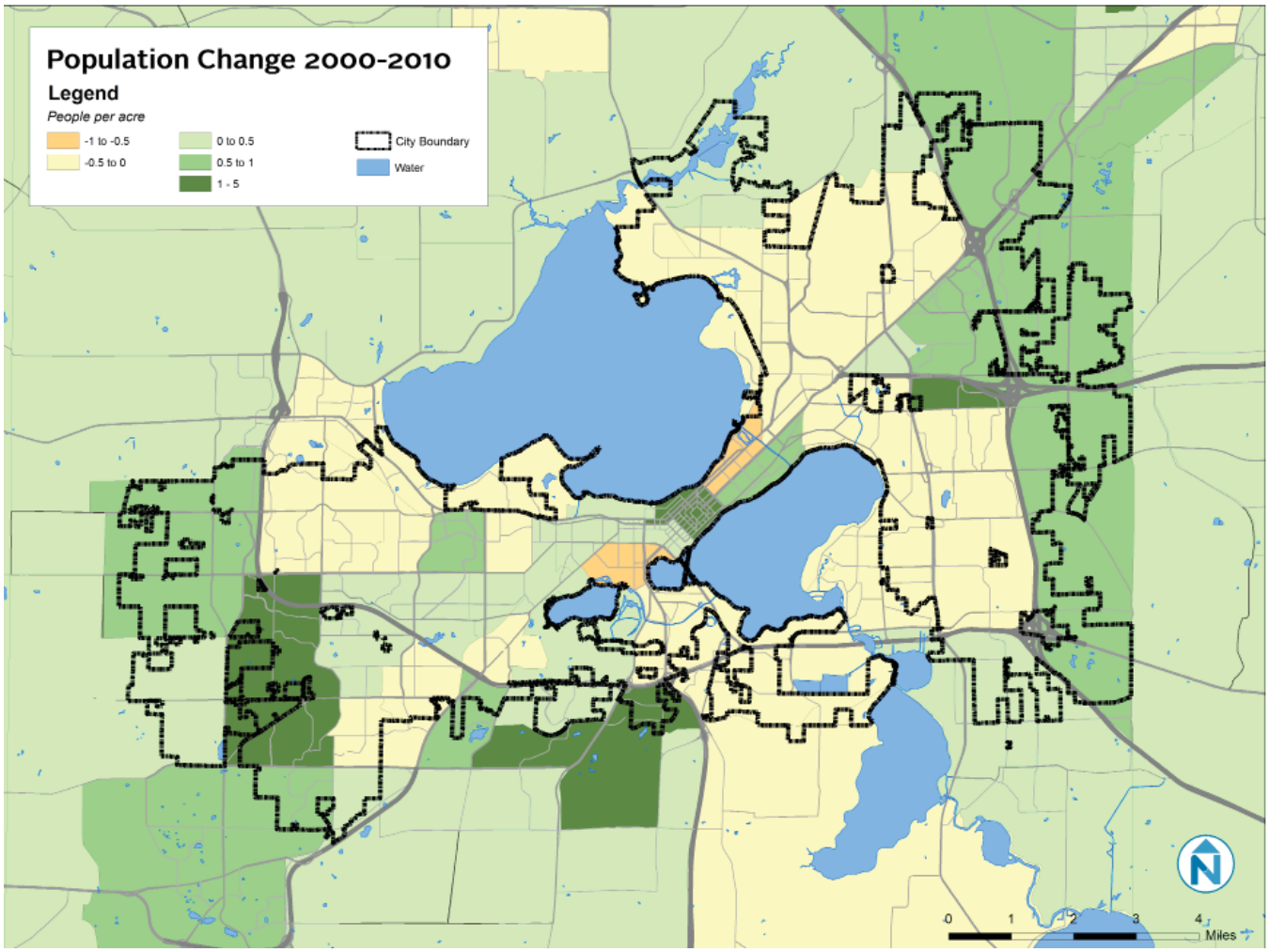
MADISON AND DANE COUNTY

In general, the population within the city of Madison has been slowly but steadily increasing over the last 20 years. This growth is expected to continue, as it is for the overall Madison region. Dane County is projected to reach a population of 606,000 by 2040, an increase of 100,000 over today's population.

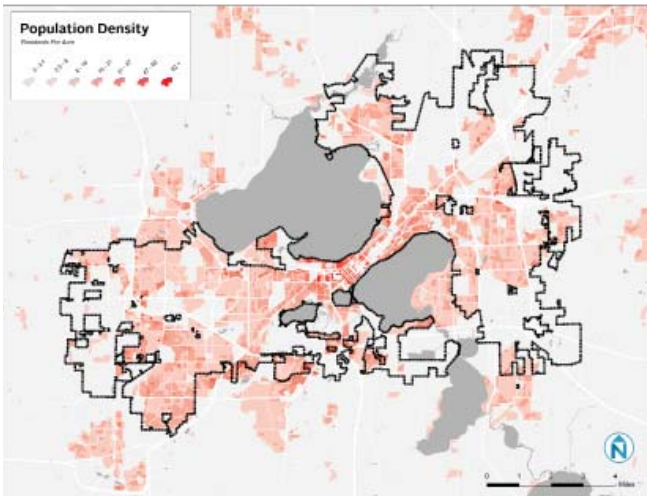
Census data clearly illustrate the trends that Madison and Dane County have been following. The region's population growth has largely been outside of Madison's core and the greatest rates of increase are outside of the US 12-Interstate 90 freeway loop surrounding the city. Many of the more recently-developed areas within the expressway loop have even stagnated or lost small numbers of residents.

These trends are not universal, however—the Madison isthmus has witnessed population increase in some areas, especially the downtown core, pointing to new forms of infill development that fit well within the city and that have contributed to walkable community nodes with a mix of land uses and amenities in short distance. Between 2000 and 2010, the downtown core saw the greatest increases in population density for the region, increasing in population by approximately four persons per acre.

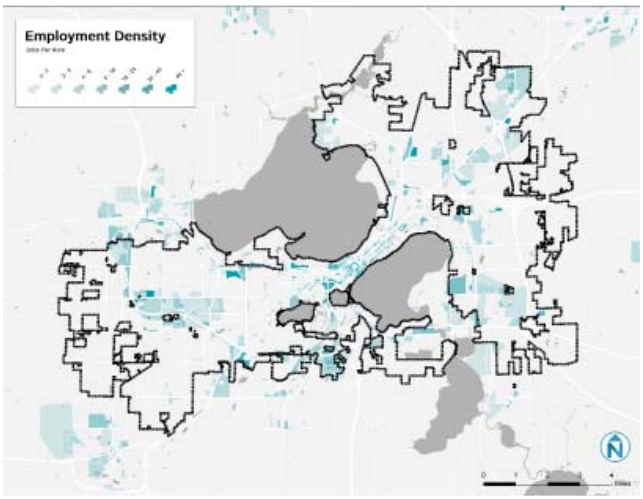
This underscores that Madison's vision for compact, walkable community nodes are not simply a vision but an achievable reality with the right kinds of supporting frameworks. Achieving this reality requires an ongoing commitment to creating a balanced transportation



POPULATION DENSITY



EMPLOYMENT DENSITY



system, as the continuing trend toward growth on the urban edge will create increased demand for access to the downtown core and University of Wisconsin but require use of the same infrastructure that central city neighborhoods use today.

DEVELOPMENT TRENDS

Existing population and employment density are two other factors that will help determine the potential load on the transportation system. Typically, areas of high density can support some level of public transportation and reduce demand on the roadways. However, in areas of high density where there is no available, or not enough public transportation, the demand can quickly overwhelm the road network if there is not enough capacity. For a city like Madison where there is limited space for road expansion, and an ever-increasing population, capacity of the existing road network is a significant concern.

The Population Density map illustrates areas where the existing population is dense enough support transit service, based on census data from 2010. The darkest red areas have the potential to support up to 12 buses per hour, or approximately every 5 minutes, while those lighter pink areas could only feasibly support bus service around every 30 minutes to an hour. Grey areas have such low population density that there is very little existing demand for transit and would not support service. Population and employment densities will be combined and discussed later in relation to the existing transit services provided by METRO Transit.

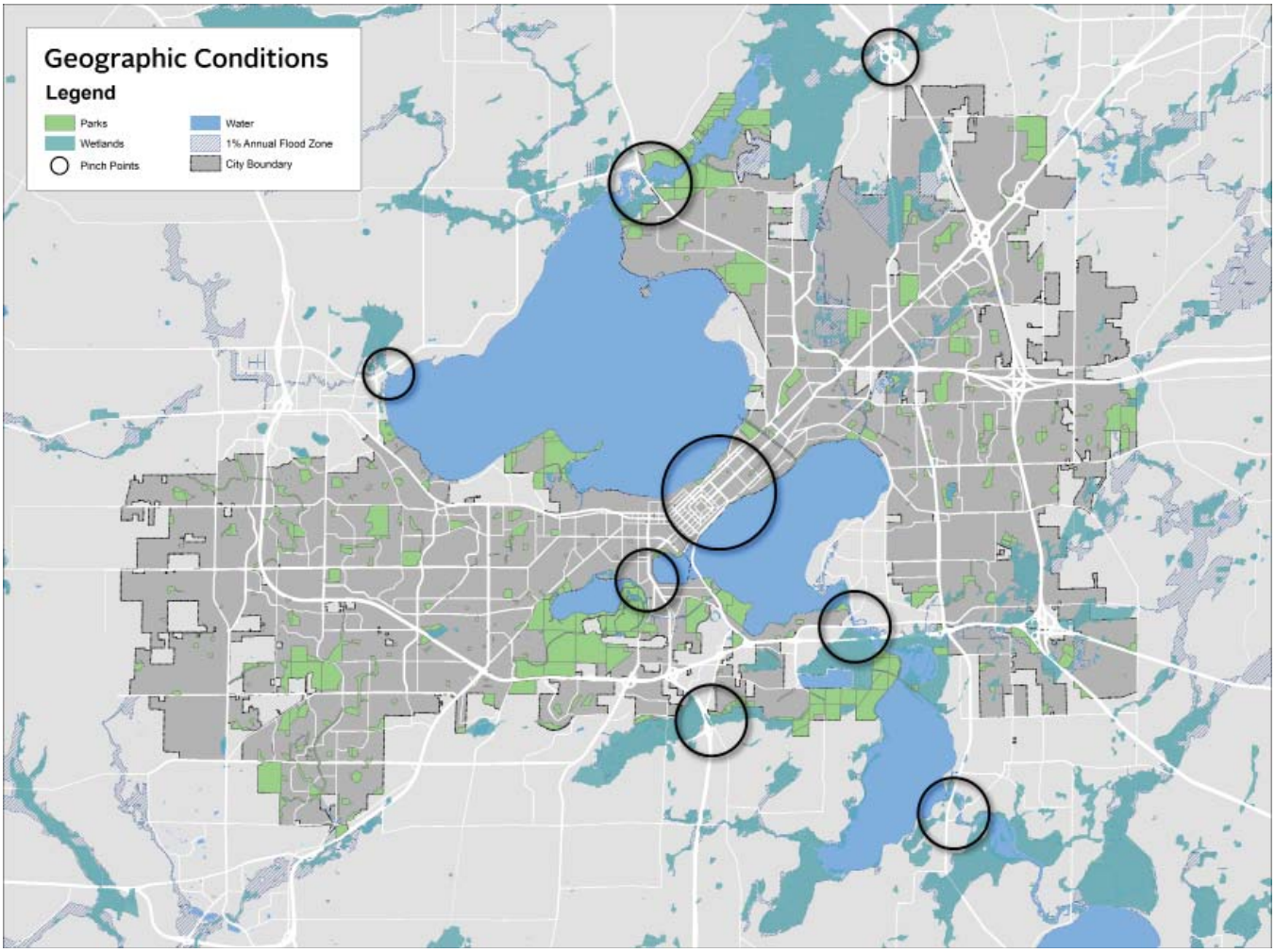
> *Madison's vision for compact, walkable community nodes are not simply a vision but an achievable reality with the right kinds of supporting frameworks.*

The Employment Density map illustrates areas where existing employment could support transit service. The darkest blue areas have the highest employment densisties and would support up to 12 buses per hour, or approximately every 5 minutes. The lighter blue areas could only feasibly support bus service around every 30 minutes to an hour, while areas in grey would not be able to support transit service as a result of very low demand. As the map illustrates, the areas of high employment density are concentrated and limited in the context of the city's overall geography, and the high -frequency transit that they would support is feasible only when there is a connected system of activity centers contributing to transit demand throughout a larger portion of the city.

UNIQUE GEOGRAPHY

Many cities throughout the United States developed on waterfronts and, as such, face constraints in how they expand; especially within their urban cores and

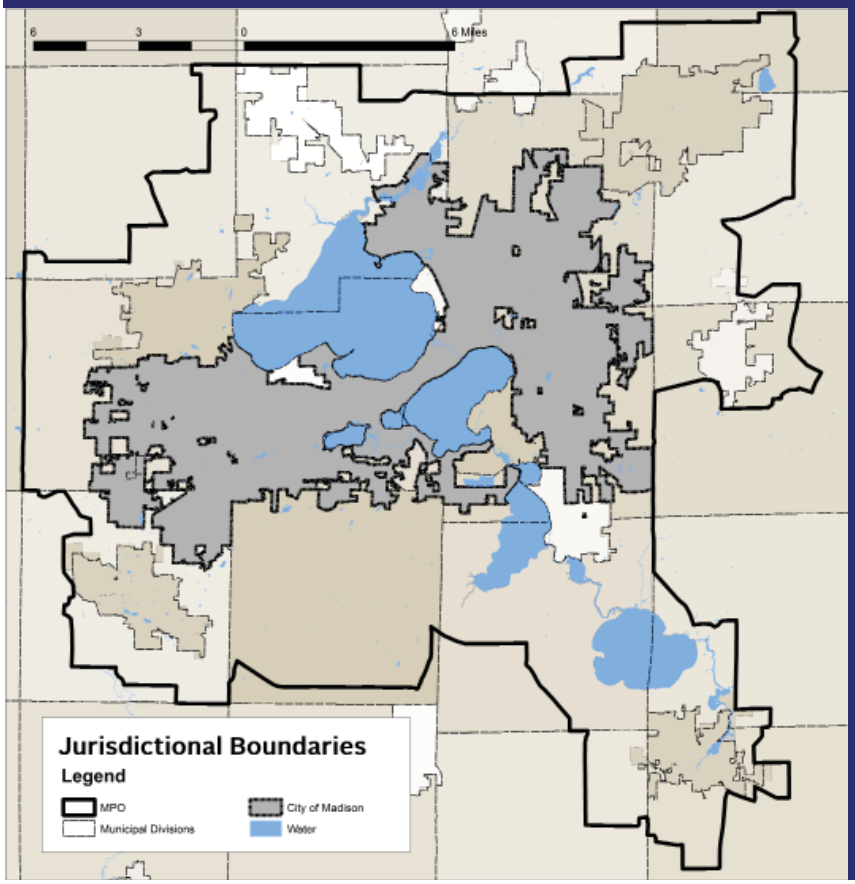
Madison's Unique Geography



the transportation infrastructure that leads to them. Few cities, however, have two waterfronts in their downtowns. While Madison's remarkable geographic setting has been one of its defining characteristics, it also presents challenges for the transportation system. With downtown Madison located on the isthmus between Lakes Monona and Mendota and the University of Wisconsin located nearby on Mendota's south shore, the greatest concentrations of travel demand in the Madison region are in a limited land area where virtually no space is available for building new transportation infrastructure.

