Report

Transportation Network Plan

City of
Middleton, WI

December 2006

Report for

City of Middleton, Wisconsin

Transportation Network Plan

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SECTION 1
INTRODUCTION AND EXECUTIVE SUMMARY

1.01 OVERVIEW

A. Background

This Transportation Network Plan identifies and prioritizes transportation network needs that are anticipated to develop in the next 15 to 20 years within the City of Middleton. It also lists possible solutions to these needs and develops a list of recommendations. This was accomplished through detailed analysis of existing conditions, consideration of forecasted land use within and surrounding Middleton, traffic demand and operations modeling, and research regarding transportation solutions being developed and used by other jurisdictions.

B. Process

The following process was used to understand motor vehicle needs and prioritize those needs:

1. Obtain Existing Traffic Data

    a. PM peak-hour turning-movement counts.
    b. Existing signal phasing and timing.
    c. Field observation of existing traffic operations at key intersections.

2. Model Existing Traffic Operations to Provide Baseline Information

    a. Demand model calibration.
    b. Existing traffic operations modeling.

3. Identify Probable Future Land Uses

4. Perform Future Traffic Forecasting Using a Demand Model

    a. Modifications to demand model for future conditions.
    b. Obtain year 2025 traffic assignments for Middleton arterials and collectors.
    c. Convert future daily traffic to future PM peak-hour traffic.

5. Perform Operations Modeling of Future Conditions

    a. Operations modeling of future traffic on existing transportation system.
    b. Development of solutions to accommodate future traffic.
    c. Operations modeling of future traffic on modified transportation system.

6. Prioritize Future Needs

    a. Development of interim year traffic volumes (~year 2015).
    b. Operations modeling of interim traffic (~year 2015) on existing transportation system.
    c. Needs prioritization.

The recommended street and intersection modifications are based on forecasted year 2025 PM peak-hour traffic volumes developed from daily travel demand modeling provided by the Madison Metropolitan Planning Organization (MPO). These volumes, and the operations modeling with these volumes, represent a forecast of future conditions. They are intended to identify the locations likely to develop the most significant needs.

Many factors will ultimately determine what modifications to the transportation network are needed and when. Actual traffic volumes and turning movements will vary from those used in this report. The City through its land use regulations has some control over how, where, and to what degree particular types of traffic will increase. Intersection and street modifications will need to be designed as actual needs develop. The recommendations included herein are intended for planning purposes and to convey the scope of modifications that are likely to be needed.

In addition to motor vehicle needs, existing and anticipated future needs for other modes were also considered. Solutions to Middleton's needs were researched and categorized based on three perspectives: Traffic Management, Mobility, and Accessibility. Recommendations for each of the three solution types have been developed.

1.02 EXECUTIVE SUMMARY

A. Existing Transportation System

The roadway with the highest classification in Middleton is US 12, which is classified as a principal arterial–freeway. This highway serves a vital role in carrying regional traffic to and from Middleton and Madison. It is the only freeway within the city limits.

Most of Middleton's remaining high-volume streets lie roughly in a rectangle, with Century Avenue comprising the north leg, University Avenue/US 14 comprising the south leg, US 12 comprising the west leg, and Allen Boulevard comprising the east leg. Each of these streets is a principal arterial (the highest roadway classification), with US 12 being a freeway and the others nonfreeways.

Figure 1.02-1 illustrates the basic configurations for Middleton's key streets without detailing the intersection configurations.

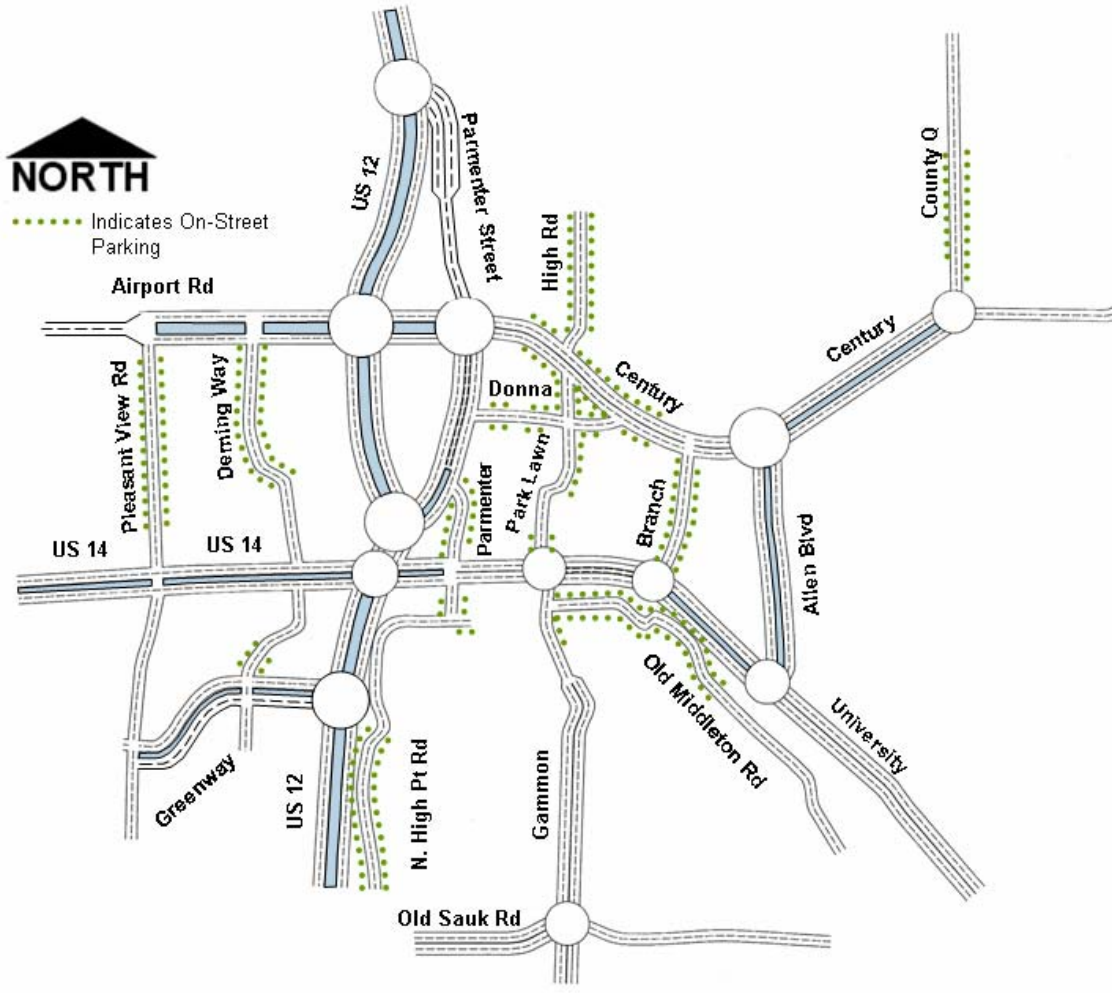

Figure 1.02-1 Basic Street Configurations

Middleton is largely a city of neighborhoods. Sidewalks exist on both sides of most City streets, with off-street connections common in many locations. Additionally, the City has increased its investment in its bicycle and pedestrian system in the last few years, beginning with completion of a Bicycle and Pedestrian Plan adopted in 1999. Significant trail construction and increases in dedicated bicycle lanes have taken place since then.

Middleton's transit is currently provided by Madison Metro Transit with most service occurring only during weekday peak periods.

Existing motor vehicle operations are generally acceptable. Currently, the most congested intersection is Century Avenue and Allen Boulevard. Overall the intersection operates at LOS E during the PM peak hour, with northbound traffic experiencing LOS F. Westbound traffic also experiences significant delay.

B. Future Traffic Forecasting

This study uses a future conditions travel demand model developed by the MPO to forecast future traffic volumes in Middleton. The model predicts future volumes based on Dane County's Visions 2020 Land Use and Transportation Plan and the supplemental land use planning completed for the North Mendota Parkway (NMP) Study. Although the forecasted land use from the NMP study was included, the roadway itself was not. The time frame and even final location of a future parkway is uncertain at this time. If the NMP is constructed, it will most likely relieve some of the traffic on Middleton's streets.

It is recommended that within five to seven years, traffic counts be conducted and the validity of the traffic projections be reviewed. This may lead to adjustment of the timing and/or priority of the improvement recommendations presented herein.

The future travel demand modeling indicates that multiple portions of the Middleton street network will be nearing or exceeding typical capacity thresholds. Figure 1.02-2 shows these locations.

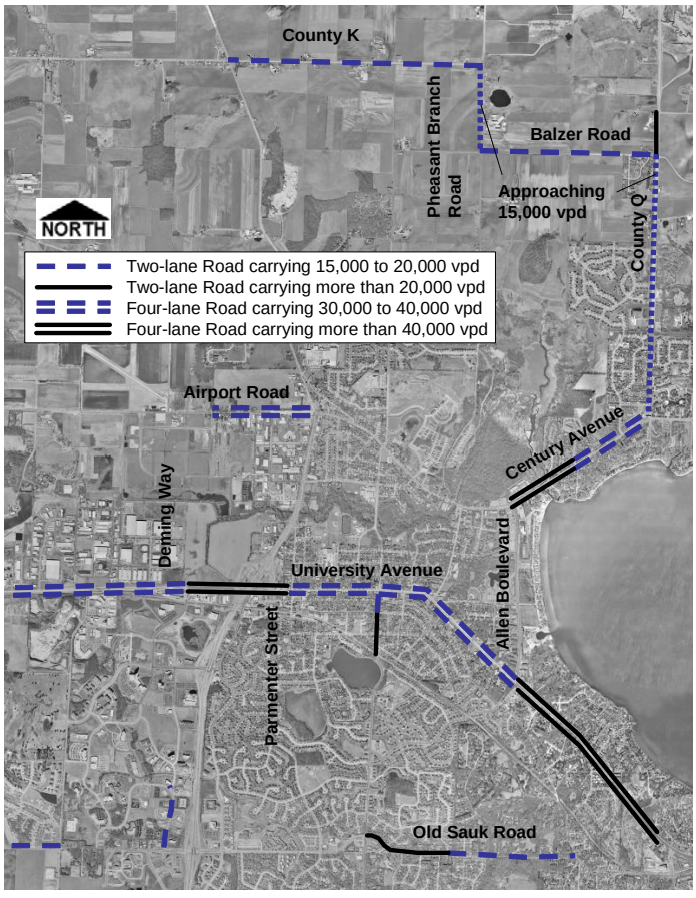

Figure 1.02-2 Future Capacity Concerns on Middleton Area Roads

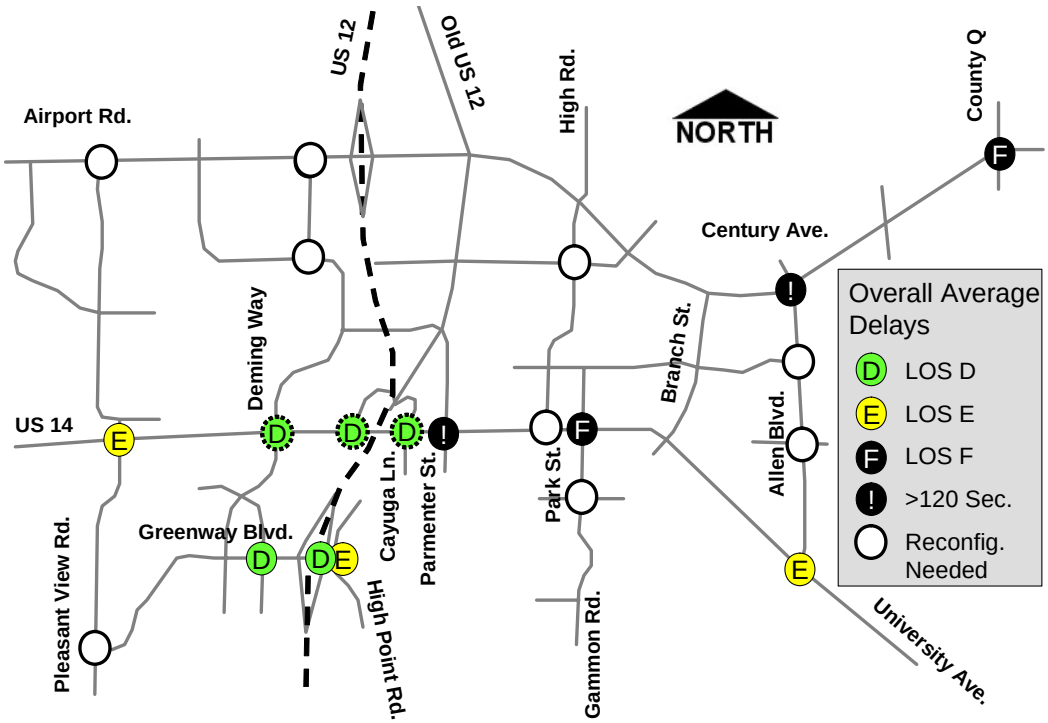

Figure 1.02-3 Future PM Peak-Hour Operations on Existing Transportation Network

Future traffic was modeled on Middleton's existing street system, with the only major modification being that the changes associated with the US 12 Bypass were in place. Figure 1.02-3 shows the results from the SimTraffic modeling.

Many of Middleton's intersections will fail during the PM peak hour if the forecasted traffic volumes are realized and no major modifications are made to the local transportation system.

C. Prioritization of Future Motor Vehicle Needs

Middleton's future traffic management needs were prioritized based on interim (~2015 and 2020) and future (~2025) traffic operations modeling. The needs are broken into corridor needs and intersection needs.

The prioritized corridor needs are:

1. US 14/University Avenue throughout Middleton.
2. Century Avenue from Allen Boulevard to County Q.
3. Park Street/Gammon Road from University Avenue to Woodgate Road.
4. East-West Connection(s) from US 12 to County Q.
5. County Q from Century Avenue to the north.
6. Pleasant View Road from US 14 to Old Sauk Road.
7. Additional corridor connections
8. North Mendota Parkway
9. West Beltline Highway

The prioritized intersection needs are:

1. Century Avenue and Allen Boulevard.
2. University Avenue and Parmenter Street.
3. University Avenue and Park Street.
4. University Avenue and Allen Boulevard (Madison jurisdiction).
5. Century Avenue and County Q/Hedden Road.
6. US 14/University Avenue and US 12 Interchange (DOT jurisdiction).
7. US 14 and Pleasant View Road (DOT jurisdiction).
8. US 14 and Deming Way (DOT jurisdiction).
9. Greenway Boulevard and North High Point Road and US 12/US 14 Interchange (DOT jurisdiction).

D. Transportation Solutions

The Transportation Network Plan divides potential solutions for anticipated needs into three categories. Traffic Management solutions tend to favor motor vehicle movement. Mobility solutions emphasize the movement of people and goods rather than vehicles. Accessibility solutions seek to treat all modes of travel equally while increasing access to goods and services.

E. Recommendations

1. Traffic Management Solutions

a. University Avenue Corridor

We recommend a “narrow roads, wide nodes” approach to the corridor. University Avenue would retain four basic travel lanes with intersections expanded to accommodate larger traffic volumes. This approach recognizes that avoiding major corridor vehicular capacity expansion on University Avenue is a trade-off that treats bicycle and pedestrian traffic more equally with vehicular traffic. This will help preserve long-term mobility within the City. The portion of University Avenue from Parmenter Street to Park Street should be modified in some regard to reduce future safety and congestion concerns. Ideally, a four-lane divided or five-lane section with a two-way left-turn lane would be provided. Impacts associated with a significantly expanded corridor may be met with resistance from local residents. If expansion is not feasible, we recommend reducing side street and driveway access to right-in/right-out only and expanding the Bristol Street intersection to provide traffic signal or roundabout control. Additionally, the following intersections should be planned for expansion as discussed in Section 5 of this report:

- US 14 and Pleasant View Road
- US 14 and Deming Way
- US 14/University Avenue and the US 12 Interchange
- University Avenue and Parmenter Street
- University Avenue and Park Street
- University Avenue and Allen Boulevard

Care should be taken in any of the above projects to consider impacts to pedestrian and bicycle use of the corridor. If not properly designed, the University Avenue corridor could become a major barrier to mobility within the City.

b. Century Avenue Corridor

The Century Avenue corridor between Allen Boulevard and County Q provides a transportation "isthmus" between Lake Mendota and the Pheasant Branch Conservancy. It is an important link between the northeast and central portions of Middleton. Similar to University Avenue, traffic forecasts indicate vehicular traffic demand that exceeds typical four-lane road capacity. However, impacts associated with a significantly expanded corridor may be met with resistance from local residents.

Expansion of the Allen Boulevard and County Q intersections are recommended as discussed in Section 5 of this report, coupled with access management on Century Avenue between these intersections. This would involve restricting left turns out of driveways and unsignalized side streets. This strategy may require traffic signal or roundabout control to be added at the Elm Lane intersection because of a lack of options for leaving this neighborhood westbound. Alternatively, traffic could be permitted to turn right and perform a u-turn maneuver at a downstream unsignalized intersection.

c. Park Street/Gammon Road/High Road Corridor

This corridor will serve an increasingly important function as a north-south travel route as development continues on the north side of Middleton. Planning to accommodate the travel demand along this corridor should include expansion of the Park Street and University Avenue intersection and construction of the Park Street link adjacent to Parisi Park.

The Park Street cross section south of University Avenue should be considered for expansion to a four-lane divided section that would restrict left turns from driveways. Side-street left turns onto Park Street could remain. At least one additional intersection is recommended for signal or roundabout control, with Hubbard Avenue and South Avenue being the best candidates. Removal of on-street parking is recommended.

d. East-West Connection(s) from US 12 to County Q

This proposed connection is important from a regional and local standpoint. Century Avenue will need relief in carrying east-west traffic. The conceptually planned North Mendota Parkway could provide this relief, but the future of this proposed roadway is uncertain. The City should begin planning a roadway with a divided four-lane boulevard section that connects US 12 and County Q. This connection should not be confused with the North Mendota Parkway as it is not intended to carry regional traffic.

2. Mobility Solutions

a. Improvements to Middleton's Bicycle and Pedestrian System

Expanding and increasing connections within the bicycle and pedestrian system is one of the best ways to increase mobility within a community. As discussed in Section 6, Middleton has done a good job of planning a comprehensive system thus far. Recommendations for continued improvements are shown in Figure 1.02-4.