The lakes are not the only physical element constraining the city's expansion - nature preserves, wetlands and other geographical features limit the city's growth in all directions. Political boundaries also serve as a sort of growth limit for the city of Madison, as it has reached the boundaries of numerous bordering municipalities. For this reason, a larger discussion of regional coordination is a critical element to defining Madison's options and evaluating transportation-related decisions. Planning for the future of the region will depend on the coordination of efforts across all boundaries.

Madison Region Jurisdictional Boundaries



Regional Players:

State of Wisconsin

Dane County

Madison Area Transportation Planning Board (MPO)

City of Madison

Surrounding Municipalities

Other small towns and villages

REGIONAL COORDINATION

There are over 50 different jurisdictions that come into play with planning and development efforts in the Madison region. The State of Wisconsin, Dane County, the City of Madison, and the Madison Area Transportation Planning Board (Metropolitan Planning Organization) are some of the larger forces at work in the Madison region. Madison's neighboring municipalities also impact planning in the region, as do the numerous other small towns and villages outside of Madison's MPO planning jurisdiction.

Moving forward, Madison will need to build on its historic success in reviewing and guiding regional development decision-making to ensure that planning decisions made outside of its jurisdictional boundaries do not create adverse impacts for its quality of life.

TRANSPORTATION TODAY

Madison's transportation system is sophisticated for a city its size—it has a high degree of transit use, a 15 percent share of work-based commuting on foot or by bicycle, and the city is a major hub of a state-coordinated intercity bus service that connects Madison to other major cities and towns throughout the Upper Midwest. However, the city's desired way of growing and developing into its future, based on the development of compact, walkable activity nodes, is not entirely consistent with Madison's system of transportation infrastructure today.

As discussed previously, the greatest concentrations of employment and economic activity in the Madison region are on or adjacent to the downtown isthmus, and this constrained geography already balances many other land uses: office and residential buildings, the Wisconsin state capitol, the University of Wisconsin campus and established single-family neighborhoods.

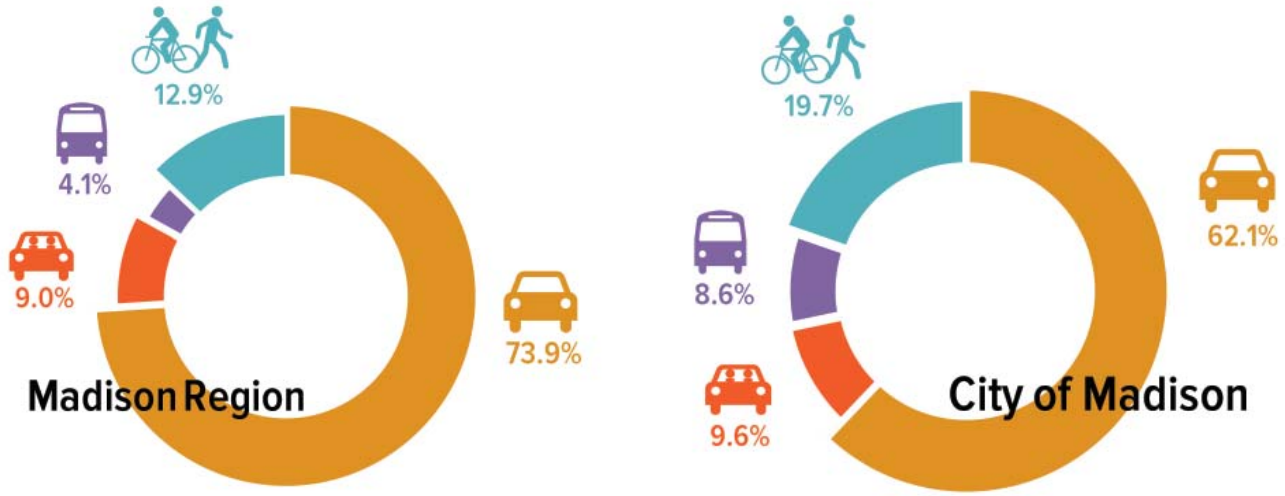
Outside of the isthmus, Madison is a fundamentally newer city, and its transportation infrastructure reflects this. Although streets have generally been built with multiple users in mind, many of the major thoroughfare streets in post-World War II neighborhoods outside of the isthmus were designed with moving automobiles as a primary goal. The city has made remarkable progress in improving conditions for bicyclists and pedestrians, with 112 miles of marked, striped on-street bicycle facilities, another 116 miles of signed bicycle routes, and 46 miles of off-street paths, critical connecting streets for bicycles continue to reflect the automobile-oriented development patterns that became dominant in Madison—just as they did throughout the United States—in the second half of the twentieth century.

MODAL TRENDS

As a legacy of these development patterns and the changing cultural preferences that accommodated them, Madison today is predominantly dependent on automobiles for much of its transportation. Relative to other cities without extensive transit systems, a relatively large percentage of the region's travel is made on transit, while carpooling, biking and walking also reflect popularity regionwide, due mostly to

HOW DOES MADISON GET TO WORK?

The current commute mode shares for the Madison region (left) and City of Madison (right).



limitations on parking downtown and at the University of Wisconsin campus, the Madison region's two primary employment centers. But much of this modal balance is due to these major activity centers downtown; while Madison's urban core supports walking and biking, the region has developed in a much different pattern than the city, and as a result, provides fewer opportunities for alternative transportation.

The city of Madison depends less on the automobile than the region as a whole, with only 62.1% of its commuting population driving alone. A much higher share of commuters in the city walk, bike or take transit to work than in the region. With over 15% of the population commuting by foot or bike, the city of Madison boasts one of the highest shares of alternative transportation in the nation.

The future of Madison's transportation system will rely on an even greater balance of mode share, reducing the strain on an already constrained roadway system marked by a confluence of routes into the downtown isthmus. Providing more mobility options will enhance the ability of streets to support the social, economic, environmental, and recreational functions of the public realm. This more balanced approach will safely move all users of the transportation system, while demonstrating fiscally responsible use of resources and adding lasting value to Madison's neighborhoods and civic amenities.

HIGHWAY NETWORK

Madison is the intersection of three Interstate highway routes—Interstates 39, 90 and 94, connecting the city directly to Milwaukee, Chicago, Rockford and Minneapolis. Owing partly to the limitations of Madison's geography, these expressways were not built through the center of the city but instead form a partial loop around it, along with US Highways 12, 14, 51 and 151. The southern and western parts of this expressway bypass are referred to locally as the Beltline, originally constructed as a two-lane downtown bypass but now expanded to a six- to eight-lane freeway. The expressway system also includes feeder routes, such as the Highway 30 expressway stub that continues Interstate 94's route from Milwaukee and connects to Washington Avenue, providing a primary route into downtown Madison.

Because Madison did not construct freeways through its downtown core, its surface arterial streets are especially important for traffic circulation.

The Beltline

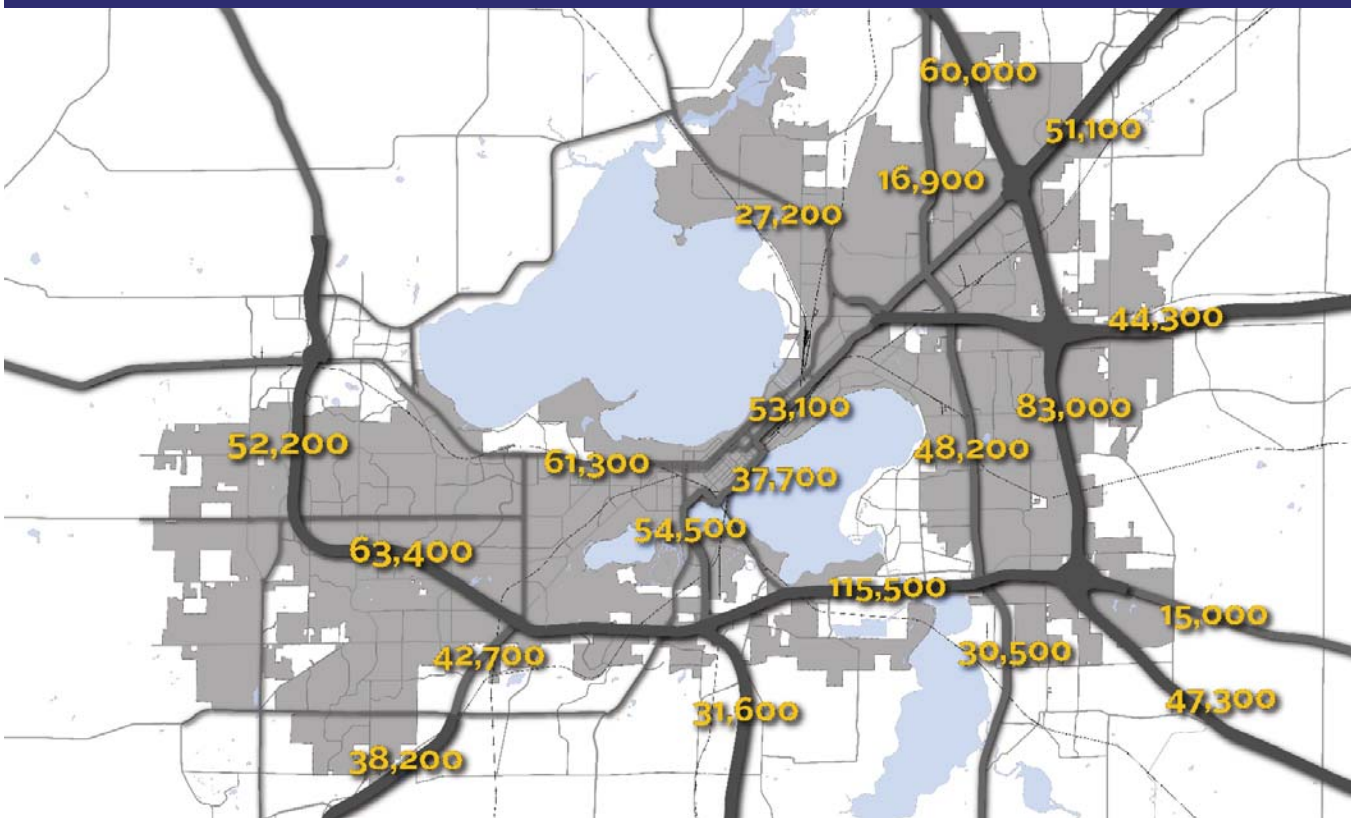
The Madison Beltline is the main east-west highway in the region and provides a critical connection for over 100,000 motorists everyday. Because Madison does not have a full expressway bypass loop, the Beltline represents a confluence in the expressway system with regional traffic from the northwest suburbs and surrounding region sharing the road with traffic from the southwest, especially in the extent between the US 18 interchange and the Interstate 39/90 interchange. Likewise, the Beltline is a critical connection to downtown Madison for traffic coming from the southeast, as Lake Monona limits connectivity from these directions.

With existing congestion already high and projections for increasing demand in the future, both the Madison region and the Wisconsin Department of Transportation have concerns regarding the limited capacity of this highway. WISDOT is currently leading a study to evaluate the future of the Beltline and how the infrastructure can be enhanced to accommodate additional growth in the region. Refer to the Madison Tomorrow section of the Briefing Book for additional discussion on the study scope and potential opportunities for the Beltline.

MAJOR CORRIDORS

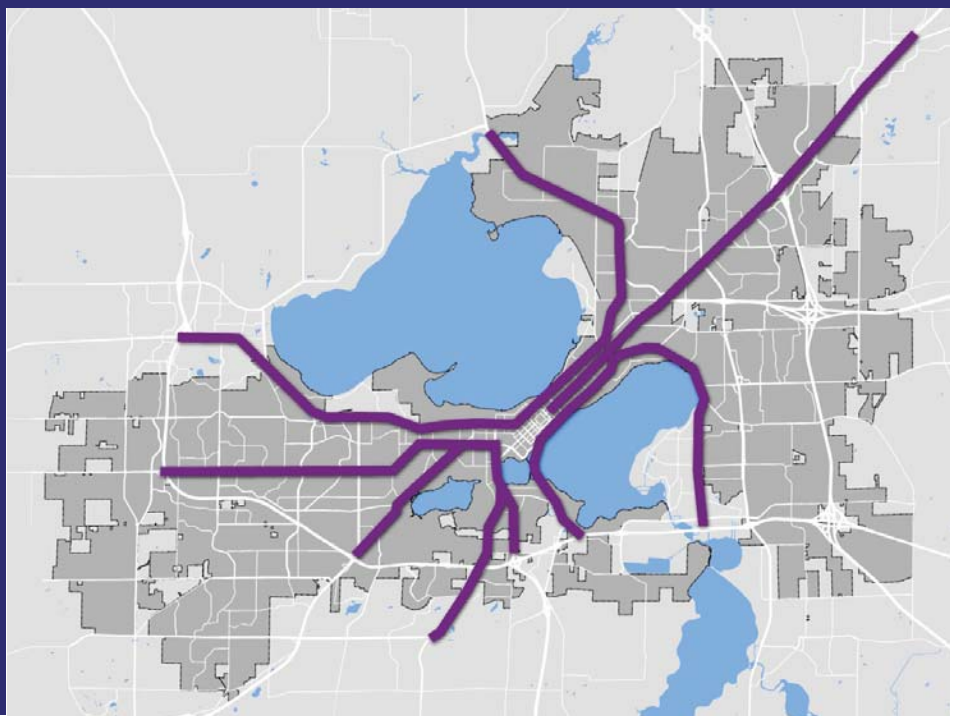
One of the key challenges that Madison faces is that connecting thoroughfares through the city are relatively limited. Corridors such as Washington Avenue, Park Street, Monroe Street and Regent Street are the key direct routes to and through downtown and the University of Wisconsin campus area. Other corridors further away from downtown, such as Segoe Road and Midvale Boulevard, help with regional connectivity

Daily Traffic Volumes on the Madison Highway System

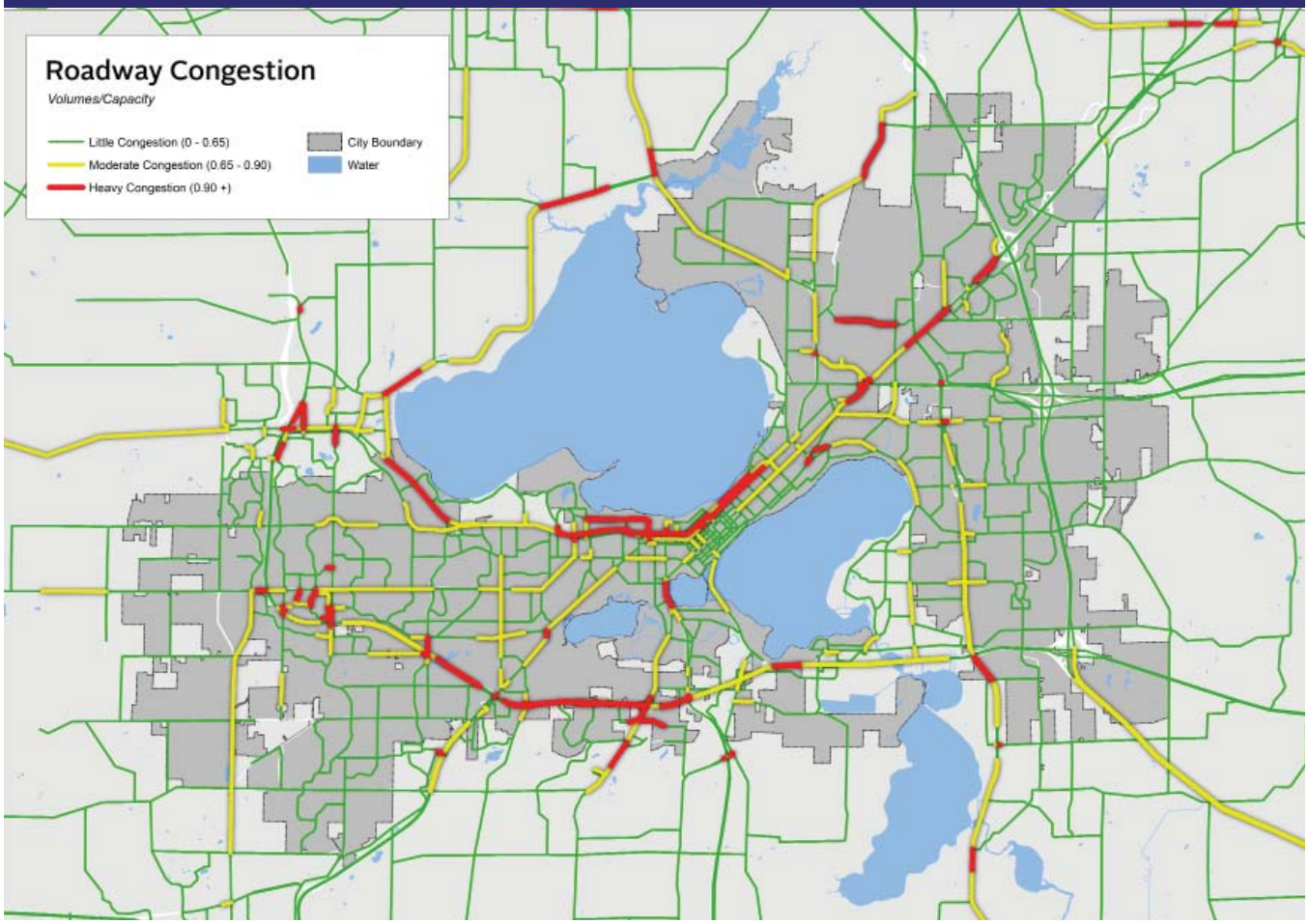


Seleted Major Traffic Corridors (more detail on 1 - 3 on pages 10-12)

1. E Washington Avenue/ US Highway 151
2. Mineral Point Road to Regent St
3. Campus Drive/ University Avenue
4. North Port Drive to Pennsylvania Avenue
5. Monona Drive to Atwood Ave



Roadway Congestion, from the Madison Area MPO travel demand forecasting model



Madison's Complex Corridors

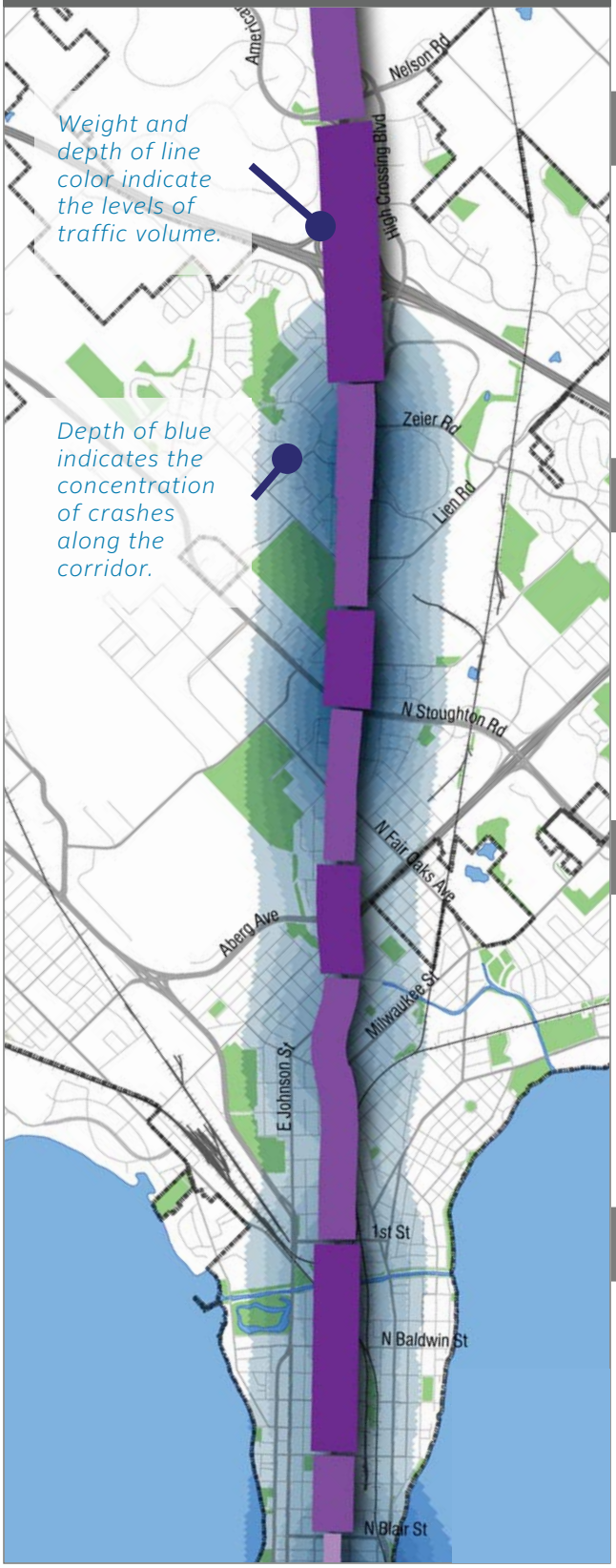
The nature of Madison's geography has led to a unique set of challenges for its roadway system— a limited set of connecting thoroughfares effectively brings all traffic to and from downtown to the rest of the city and region. This places pressure on these streets to carry as many vehicles as possible. Partly for this reason, several of these connecting streets experience congestion, as shown in the map above. And even beyond congestion, there is a demand to be able to use these corridors to provide connections into the heart of the city for other modes—bicycles, pedestrians, and transit vehicles.

How can congested streets with no practical room for expansion continue to meet demand, especially as that demand is expected to grow along with regional population and employment? Madison's streets need to be able to meet travel demand by moving the greatest numbers of people possible—not simply the greatest number of vehicles. To do this street design needs to continue being considered and implemented from the standpoint of a broader range of travel modes.

The diagrams on the following three pages illustrate three of Madison's most important corridors and provide detail on the traffic and operational characteristics of each, helping to illustrate the complexity of transportation needs on these thoroughfares.

MAJOR CORRIDORS

East Washington Avenue



As Madison's eastern gateway street, East Washington carries consistently high volumes of traffic into and out of downtown. Traffic volumes between Interstate 39 and the downtown isthmus vary, though not considerably.

Interstate 39 to Stoughton Road

Traffic: 40,000 to 55,000 vehicles per day

Street Design Characteristics: 6 lanes with medians, some sections have parallel access roads that support driveway access

Multimodal Accommodation: Sidewalks, though only along access roads; also features dedicated bike lanes

Stoughton Road to Aberg Avenue

Traffic: 36,000 to 42,000 vehicles per day

Street Design Characteristics: 6 lanes with medians; regular driveway spacing

Multimodal Accommodation: standard-width sidewalks, dedicated bike lanes

Land Use Context: lower-density commercial and office

Aberg Avenue to Yahara River

Traffic: 44,000 to 52,000 vehicles per day

Street Design Characteristics: 6 lanes with median and on-street parking

Multimodal Accommodation: standard-width sidewalks, dedicated bike lanes

Land Use Context: small commercial properties; mostly single-family residential

Yahara River to Blair Street

Traffic: 48,000 to 50,000 vehicles per day

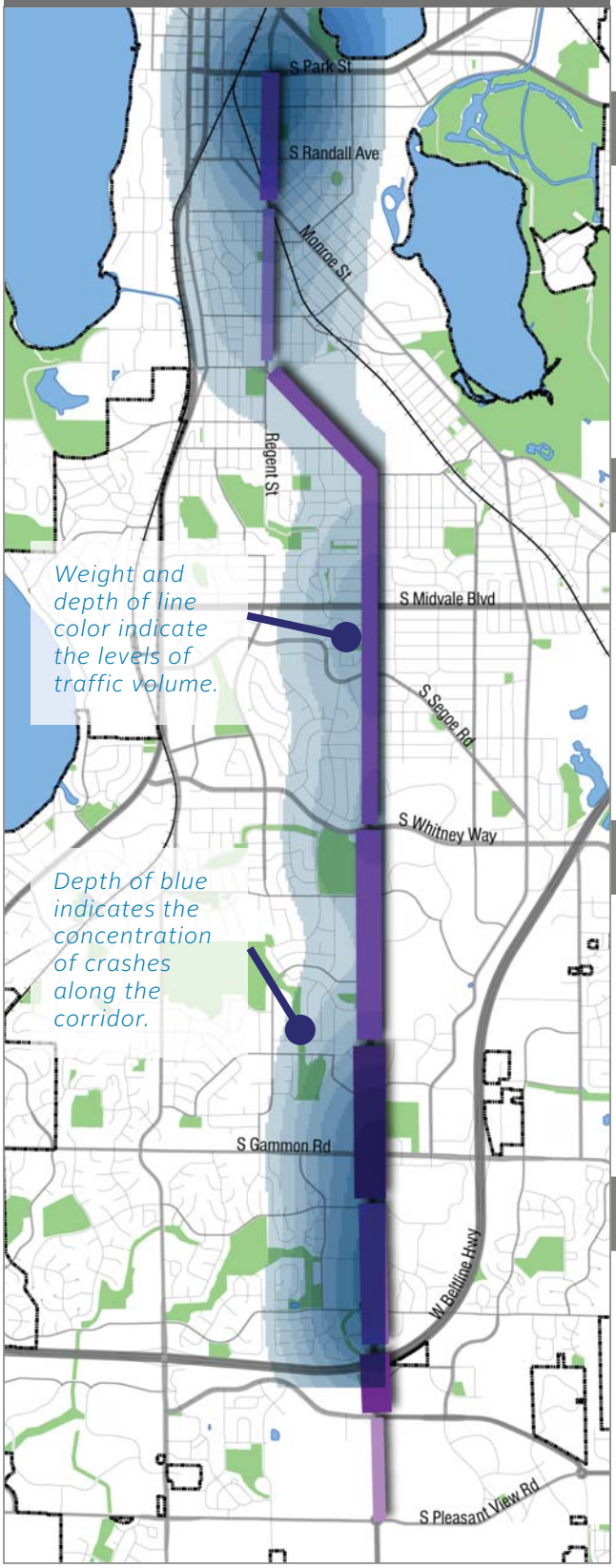
Street Design Characteristics:

Multimodal Accommodation: Consistent sidewalks; dedicated bike lanes and facilities on parallel streets

Land Use Context: Urbanized with medium to high densities and increasing infill development.

MAJOR CORRIDORS

Regent Street/Mineral Point Road



Regent Street, Speedway Road and Mineral Point Road form a primary thoroughfare connecting Madison's western in-town neighborhoods to downtown. Regent is a key street through the southern edge of the University area.

Park Street to Highland Avenue

Traffic: 16,000 to 22,000 vehicles per day

Street Design Characteristics: 2 lanes with parking; parking not allowed in 3-lane sections during peak hours

Multimodal Accommodation: standard width sidewalks

Safety Concerns: high number of vehicle and bike crashes between Park and Monroe (the University area)

Land Use Context: higher-density office and University buildings

Highland Avenue to Midvale Boulevard

Traffic: 16,000 to 20,000 vehicles per day

Street Design Characteristics: 2 lanes with parking; parking not allowed in 3-lane sections during peak hours

Multimodal Accommodation: Standard width sidewalks with minimal separation from roadway

Safety Concerns: limited room for bicycles

Land Use Context: single-family residential with direct driveway access to streets; cemeteries along Speedway Road

Midvale Boulevard to Whitney Way

Traffic: 15,000 to 20,000 vehicles per day

Street Design Characteristics: 2 lanes with parking; parking not allowed in 3-lane sections during peak hours

Multimodal Accommodation: standard-width sidewalks well separated from roadway

Land Use Context: residential subdivisions, mostly with internal circulation and limited access to Mineral Point. Rear lot lines of subdivisions face Mineral Point.

Whitney Way to the Beltline

Traffic: 30,000 to 40,000 vehicles per day

Street Design Characteristics: 4 main lanes with median; shared transit and bike lane in outer lane

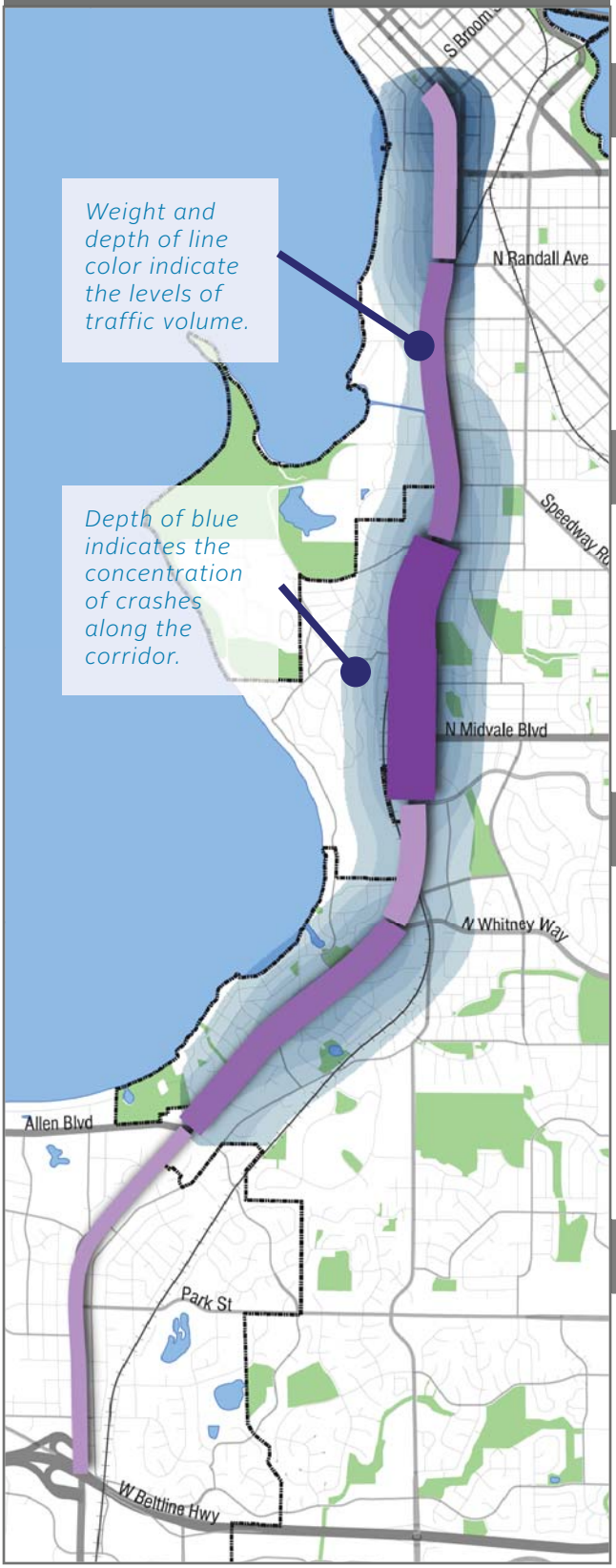
Multimodal Accommodation: Consistent sidewalks; dedicated bus lane within street right-of-way

Safety Concerns: Higher volumes and greater number of crashes; multiple bike crashes near the Beltline interchange

Land Use Context: Office parks and small office buildings on individual parcels; suburban corridor retail and major regional retail

MAJOR CORRIDORS

Campus Drive/University Avenue



The Campus Drive/University Avenue corridor is one of the major traffic arteries in and out of the University area, and varies from being a one-way pair of streets in a network grid to being a limited access highway.