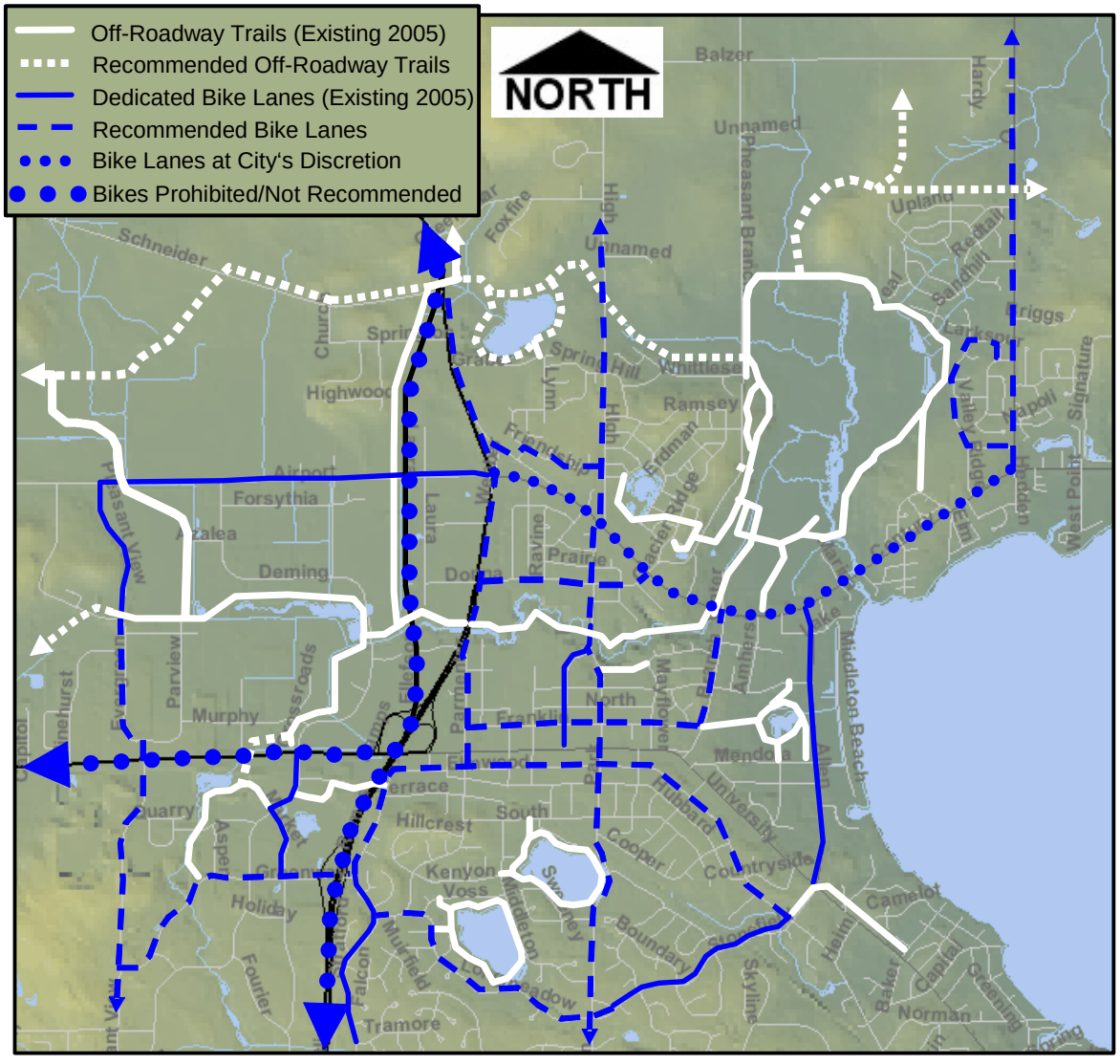

Figure 1.02-4 Recommended Middleton Bicycle and Pedestrian System Plan

b. Citywide Transportation Demand Management

Requiring large traffic generators to complete a Transportation Demand Management (TDM) plan can help reduce peak period single occupant vehicle trips. TDM is most effective when applied across an entire community. The City of Madison is beginning to require TDM as large developments or redevelopment proposals appear before the Planning Commission. Middleton should begin requiring the same. Additional information on TDM practices and policies is available at "www.vtpi.org/tdm/".

c. Access Management

As noted under the recommendations for Traffic Management solutions, access control should be implemented as much as practical on Middleton's most important transportation corridors. These include University Avenue, Century Avenue, Park Street/Gammon Road/High Road, the future connection between US 12 and County Q (North Mendota Parkway), and any new arterial streets. Access control would seek to alter direct access to these corridors as follows, listed from most effective to marginally effective:

- Close access completely (generally only possible with a commercial property that has an existing second access on an adjacent side street)
- Relocate access to a side street
- Combine access points
- Restrict access to right-in/right-out movements only
- Restrict access to right-in/right-out/left-in movements only

Access management is much easier to apply to new corridors than it is to existing ones. Opportunities do arise to alter access as properties redevelop.

d. Continued Advocacy for Improvements to Transit Service

Madison Metro Transit currently serves the City of Middleton. Continued service and expansion as appropriate will help reduce long-term overall congestion. The commuter rail proposal contained in the MPO's long-range transportation plan, Transport 2020, will benefit the City of Middleton by reducing travel demand on its most important travel corridor, University Avenue, and by improving resident mobility and increasing transportation options. Middleton should consider supporting improvements to existing transit and expansion of services.

3. Accessibility Solutions

We recommend continued and expanded application of Smart Growth practices within Middleton. The City has already put many Smart Growth practices to use, and should continue to do so. Continuing to plan mixed use developments that try to balance accessibility between motorized and nonmotorized modes is key. Also important is continued protection of open space, farmland, and environmental corridors that border Middleton.

SECTION 2
EXISTING TRANSPORTATION SYSTEM

2.01 EXISTING TRANSPORTATION SYSTEM

A. Classification

The Federal Highway Administration (FHA) and the Wisconsin Department of Transportation (WisDOT) determine street classifications according to the function they provide. Typical classifications in an urban area are of principal arterials-freeway, principal arterials-other, minor arterials, collectors, and local streets. The following paragraphs briefly describe each of these types of roadways:

1. Principal Arterial-Freeway–These roadways are designed to carry high volumes of regional traffic. They are fully access-controlled with access only at moderately spaced interchanges. These roadways are designed to convey vehicles on longer trips at high speeds. US 12 is a principal arterial-freeway in Middleton.

2. Principal Arterial-Other–These streets are designed to carry high volumes of subregional traffic between population and employment centers. They emphasize mobility and are typically designed with some measure of access control, but they do have at-grade intersections at reasonable spacing. University Avenue is a principal arterial-other in Middleton.

3. Minor Arterial–These streets interconnect with and augment the principal arterial system. Typical daily traffic volumes range from about 10,000 to 15,000 vehicles per day. They accommodate trips of moderate length at somewhat lower levels of mobility. This system begins to place more emphasis on land access and less emphasis on travel movement. Airport Road is a minor arterial in Middleton.

4. Collector–The collector system provides both land access and traffic circulation within residential neighborhoods and commercial/industrial areas. Typical daily traffic volumes range from about 1,000 to 10,000 vehicles per day. The collector system connects trips on the arterial system to their origin/destination. North High Point Road is a collector in Middleton.

5. Local Streets–The local street system comprises all facilities not in the higher classifications. Local streets generally carry less than 1,000 vpd. Local streets permit direct access to adjacent properties. These streets provide the lowest level of mobility and typically through movements are discouraged. Friendship Lane is a local street in Middleton.

Figure 2.01-1 shows the 2005 functional classification of City of Middleton streets prepared by the Madison Area Metropolitan Planning Organization (MPO). This classification coincides with the classifications maintained by the Wisconsin Department of Transportation and the City of Madison.

Most of Middleton's high-volume streets lie roughly in a rectangle, with Century Avenue comprising the north leg, University Avenue/US 14 comprising the south leg, US 12 comprising the west leg, and Allen Boulevard comprising the east leg. Each of these streets is a principal arterial.

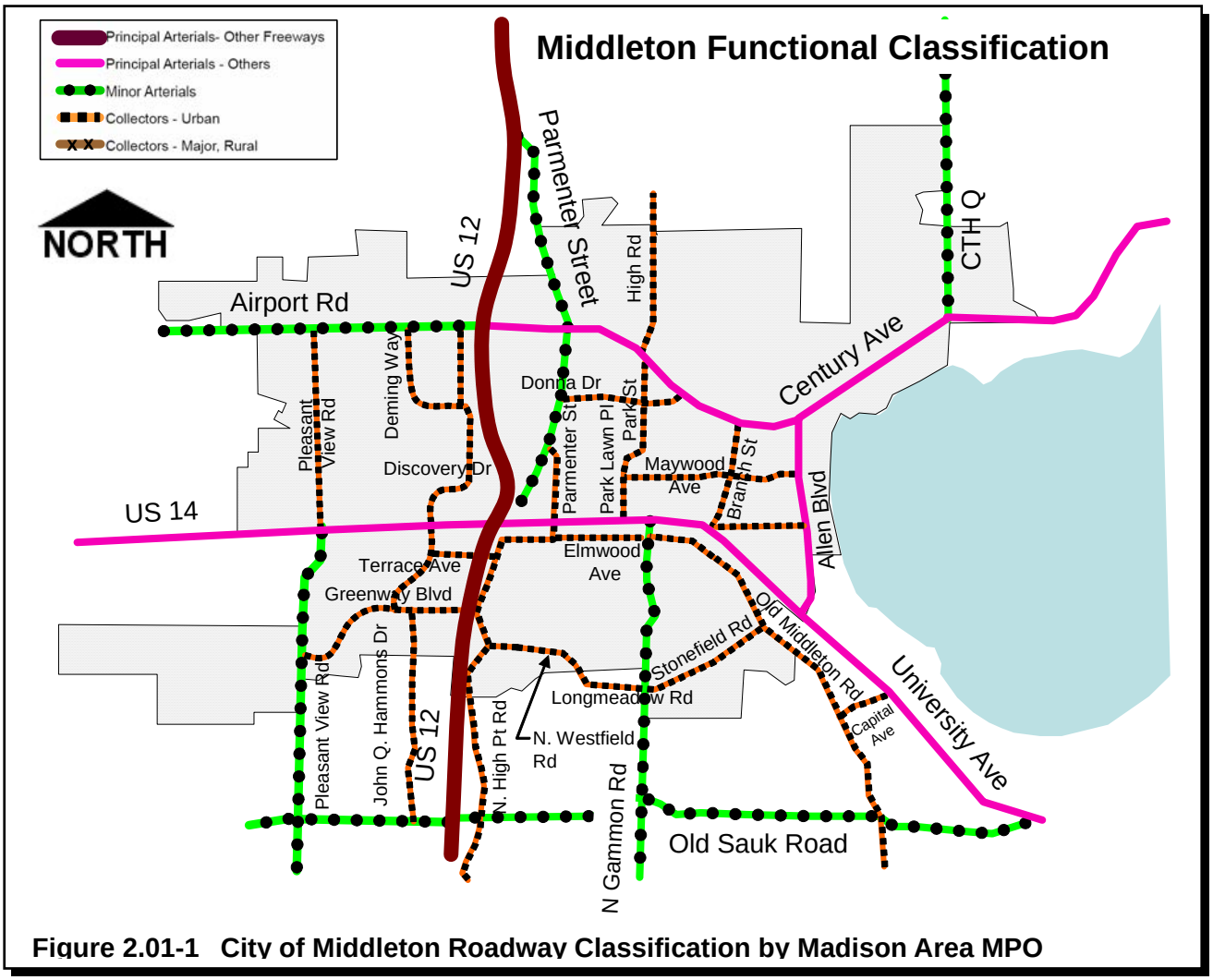

Figure 2.01-1 City of Middleton Roadway Classification by Madison Area MPO

B. Recommended Changes to Functional Classification

The City of Middleton Traffic Management Plan classifies Middleton's streets based on the MPO functional classification shown in Figure 2.01-1. Some changes are recommended, however, concerning the collector and local street designations, as shown in Figure 2.01-2. The recommendations are made with consideration given to the role that land use along a corridor plays in a street's classification. Collector streets tend to provide low-level local mobility and access to higher functioning streets. Local streets provide direct access to adjacent land use and are not intended to carry through traffic.

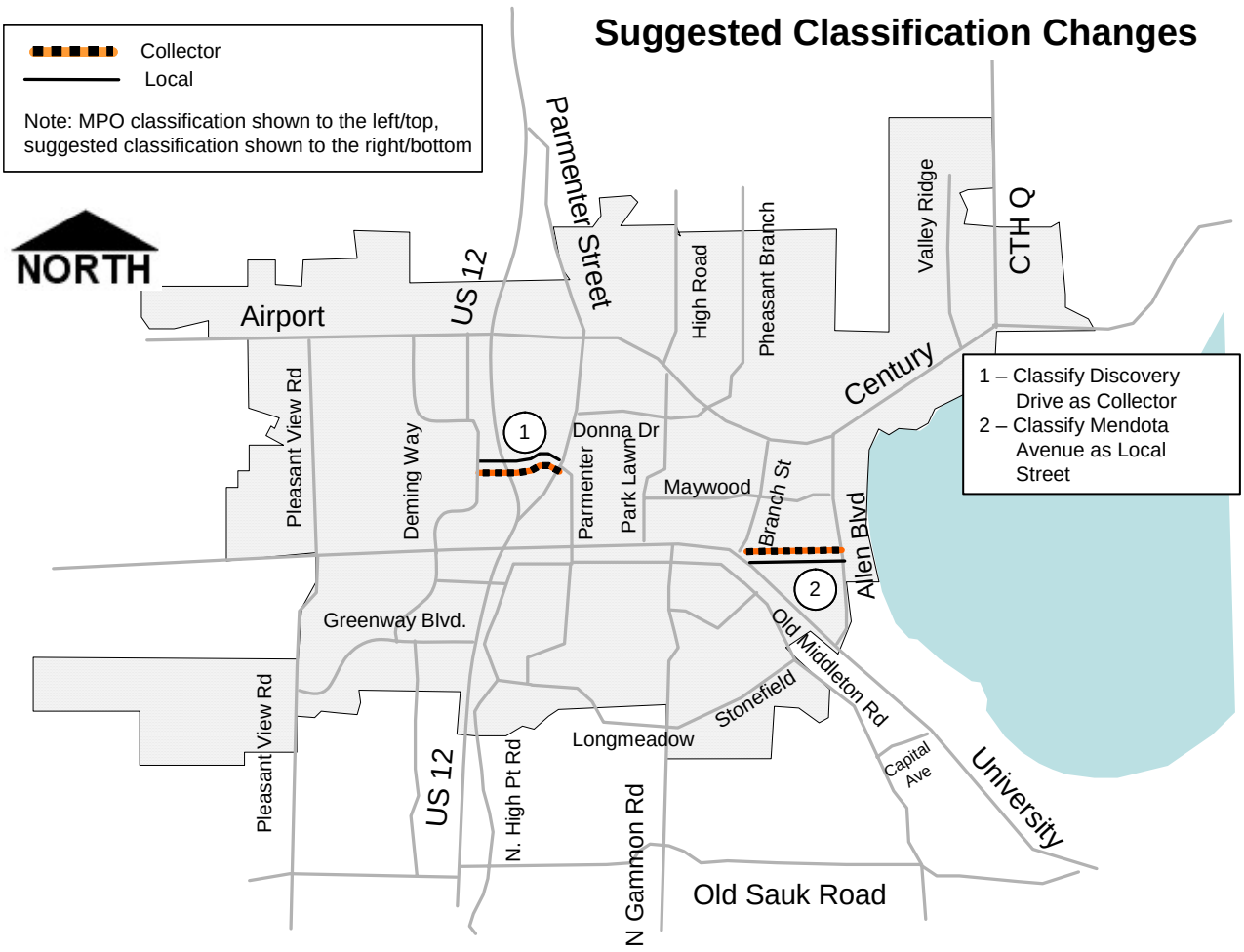

Figure 2.01-2 Suggested Changes to City of Middleton Functional Classification of Streets

Murphy Drive will be extended to provide a new connection between the east and west side of the US 12 Bypass, and will be renamed Discovery Drive following the extension. This connection will cause it to function as a collector rather than a local street. While Mendota Avenue often attracts cut-through traffic between University Avenue and Allen Boulevard, its short length and limited number of connections suggest that it be classified as a local street instead of a collector.

In addition to the formal changes approved by the Plan Commission, the study team has the following observations. Parmenter Street south of University Avenue provides a route that is parallel to US 12/14 (the Beltline Highway). It currently functions as a collector rather than a local street. Continued development anticipated for the north side of Middleton will increase the Frank Lloyd Wright Avenue to Pheasant Branch Road corridor's impact on City mobility. This corridor will function more like a collector in the future. The connection between Park Street and University Avenue provided by Cooper Avenue and Maple Street suggests that these will also function as collectors. Finally, Valley Ridge Road serves as a connection between adjacent neighborhood streets and Century Avenue. It functions as a collector rather than a local street.

The suggested changes are achieved by updating official documents (such as this Traffic Management Plan) and related maps to reflect them and forwarding this information to the appropriate agencies (Madison Area MPO, Dane County, and Wisconsin DOT). No physical changes to the streets listed are recommended. The changes are intended to align each street's classification with its existing or anticipated function and to aid the City in making discretionary decisions on items such as stop sign placement and maintenance frequency.

The recommended functional classification of City of Middleton streets is shown in Figure 2.01-3. It is also summarized in the following paragraphs.

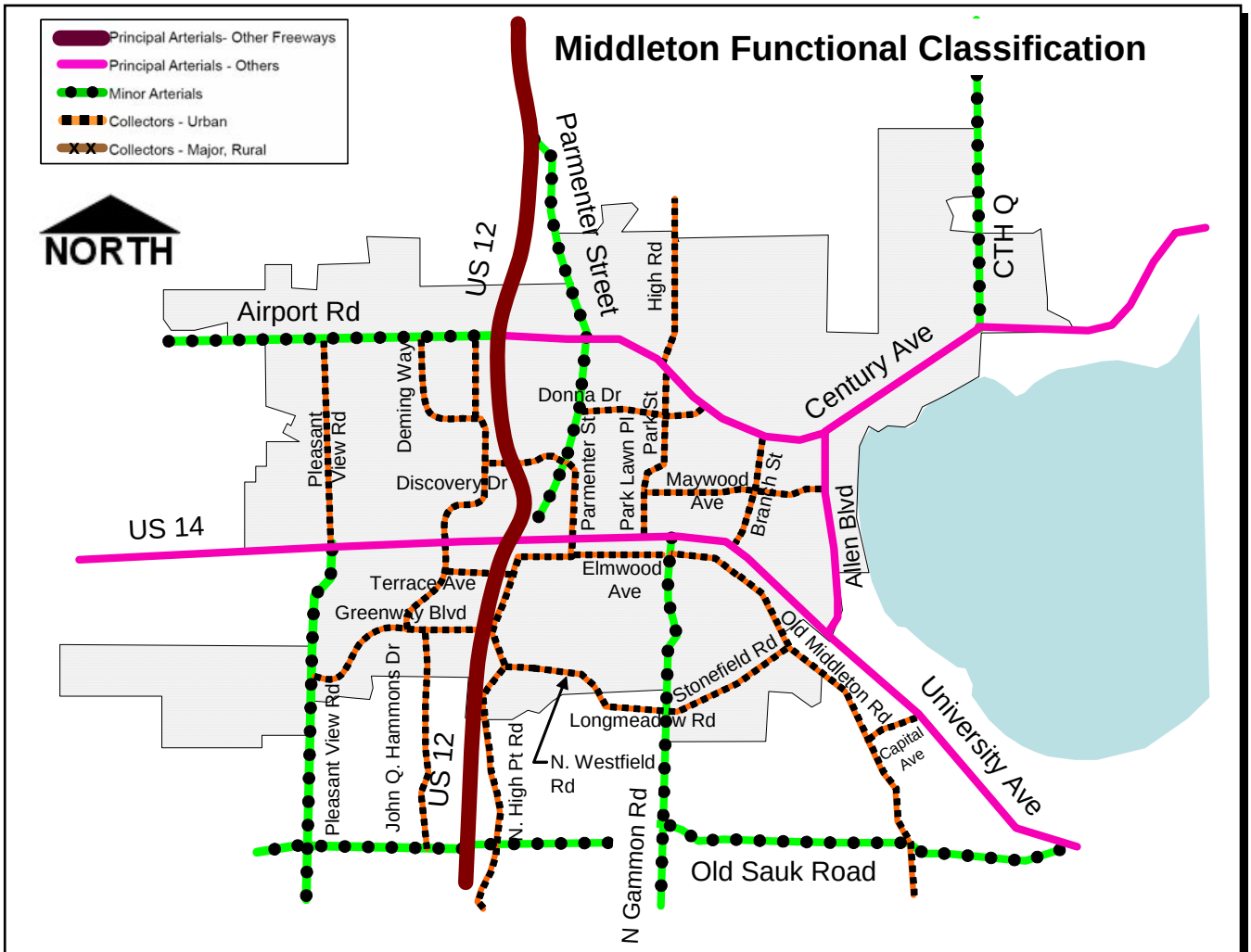

Figure 2.01-3 Recommended City of Middleton Functional Classification of Streets

The roadway with the highest classification in the area is US 12, which is classified as a principle arterial–freeway. This highway serves a vital role in carrying regional traffic to and from Middleton and Madison. It is the only freeway within the city limits.

Nonfreeway principal arterials within the City include the entire length of University Avenue/US 14 and Allen Boulevard, and Century Avenue east of US 12. For these streets, motor vehicle traffic carrying capability is the primary function. Access to them should be controlled as much as is practical to optimize traffic operations and improve motor vehicle safety.