Broom/Bassett to Randall Avenue

Traffic: 55,000 to 75,000 vehicles per day (Johnson + University)

Street Design Characteristics: pair of one-way streets, each with three lanes, bike lanes and parking

Multimodal Accommodation: Sidewalks and bike lanes (includes barrier-protected contraflow bicycle lane); dedicated bus lane

Safety concerns: high number of bicycle crashes

Land Use Context: higher density mixed use and University buildings

Randall Avenue to Highland Avenue

Traffic: 45,000 to 55,000 vehicles per day

Street Design Characteristics: 4 lanes with median

Multimodal Accommodation: no sidewalks or bike facilities (bikes not prohibited), although parallel Blackhawk Path provides a separated facility for pedestrians and bicycles

Land Use Context: Campus drive features freeway design, adjacent to railroad and separated from land uses

Highland Avenue to Segoe Road

Traffic: 50,000 to 60,000 vehicles per day

Street Design Characteristics: 6 lanes with median

Multimodal Accommodation: standard-width sidewalks; bicycle lanes from Shorewood to Segoe

Safety Concerns: higher volumes and a greater number of crashes; several bike crashes have occurred in roadway section lacking a bike lane.

Land Use Context: on surface roadway west of Franklin, office and commercial uses with a few major facilities (e.g. WISDOT)

Segoe Road to Allen Boulevard

Traffic: 30,000 to 40,000 vehicles per day

Street Design Characteristics: 4 lanes with median/left turn lanes

Multimodal Accommodation: sidewalks, though not consistent; bike lanes; shared-use path

Land Use Context: Residential and low-density commercial

and overall transportation system capacity, but they eventually link to the same limited number of streets that passes through Madison's downtown core.

The diagrams on the following page illustrate how traffic moves and is distributed throughout the region, and underscores the critical importance of a key set of thoroughfare corridors. It is no surprise that these are also some of the region's most congested corridors, as illustrated in the roadway congestion map on page 9.

LOCAL STREETS

Although constructed on a grid, downtown Madison's street pattern is heavily constrained by natural and manmade features. It generally follows the orientation of the downtown isthmus as far north as the Yahara River and as far south and west as the Canadian Pacific Railroad tracks. From these limits, the downtown street network changes orientation in multiple directions: along State Street through the UW campus, along Atwood Avenue on the north side of Lake Monona, and into other grid orientations following main streets further away from the city center.

This series of grid patterns leads to a heavy degree of reliance on arterial and collector thoroughfares for connectivity, as these are the only streets that cross rail corridors, water, parks and cemeteries. This places a higher degree of non-automobile demand on these streets than what a well-connected grid network of streets might suggest, and many of these thoroughfares are relatively narrow, constrained streets with no available space for expanding the right-of-way. Based on traffic volumes and levels of bicycle and pedestrian demand, these constrained corridors are virtually every connecting street outside of the isthmus.

This points to one of Madison's central transportation challenges. Demand for downtown and University-area access has grown along with the city's footprint, but there is no opportunity for expanding city streets.

PARKING

Parking in cities can be a contentious issue. Providing free parking in a city inevitably results in a number of other costs concerning quality of life and the environment. The availability of free parking encourages those who have the ability to drive to

Madison Streets

Street Conditions

Monroe Street

E Washington Avenue

University Avenue

THE BUILT ENVIRONMENT

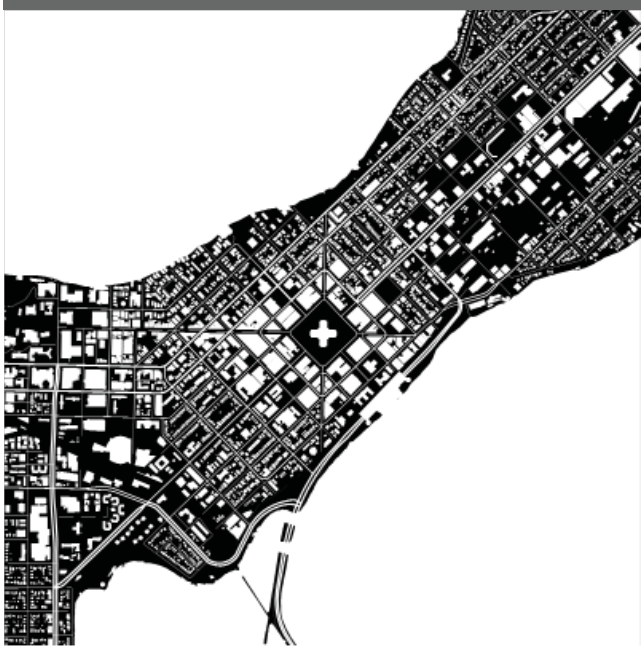
The diagrams below illustrate building density in areas throughout the city of Madison.

Near West

68 Miles of streets
200 Intersections per sq.mile
10,000 SF of building per acre

Downtown/Isthmus

48 Miles of streets
180 Intersections per square mile
11,100 SF of building per acre



Near East

South Central

do so, which increases the number of motorists on the roadways and increases congestion in the city. Providing enough parking capacity for those who drive becomes another issue, as parking requires a lot of space that is more valuable for other uses. In a city such as Madison, with such limits on the space available for growth, land utilized for parking will be in high demand for redevelopment in the future. As parking lots are redeveloped, the parking supply will diminish, and the need for more efficient demand management will be much greater.

TRANSIT

Transit is a critical component of a multi-modal transportation system because it is the biggest potential contributor to additional person-carrying capacity. Buses and trains can carry 50, 80 or more passengers in a single vehcle while taking up only marginally more space than an auto. These modes are thus much more efficient within the overall transportation system. However, unlike other modes like bicycling and walking, transit service requires a significant ongoing operational expense, so investments must be carefully targeted.

The city and surrounding region's primary transit service provider is Madison Metro Transit, a division of the City of Madison government that provides scheduled bus service on 62 main line fixed routes and paratransit services in Madison and adjacent Fitchburg, Middleton and Verona. Metro handled nearly 15 million boardings in 2011, with about 50,000 on an average weekday. For a service area population of about 250,000, this is a remarkable number – generally equal to an average of one in ten Madisonians taking a round trip on transit each weekday. When this is compared to other American transit systems in cities of similar size and characteristics to Madison (namely city centers dominated by universities or state government), Madison shows a relatively high level of transit usage for its community size.

TRANSIT SYSTEM	SERVICE AREA POPULATION	AVG WEEKDAY RIDERSHIP
Madison (Metro)	**253,100**	**51,200**
Tallahassee, FL (StarMetro)	162,300	18,200
Baton Rouge, LA (CATS)	388,500	13,400
Tucson, AZ (City of Tucscon)	544,000	69,300
Des Moines, IA (DART)	374,900	16,709
Lansing, MI (CATA)	267,600	41,200

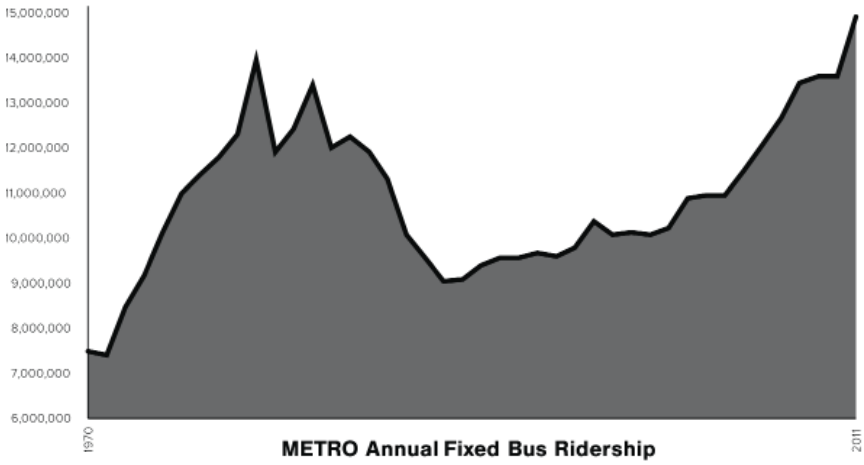
As one might expect, the most heavily-used transit routes pass through downtown and the University area, carrying commuters from the east and west into downtown. Metro also provides campus circulators for the University that are fare-free to passengers. Metro's route network is focused on a series of transfer hubs.

Service characteristics are considerably different among weekday peak periods, weekday off-peak periods, and weekends. Metro Transit has about three times as many fixed-route buses in service during peak periods compared to the weekday mid day, and even fewer on weekends; about one-third of its routes are peak-period only. Nonetheless, there are still around 18,000 daily trips made on Saturdays and 12,000 on Sundays.

Madison in Motion has analyzed population and employment density and identified areas throughout Madison that could feasibly support transit service based on those combined densities. The areas were then compared to the existing transit service routes to determine whether or not there are locations that may be underserved or areas with service that may not support it.

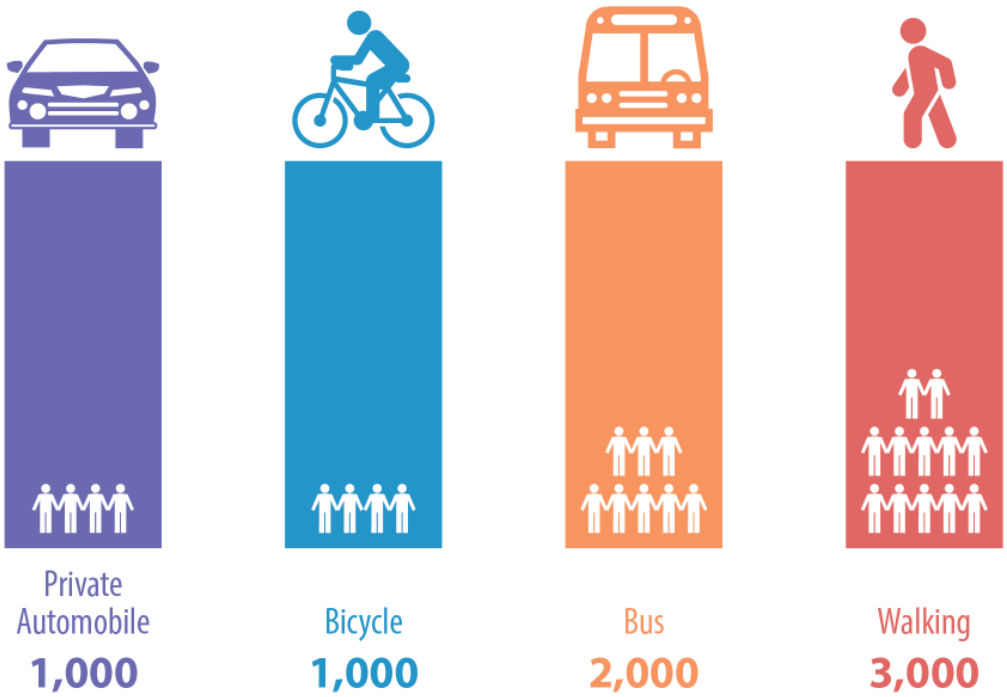
The Composite Transit Index map that illustrates this propensity, shown on Page 18, shows the potential headways each area could support, whether or not there is an existing bus route, and if there is an existing (or planned) park and ride station in the vicinity.

Madison is served by two major official park-and-ride lots: the North Transfer Point and Dutch Mill.and are located in areas where they serve existing demand. Many of the planned park and ride stations (shown as the purple P icons) are located in areas with potentially high demand as well.



Transit ridership has increased steadily in Madison since 2002.. Metro reached nearly 15 million boardings in 2011, the highest ridership level the agency has seen since its inception in 1970.

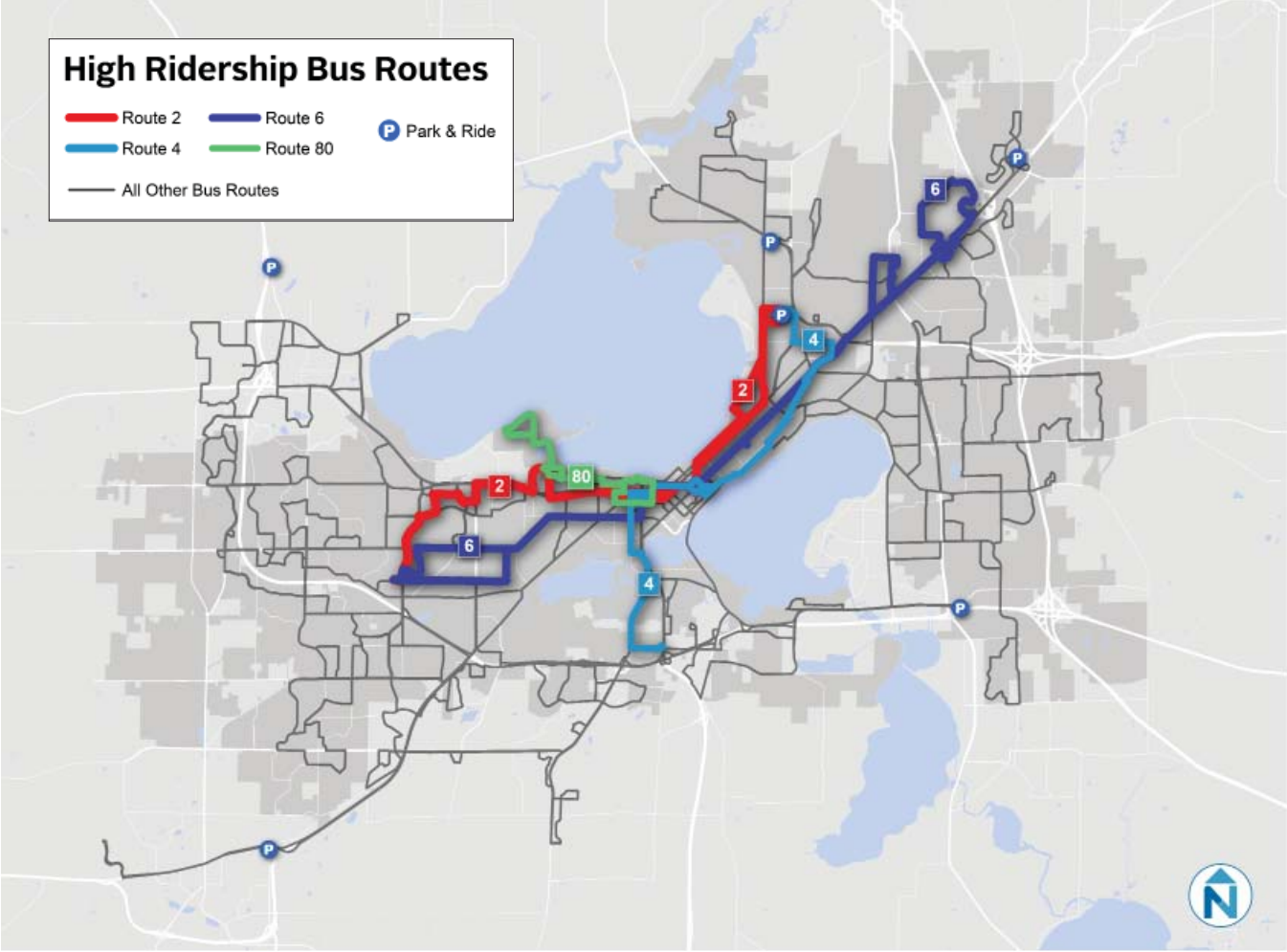
Person Throughput Capacity by Mode



Number of people traveling in one-lane in an urban environment during a one-hour period

Note: The numbers represent a daily average throughput per hour. They are calculated as daily demand divided by the number of operating hours for each facility. Data source is city and transit agency data on real facilities from U.S. and Latin American cities.

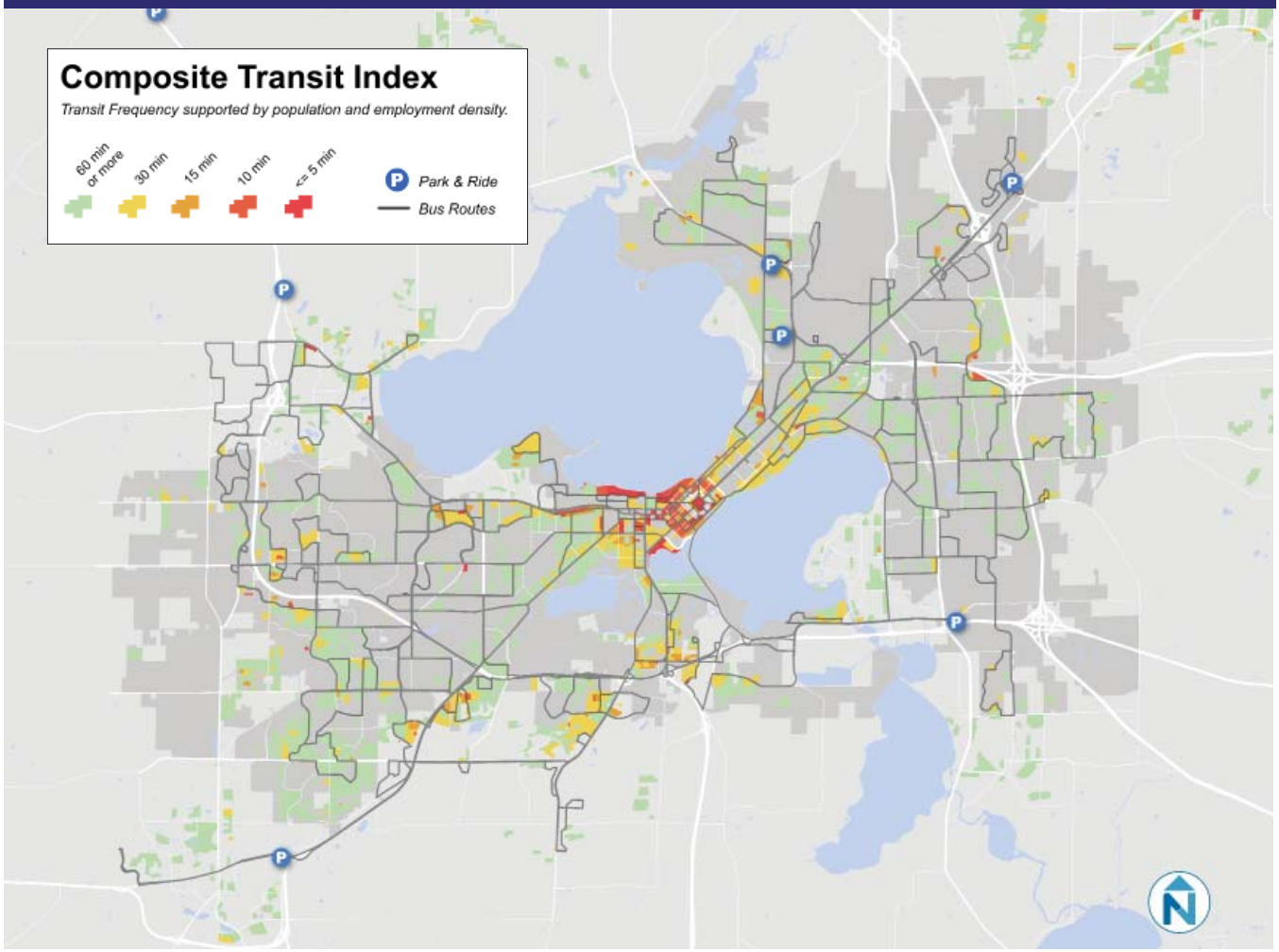
High Ridership Bus Routes



Major METRO Routes

Route		Average Weekly Ridership	Boardings/ Revenue Hour
2	West Transfer Point to/from North Transfer Point	5,524	51
4	South Transfer Point to/from North Transfer Points	3,176	41
6	West Transfer Point to/from East Towne Mall	5,090	36
80	80-UW Campus Route *[free service]*	11,872	83

Transit Propensity



TRANSPORTATION DEMAND MANAGEMENT

In a setting with such a high level of center city travel demand and infrastructure constraints like those in Madison, it is important to find ways to extend the person-carrying capacity of the transportation system beyond rethinking the street design. There are also strategic policy approaches that can be used to reduce the need to drive alone or drive during weekday peak travel periods when the transportation system is most prone to congestion.

Transportation planners refer to these strategies as transportation demand management (TDM), and they include a variety of approaches and strategies that increase higher-occupancy travel, such as transit and carpooling; encourage non-motorized travel (bicycles and walking); shift travel to less congested periods of the day; or reduce or eliminate the need to travel for certain trips altogether, such as through telecommuting.

These approaches are not new to Madison. The Madison Area MPO coordinates ridesharing and commute alternative programs, including partnership with private employers and supporting these employers in developing their own programs, a ride-matching service with a database of over 1,500 commuters and a Web-based ride-matching serving allowing interested participants to enroll directly, and coordination with Metro Transit to promote transit use through discounted fare passes.

One of the most successful TDM measures in the Madison region has been the Group Unlimited Bus Pass program negotiated between Metro and Madison's major universities and employers. For the University of Wisconsin and the Madison Area Technical College, the cost of these passes is included in student fees for each semester. UW extended this program in 2002 to include all of its employees, including those at the University Hospital and Clinics. These programs have been credited as one of the primary generators of increased ridership.

Madison has also explored unique TDM-based approaches, such as the Smart Commute Initiative organized by Madison Area MPO and working with four participating banks. This was a loan program that helped to extend homebuyers' mortgage qualification levels if they purchased a home along a Metro route. It would allow lenders to increase the effective monthly income of potential borrowers by a transit savings amount, typically $200 per month for single wage-earner households and $250 per month for two wage-earner households.

THE BICYCLE AND PEDESTRIAN SYSTEM

Bicycling and walking are essential modes of transportation for the City of Madison, and together they account for nearly 20 percent of all commute travel to work destinations (which includes students traveling to educational institutions). The greatest areas of bicycle and pedestrian demand are downtown and near the university, but other locations throughout the city may also have potential as pedestrian- and bicycle-friendly centers of activity.

Gauging the level of bicycle and walking travel is easier in Madison than in many cities. In addition to having census data on work trip commuting, the City of Madison also has counting devices at a dozen stations throughout the city, and there was a significant add-on to the National Household Travel Survey which provided statistically significant data for the city.

Clearly, walking and bicycling have a major role in transporting the city's population. There is no other city in the United States with a population of over 200,000 that has a higher bicycle commuting percentage.

General Sidewalk Coverage

The City of Madison generally has a well-connected pedestrian network comprised of sidewalks and shared use paths, although there are areas of the city that are not well-served by these pedestrian facilities. Sidewalks, and some extent shared use paths, provide important connections for pedestrians throughout the city to residences, schools, retail areas, and other attractions such as libraries and parks. When sidewalks are not available, pedestrians, must walk in the street, walk on unpaved surfaces, or use another form of transportation, such as driving, to reach their destination.

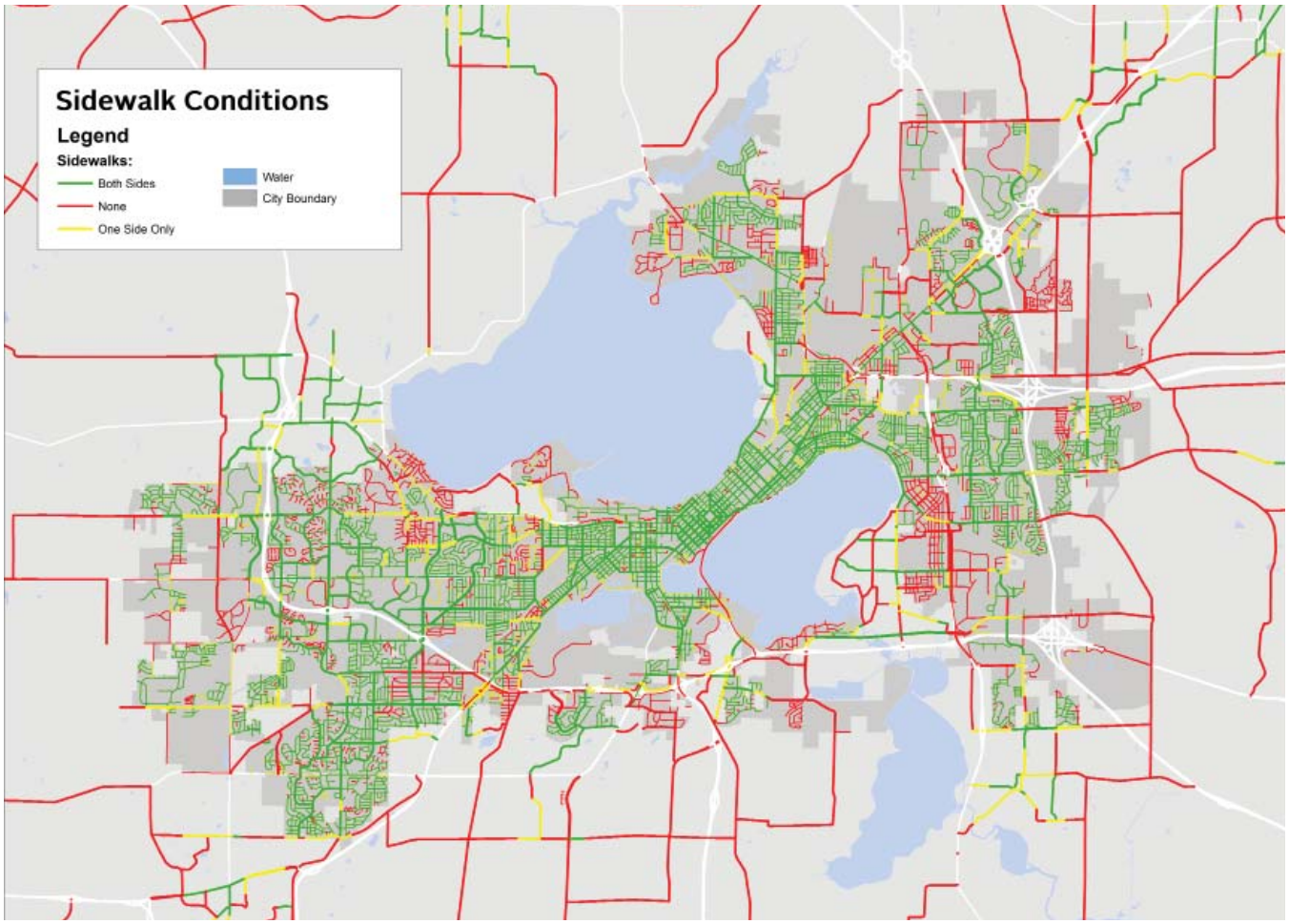
Inside the city of Madison, there are over 1,000 miles of existing streets and roadway. A significant portion of those miles include streets with no sidewalks at all, while many have sidewalks on both sides and others have sidewalks only on one side. Much of the downtown core, University of Wisconsin campus, and pre-WWII neighborhoods as well as neighborhoods built in the last 40 or so years have sidewalks on both sides of their respective streets.

Barriers to Walking

A number of barriers to walking exist in the city. These barriers range from lack of sidewalks in some neighborhoods, to physical barriers, and difficult crossings.

SIDEWALK CONNECTIVITY

A lack of sidewalks or incomplete sidewalk networks can serve as a barrier to walking, particularly for people with disabilities and children. Overall, sidewalk



coverage is nearly complete on the Isthmus and near-east and near-west sides of the city – areas that were generally developed before World War II. Areas of the city that have been annexed from adjoining towns, some post-war developments, and some subdivisions built in the 1950s often lack comprehensive sidewalk coverage.

It is important to recognize that the lack of sidewalks on certain streets is far more important than on other streets. Streets that carry large amounts of traffic (arterials and collectors) should have sidewalks since walking in the street is not a safe option for pedestrians. Most arterials and collectors in Madison currently have sidewalks, although there are notable exceptions including portions of Tompkins Drive on the east side, portions of Packers Avenue on the north side, and much of Hammersley Road on the

*Numbers only include streets within City of Madison boundaries

*Totals do not include Principal Arterials or Private Roads

south side. It is also important to provide sidewalks on streets that connect to schools and popular parks – both because of the overall number of pedestrians accessing many of these sites, and the large number of children accessing these sites. On the other hand, neighborhood streets with very low traffic volumes may not require sidewalks unless they provide a connection to a school, park or other attraction. The City of Madison takes this approach when retrofitting streets originally constructed without sidewalks, although the City's policy for new street construction is to construct sidewalk on both sides of all new streets.