Minor Arterials include Airport Road west of US 12, Pleasant View Road south of US 14, Old Sauk Road, Parmenter Street north of Murphy Drive, Gammon Road/Park Street south of University Avenue, and County Q. These streets seek to balance land access with traffic mobility.

Collectors that distribute traffic from and to these arterials include Pleasant View Road north of US 14, Deming Way, John Q. Hammons Drive, Murphy Drive east of Deming Way (Discovery Drive), Terrace Avenue west of N. High Point Road, Greenway Boulevard, N. High Point Road, Parmenter Street north of Elmwood Avenue, High Road, Park Lawn Place/Park Street north of University Avenue, Branch Street, Donna Drive, Maywood Avenue, Elmwood Avenue-Old Middleton Road, and North Westfield Road-Longmeadow Road-Stonefield Road.

C. Basic Street Configurations

Figure 2.01-4 illustrates the basic configurations for Middleton's key streets, without detailing the intersection lane configurations. The following bullets summarize the cross sectional elements of the main streets.

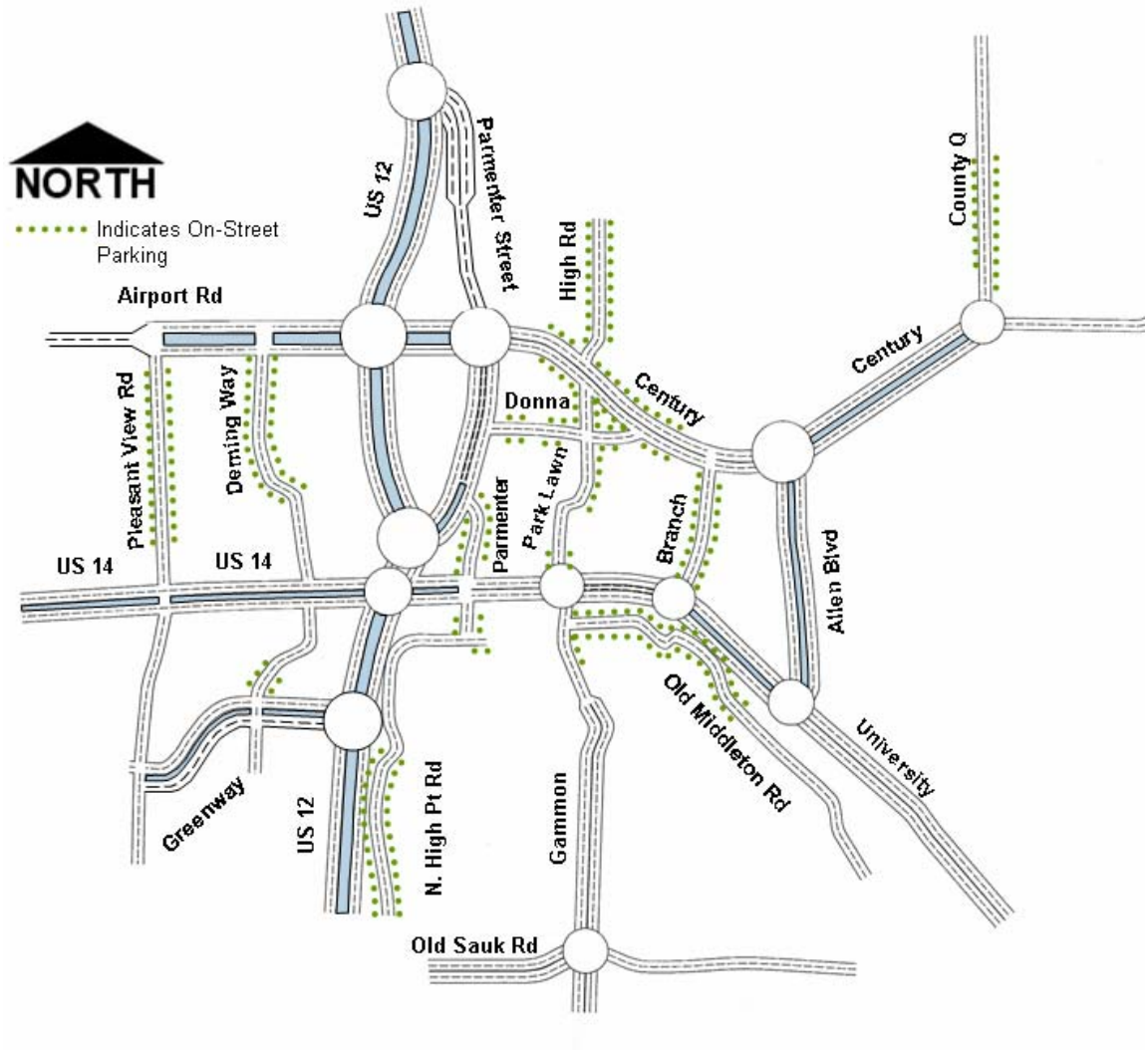

Figure 2.01-4 Basic Street Configurations

- Airport Road is a four-lane divided street between Pleasant View Road and the US 12 Bypass. East of US 12 it becomes Century Ave and continues as a four-lane divided street to Parmenter Street (old US 12). Between Parmenter Street and Allen Boulevard, Century Avenue is a four-lane undivided street. Between Allen Boulevard and County Q, Century Avenue is a four-lane divided street. East of County Q it becomes a two-lane rural roadway.

- Within the City limits, US 14 is a four-lane divided roadway west of US 12. East of US 12 the street is designated as University Avenue and County MS and is a four-lane undivided street between Cayuga Street and Park Street. Between Park Street and Branch Street it gains a center Two-Way-Left-Turn-Lane (TWLTL). As University Avenue travels between Branch Street and Allen Boulevard, it is a four-lane divided street. Several hundred feet east of Allen Boulevard, University Avenue is an undivided four-lane street.

- Pleasant View Road is a two-lane rural road from the south City limits to US 14.

- Parmenter Street (old US 12) is planned for reconstruction in 2006. At that time it will be a four-lane divided street between the US 12 off-ramp and Century Avenue. North of Century Avenue, Parmenter Street will transition to the existing two-lane rural roadway until it becomes a four-lane undivided roadway north of Springton Drive and connects with the US 12 Bypass.

- Gammon Road is a four-lane undivided street from the south City limits to a transition south of the railroad tracks, at which point it becomes a two-lane street named Park Street.

- Allen Boulevard is a four-lane divided street between University Avenue and Century Avenue.

- County Q is a two-lane urban street with a wide cross section immediately north of Century Avenue.

D. Existing Intersection Control

Currently, there are 23 signalized intersections in Middleton. Not all of them are under Middleton jurisdiction. The City of Madison controls the intersection of University Avenue and Allen Boulevard. Also, the following intersections are under jurisdiction of the Wisconsin Department of Transportation (WisDOT):

- Airport Road and Eastbound US 12
- Century Avenue and Westbound US 12
- US 14 and Pleasant View Road
- US 14 and Deming Way
- US 14 and Eastbound US 12
- University Avenue and Westbound US 12 and Cayuga Street
- Greenway Boulevard and Eastbound US 12/14
- Greenway Boulevard and Westbound US 12/14
- Greenway Boulevard and North High Point Road

Figure 2.01-5 shows the existing signalized intersections in Middleton.

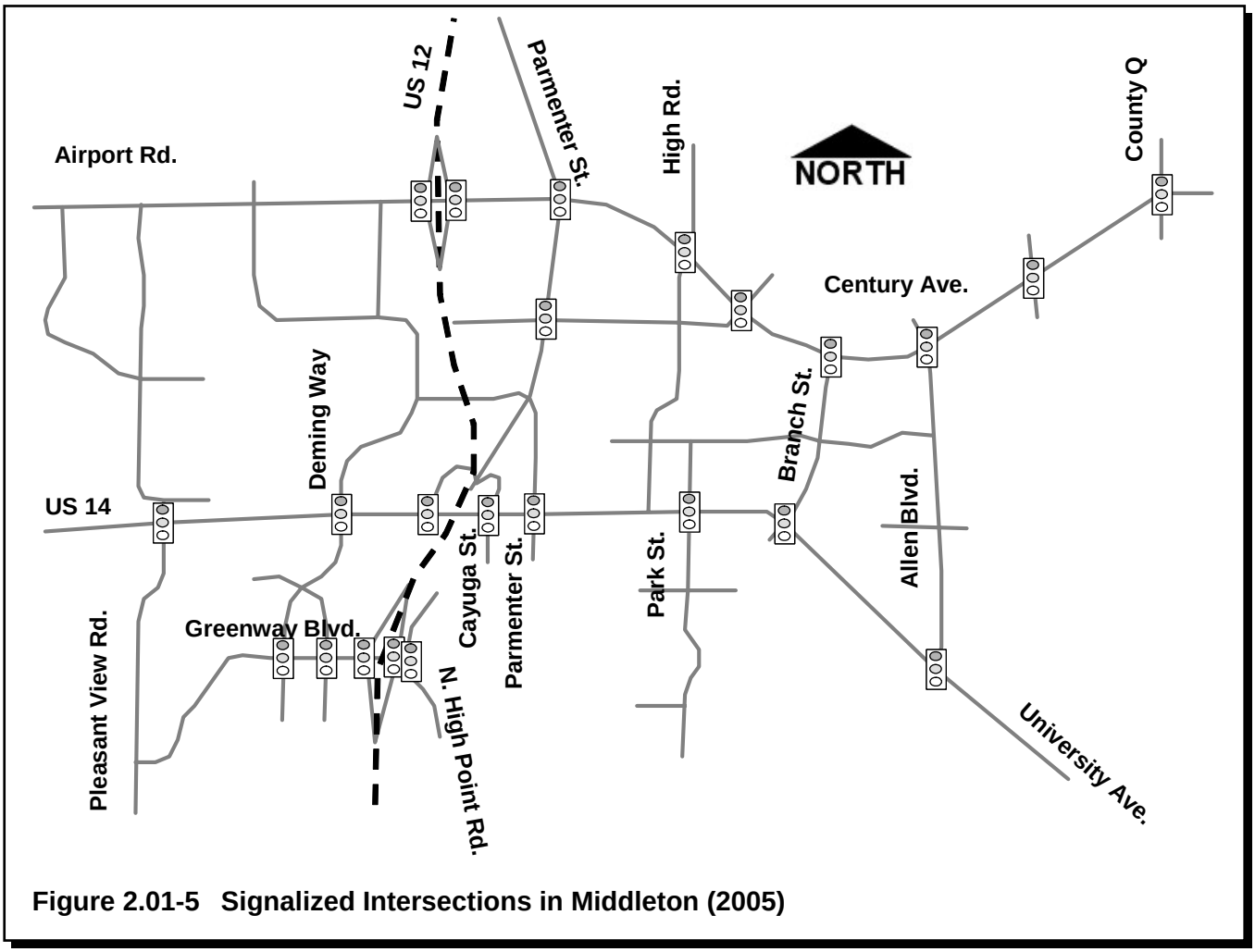

Figure 2.01-5 Signalized Intersections in Middleton (2005)

E. Existing Intersection Crash Rates

Strand Associates worked with City of Middleton staff to identify five priority intersections on which to perform a crash analysis. Crash data from 2000 to 2005 was analyzed at the following locations:

- Century Avenue and Allen Boulevard
- University Avenue and Parmenter Street
- University Avenue and Park Street
- University Avenue and Allen Boulevard
- Century Avenue and County Q/Hedden Road

Figure 2.01-6 shows the results of the intersection crash analysis.

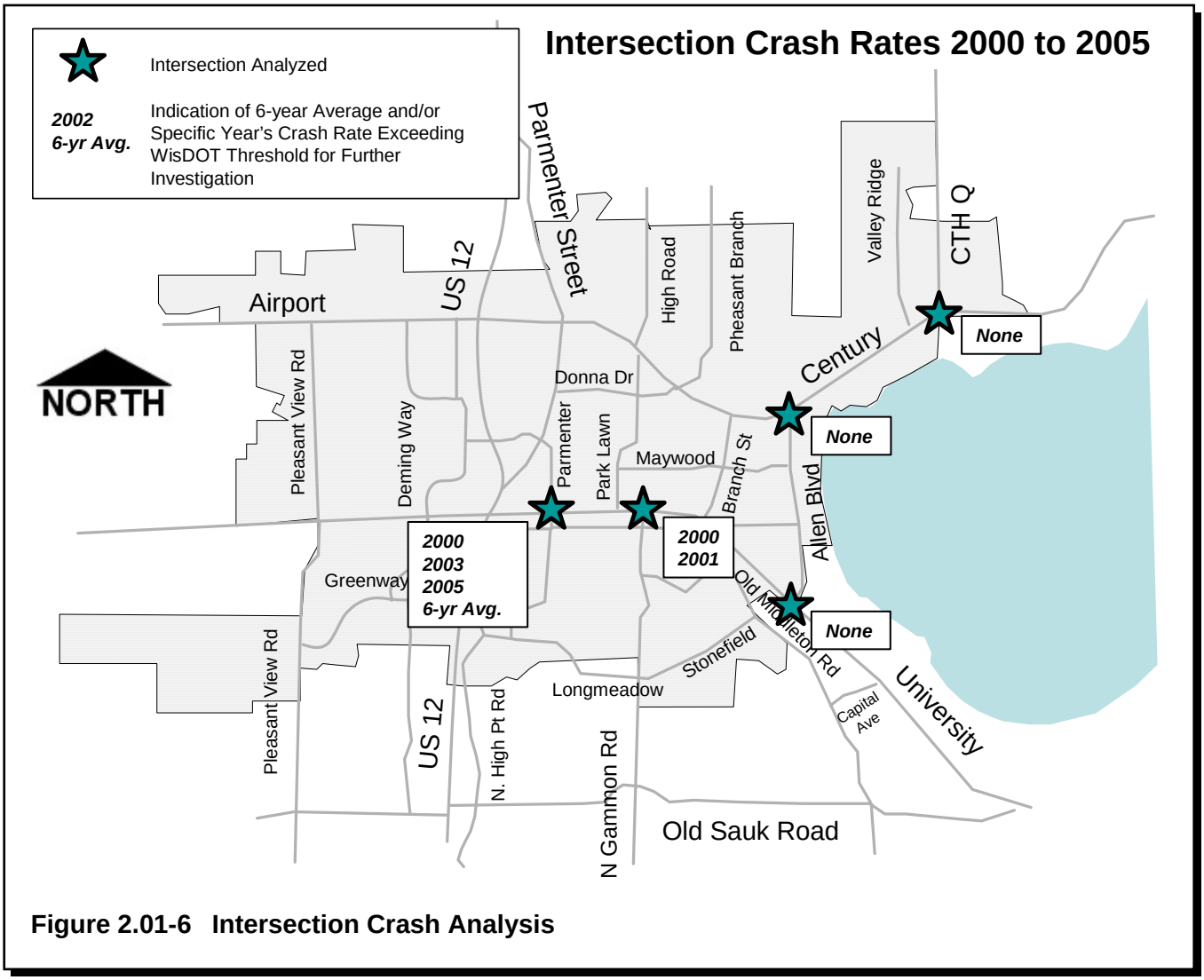

Figure 2.01-6 Intersection Crash Analysis

Intersection crash rates are commonly calculated using the total number of crashes per one million vehicles entering the intersection (MVE). WisDOT has established 1.5 crashes/MVE as the threshold for investigation of safety improvements. There were no fatalities at the intersections analyzed from 2000 to 2005. Century Avenue and County Q/Hedden Road has the highest injury crash rate, probably due to higher speeds through this intersection. This location experiences a crash with injury(ies) every 100 days, on average. It should be noted that the total crash rate did not exceed the WisDOT threshold of 1.5 crashes/MVE.

The overall crash rates at Century Avenue and Allen Boulevard, University Avenue and Allen Boulevard, and Century Avenue and County Q did not exceed the WisDOT threshold during any of the years considered. At University Avenue and Park Street this threshold was exceeded in 2000 (1.54) and 2001 (1.51) and was very close in 2002 (1.48). At University Avenue and Parmenter Street the safety needs are more acute. The crash rate at this intersection exceeded 1.5 crashes/MVE in 2000 (1.60), 2003 (1.94), 2005 (2.07), and averaged above this threshold over the six year period considered (1.56). During 2005, this intersection averaged one crash every 18 days.

At Park Street and University Avenue, it is suspected that one contributing factor to the crash rate may be the northbound shared through/left turn lane. This shared lane assignment is somewhat atypical at signalized intersections and has several consequences. First, because northbound through traffic uses the left lane it must cross the intersection at a skew. This increases the chance of operator error. Second, southbound vehicles sometimes assume all traffic in the left northbound lane is turning left onto University Avenue. As a result, some southbound left turning drivers fail to yield to northbound through traffic. Finally, shared through/left turn lanes at signalized intersections always carry the risk of increased rear-end accidents as drivers of vehicles continuing through the intersection are not accustomed to left turning traffic sharing their lane and may not be anticipating vehicles slowing or stopping in front of them.

In addition to the more substantial intersection changes recommended in Section 5, interim improvements to address crash rates at the University Avenue and Park Street intersection have also been considered. The City has received complaints about the configuration of the northbound and southbound approaches. The City has considered multiple alternatives for modification to these approaches that include combinations of signage, pavement markings, and lane assignment alterations. The recommended interim improvement is to add pavement markings to better delineate the movements through the intersection on Park Street and to add a “Right Lane Must Turn Right” sign for northbound traffic. Figure 2.01-7 shows a schematic of the interim improvements.

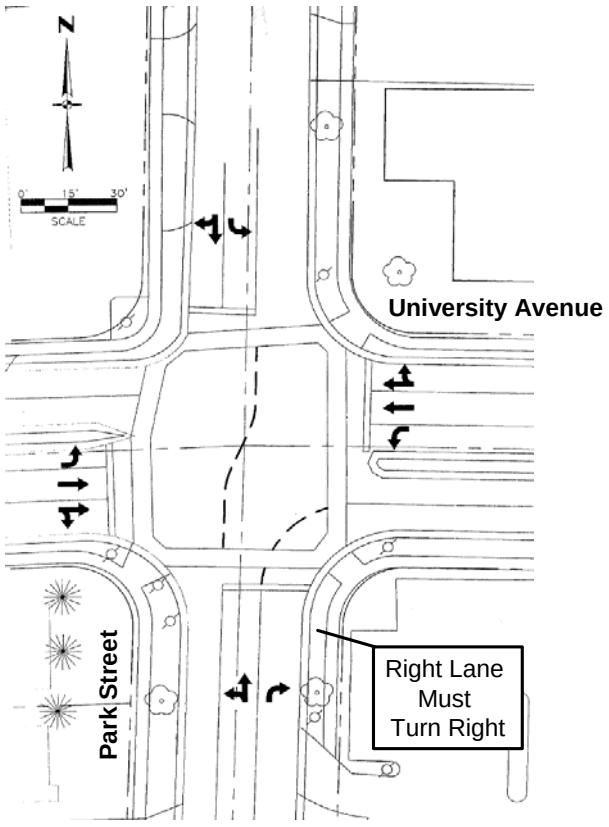

Figure 2.01-7 Pavement Markings at University Avenue and Park Street

At Parmenter Street and University Avenue there are several intersection characteristics that may contribute to the crash rates. The eastbound and westbound approaches both have shared through/left turn lanes. As previously discussed, this configuration at a signalized intersection tends to increase rear-end, and sometimes angle collisions. Also, there are multiple access points located very close to the intersection. Traffic turning into and out of these driveways increases opportunities for vehicle movements to conflict. Finally, restricted sight distances may contribute to crashes involving drivers attempting to turn right during a red signal interval.

It is expected the largest contributor to the high crash rates at the intersection of University Avenue and Parmenter Street are the shared through/left-turn lanes for eastbound and westbound University Avenue traffic. Several options exist to reduce or eliminate the concerns that arise from the shared lane configuration. First, the shared lane could be changed to an exclusive left-turn lane. The intersection often operates as if this is the case during the heaviest traffic periods today. Existing congestion and continuing traffic growth on University Avenue suggest that this option is not practical and that two through lanes need to be maintained eastbound and westbound. Second, the eastbound and westbound left turns could be restricted at this intersection. This would require that drivers wishing to make these maneuvers use adjacent streets upstream or downstream of Parmenter Street. While this would be an effective solution to reduce crashes, the restriction is most needed only during the heaviest traffic periods. Local residents may object to restricting these movements at all times of the day. The recommended interim improvement is to restrict eastbound and westbound left turns only during the heaviest traffic periods. This can be accomplished through traditional signage displaying the time of day that left turns are prohibited, or can be accomplished through the use of blankout signs. Blankout signs are lit when the restriction is in place and are black at other times of the day. Figure 2.01-8 shows a picture of a blankout sign.

Figure 2.01-8 Blankout Sign

In addition to the eastbound and westbound shared through/left-turn lanes, it is possible that reduced sight distances on Parmenter Street contribute to crashes as vehicles turn right on red. These crashes can be reduced or eliminated by restricting right turns on red from Parmenter Street. This will negatively impact the capacity of the intersection, however, and additional investigation into the crash types is recommended before implementation of such a restriction.

F. Bicycle and Pedestrian System

An extensive system of bicycle and pedestrian facilities provides many benefits to a community. Encouraging these forms of travel promotes neighborhood livability. It can benefit the physical health of the community and thereby reduce societal costs. It can also reduce motor vehicle travel demand and its associated environmental impacts.

Middleton is largely a city of neighborhoods. Sidewalks exist on both sides of most City streets, with off-street connections common in many locations. Currently, Middleton ordinance does not require sidewalks in existing neighborhoods, only in new developments. It is recommended that opportunities to provide additional connections in existing neighborhoods continue to be investigated. The City has increased its investment in its bicycle and pedestrian system in the last number of years, beginning with completion of a Bicycle and Pedestrian Plan adopted in 1999. Significant trail construction and increases in dedicated bicycle lanes have taken place since then.

Figure 2.01-9 illustrates the bicycle and pedestrian facilities in place as of 2005.

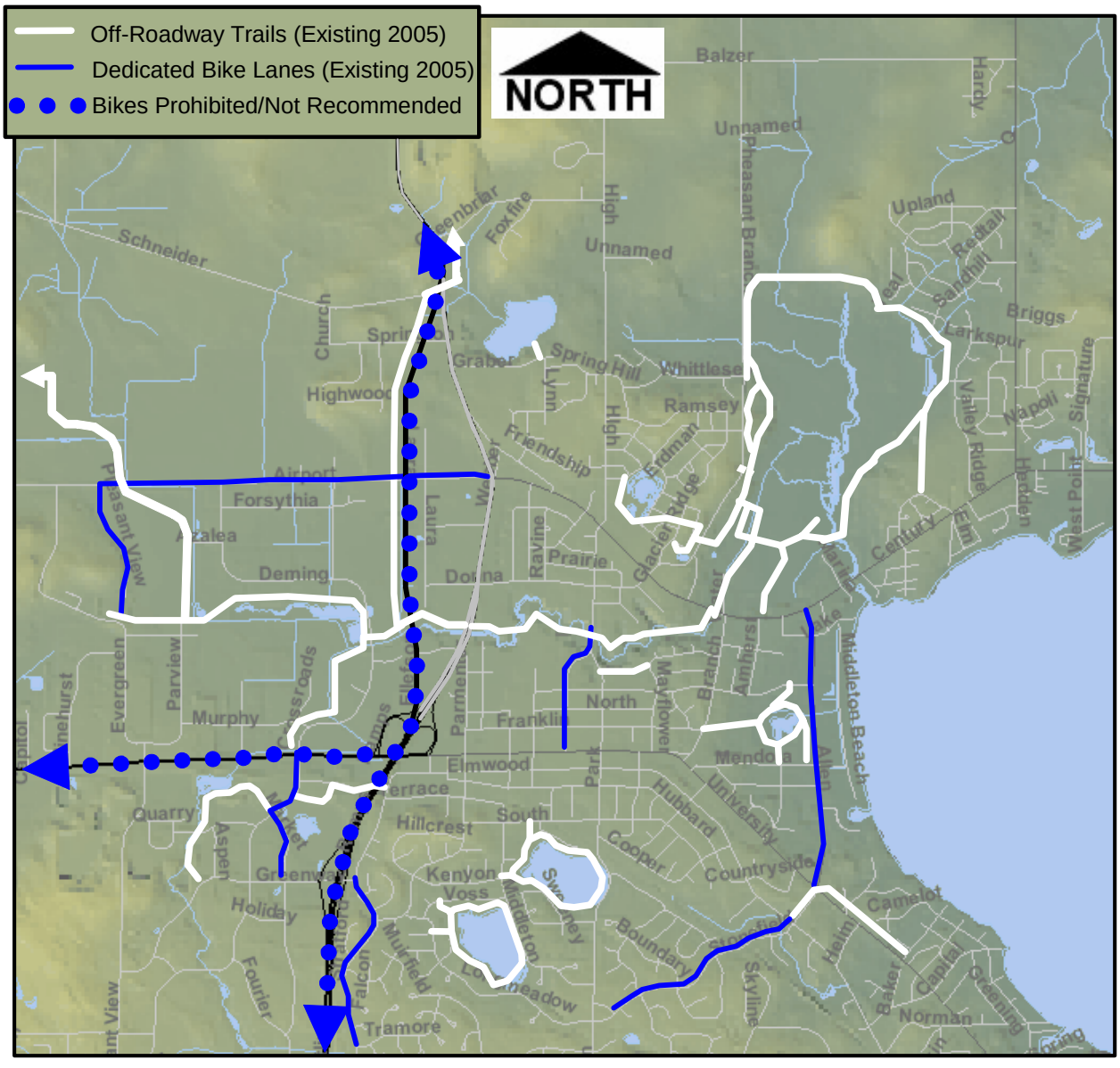

Figure 2.01-9 2005 Bike/Ped Facilities

Most of the multi-use trails follow environmental corridors. Some portions of these trails are not ideally suited to recreational bicycle travel (for example, they may cross Pheasant Branch Creek with a series of stepping stones), but the construction of bridges at these locations is planned. In addition to the trails located within the conservancy areas, there are also existing paths in Middleton's City parks.

Bike lanes are provided on a limited number of City streets including portions of Pleasant View Road, Airport Road, Deming Way, John Q. Hammons Drive, North High Point Road, Park Lawn Place, Stonefield Road, and Allen Boulevard. Generally, the striped lanes are dedicated for bicycles only in the commercial / retail areas and they are shared with a curb parking lane in the residential areas.

G. Transit

Figure 2.01-10 shows the weekday Madison Metro Transit bus routes serving Middleton as of September, 2006. Routes 70 through 74 provide the broad coverage of Middleton during the week. Routes 70 and 73 provide all day service on weekdays, while routes 71, 72, and 74 provide weekday peak hour service only.

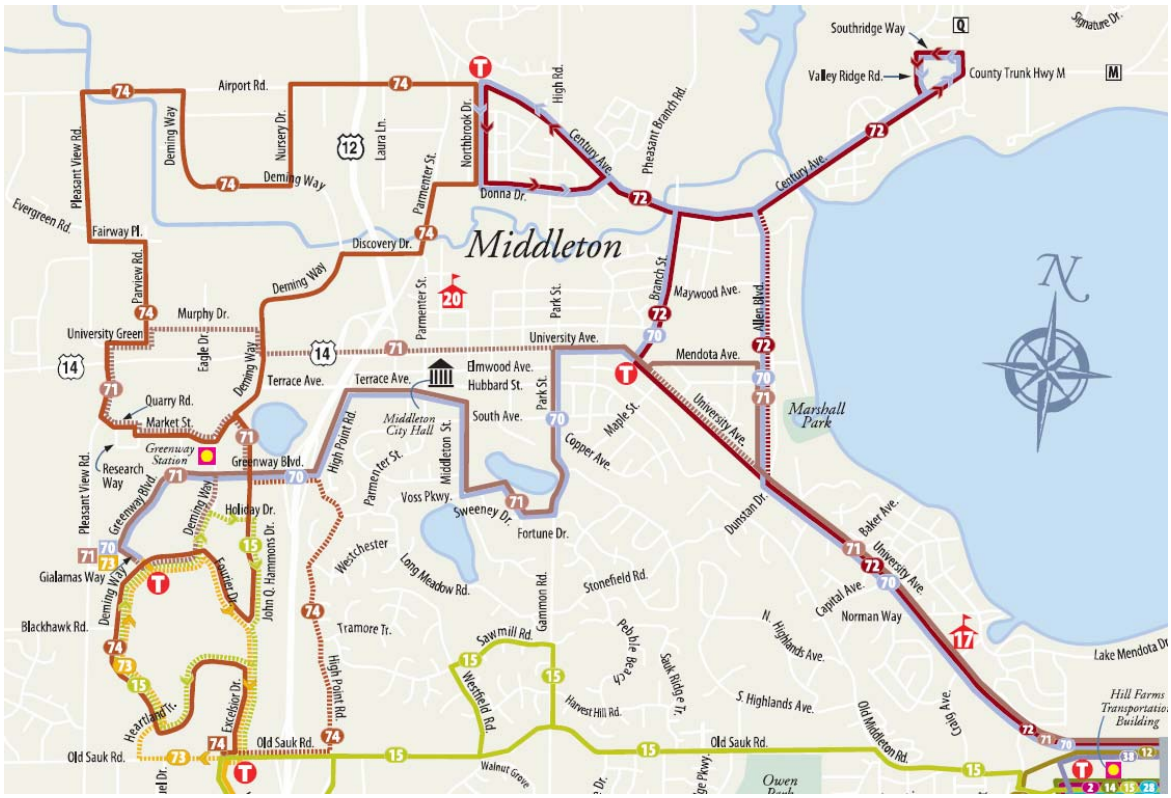

Figure 2.01-10 Madison Metro Transit Route Schedule

On the weekend, only route 68 (not shown) provides service to a small portion of Middleton south of Greenway Station.

2.02 TRAFFIC DATA COLLECTION

Existing traffic data was collected, modeled and calibrated so that existing operations could be used as a baseline to evaluate the effectiveness of alternative solutions. Afternoon peak-hour volumes are generally around 15 percent higher than morning peak-hour volumes in Middleton. Additionally, while Saturday mid-day peak traffic can sometimes be greater than the weekday PM peak-hour volumes, from a systemwide viewpoint the weekday PM peak-hour is the controlling time period. To streamline the project scope and maximize efficiency, only PM peak-hour existing operations were modeled.

Existing turning-movement counts were supplemented with field counts conducted by Strand Associates and City of Middleton employees. PM peak-hour turning-movement data were compiled at the following intersections:

- US 12 and Graber Road (August 1999)
- Century Avenue and US 12 (October 2000)
- Century Avenue and Park Street (November 2000)
- Century Avenue and Donna Drive (October 2000)
- Century Avenue and Branch Street (October 2000)
- Century Avenue and Allen Boulevard (October 2000)
- Century Avenue and County Q (October 2000)
- Century Avenue and Highland Way (November 2001)
- Century Avenue and US 12 (June 2003)
- US 12 and Donna Drive (June 2003)
- University Avenue and Park Street (October 2004)
- University Avenue and Branch Street (October 2004)
- University Avenue and Allen Boulevard (October 2004)
- University Avenue and Deming Way (November 2004)
- Greenway Boulevard and Deming Way (November 2004)
- University Avenue and Parmenter Street (December 2004)

Supplemental half-hour counts were conducted in January 2005 at the following intersections:

- University Avenue and Cayuga Street/Westbound US 12 Ramps
- US 14 and Pleasant View Road
- Pleasant View Road and Evergreen Road
- Airport Road and Nursery Drive
- Greenway Boulevard and North High Point Road
- Greenway Boulevard and John Q. Hammonds Drive

The raw turning-movement data was seasonally and annually adjusted so that it represented average existing traffic volumes. The adjusted turning movement volumes were used with the existing conditions demand modeling to develop PM peak-hour turning movements at all the major intersections in the City of Middleton. The volumes were roughly balanced so that the number of vehicles leaving one

intersection was approximately equivalent to the number of vehicles approaching the next intersection. The existing conditions turning movements are shown in Appendix A.

In addition to the turning-movement data, existing signal timing data was collected from the City of Middleton, the City of Madison, and WisDOT. The existing signal settings, phasings, and timings were used in the existing conditions modeling to accurately reflect operations as they are today. Additionally, signal settings such as clearance intervals and minimum gap were carried forward in the analysis of future conditions and consideration of modifications.

The final component of the data collection was field observation of existing conditions. This is an important step when using microsimulation modeling. Microsimulation programs simulate driver behavior on a model of the transportation network. Calibration to existing conditions is important because driver behavior varies by locale. Having a model calibrated to existing conditions increases confidence in the modeling of future conditions. Observations included queue lengths and driver behavior (such as tendency to enter a signalized intersection during the yellow change interval and judgment regarding gap length needed to enter the flow of traffic).

2.03 EXISTING CONDITIONS MODELING

A. Demand Model Calibration

Calibration of the demand model for existing conditions was the first step in creating a baseline for countywide travel patterns at an Average Daily Traffic (ADT) scale. For this study, the City of Middleton was extracted from the countywide model. This provides a smaller area to work with and simplifies calibration. The demand model was calibrated to ADT volumes reported in the WisDOT *2003 Wisconsin Highway Traffic Volume Data* book. Figure 2.03-1 shows the approximate ADT on most of Middleton's arterial and collector streets. The US 12 Bypass is not shown because it was not in operation when the existing conditions model was created.

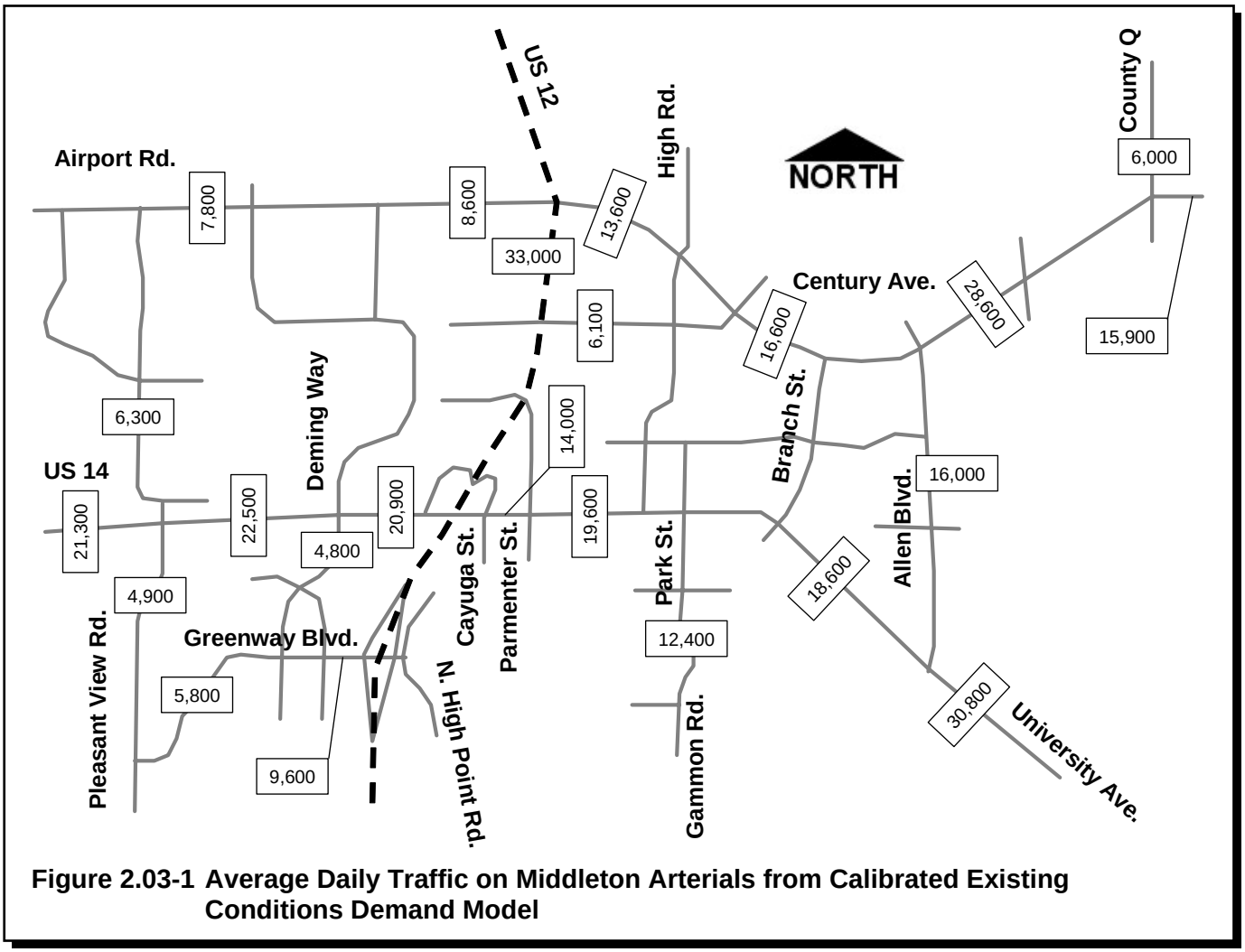

Figure 2.03-1 Average Daily Traffic on Middleton Arterials from Calibrated Existing Conditions Demand Model

The existing transportation system is generally operating within typical design capacity thresholds. Two-lane portions of the arterial streets are below 15,000 vehicles per day. Four-lane undivided portions are below 20,000 vehicles per day. Four-lane divided sections are below 30,000 vehicles per day. Locations that are nearing these thresholds include University Avenue between Cayuga Street and Gammon Road/Park Street and Century Avenue between Allen Boulevard and County Q. University Avenue east of Allen Boulevard (which is in the City of Madison for the most part) is currently operating above typical capacity for a four-lane undivided street.

B. Existing Traffic Operations Modeling

The operation of a roadway (e.g., congestion levels) is typically described as “Level of Service” (LOS). The Transportation Research Board’s *Highway Capacity Manual* (HCM) defines an LOS rating system which describes the traffic flow conditions of a street or intersection. The LOS ratings range from A (free flow conditions) to F (over capacity). In urban areas, intersection operation is the primary evaluation measure for traffic conditions. Intersection operation is less of a measure of traffic conditions in rural areas, yet it still provides insight on how difficult it may be to enter and cross a highway. The HCM notes that “safety is not included in the measures that establish” LOS.

For intersections, LOS is determined by the average delay (in seconds) of all vehicles entering the intersection, regardless of where they are coming from or going to. The average delay is based on the peak 15-minute period of the peak hour being analyzed. Since this delay is an average value, some vehicles will experience greater delay and some will experience less delay than the average value. Intersections with short average delays have a high LOS; conversely, intersections with long average delays have a low LOS. Many communities establish a delay of up to 55 seconds for signalized intersections and 35 seconds for unsignalized intersections, both corresponding to LOS D, as their minimum acceptable operations standard. For this study, the traditional intersection capacity expansion alternatives that were developed maintain an overall intersection LOS D under future traffic conditions. Note that it is possible for an intersection to operate at LOS D overall, while still experiencing LOS F operations for specific movements. LOS E is often considered to be the upper limit of delay that drivers will accept. An LOS F for the total intersection is considered to be a definite indication of the need for modifications.

LOS characteristics are different for signalized and unsignalized intersections. Drivers anticipate longer delays at signalized intersections that carry large amounts of traffic. However, drivers generally feel unsignalized intersections should have less delay. Additionally, several driver behavior considerations combine to make delays at unsignalized intersections less desirable than at signalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, whereas drivers on the minor approaches to unsignalized intersections must remain attentive in order to identify acceptable gaps for entry. Typically, LOS is only calculated for the movements of an unsignalized intersection that have to yield to other movements (stop control or left turns). Table 2.03-1 shows the delay thresholds for each LOS for both unsignalized and signalized intersections.