CROSSINGS

Pedestrians experience their greatest safety threats when crossing streets, and having to cross busy streets can serve as a significant barrier to many pedestrians. Street crossings can broadly be classified into controlled and uncontrolled crossings based on the presence of traffic controls such as stop signs or traffic signals. Pedestrian crossings at controlled intersections are generally good in Madison, although pedestrians must be aware of turning motorists who may not yield to them. Additionally, many traffic signal controlled intersections in Madison cross multiple lanes of traffic, and crossings can be lengthy, particularly for the elderly or people with disabilities who may need more time to cross the street.

Crossings at uncontrolled intersections can vary greatly in quality throughout the city. In Wisconsin, motorists are legally required to yield to pedestrians in marked or unmarked crosswalks, which is particularly important at uncontrolled intersections. Despite this requirement, yielding behavior varies widely throughout the city. Anecdotally, motorists yield to pedestrians on busy streets most frequently in the downtown area, and in some neighborhood commercial centers, such as on Williamson or Monroe Streets. However, even in these locations, crossing busier streets can be challenging, particularly when attempting to cross streets with multiple travel lanes in each direction with no center crossing island.

PHYSICAL BARRIERS

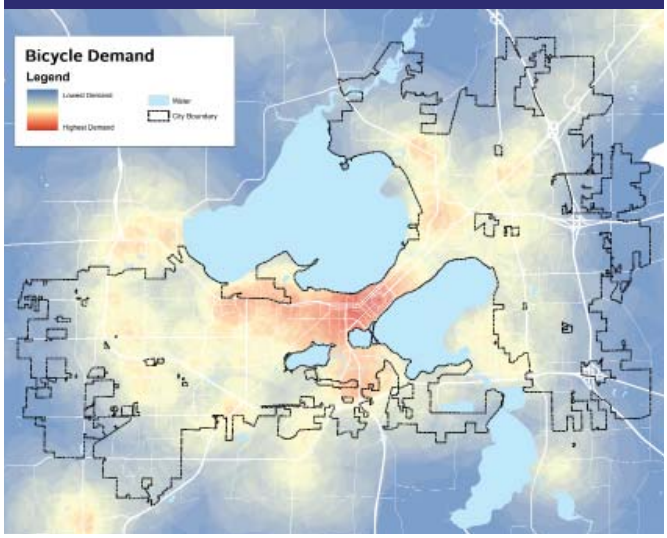
A number of physical obstructions serve as barriers to walking in Madison. These barriers are primarily freeways or highways including the Beltline, Interstate 39/90/94, U.S. Highway 30, and Stoughton Road. These highways have very infrequent pedestrian crossings in Madison, and effectively cut-off all pedestrian access from one side of the highway to the other side. Where pedestrian crossings of these highways do exist, they are often involve crossing ramps leading to and from the highway, or are noisy and generally unpleasant to use. Grade-separated bicycle and pedestrian crossings of these highways provide comfortable crossings for pedestrians, but often are not located where pedestrians may need them to be.

The Bicycle Network

The city of Madison has been designated a Gold Bicycle Friendly Community (BFC) by The League of American Bicyclists, and has been ranked as a BFC since 2006. This status was awarded as a result of a number of factors, including: 50-75% of arterial streets in Madison have dedicated bicycle facilities, 6% of total mode share in Madison is bicyclists, and a significant percentage of Madison schools offer bicycling education.

In 2006, the mayor formed a committee to focus on achieving the Platinum BFC designation for Madison and promote the city to the status of "best city in the country for bicycling". The Platinum Bicycling

Bicycle Demand



Committee developed a report to guide the city in its efforts, which was adopted by Clty Council in 2008. The City hopes to reach its goals by continuing to build a world class network of bicycle facilities.

The city of Madison and the Madison area already have an extensive system of bikeways. This network has been developed over the past 40 years. Within the city in 2013, there were 46 miles of paths, 112 miles of bicycle lanes, and 116 miles of signed bicycle routes. The city's standards for new and reconstructed major streets include bicycle lanes. Often paths are considered in addition to bicycle lanes. In some cases, bicycle lanes have been added through re-striping efforts such as Segoe Road or reallocating lanes such as West Washington Avenue.

The city has invested millions of dollars over the past 20 years in the construction of paths within separate corridors. These include the Capital City Trail (Isthmus, E-Way, and Verona Road segments), the Southwest Commuter Path (leading to the Badger State Trail), the Cannonball Path, the Campus Drive Path/Black Hawk Path/expanded path segment west of Whitney Way all in the University Avenue corridor, the Ice Age Junction Trail, the Yahara River Trail, the Starkweather Creek Path, the Wingra Creek Path, and other minor path segments.

BICYCLE SYSTEM GAPS AND BARRIERS

During past 40 years the City of Madison has been able to incorporate or retrofit bikeways into most the major streets in the city. At the same time, nearly 50 miles of path have been constructed. Most of the gaps in the Madison bikeway network are a result of barriers or streets that have very restricted rights-of-ways. The gaps can be summarized as the following:

Gaps with no Bicycle Service. Despite considerable efforts to include bicycle lanes in all major street projects several key segments of major streets that have not been rebuilt with bicycle lanes. Several examples include these streets: Mineral Point (part), Speedway, Odana, Monroe, Regent and Cottage Grove (part).

Low Bicycle Level of Service. There are a number of arterial streets that have been reconstructed with bicycle lanes. Since the time they were built with bicycle lanes, traffic has increased and conditions have

Bike Share

Madison B-cycle

The city of Madison was one of the first cities in the United States to experiment with bike share with the launch of the Red Bikes Project in 1996. These bikes were available to the general public for free in areas around the University of Wisconsin campus and the Wisconsin State Capitol. Unfortunately, many of the bikes were stolen and the program was modified to require a valid credit card.

In 2011, Madison B-cycle debuted with just six stations on the Isthmus. Since then, the system has grown to 35 stations with 350 bikes spread throughout the downtown area.

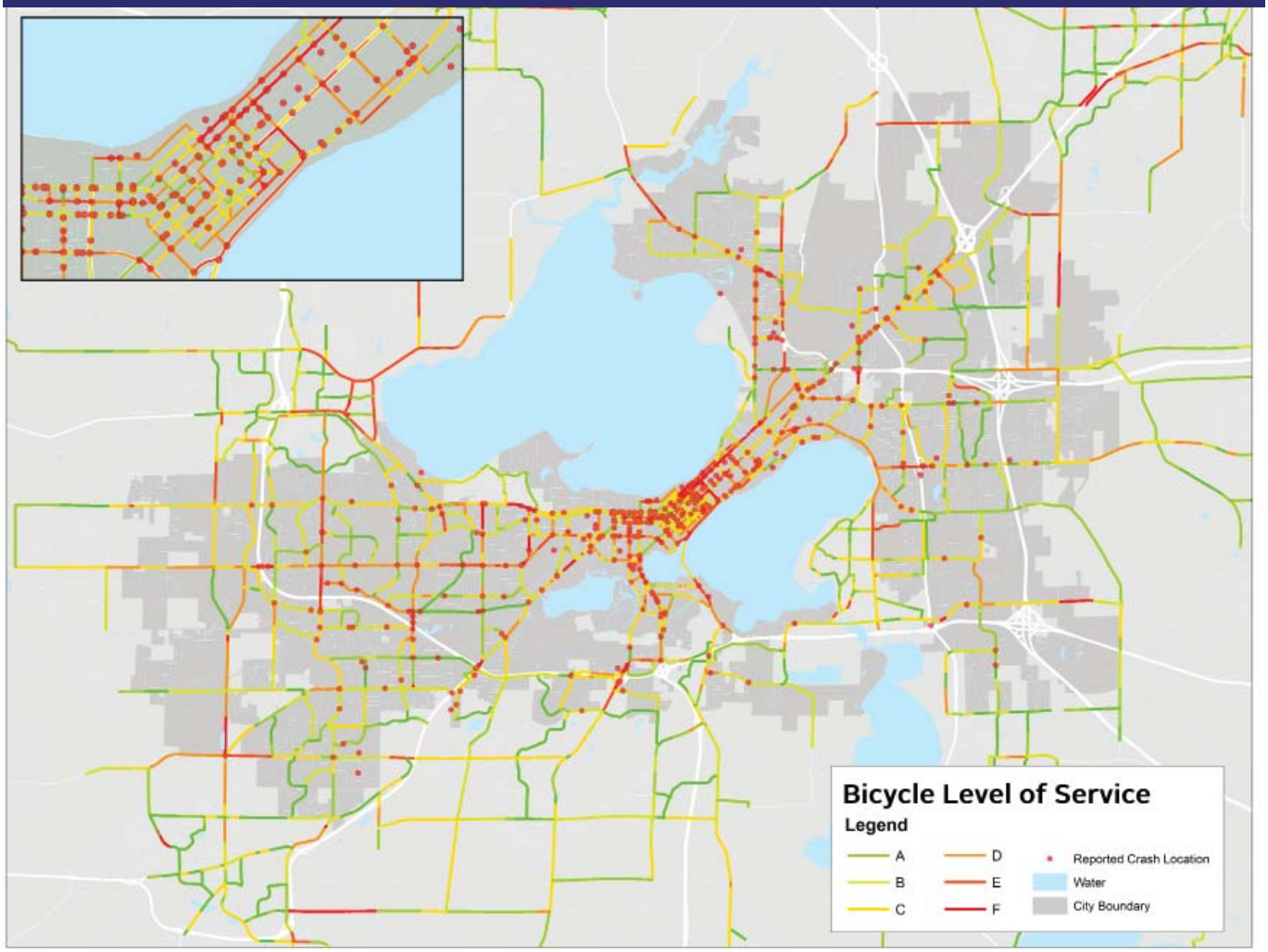
Bike share systems in cities make trips that would normally be too far to walk much more convenient. For those without access to a vehicle, or who simply choose not to drive, bike share provides a healthy and sustainable alternative.

Information from madison.bcycle.com

Madison B-cycle bikes parked at a station.

Image from flickr.com/tabor-roeder

Bicycle Crashes in Relation to Bicycle Level of Service



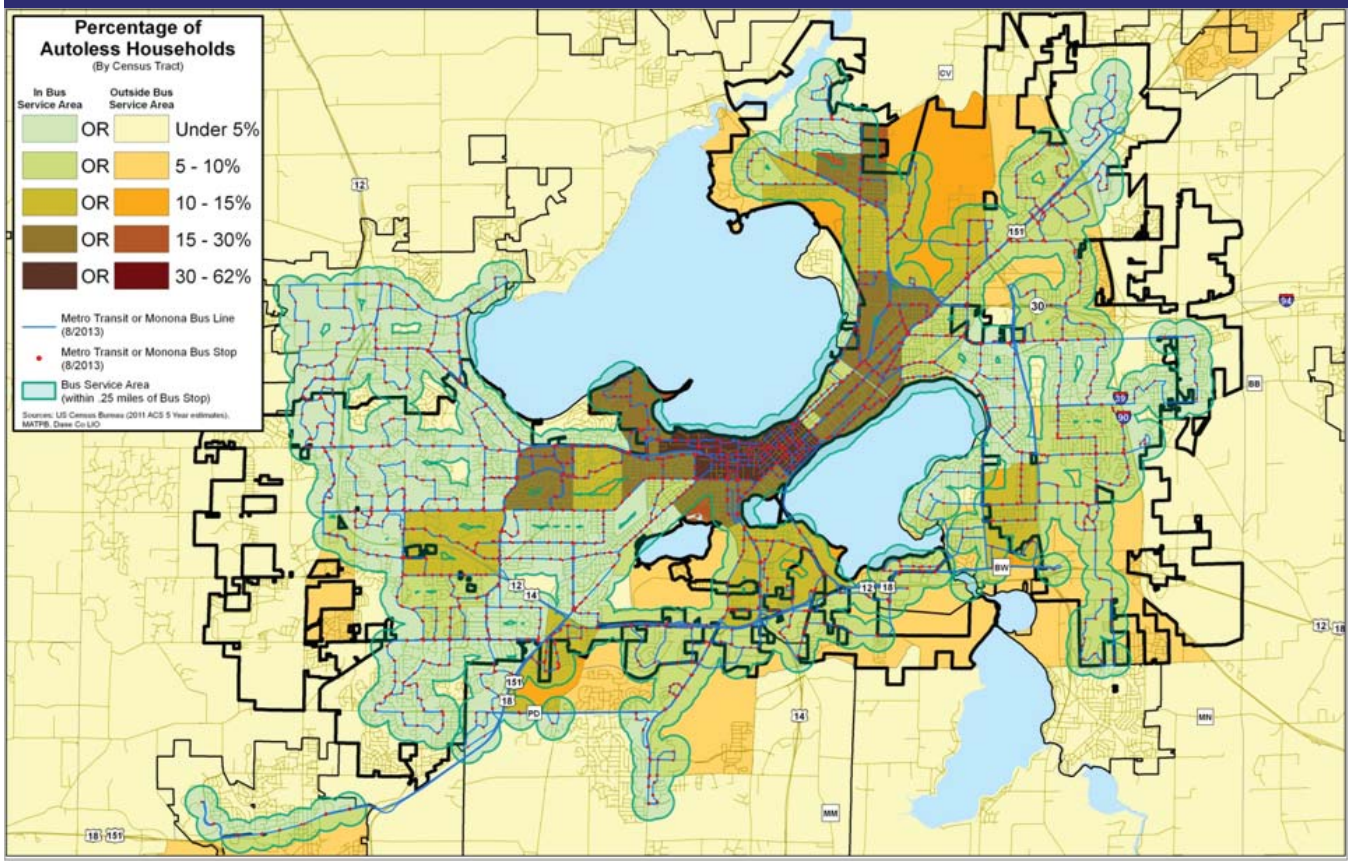
become more stressful for bicyclists. The Madison Area Transportation Planning Board (Metropolitan Planning Organization) has recently produced a bicycle level of service analysis using the 2010 Highway Capacity Manual methodology. Examples of streets with low bicycle level of service but having bicycle lanes include: Johnson/Gorham, and part of Mineral Point near West Towne.

Crossings of Limited Access Highways. The Beltline, Stoughton Road (Highway 51), and Interstates 90/94/39 have very few crossings that are considered bicycle friendly. The Beltline and the Interstate act as major bicycle barriers in Madison and part of the problem stems from the lack of non-interchange street crossings of these freeways. In many cases, bike lanes have been provided through the interchanges, but given high traffic volumes and the numerous crossings of ramps, they are rated moderately low for overall bicycle level of service.

Peak Travel Lane Streets. Several streets including Monroe and Williamson, and a portion of Regent, lose a parking lane during peak travel times to become a travel lane.

This requires that bicyclists use the travel lane during peak traffic periods. Generally conditions are far better when the bicyclists share the lane with the parked autos.