Level of Service	Unsignalized Intersections (average delay, seconds)	Signalized Intersection (average delay, seconds)
A	< 10	<10
B	10 to 20	10 to 15
C	21 to 35	16 to 25
D	36 to 55	26 to 35
E	56 to 80	36 to 50
F	> 80	> 50

Table 2.03-1 Level of Service (LOS) Thresholds

Operations modeling for this study was carried out using Synchro/SimTraffic software. Traffic operations are evaluated based on Measures of Effectiveness (MOEs). LOS is one MOE, another commonly used MOE in urban areas is maximum queue length. Synchro is a macroscopic program that calculates MOEs based on equations from the Transportation Research Board's *Highway Capacity Manual*. SimTraffic is a sister program to Synchro which uses microscopic simulation to calculate MOEs. Microscopic programs simulate vehicle behavior on a model of the transportation network. Since microscopic simulation relies on random numbers to generate some of the parameters used in its calculations, multiple simulation runs were used when compiling the MOE data.

Results of the existing PM peak-hour operations modeling in SimTraffic are shown in Figure 2.03-2. Note that the modeling was carried out prior to the opening of the US 12 Bypass. Only the overall intersection operations are shown, and only those that function at LOS D or poorer.

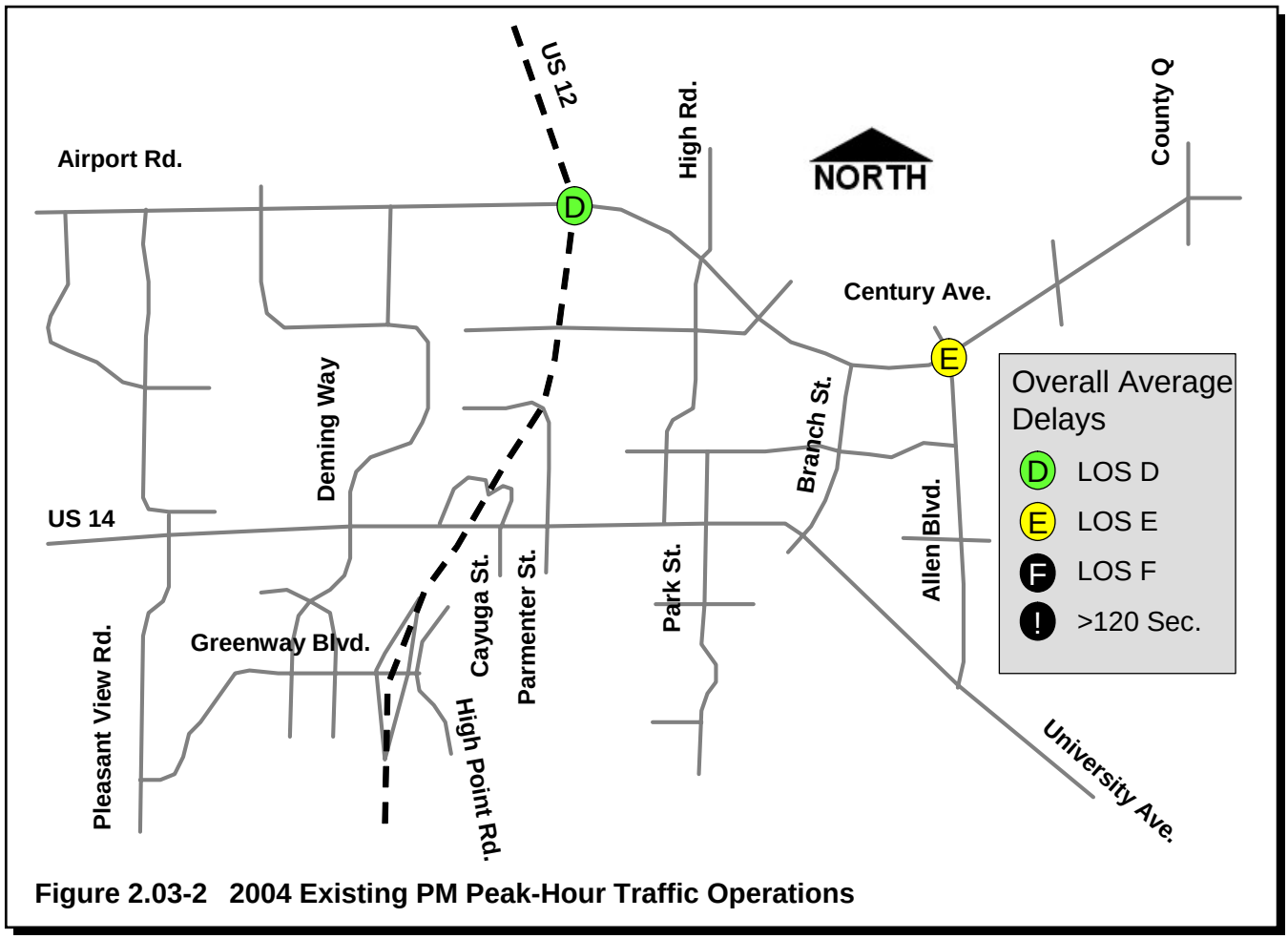

Figure 2.03-2 2004 Existing PM Peak-Hour Traffic Operations

Existing operations are generally acceptable. Currently, the most congested intersection is Century Avenue and Allen Boulevard. Overall the intersection operates at LOS E, with northbound traffic experiencing LOS F. Westbound traffic also experiences significant delay resulting in LOS E operations.

Prior to the opening of the US 12 Bypass, the US 12 and Century Avenue intersection operated at LOS D overall. The northbound through and left-turning traffic experienced the highest delays, which were in the LOS F range. Eastbound traffic also experienced significant delay because of the large volume of opposing westbound left-turning traffic served with a single exclusive left-turn lane. With the opening of the US 12 Bypass in the Fall of 2005, conditions at this intersection have improved.

Detailed operations modeling results are included in Appendix B.

SECTION 3
FUTURE CONDITIONS

3.01 FUTURE TRAFFIC FORECASTING

A. Identification of Probable Future Land Uses

This study used a travel demand model developed by the MPO to forecast future traffic volumes in Middleton. The model predicts future volumes based on Dane County's Vision 2020 Land Use and Transportation Plan and the supplemental land use planning completed for the North Mendota Parkway (NMP) Study. Although the forecasted land use from the NMP study was included, the future North Mendota Parkway itself was not included in the model. The final location and time frame for construction of a future parkway is uncertain at this time. If the NMP is constructed, it will most likely relieve some of the traffic on Middleton's streets.

Once again, the Middleton area was extracted from the MPO model. The extraction allows land uses in and around Middleton to be adjusted without changing the regional traffic patterns of the countywide model. In other words, regional traffic moving through Middleton is not affected by the changes to the local land uses in the extracted model.

Strand Associates met with City of Middleton staff and MPO representatives to review the future land uses contained in the extracted Middleton model. Demand models break land area into Traffic Analysis Zones (TAZs). There were initially 45 TAZs in the extracted Middleton model. Five of these zones were split into an "A" and "B" component. This was done to refine the larger TAZs or to reflect future known changes to the transportation system (such as the bisection of a TAZ because of the US 12 Bypass on the west side of Middleton).

At the meeting, the land use in the existing and future MPO models was discussed on a zone-by-zone level and modified as needed. Factors were applied to increase or decrease the trips generated in each zone based on the discussion. The development horizon for the discussion was 2025. The existing and future land uses and a map of the TAZs is included in Appendix A.

B. Future Average Daily Traffic

The traffic forecast did not consider alternative transportation modes any differently than the existing conditions demand model. In other words, nearly every motorized trip that the future land uses generate is assumed to be a private motor vehicle trip, similar to today's travel patterns. In reality, if transit ridership increases in the future, this pattern may change. This is one example of why actual traffic volumes in the future will likely differ from the forecasted volumes. Future traffic will be a result of the interaction of many factors that influence travel demand. The forecast is sufficient, however, for transportation planning purposes, and is a reasonable estimate of traffic volumes that will develop in the next 15 to 20 years. Figure 3.01-1 shows the forecasted average daily traffic on many of the arterial and collector streets in Middleton.

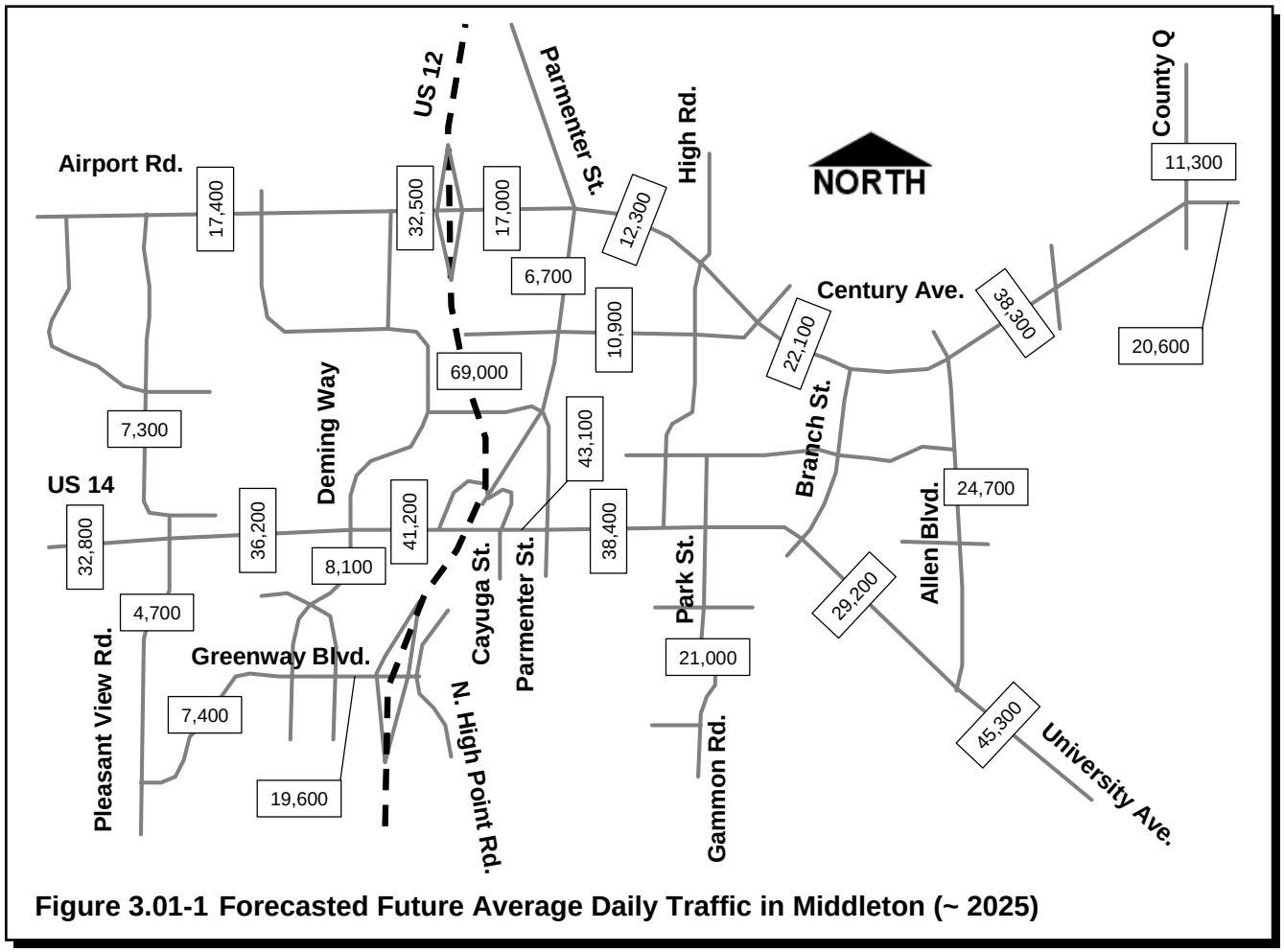

Figure 3.01-1 Forecasted Future Average Daily Traffic in Middleton (~ 2025)

The future travel demand modeling indicates that multiple segments of the Middleton street network will be nearing or exceeding typical capacity thresholds. Figure 3.01-2 shows these locations.

The most critical stretches of roadway will include University Avenue between Deming Way and Parmenter Street, University Avenue east of Allen Boulevard, and Century Avenue between Allen Boulevard and Highland Way/Baskerville Avenue. These streets are projected to carry volumes typically handled by a six-lane facility. Without corridor modification, there is likely to be significant traffic diversion to adjacent parallel routes. In particular, the Terrace Avenue–Elmwood Avenue–Old Middleton Road corridors will probably see significant increases in traffic as their role changes from collector streets to secondary arterials.

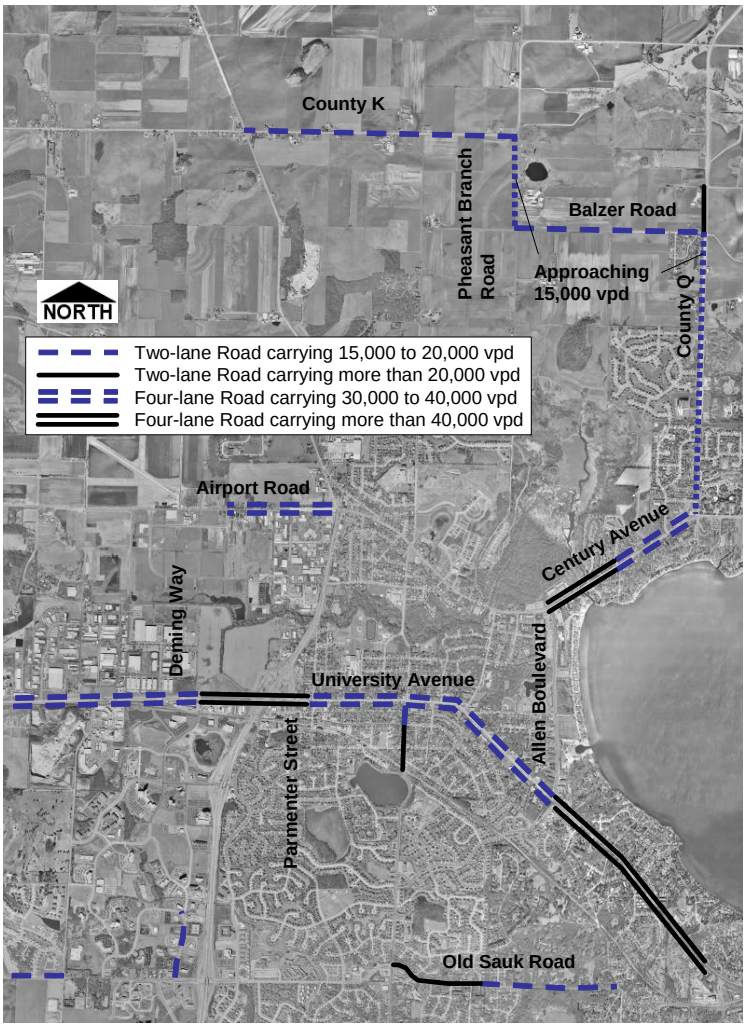

Figure 3.01-2 Future Capacity Concerns on Middleton Roads

Remaining portions of University Avenue throughout Middleton, Century Avenue/Airport Road between Parmenter Street (old US 12) and Deming Way, and Century Avenue between Highland Way/Baskerville Avenue and County Q will also be congested and volumes will approach thresholds typical of a six-lane corridor.

Park Street/Gammon Road south of University Avenue and a portion of County Q on the north side of Middleton are two-lane streets that are expected to carry volumes typically handled by four-lane facilities. The character of County K and Balzer Road on the north side of the City will also change. Each is expected to carry volumes typical of a congested, urban two-lane street.

3.02 FUTURE CONDITIONS TRAFFIC OPERATIONS MODELING

A. Conversion of Average Daily Traffic to PM Peak-Hour Volumes

Future PM peak-hour traffic volumes were developed based on both existing turning-movement counts and the forecasted ADT growth on each approach at each intersection. For each movement at an intersection, the average ADT growth of the approaching and departing legs was multiplied by the existing traffic volume. Figure 3.02-1 illustrates an example calculation at a hypothetical intersection.

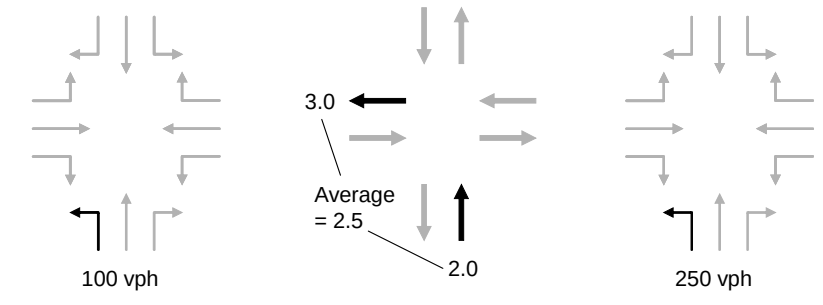

Figure 3.02-1 Example of Starting Point for Future Hourly Traffic Volume

This calculation provided a starting point for the future PM peak-hour traffic volume. Changes to Middleton's street network associated with the US 12 Bypass on the west side of the City were also considered. Additionally, individual turning movements were adjusted to approximately balance the traffic leaving one intersection with the traffic approaching the next.

Future PM peak-hour turning movements are included in Appendix A.

B. Operations Modeling of Future Traffic on the Existing Transportation System

Future traffic was modeled on Middleton's existing street system, which was modified only to include the changes associated with the US 12 Bypass construction. Figure 3.02-2 shows the results from the SimTraffic modeling.

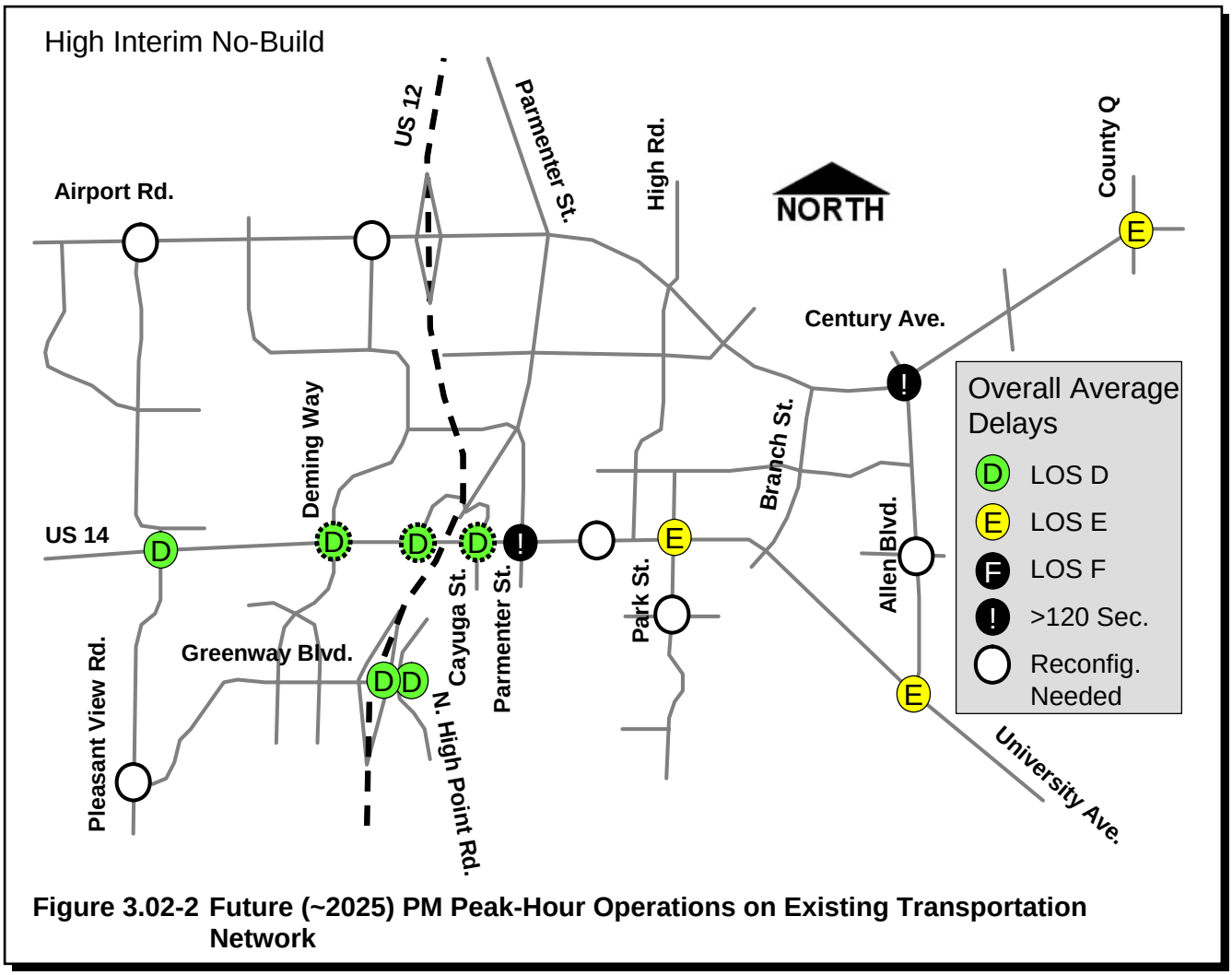

Figure 3.02-2 Future (~2025) PM Peak-Hour Operations on Existing Transportation Network

Within 20 years, many of Middleton's intersections will fail during the PM peak hour if the forecasted traffic volumes are realized and no major modifications are made to the local transportation system. At the Allen Boulevard and Century Avenue intersection, the forecasted volume is well over capacity and queues build throughout the simulation period.