Households without Vehicles and their Proximity to Transit

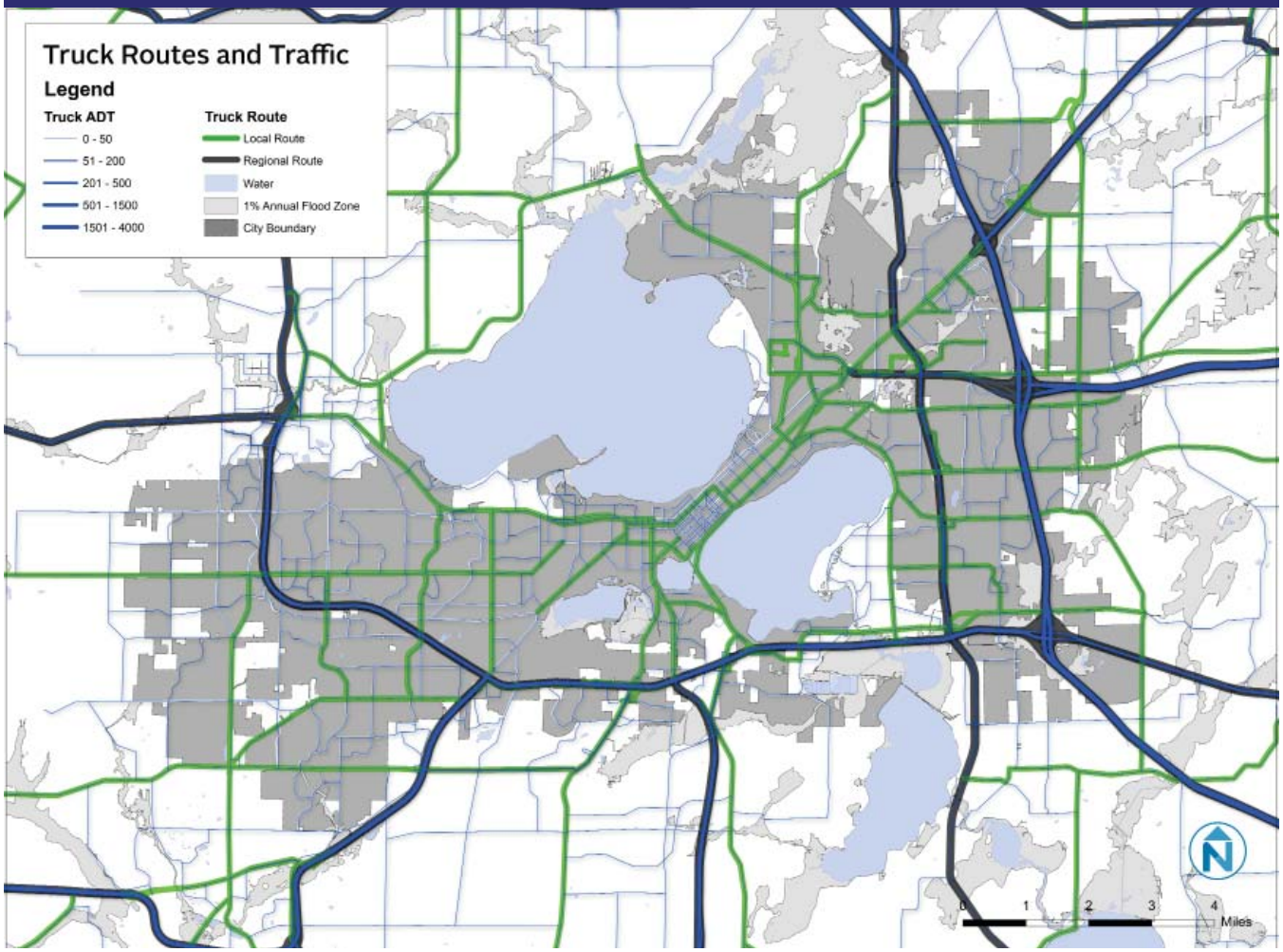


Gaps in the Path System. There are several key segments of paths that are lacking continuity and require key connections. Just a few of the most pressing examples include: the continuation of the Capital City Trail from Madison's Cottage Grove Road to the beginning of the Glacial Drumlin Trail in Cottage Grove, the continuation of the Cannonball Trail to the north to connect to Fish Hatchery Road or the Wingra Path, the Sherman Flyer, and the Goodman Path.

Zero Vehicle Households

There are areas in the city of Madison where significant percentages of households do not own or have access to a vehicle. Some of these do not own a vehicle by choice, but many of them simply cannot afford to own one. For these households, transportation can be a hurdle in their daily lives. For those households without a vehicle that live near transit, they have a feasible transportation option. Unfortunately, there are some that lie outside of the existing Metro Transit service area, and are limited in transportation to the options of either biking or walking. It is in these areas where quality bicycle and pedestrian infrastructure is critical.

Truck Routes and Traffic Volumes

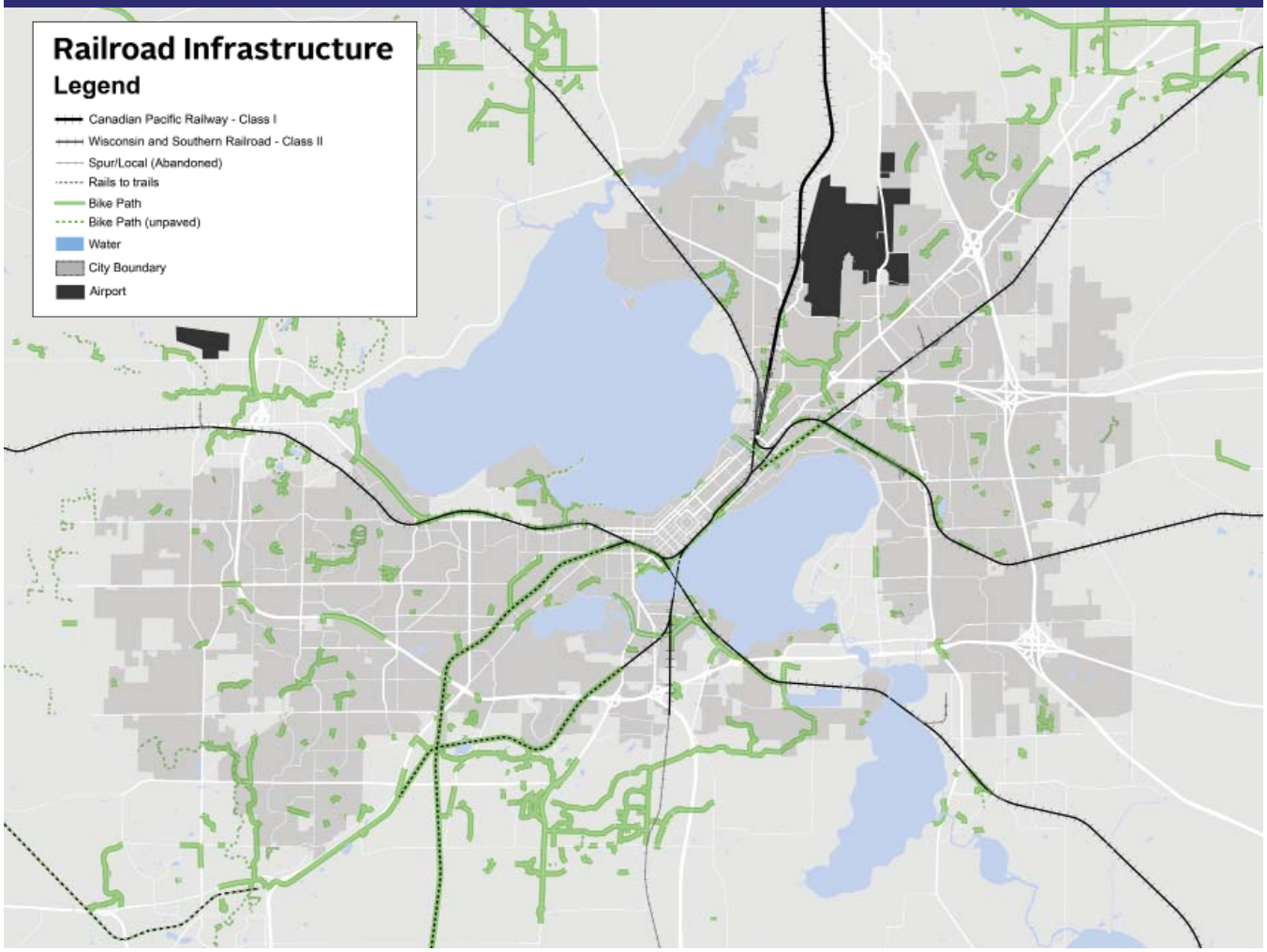


AVIATION, FREIGHT AND LOGISTICS

Trucking

The city of Madison has designated routes for large trucks that are differentiated between local-serving and regional truck traffic. As illustrated by traffic data, much of the truck traffic moving through Madison utilizes the Beltline and other interstate highways. Some of the traffic continues into Madison using the designated local routes, and an even smaller portion takes to minor arterials within the city that are not designated for truck traffic. Trucks account for a significant amount of wear and tear on the roadway and greatly increase the maintenance required.

Aviation and Rail



Aviation

Madison has scheduled commercial passenger air service through Dane County Regional Airport (IATA code MSN, ICAO code KMSN), located six miles northeast of downtown Madison. The airport served approximately 1.6 million passengers in 2013, the most recent year for which statistics are available, and is served by the three major American legacy passenger airlines (United, American and Delta) as well as Frontier Airlines. The airport provides service to over 10 destinations, primarily focused on hub airports of the airlines providing service, but also including direct service to major national destinations such as New York, Washington, DC and Orlando, Florida. Nearly one-third of passengers using the airport travel to three major Midwestern hub airports, either to transfer to connecting flights or as final destinations—Chicago O'Hare, Minneapolis-St. Paul, or Detroit.

Dane County Regional Airport is a joint civil-military airport, and for this reason most general aviation activity in the Madison area uses Middleton's Morey Field, around 15 miles from downtown Madison.

Freight Rail

The majority of freight rail service is provided by the Class II Wisconsin and Southern (WSOR) Railroad, owned by WATCO Companies, LLC. WSOR is based out of Milwaukee and provides freight service to Milwaukee, Chicago, and other areas of south central Wisconsin on track predominantly owned by WisDOT. The Class I Canadian Pacific Railroad also has a spur connecting Madison with its system. Historically, Madison was served by three railroads – The Milwaukee Road, Chicago and North Western, and Illinois Central. When these competing railroads went out of business or left Madison, the rights-of-way were purchased by WisDOT and others and consolidated into the single system we have today. Two of the original four train stations are still in place and have been repurposed.

Due in part to the shape of Lake Monona and the circuitous routes leaving downtown Madison from the south, the first trailroad constructed to Madison by the Milwaukee and Mississippi Railroad in 1854 crossed the lake and separated an inlet (today's Monona Bay) 52 years before the current state capitol building was built. The shortcut that these bridges provided from the south side of the lake led to their informal use as pedestrian crossings. Eventually this desirable direct route was opened to vehicle traffic with construction of the John Nolen Drive causeway in the 1960s.

Historically, Madison was not on any of the three main high traffic rail routes between Chicago and the Twin Cities, as a result many rail crossings lie at street grade, which can present potential challenges for users navigating those intersections. Pedestrians and bicyclists in particular may find these intersections to be obstacles if care is not taken to ensure safety. A few of the existing rail lines through the city are followed by off-street bicycle paths running within the rail right-of-way. Some of the rail lines have been repurposed as rail-to-trail projects and are now simply multi-purpose pathways. In locations where these paths do cross, it is necessary to provide adequate and safe crossings.

Intercity Passenger Services

Madison does not have direct access to passenger rail service within its city limits; the nearest train station is in Columbus, Wisconsin, approximately 30 miles northeast of Madison, serving Amtrak's once-daily Empire Builder. However, Madison is a major hub of an intercity bus network operated by private companies. This system is one of the most extensive in the United States and includes service to Chicago (where passengers may connect to Amtrak service), Milwaukee, Minneapolis, Dubuque, Wisconsin Rapids, Green Bay, and many cities in between. Services also provide direct connections to major airports in Minneapolis-St. Paul, Milwaukee and Chicago (O'Hare airport).

Madison's intercity bus services do not access a central terminal facility, but instead generally offer curbside pickup on University Avenue in the UW campus and at a variety of locations around the city. Passengers often do not have waiting facilities or shelter, and different intercity operators serving different points suggests that bus transfers through Madison may be difficult or time-consuming. For example, Greyhound only stops at Dutch Mill, where passengers often have no transit service into central Madison available to them.

Bus passengers and members of the Madison community have been aware of this need since the Badger Bus Depot on Bedford Street was closed in the late 2000s, and there is current planning effort to identify locations and needed funding and to construct a central bus passenger facility.

MADISON TOMORROW

BRIEFING BOOK

THE VISION

Preparing for future growth in Madison can take one of two paths. The city can either continue to expand spatially with relatively little population growth, developing a more sprawling urban form, or the city can plan for high density in areas that are suitable for redevelopment and preserve what remains.

The first option suggests that the transportation future is about using resources to promote greenfield development and spreading service provision (especially transit service and street maintenance) to a larger area, with presumably little to no increase in available resources and transportation revenue. The second option offers a transportation future that is focused on connecting nodes and building on small projects to fill in gaps in a system of complete streets, and for rethinking services to make the most of public resources.

The city and its residents have already decided which option they want to take, opting for a future with compact development, expanded mobility options and sustainable growth. This vision is supported by the city's comprehensive plan, and recent efforts have developed a blueprint for how that happens from a land development and future land use perspective. The role of the Madison in Motion plan is to develop that blueprint for transportation.

ANALYTICS, EMERGING TECHNOLOGY AND 'BIG DATA'

With the wealth of the data that is now available due to modern technology, local governments and private corporations alike have access to an unprecedented asset. Although the efforts at collection of personal data have largely been led by private organizations, especially marketing companies who have utilized this type of information for years to develop targeted marketing programs, the potential for public sector use is only beginning to be realized. Many of the private organizations involved in data collection have begun proposing to government agencies how their use of data can significantly improve how governments provide public services. Consumer purchases, mobile "check-ins", smartphone applications and other related sources of data create any number of possibilities for predictive analytics. Local governments can use this information to make more informed decisions.

An example of how the public sector can utilize big data for public service improvements is a smartphone application that was developed in the city of Boston to detect bumps in the roadway. A smartphone user can turn on the application and, while the user is driving, the application will collect information about the smoothness of the ride. This provides the City with real-time data as to where there are streets in need of repair. This simple smartphone application allows local governments to utilize citizens as sensors to help improve public services.

Likewise, emerging technologies that appear poised to have a greater role in the future of local transportation systems, such as bicycle sharing, on-demand transportation network services (such as Uber and Lyft) and driverless vehicles, have been developed largely in a paradigm of analytics and data-collection and analysis capability. As these kinds of technologies evolve and become more common, data collection will become an even greater element of transportation planning and decision-making.

Big data, however, comes with the challenge of interference with personal privacy and how to protect personal information. For this reason, it is critical to develop a policy framework for how to regulate proper usage of any available data.

Madison's growth limitations point to a future where decisions must be made to create a more efficient transportation system. Many of these new technologies with data sharing abilities–smartphone applications, bike sharing systems, smart parking systems and smart vehicles—have the potential to create a more efficient system and contribute to public good. The data collected through these systems can be easily shared with the public to ensure transparency, illustrating how the data is being analyzed as well as how decisions are being made as a result, but when this data is not collected by public agencies that will be delivering public services, Madison will need to define ground rules and parameters for its collection and use, ensuring that it respects personal privacy and civil liberties.