The Parmenter Street and University Avenue intersection also experiences extreme congestion. Westbound traffic is particularly underserved, and the intersection meters traffic bound for the US 12 ramp terminals and the Deming Way intersection. Operations at these locations are skewed by this metering effect since they are not receiving the full traffic demand. The US 12 and Deming Way intersections would likely operate worse than the LOS D shown above if the westbound traffic were not being metered upstream at Parmenter Street.

The intersections of University Avenue at Park Street and Century Avenue at County Q also operate poorly. Both of these intersections will operate at LOS F overall, with some movements experiencing extreme delay because projected volumes are well over capacity.

Intersections operating at LOS E overall include University Avenue and Allen Boulevard, US 14 and Pleasant View Road, and Greenway Boulevard and North High Point Road. These locations will need modifications to operate within acceptable LOS thresholds.

The intersections that are labeled “Reconfiguration Needed” are unsignalized intersections that will need to be considered for an upgrade to signal or roundabout control. Left turns onto any of the arterials will become difficult or impossible from a side street without a mechanism to create gaps in the arterial traffic (traffic signal corridor) or the ability for left turns from a side street to instead be completed by making a right turn onto the arterial followed by a u-turn downstream (roundabout corridor).

Detailed operations modeling results are included in Appendix B.

3.03 PRIORITIZATION OF FUTURE MOTOR VEHICLE NEEDS

A. Development of Interim Traffic Volumes

Interim traffic volumes were developed to help prioritize Middleton’s motor vehicle transportation system needs. “Interim-Low” (approximately equal to year 2010 or 2012) and “Interim-High” (approximately equal to year 2015 or 2020) traffic volumes were calculated to understand the chronology of Middleton’s transportation network needs.

If the forecasted future turning-movement volume was greater than the existing volume, then the traffic growth was distributed evenly among the interim scenarios. The Interim-Low volume was calculated as the existing volume plus one third of the forecasted growth. The Interim-High volume was calculated as the existing volume plus two thirds of the forecasted growth.

If the forecasted future turning-movement volume was less than the existing volume, a different approach was used. The US 12 Bypass was completed in late 2005 and changed travel patterns on a number of Middleton streets. The turning-movement volumes that are forecasted to be more than marginally lower than existing volumes are the result of the Bypass -- for example, northbound traffic at the intersection of Parmenter Street (old US 12) and Century Avenue. For these movements, it was assumed that the changes in travel patterns occurred in 2005 and the individual turning movements will grow at a constant rate through the two interim scenarios until reaching the future forecasted volume. Therefore, the interim volumes for such movements were calculated by reducing the future forecasted volume by a set percentage. The Interim-Low volumes were calculated to be 70 percent of the horizon year volume and the Interim-High volumes were calculated to be 85 percent.

B. Operations Modeling of Interim Traffic on Existing Transportation System

Interim traffic was modeled with no major modifications made to Middleton’s street system except those associated with the US 12 Bypass. SimTraffic software was used to calculate the MOEs.

1. Interim-Low Traffic Modeling

The results of the Interim-Low scenario traffic modeling are shown in Figure 3.03-1

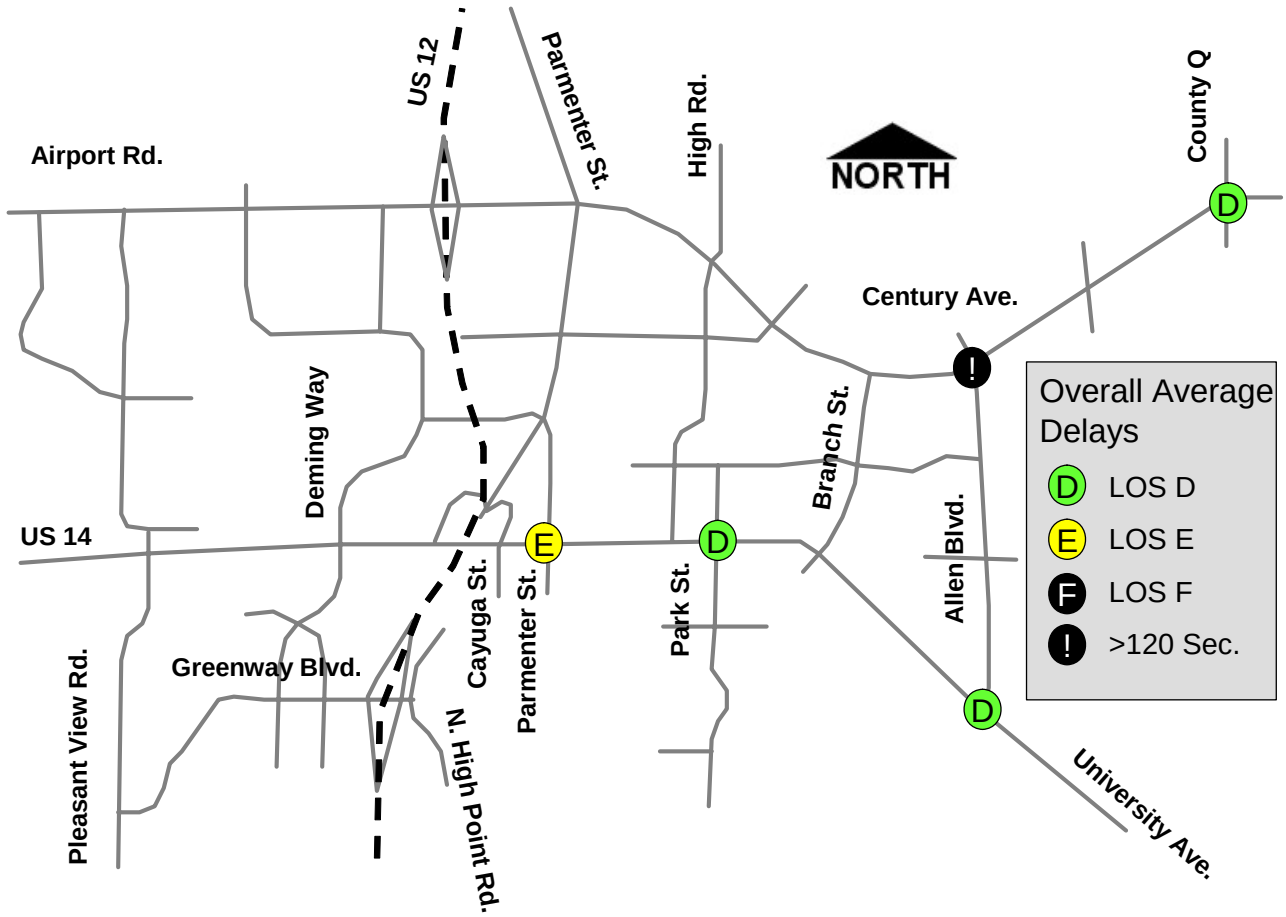

Figure 3.03-1 Interim-Low (~2010 to 2012) PM Peak-Hour Operations on Existing Transportation Network

During the PM peak hour, the intersection of Century Avenue and Allen Boulevard operates at LOS E under existing conditions but quickly fails under the Interim-Low traffic volumes. The split signal phasing required by the existing intersection geometry simply cannot serve the projected traffic volumes.

At the intersection of Parmenter Street and University Avenue, westbound traffic experiences substantial delay (LOS F conditions) because of the shared lane configurations. Overall, the intersection operates at LOS E.

The intersections of University Avenue and Park Street, University Avenue and Allen Boulevard, and Century Avenue and County Q operate at LOS D overall. Some movements begin to experience substantial delay (LOS F conditions), and queuing becomes significant on some of the approaches.

Detailed operations modeling results are included in Appendix B.

2. Interim-High Traffic Modeling

The results of the Interim-High scenario traffic modeling are shown in Figure 3.03-2.

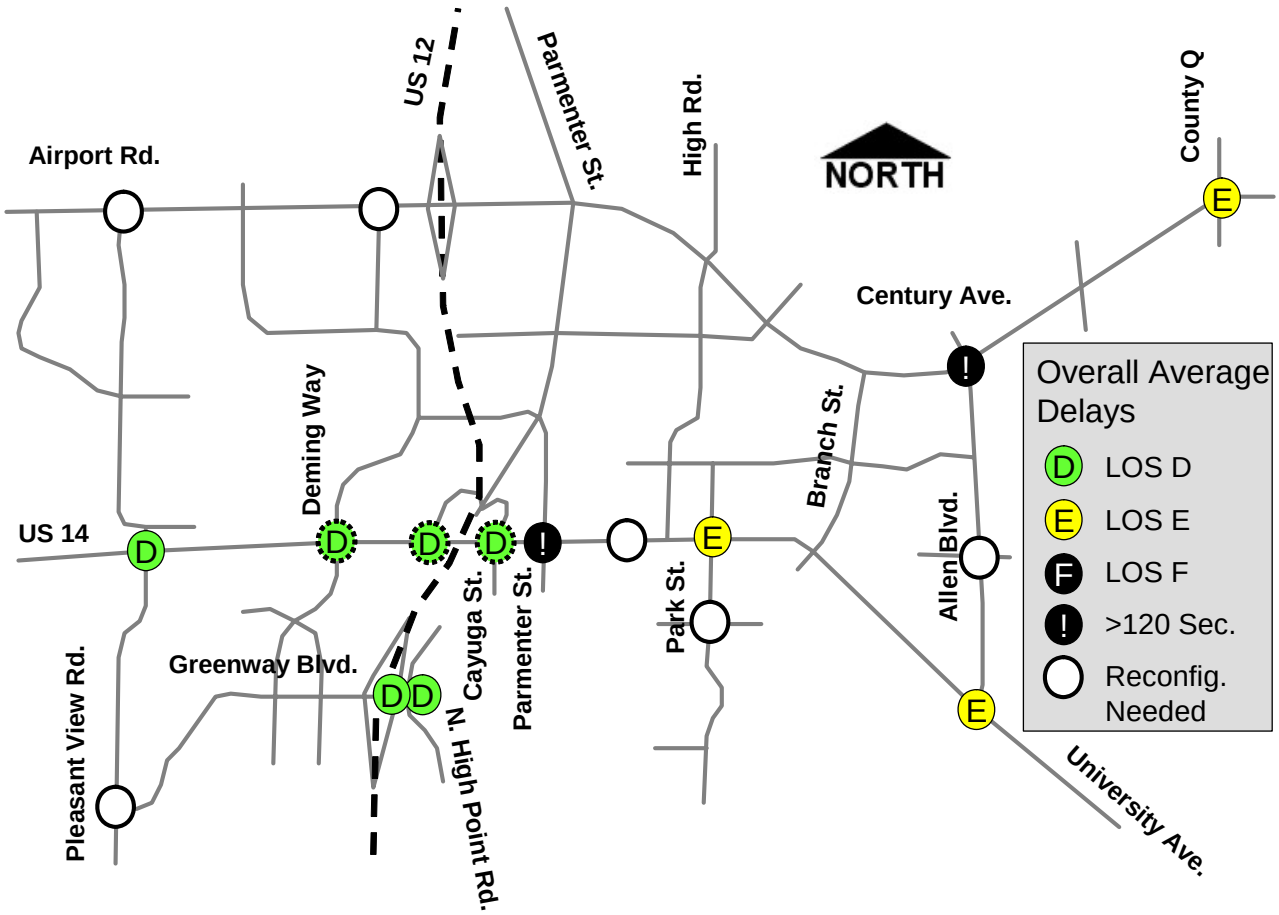

Figure 3.03-2 Interim-High (~2015 to 2020) PM Peak-Hour Operations on Existing Transportation Network

During the PM peak hour, operations with the Interim-High traffic volumes begin to show more widespread concerns. Conditions continue to worsen at the intersection of Century Avenue and Allen Boulevard. The intersection of University Avenue and Parmenter Street suffers from severe congestion with westbound queues that grow throughout the simulation period. Parmenter Street meters westbound traffic on University Avenue/US 14 such that operations at the US 12 ramp terminals and at Deming Way benefit from this. If modifications are made to the University Avenue and Parmenter Street intersection and operations are improved, westbound traffic may no longer be metered. This would likely result in traffic operations below LOS D at the intersections of University Avenue/US 14 with the US 12 ramp terminals and Deming Way.

A number of intersections reach the LOS E range indicating the need for modification. These include University Avenue and Park Street, University Avenue and Allen Boulevard, and Century Avenue and County Q.

Congestion becomes more apparent at the intersections of US 14 and Pleasant View Road, Greenway Boulevard and the westbound US 12 ramp terminal, and Greenway Boulevard and North High Point Road.

There are a number of unsignalized intersections that fail under the Interim-High traffic volumes. These include Pleasant View Road and Greenway Boulevard, Pleasant View Road and Airport Road, Airport Road and Nursery Drive, University Avenue and Park Lawn Place, Park Street and South Avenue, and Allen Boulevard and Mendota Avenue. Alternative traffic control will need to be considered at these locations to improve operations.

C. Needs Prioritization

Middleton's future traffic management needs were prioritized based on the interim and future traffic operations modeling. The needs are categorized as corridor needs and intersection needs. The order in which they are presented (corridor needs followed by intersection needs) is not intended to convey that corridor needs are a higher priority than intersection needs. Both types will develop concurrently.

1. Corridor Traffic Management Needs

Traffic volumes on Middleton's arterial streets will continue to increase as the City and surrounding communities grow. Dane County is experiencing one of the fastest growth rates in the nation and indications are that this growth is likely to continue. In some locations the existing traffic load on Middleton's streets is approaching typical capacity thresholds for their type of facility. Figure 3.03-3 shows the prioritized corridor needs within the City.

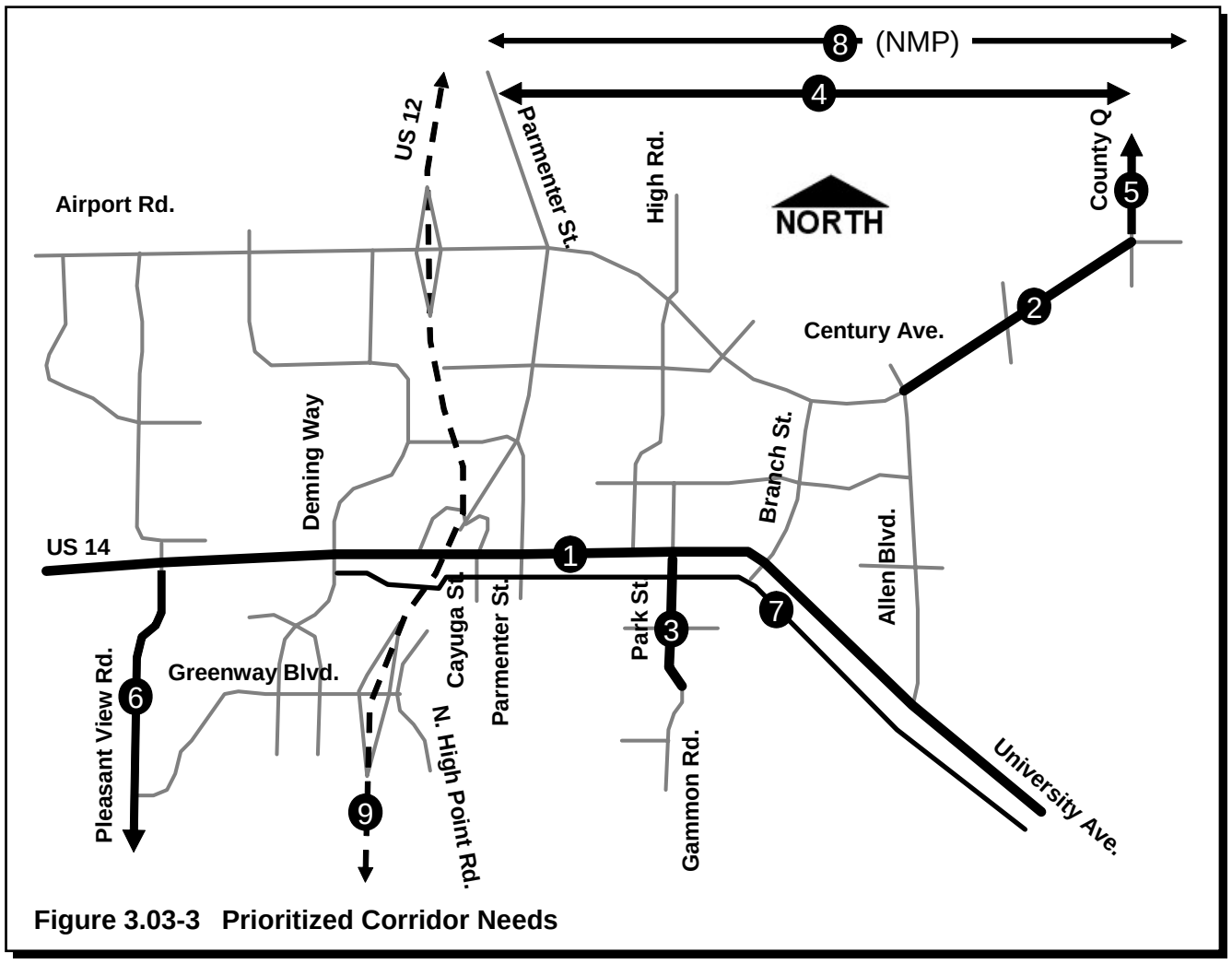

Figure 3.03-3 Prioritized Corridor Needs

a. Priority 1: US 14/University Avenue through all of Middleton

University Avenue serves as the only direct route to downtown Madison and the University of Wisconsin from areas located northwest of Lake Mendota. Existing daily traffic volumes east of Allen Boulevard are approaching six-lane corridor thresholds at over 30,000 vehicles per day (vpd). The same will eventually be true on the corridor throughout Middleton, with portions likely to exceed 40,000 vpd within 20 years. This is a similar volume to Fish Hatchery Road north of the Beltline or Mineral Point Road west of the Beltline. At stop-controlled side streets, left turns will become very difficult as will crossing the street on foot. The street will not be suitable for bicycle travel without modification. Peaks in traffic volumes will become less discernable as the duration of periods with the highest congestion and poorest operations grow longer.

The most critical sections are from Deming Way to Parmenter Street and east of Allen Boulevard. Serving the projected vehicular demand will be difficult in these areas without capacity expansion or major delays.

b. Priority 2: Century Avenue between Allen Boulevard and County Q

While some problem areas already exist, this corridor will likely see operational concerns develop along its entire length. At present, portions of this section of Century Avenue carry more than 30,000 vpd. Traffic forecasts indicate this could increase to over 40,000 vpd in 15 to 20 years. At stop-controlled side streets, left turns will become very difficult as will crossing the street on foot. The street will be poorly suited for bicycle travel without modification. Peaks in traffic volumes will become less discernable as the duration of periods with the highest congestion and poorest operations grow longer.

c. Priority 3: Park Street/Gammon Road from University Avenue to Woodgate Road

This corridor currently functions as a minor arterial. As traffic volumes increase this street will become increasingly important. Traffic forecasts indicate that it will carry more than 20,000 vpd, a volume typically served by a four-lane street.

d. Priority 4: East-West Connection(s) from US 12 to County Q

County K and the combination of Balzer Road, Pheasant Branch Road, High Road, and Greenbriar Road are likely to see large increases in traffic as future development patterns shift to the north side of Middleton and traffic operations on Century Avenue and University Avenue deteriorate. Traffic forecasts show from 15,000 to nearly 20,000 vpd on these two-lane streets. The modeling carried out for this study did not include the proposed North Mendota Parkway because its future construction date and location are uncertain. If the parkway is constructed, it should lessen the burden on east-west streets on Middleton's north side. Specific priorities for improvements to existing roads or the construction of a new east-west corridor will depend on future development patterns on the north side of Middleton. As land use in this area changes, dedication of sufficient right-of-way and, where appropriate, construction of expanded streets should be required.

e. Priority 5: County Q from Century Avenue to the north

Traffic forecasts indicate that portions of County Q could exceed 20,000 vpd in the horizon year. This type of volume is normally handled with a four-lane facility. The future of the North Mendota Parkway and conditions on Century Avenue will play large roles in future traffic on County Q.

f. Priority 6: Pleasant View Road from Old Sauk Road to US 14

While the traffic forecasts do not show significant traffic growth on this portion of Pleasant View Road, future development on the west side of Madison and Middleton may result in a steady increase in traffic volumes on this corridor. It is possible that the forecast underestimates this because the street is located on the edge of the travel demand model.

g. Priority 7: Additional Corridor Connections

Providing route choices for drivers will help alleviate congestion in the future. Street connections that make these routes more direct will increase their use. East-west routes in Middleton are limited to University Avenue and Airport Road/Century Avenue with little opportunity to provide additional choices. The existing street grid system in place between Parmenter Street and Branch Street north of University Avenue and between Parmenter Street and Gateway Street south of University Avenue will provide some relief, allowing some local trips to be completed on collector and local streets. The east-west route that will likely see significant traffic growth is the Terrace Avenue–Elmwood Avenue–Old Middleton Road corridor between Deming Way and the City of Madison. As operations on University Avenue deteriorate, diversion of non-local traffic to this corridor is likely to become more common.

h. Priority 8: North Mendota Parkway

As development patterns shift to the north side of Middleton and Madison and with continued growth in the Village of Waunakee, the role of the proposed North Mendota Parkway (NMP) and the recommendations from the NMP study in Middleton's future traffic operations continues to grow. The time frame, funding, and even final location of the parkway are still uncertain, but the proposed high-mobility east-west connection from US 12 to I-39/90/94 should help relieve travel demand on Middleton's core arterials in the future. Century Avenue and County Q south of Balzer Road are likely to benefit the most from Parkway implementation, but many additional Middleton streets could see reduced future traffic volumes as drivers alter route choices based on the availability of new and more attractive route options.

i. Priority 9: West Beltline Highway

The Beltline Highway on Middleton's west side and Madison's west and south sides accommodates regional and local traffic. If Beltline operations suffer, it will lead to increased traffic on Middleton's adjacent arterial streets as drivers seek alternative routes. If the Beltline is able to provide reasonable future traffic operations, it will minimize this traffic diversion to Middleton streets.

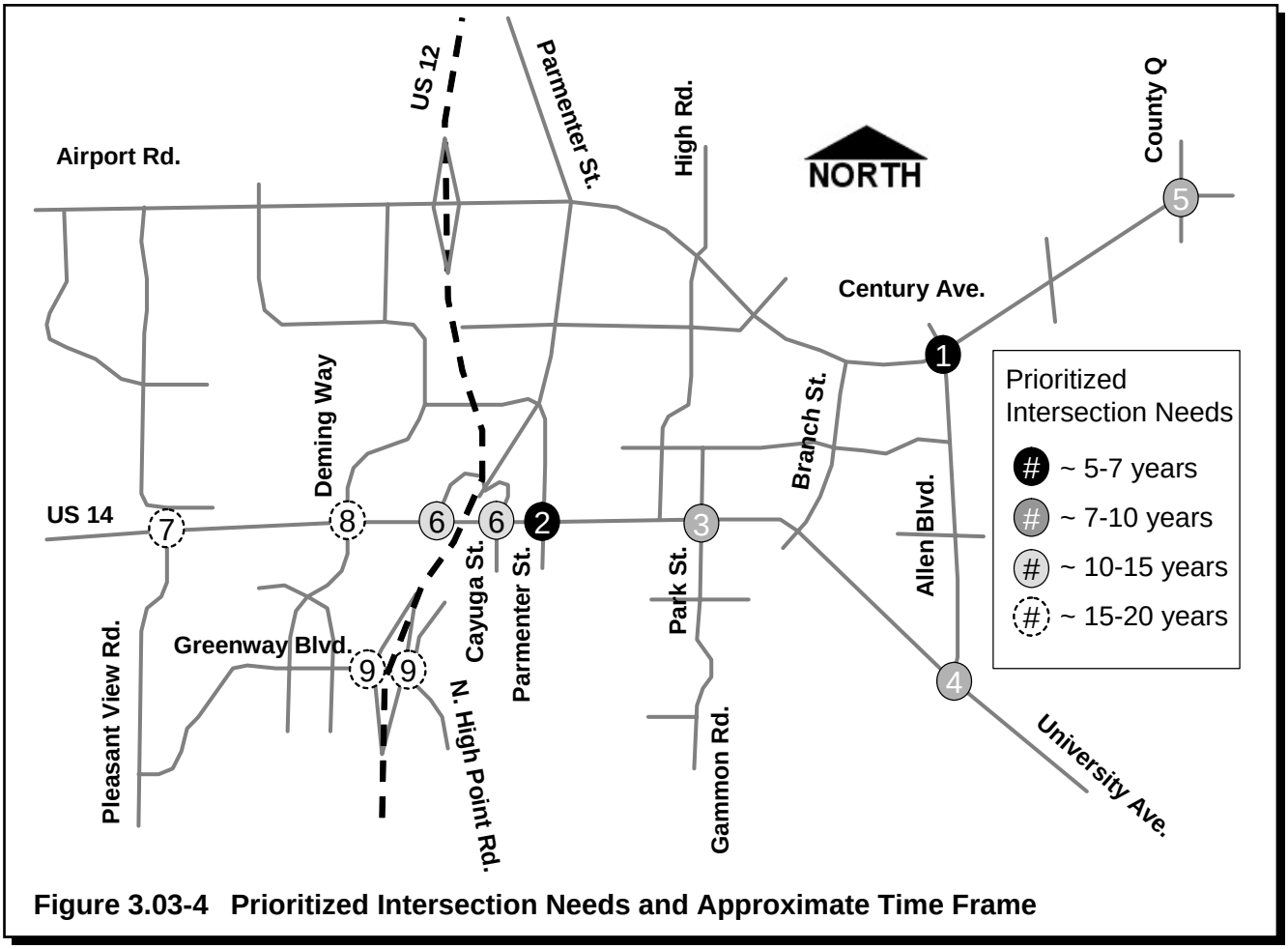

Figure 3.03-4 Prioritized Intersection Needs and Approximate Time Frame

2. Intersection Traffic Management Needs

Following are the anticipated needs at specific intersections throughout Middleton. The needs are prioritized based on the interim and future no-build operations modeling. The no-build modeling did include adjustments to signal timings and settings but no capacity expansion. An estimated time frame for the need is provided for planning purposes. The range of years is based on the future conditions demand modeling. Actual traffic growth will likely be different than that forecasted by the demand model, and therefore the needs may develop before or after the years shown, but the prioritized order is not likely to change. Operations modeling results for each of the traffic scenarios at all of the modeled intersections are included in Appendix B. Figure 3.03-4 shows the prioritized intersection needs.

a. Priority 1: Century Avenue and Allen Boulevard (5 to 7 years)

Existing traffic is near or at capacity for northbound and westbound vehicles during the PM peak hour at this intersection. Even small increases in traffic for certain movements are likely to cause major delays and queuing. The Interim-Low traffic modeling (representing year ~2010 to 2012) indicates the intersection will completely fail during

the PM peak hour. Average delay experienced per vehicle are forecasted to be over two minutes with queues exceeding 2,000 feet.

b. Priority 2: University Avenue and Parmenter Street (5 to 7 years)

Westbound left turns in the afternoon are experiencing substantial delay under existing traffic volumes. The movement will become more difficult as opposing through traffic continues to increase. Interim-Low traffic modeling projects LOS F conditions for westbound traffic. Because the westbound left-turning vehicles find few gaps in eastbound traffic in which to turn, large backups occur in the shared lane. This causes the intersection to operate as though only a single westbound through lane exists, underserving the westbound through traffic.

c. Priority 3: University Avenue and Park Street (7 to 10 years)

This intersection currently experiences significant queuing on the south approach during the PM peak hour. Operations modeling of the Interim-High scenario suggests that increased eastbound traffic will ultimately cause the westbound left-turn movement to fail. Heavy delays (LOS E to F) are also expected for northbound and eastbound vehicles.

d. Priority 4: University Avenue and Allen Boulevard (7 to 10 years)

This intersection must serve heavy PM peak-hour traffic volumes on all three approaches. The Interim-High operations modeling shows LOS F conditions for both eastbound left-turning vehicles and westbound right-turning vehicles.

e. Priority 5: Century Avenue and County Q/Hedden Road (7 to 10 years)

This intersection serves two conflicting movements that become significant during the PM peak hour. The eastbound left-turn and westbound through movements must compete with each other for green time. Both of these movements experience LOS F in the Interim-High operations modeling.

f. Priority 6: US 14/University Avenue and US 12 Ramps (10 to 15 years)

This interchange is likely to experience poor operations if the intersection of University Avenue and Parmenter Street is able to accommodate the projected westbound PM peak-hour traffic.

Traffic projections indicate a very large volume of westbound University Avenue traffic will be destined for eastbound US 12. Interim-High operations modeling shows a lane imbalance as westbound traffic queues in the outside lane at the westbound US 12

Ramps/Cayuga Street intersection in anticipation of turning right at the eastbound US 12 on-ramp. The lane imbalance causes large queues and delays for westbound traffic at the westbound US 12 Ramps/Cayuga Street intersection. Modification to both ramp terminals will likely be needed to improve future operations.

g. Priority 7: US 14 and Pleasant View Road (15 to 20 years)

Future operations modeling indicates that northbound traffic will be underserved by the existing intersection configuration.

h. Priority 8: US 14 and Deming Way (15 to 20 years)

The Deming Way approaches will begin to experience poor operations according to future PM peak-hour operations modeling. Specifically, northbound and southbound left turns will operate poorly.

i. Priority 9: Greenway Boulevard and North High Point Road and US 12/14 Interchange (15 to 20 years)

The close spacing of the US 12/14 ramp terminals and North High Point Road may cause problems in the future. While the operations modeling did not indicate significant PM peak-hour concerns, it can be expected that the limited signal timing options provided by the intersection spacing may result in difficulties in the future. Reconfiguration of the three intersections may or may not be needed.

j. On-going Priority: Intersection Control

As traffic volumes grow in Middleton, many unsignalized intersections will need to be reconfigured to provide roundabout or signal control. County Q north of Century Avenue, Century Avenue between Allen Boulevard and County Q, all of Allen Boulevard, Park Street south of University Avenue, and University Avenue/US 14 through all of Middleton will eventually reach traffic volumes that will make accessing them via a left turn from a stop-controlled side street very difficult or impossible during the heaviest traffic periods. Following is a list of stop-controlled intersections that operations modeling showed are likely to need reconfiguration to improve future operations. Figure 3.03-5 shows the listed locations.

- Pleasant View Road and Greenway Boulevard
- Airport Road and Pleasant View Road
- Airport Road and Nursery Drive
- Park Street and South Avenue
- Allen Boulevard and Mendota Avenue
- Deming Way and Nursery Drive
- Park Street and Donna Drive
- Allen Boulevard and Maywood Avenue

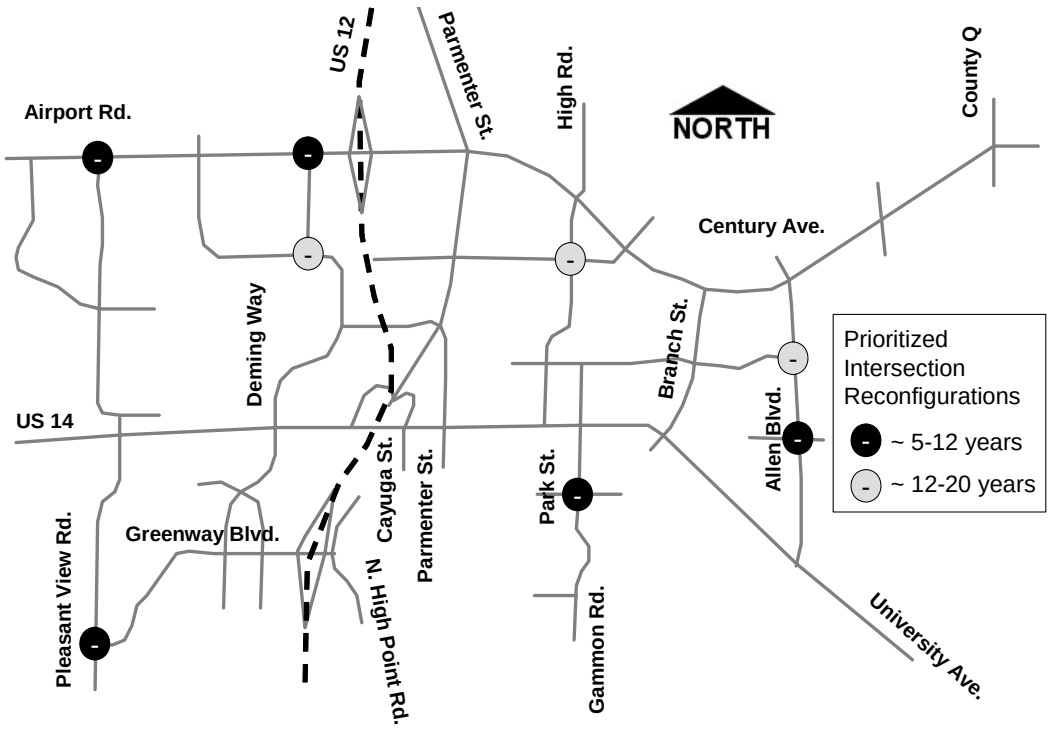

Figure 3.03-5 Prioritized Needs for Unsignalized Intersections

Note that not every intersection in Middleton could be modeled within the scope of this study. Additional stop controlled intersections may also operate poorly in the future.

SECTION 4
SOLUTION TYPES

4.01 TRANSPORTATION SOLUTIONS

As vehicular traffic volumes grow, City streets will ultimately become highly congested and long delays and queues will result. Some of the solution types that follow will influence when this occurs, but it is unlikely that congestion can be completely avoided because of local geographical and land use constraints and anticipated continued growth in Middleton and surrounding communities. As traffic volumes reach the capacity of streets and intersections, peak traffic periods will grow in duration, resulting in a daily traffic volume distribution similar to that shown in Figure 4.01-1.

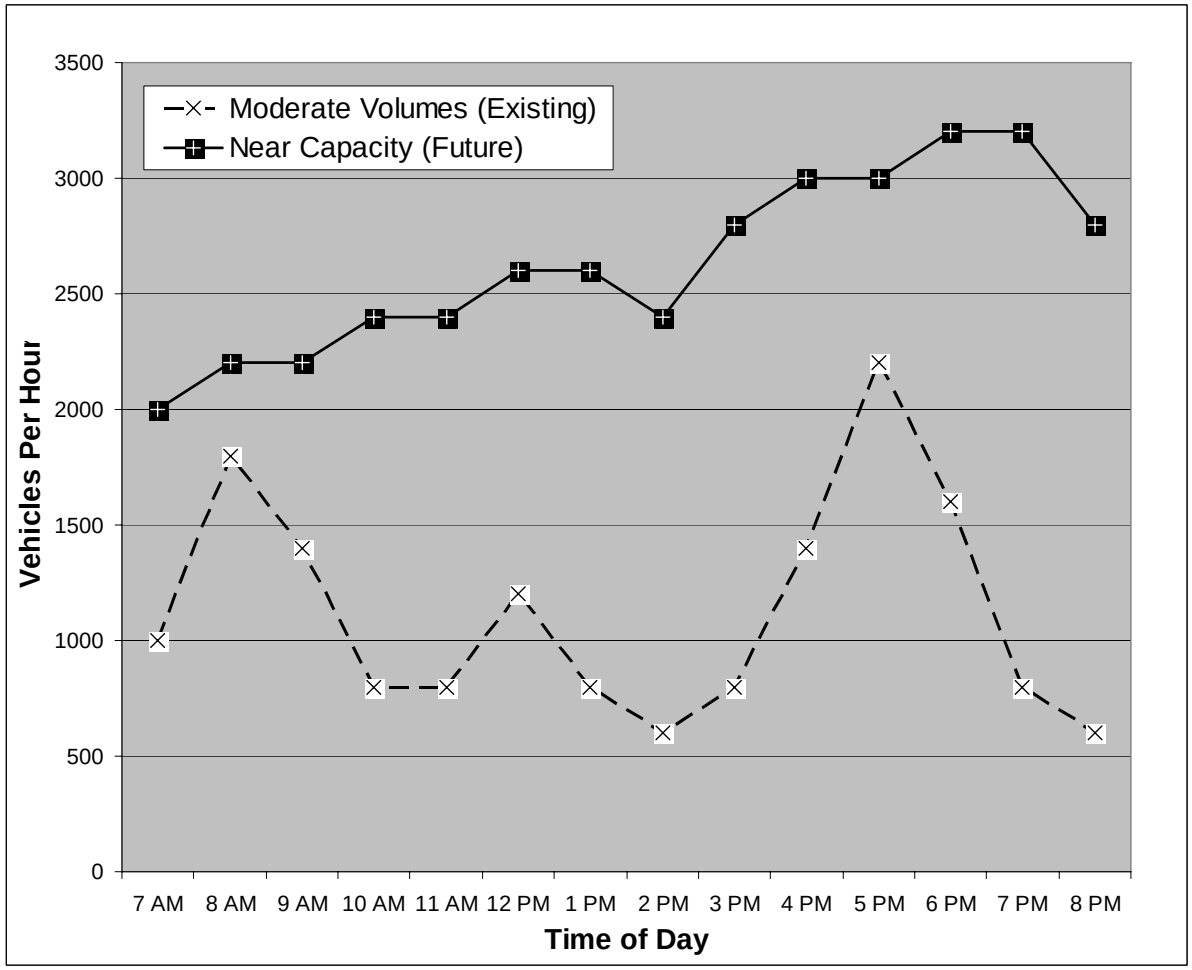

Figure 4.01-1 Potential Hourly Traffic Volume Distribution for a Typical Weekday

The management of Middleton's transportation system and the planning of its future will benefit from a comprehensive approach. The following paragraphs include a general description of different approaches to comprehensive transportation system management. Sections 5 through 7 of the report present opportunities for implementation in Middleton and a discussion of the likely strengths and weaknesses of each strategy.

4.02 TRAFFIC MANAGEMENT PERSPECTIVE

The Traffic Management approach to transportation system management generally emphasizes motor vehicle movement. It is based on the assumption that increased vehicle mileage and speed are desirable and benefit the community. It places little emphasis on transit, bicycling, or walking as alternative modes. It generally assumes that the best location for a land use that generates significant person-trips is adjacent to highways with an ample parking supply. Consequently, it often is accompanied by "sprawling" land use patterns. Figure 4.02-1 shows a section of Middleton that fits the Traffic Management perspective. Nearly all trips into and out of this area of the City are made by motor vehicle since other modes either don't exist or are inconvenient.