Accessible Bus | Tri-Met | Portland

Image from Nelson\Nygaard

TRANSPORTATION EQUITY

Madison is a community that values public processes in decision making and believes that all citizens deserve access to public services and civic amenities. For this reason, it is important to consider how transportation infrastructure and services will be delivered in an equitable manner. This can be thought of from three perspectives:

Fairness in distribution of resources: one constituency or division of the city, such as a neighborhood or organization should not be given a share of public resources or attention that is grossly disproportionate to that group's needs and proportion of the overall city. Likewise, there should be an rough proportionality between how resources are used for a particular transportation mode and the share of Madison's population that is using that mode. Although a heavy reliance on automobile travel in Madison has historically tilted the balance of transportation spending to automobile travel, the desires for infill development and investment in the central city point to a need to encourage a more robust balance of travel options—and in so doing, reconsider the balance of how transportation funds are spent.

Socioeconomic equity and environmental justice: Equity is also a matter of ensuring that groups and sections of the community who have historically not been well-represented in the transportation planning process have a voice in Madison's conversations about its future. This involves not only attention to the needs of these groups and identifying project and policy approaches to addressing these needs, but also to ensuring that these groups do not bear a disproportionate amount of the environmental or social impacts of transportation decisions.

Mobility equity: Madison must also address the differences in need and ability for different users of the transportation system, especially those who cannot or do not want to rely on private vehicle transportation, either through physical limitations or economic circumstances.

AGING POPULATION

As a significant portion of the population ages, many senior residents in the region find themselves severely limited in their mobility. Ensuring that seniors have transportation options available to them will be important for the future of the region.

AIR QUALITY AND CLIMATE CHANGE

The Madison region has consistently met federal air quality standards, enjoying a majority of days per year under the status of "good quality" air. The ozone levels for the region, however, have only been just below the federal standard over the last few years. As congestion in the region worsens, air quality will become a greater challenge, and it will be critical to address solutions within the transporation system itself.

MILLENNIAL TRAVEL HABITS

Although data is not yet definitive, patterns in living choices among those born since 1983—the generation known as "Millennials"—suggest an increased preference for walkable environments where driving is not a necessity. One trend that supports this is the decrease in driver license registrations among this age group and the growing numbers of college graduates stating preference for living in cities where they have alternative transportation options.

PLAN GOALS

Madison has expressed a desire to foster and build a sustainable community and the Madison in Motion Plan will identify capital projects and key policy strategies to prepare the city's transportation system for a more sustainable future. It is important, however, for even a transportation plan to look beyond its conventional technical purview and recognize the impacts that any public investment—especially one as vital as transportation—can have on other community concerns such as public health, safety, and civic institutions. The goals discussed here are the guiding elements for the Madison in Motion Plan and the projects and policies that it recommends.

EXPAND MOBILITY CHOICES

Expand transportation infrastructure to support a greater range of options for all user types.

IMPROVE AND PROTECT SAFETY AND HEALTH

Ensure that all future growth contributes to healthy living and good quality of life for all residents.

ASSURE EQUITY FOR ALL SYSTEM USERS

The transportation system of the future must address the needs of all potential users.

ENHANCE NEIGHBORHOODS

All future growth should contribute to the creation of vibrant communities and strong neighborhood identities.

PROMOTE BENEFICIAL GROWTH

All future growth should be good quality and sustainable, leading to community benefits that all of Madison can enjoy.

ASSURE ENVIRONMENTAL SUSTAINABILITY

Transportation projects and policies will not generate adverse impact on air and water quality and will seek to improve both.

MAINTAIN FISCAL RESPONSIBILITY

Madison should continue to build a transportation system that the current generation and future generations can afford to maintain and preserve.

ENCOURAGE ECONOMIC DEVELOPMENT

Madison's transportation projects should help to promote economic opportunity and community prosperity.

ENSURE REGIONAL COORDINATION AND INTEGRATION

Madison will be a regional partner and work to ensure that its transportation decisions benefit its neighboring communities and surrounding region.

World-Class Cycling

What happens after Madison achieves its goal of becoming a Platinum Bicycle Friendly Community and a 20 percent bicycle mode share?

BICYCLE SYSTEM EVOLUTION

To be sure, Madison has made great progress in enabling bicycling as a safe and desirable mode of transportation in the city. It has also set goals and specific objectives for how to improve, with attaining a League of American Bicyclists Platinum Bicycle Friendly Community designation. Parallel goals not adopted as City policy but still inspiring community discussion include reaching a 20 percent bicycle mode share by the year 2020. The Platinum Bicycle Friendly goal has been supported through a strategic plan that takes advantage of a large cycling community, a university population with limited access to vehicles and parking, and an extraordinary presence of the bicycle industry.

Moving Beyond Platinum

As this briefing book has asserted, to continue accommodating growth Madison will need to continue designing streets and finding appropriate opportunities to retrofit streets in ways that increase their person-carrying capacity— even more than striping bicycle lanes, building key off-street path connections, and calming traffic to make cycling even more attractive. There are multiple techniques practiced in other parts of the world, primarily in Northern Europe, that provide useful case examples for Madison and that are being used to the city, even if in very early stages.

WOONERFS

The concept of ***woonerfs***, translated from Dutch as "living streets,' originated in the Netherlands in the 1970s as a reaction to growing levels of vehicle mobility and the dominance that automobiles were beginning to assert on city streets. These designs originally featured a mix of traffic, bicycles and pedestrians in the same space, and over time evolved to resemble city squares or open spaces that do not have conventional curb-to-curb delineation of the traveled way.

Madison's State Street is an existing example of a similar configuration: regular automobile traffic is currently prohibited on the street between the Capitol and Lake Street at the edge of the University campus, with only pedestrians, bicycles, transit vehicles and emergency vehicles allowed. However, State Street is also vital public space in Madison and serves as one of the city's major commercial districts (and the

A woonerf intersects with a street open to vehicles near the Museumsplein, Amsterdam.

primary pedestrian-oriented commercial district for the UW campus). Madison may consider other streets for this kind of a configuration, but orient their use to transportation and recreational public space as opposed to commercial pedestrian mall environments.

BICYCLE SIGNAL TIMING

Some American cities have begun to use conventional traffic engineering and control infrastructure to increase bicycle convenience. In 2011, San Francisco introduced a corridor-based signal timing sequence along Valencia Street in the city's Mission District, changing signal timing patterns to allow a 'green wave,' or continuous flow of traffic with sequentially-changing signals, timed for bicycle travel speeds. This has been followed with a half-dozen such implementations around the city and has been met with enthusiastic support by cyclists.

20 MINUTE NEIGHBORHOODS

A "20-minute neighborhood" is one in which residents and employees can reasonably walk or bike to places and services to meet a number of their daily needs such as transit, shopping, groceries, public services, schools, parks, and entertainment.

20-minute neighborhoods allow residents and employees to drive less on a daily basis. Consider a downtown employee who is able to complete a number of errands by foot on her lunch hour compared to a suburban office park worker who must drive 1-5 miles to do the same. Over the course of a year (and career), this amounts to significant individual and household savings. From a public standpoint, this reduces congestion and wear and tear on local streets, thereby improving air quality and lowering maintenance costs.

These neighborhoods promote active forms of transportation including walking, biking and taking transit. Recognizing the connection between the built environment and active transportation rates, local and national organizations are increasingly promoting walkable neighborhoods as an effective public health measure.

BEST PRACTICES

PERSON-CAPACITY OF STREETS

Moving people as opposed to concentrating on moving vehicles represents a fundamental policy shift for many cities, and those that have begun thinking about their transportation systems in this manner have often faced challenges in retrofitting streets to appeal to a more balanced set of users. Madison has already taken notable steps in lessening the dominance of vehicle travel, and providing sufficient support infrastructure and services to make transportation without a personal vehicle a feasible option.

EXPANDING BICYCLE NETWORKS

Madison has an existing planning committee to lead the city to achieving the Platinum designation level though the League of American Bicyclists; this committee prepared a report that was adopted in 2008 and has helped to guide city policy on bicycle investment since. This involves promoting a bicycling culture that brings new cyclists onto the network. New Orleans currently features a program (through its metropolitan planning organization) to teach bike safety classes and riding with confidence. In some other cities, such as Atlanta and Chicago, this is handled through advocacy organizations. Madison in Motion will build on current efforts in Madison, including those led by the 20 By 2020 campaign, and will work toward a formal policy framework for developing the institutional capacity for this, either through the City or through expanding the program in cooperation with private sector partner organizations.

Madison has unique resources, including a large concentration of bike industry organizations in the area, such as Saris, Planet Bike, Trek and Pacific Cycle. The Madison in Motion Plan can develop a framework for private partnerships to develop local infrastructure, especially the relatively low-cost end of trip facilities that are highly important to making cycling an attractive travel option.

BICYCLE CENTERS

In cities ambitious about bicycle use and commuting such as Madison, safe and convenient parking locations can be a challenge. Madison has had bicycle sharing facilities as part of the B-Cycle system for several years and these feature dedicated parking slots, but they are not available to cyclists using their own bicycles.

Bike Station Washington D.C.

Image from flickr.com/dylanpassmore

One emerging type of facility to address parking shortages is bicycle commuting stations, essentially structured, enclosed bicycle parking that often features such amenities as repair equipment or services, showers and changing facilities, and food concessions. Perhaps the best known of these are those constructed and operated by the private company Bikestation, with well known examples in Long Beach, California and Washington, DC, although there are other examples throughout the United States, such as the McDonald's Cycle Center at Millennium Park in Chicago.

These stations have tended to be located in downtowns or other key civic locations, but strategic location of these at major transit stops or stations could be a way to increase the reach of transit service without needing to operate service over a larger area. The Washington Bikestation location is adjacent to the entrance of Union Station, allowing commuters who reach Washington by train to have convenient access to a bicycle that serves to complete the local end of the trip.

MADISON BELTLINE

Beltline Study

Planning is currently underway to address a number of deficiencies associated with the Beltline freeway. There are significant roadway safety concerns, in combination with increasing travel demand and congestion, as well as limited accommodations for alternative transportation.

As the future of transportation in the Madison region will rely on a more balanced and efficient transportation system, accommodating and enhancing infrastructure for alternative transportation will be a critical element in the planning for this freeway.

With current transit services utilizing the Beltline and experiencing congestion delays, innovative facilities such as bus-only shoulder zones may be an ideal solution.

The Madison Beltline Freeway

Image from citydictionary.com user strudelwagon

TRANSIT EVOLUTION

Shoulder-Running Buses and Transit Signal Priority Corridors

In cases of constrained freeway corridors such as the Madison Beltline, increasing person-moving capacity through transit presents challenges. If the corridor experiences congestion, transit service that must be operated in that congestion is unlikely to appeal to riders as a driving alternative; on the other hand, limited space for expanding the roadway width means that dedicated lanes for transit come at the expense of vehicle travel lanes—only worsening congestion for non-transit riders.

The Minneapolis-St. Paul metropolitan area's transit provider, Metro Transit, worked with the Minnesota Department of Transportation to develop a third approach to this challenge—reconstructing highway shoulders for bus use. These shoulder bus lanes are used only when traffic speeds on highways slow below 35 miles per hour; authorized transit vehicles can then use the shoulders to bypass traffic. The buses are allowed to travel no more than 15 miles per hour over the mainline traffic speeds, but when mainline traffic is not moving due to heavy congestion, this provides a reasonable travel speed.

The results of this have been largely successful. Since the Minneapolis area began employing this service in the early 1990s, only one crash injury has occurred. Passengers are able to make this trip in less time, saving between 5 and 15 minutes per trip on average.

When not on freeways, enhanced traffic control technology can still offer improved travel times for transit vehicles. Transit signal priority (TSP) is growing in use as a way to enhance transit performance without the major capital investment of dedicated guideways and higher-capacity transit vehicles. Buses and signals both are equipped with communication technology that allows a transit vehicle to communicate with a signal, extending green-light time for approaching buses or reducing the red-light wait time for a bus waiting at an intersection. Key intersections are often enhanced with 'queue jumper' lanes that allow buses to bypass lengthy queues of traffic waiting at intersections to enjoy the flexibility of movement that the signal priority affords.

Eugene BRT Emerald Express

Image from Nelson\Nygaard

Orlando BRT LYMMO Station

Image from flickr.com/beyonddc

Pierce Transit, the service provider for Tacoma, Washington and its immediate metropolitan area (with a population of 700,000, comparable in size to Madison's). Many of Pierce Transit's higher-performing routes operate on corridors that experience congestion similar to central corridors in Madison, and through implementation of TSP over the last 20 years has shown reductions in signal delay of up to 45 percent for transit vehicles, leading to multiple associated benefits in reduced fuel costs, increased travel times, and greater customer satisfaction with transit service.

Low-Cost BRT Corridors

Eugene, Oregon shares similarities with Madison: it is a university town and its downtown street network is constrained by established building fabric and unable to add to right-of-way. Its sister city Springfield is located across the Willamette River, and the limited bridge connections carry the burden of the regional cross-river commuting. The city's transit system (Lane Transit District) had worked with various service options along key commute corridors, and chose BRT as a premium transit mode in order to increase transit speeds and attract new riders.

The Emerald Express route (typically abbreviated EmX) replaced an existing bus route on the busy Broadway corridor and immediately saw increases in ridership and improvements in speeds and travel times. It is a true BRT service with dedicated lanes on about half the route, limited stops, frequent all-day service, off-board ticketing, transit signal priority, branding, and well-defined stations.

Central City Bus Rapid Transit

When the highest demand for transit use is concentrated in a small area, there may be ways to improve service quality and increase the person-carrying capacity of streets at a low cost by focusing premium transit approaches to small areas and using non-capital-intensive transit technologies.

Orlando, Florida's LYMMO is an exclusive-lane bus service that operates through the city's central business district. Orlando, like Madison, has a long and narrow downtown core, constrained from easy growth with the city's central park to the east and by downtown freeways to the west and south. However, its core business district is not as compact as Madison's and key destination, such as City Hall, the Orange County Courthouse, and the Church Street entertainment district are separated by nearly a mile— the same distance Madison's Bascom Hall is separated from the State Capitol building. Orlando's downtown redevelopment strategies in the 1980s focused increases in the downtown parking supply on perimeter locations, allowing sites in the core

of downtown to remain available for additional development. The LYMMO service provided a way to quickly connect these downtown functions, to facilitate access through downtown Orlando without a need to park at multiple locations, and to promote downtown economic development through public investment in the transportation system.

Key characteristics of LYMMO's operations are its dedicated guideway and its use of signal prioritization for transit vehicles, which are connected through positioning system technology to the traffic signal system and to information kiosks at LYMMO stations to provide real-time arrival information. It is a fare-free service that connects to the LYNX (transit service provider) downtown bus terminal, allowing easy transfer to other parts of the Orlando transit system.

The system is currently undergoing expansion connect to a new arena and events center and to Orlando's two main hospital campuses, each about a mile from the current north and south endpoints of downtown. This will allow direct access between central Orlando's largest employment centers on fare-free, frequent service transit.