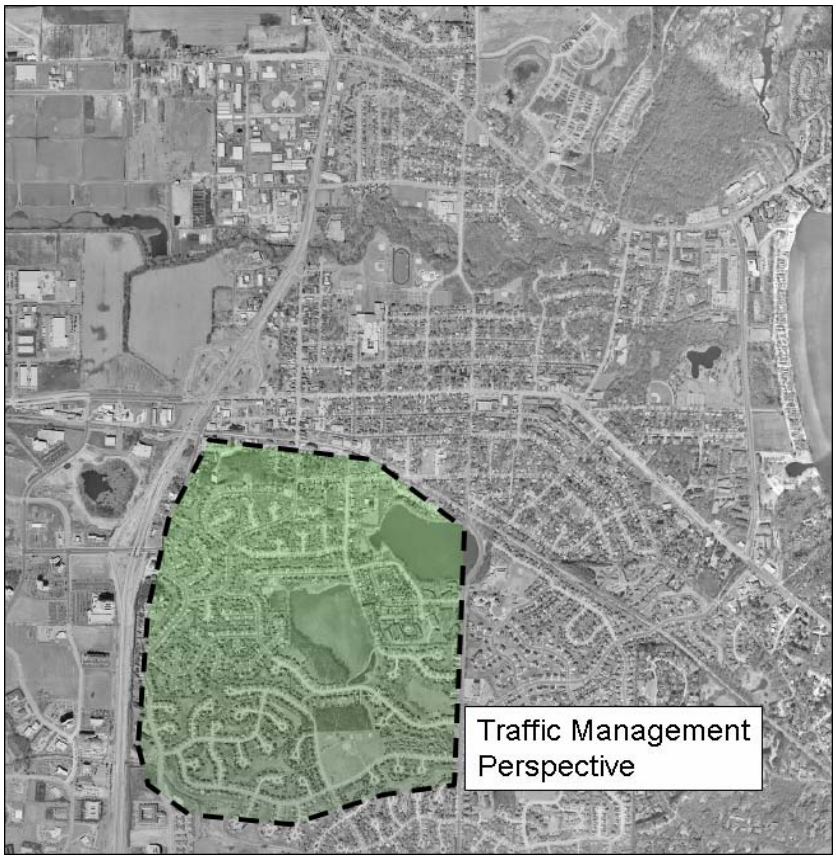

Figure 4.02-1 Land Use in Middleton That Fits the Traffic Management Perspective for Transportation System Management

The Traffic Management perspective identifies transportation system needs in terms of motorists and their ability to reach their destinations with minimal delay. Solutions to identified needs tend to favor increased roadway capacity and higher motor vehicle speeds. Measurement of vehicle traffic is relatively easy, and methodologies for forecasting a solution's effectiveness are well-established and accepted.

4.03 MOBILITY PERSPECTIVE

The Mobility approach to transportation system management generally emphasizes the movement of people or goods. It is based on the assumption that increased travel mileage and speed are desirable and benefit the community. It places some emphasis on alternative transportation modes recognizing that some portion of travel is through nonmotorized modes at least occasionally. It generally assumes that land uses generating significant person-trips need convenient highway access and parking, but that transit and high occupancy vehicle (HOV) access are important in areas where population densities are high enough to support them. Figure 4.03-1 shows a section of Middleton that fits the Mobility perspective. This area includes higher density land uses (commercial and office) near a major motor vehicle arterial street but also in a location that is convenient for some users to reach as pedestrians or bicyclists.

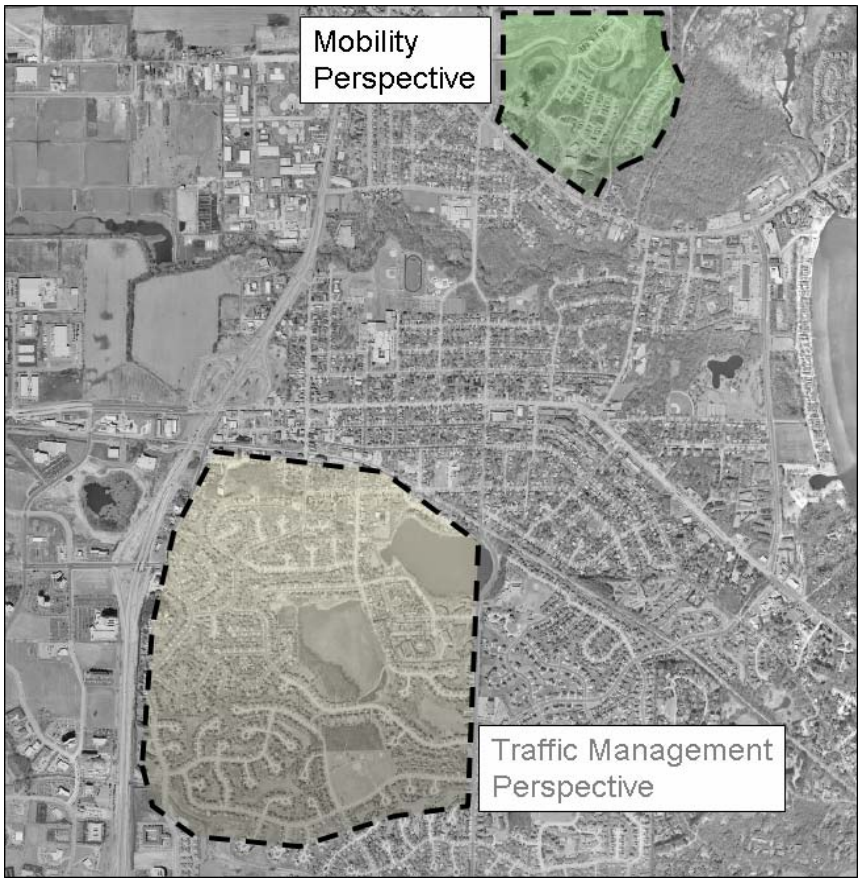

Figure 4.03-1 Land Use in Middleton that fits the Mobility Perspective for Transportation System Management

The Mobility perspective identifies transportation system needs in terms of barriers to physical movement. Solutions to identified needs often focus on increased roadway capacity, higher motor vehicle speeds, expansion of transit and ridesharing services, improvements in bicycle and pedestrian facilities, and increases in intermodal connections. It is more difficult to measure the effectiveness of some types of mobility improvements.

4.04 ACCESSIBILITY PERSPECTIVE

The Accessibility approach to transportation system management values opportunities for people to reach desired goods, services, activities, and destinations. It is based on the assumption that improved access benefits society, and mobility is one way to achieve this. This perspective attempts to strike a more equal balance between transportation modes such as motor vehicles, transit, ridesharing, walking, and bicycling. It also considers substitutes for personal movement such as telecommuting. It supports an integrated view of transportation and land use. Figure 4.04-1 shows a section of Middleton that fits the Accessibility perspective (in at least one respect). In this area, the high traffic generator (Middleton High School) is located in the middle of a residential neighborhood rather than adjacent to a major street. This treats pedestrian and bicycle traffic more equally with motor vehicle modes.

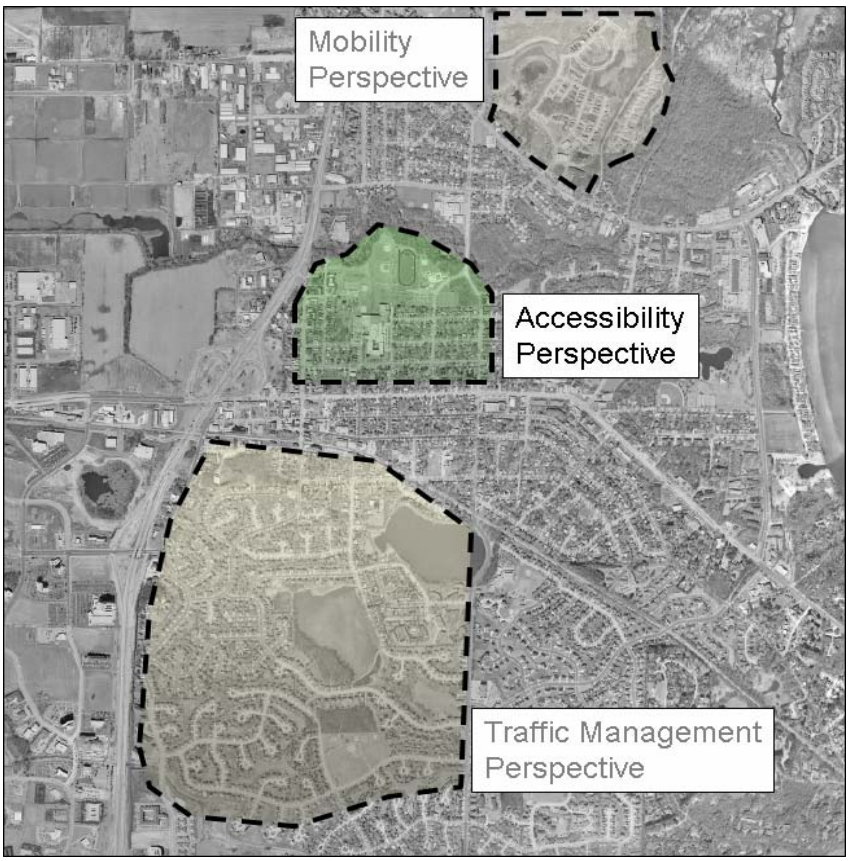

Figure 4.04-1 Land Use in Middleton That Fits the Accessibility Perspective for Transportation System Management

The Accessibility perspective identifies a wider range of transportation system needs and therefore allows a wider range of potential solutions. Needs include the elimination of any barriers that potentially prevent people from accessing goods, services, activities, or destinations. Solutions to identified needs can include traffic management and mobility solutions as well as mobility substitutes and more accessible land uses. Accessibility is the most difficult perspective to quantify. Needs are typically based on time, money, discomfort, and risks associated with reaching desired goods and services.

SECTION 5
TRAFFIC MANAGEMENT SOLUTIONS

5.01 TRAFFIC MANAGEMENT SOLUTION TYPES

From a Traffic Management perspective, solutions to Middleton's anticipated transportation system needs involve motor vehicle capacity expansion of City streets and intersections. This is typically done with geometric expansion, such as the addition of a through lane to a corridor or exclusive turn bays at intersections, combined with traffic signal systems management. It should be noted that vehicular capacity expansion often makes pedestrian and bicycle travel less comfortable.

A. Traditional Capacity Expansion

The following discusses traditional capacity expansion options based on corridor and intersection alternatives.

1. Corridor Expansion Options

a. Priority 1: US 14/University Avenue through all of Middleton

1) Routine Maintenance and Safety Improvements

On one end of the spectrum of traditional capacity expansion is a no-build alternative. US 14 would remain a divided four-lane highway west of the US 12 interchange. University Avenue would remain an undivided four-lane street from US 12 to Park Street, and a combination of divided four-lane and five-lane with a center left-turn lane from Park Street to Allen Boulevard. Only routine maintenance and safety improvements would be planned. This approach could be combined with intersection expansion to maximize through vehicle capacity, but the forecasted peak-hour traffic volumes would probably not be fully accommodated.

The result of providing less motor vehicle capacity than traffic demand would be high congestion during at least some part of the day. As a result of this congestion, a combination of responses will occur. First, some travelers will elect to use a different route, as shown in Figure 5.01-1. The streets most likely to receive traffic diverted from University Avenue would include:

- Old Sauk Road.
- Terrace Avenue–Elmwood Avenue–Old Middleton Road.
- Century Avenue (via Donna Drive (eastbound only) and US 12 Bypass).

Second, some drivers will elect to make their vehicle trips before or after the heaviest congestion occurs, resulting in a spreading or lengthening of peak periods. Third, some travelers will choose an alternate mode such as walking or bicycling to complete their trip. Fourth, some travelers will choose not to make their trip at all. These responses to congestion will reduce motor vehicle travel demand until it equals the street capacity.

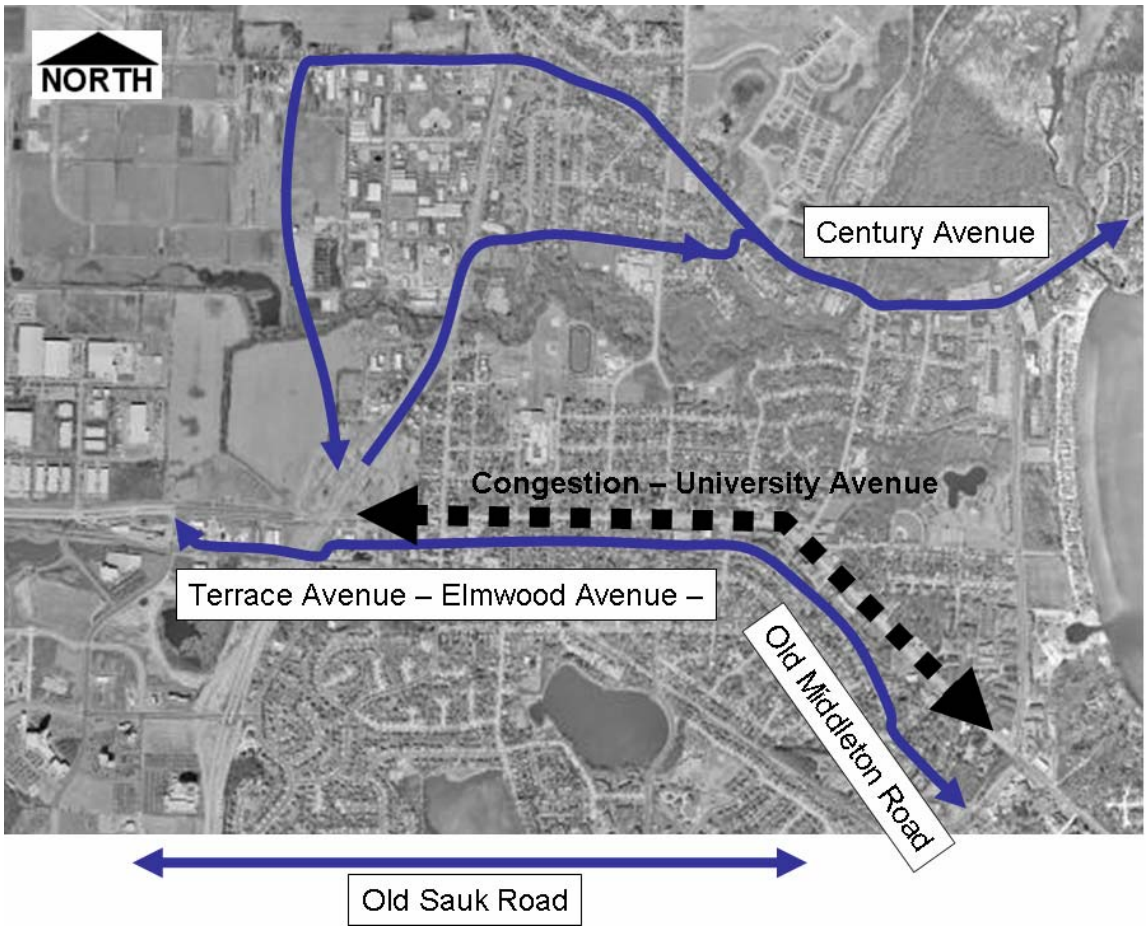

Figure 5.01-1 Routes Likely to Receive Diverted University Avenue Traffic

As congestion increases, political pressure to expand University Avenue is likely to increase. Efforts to enhance alternative mobility options described in Section 6 could reduce this pressure. Pedestrian and bicycle safety would be a concern, particularly within the undivided portion of University Avenue. At least one additional signalized or roundabout-controlled intersection would be recommended between Parmenter Street and Park Street to allow access to and from the adjacent residential neighborhoods and reduce University Avenue's impact as a barrier to north-south movement through the City. Bristol Street would be recommended because of it's location nearly half-way between Parmenter Street and Park Street and it's access to Middleton High School. If the Park Street connection adjacent to Parisi Park is made, Bristol Street becomes a more attractive candidate due to the decreased importance of the Park Lawn intersection.

2) Divided Four-Lane Street and/or Five-Lane Street

As volumes near four-lane capacity on University Avenue, it will become nearly impossible to access undivided portions of the street by a left turn from a stop-controlled side street. Expansion of the undivided portions of University Avenue to provide a median or a continuous center left-turn lane would be the logical first step in corridor capacity expansion. A median or center turn lane provides refuge for left-turning traffic so the maneuver can be completed more safely in two stages, requiring a gap in only one direction of traffic at a time. It also allows left-turning traffic on the main road to depart the through traffic lanes and provides refuge for bicycles and pedestrians crossing the street. Reducing access points (driveways and side streets) would also increase through motor vehicle capacity and improve safety. Appendix C contains a schematic drawing of this typical section.

Impacts of the expansion may include some commercial and/or residential relocations. Even following this expansion, the street would still have difficulty providing enough capacity to meet the forecasted traffic demand.

3) Six-Lane Street

Forecasted traffic volumes on University Avenue are above typical four-lane street capacity thresholds. The most conventional way to fully accommodate these volumes would be expansion to a divided six-lane street on University Avenue, similar to what exists farther east on University Avenue in Madison and on East Washington Avenue in downtown Madison. Removal or restriction of access at lower volume streets would be recommended. Similar to the option for a divided four-lane or five-lane street, at least one additional signalized or roundabout-controlled intersection would be recommended between Parmenter Street and Park Street to allow access to and from the adjacent residential neighborhoods and reduce University Avenue's impact as a barrier to north-south movement through the City. Appendix C contains a schematic drawing of this typical section.

Expansion to a six-lane cross section will have high impacts, particularly from Deming Way to Park Street, and may be cost prohibitive. The expansion under US 12 may require reconstruction of the US 12 bridges (which were just reconstructed) and, therefore, may not be feasible. Many residential and commercial relocations would be required, potentially making it politically unfeasible as well. While a six-lane street will accommodate the forecasted traffic volumes, at some point traffic volumes will reach the capacity of the six-lane street as well. This may occur after the planning horizon of this study (15 to 20 years).

4) One-way Pair System

An alternative to a six-lane section on University Avenue through much of Middleton would be conversion to a one-way pair system. The existing grid system of local streets to the north and south of University Avenue lend themselves to this solution. The two-lane one-way pair of East Johnson Street and East Gorham Street in downtown Madison carry volumes today comparable to those forecast for University Avenue in the future. Appendix C contains a schematic drawing of this typical section. On-street parking could be allowed with this configuration. It would not be recommended with the other cross sections.

While there would likely be significantly fewer relocations, political acceptance is again a large barrier for implementation of a one-way pair system. One of the streets would be located on an existing local residential street. Additionally, commercial businesses typically object to one-way pair systems because of reduced exposure to traffic. One-way pair systems also tend to negatively impact transit ridership.

A system of two-lane one-way streets has comparable capacity to a two-way six-lane street because of elimination of opposed left turns, while a three-lane one-way street pair can carry additional traffic. Even a three-lane one-way pair system will reach capacity at some point, but this would occur after a two-way six-lane street or two-lane one-way pair system would reach capacity.

b. Priority 2: Century Avenue between Allen Boulevard and County Q

1) Routine Maintenance and Safety Improvements

Century Avenue would remain a divided four-lane street. Only routine maintenance and safety improvements would be planned. This approach could be combined with intersection expansion at Allen Boulevard and at County Q/Hedden Road to maximize through vehicle capacity.

To avoid the congestion in this section of street, some drivers would likely elect to use a different route. The streets most likely to receive traffic diverted from Century Avenue are shown in Figure 5.01-2 and they include:

- Balzer Road to Pheasant Branch Road or High Road.
- Greenbriar Road and US 12 Interchange.
- County K.
- Possible future east-west collector road (if constructed, it may include some portion of the roads mentioned above).
- North Mendota Parkway (if constructed, it may include some portion of the roads mentioned above).

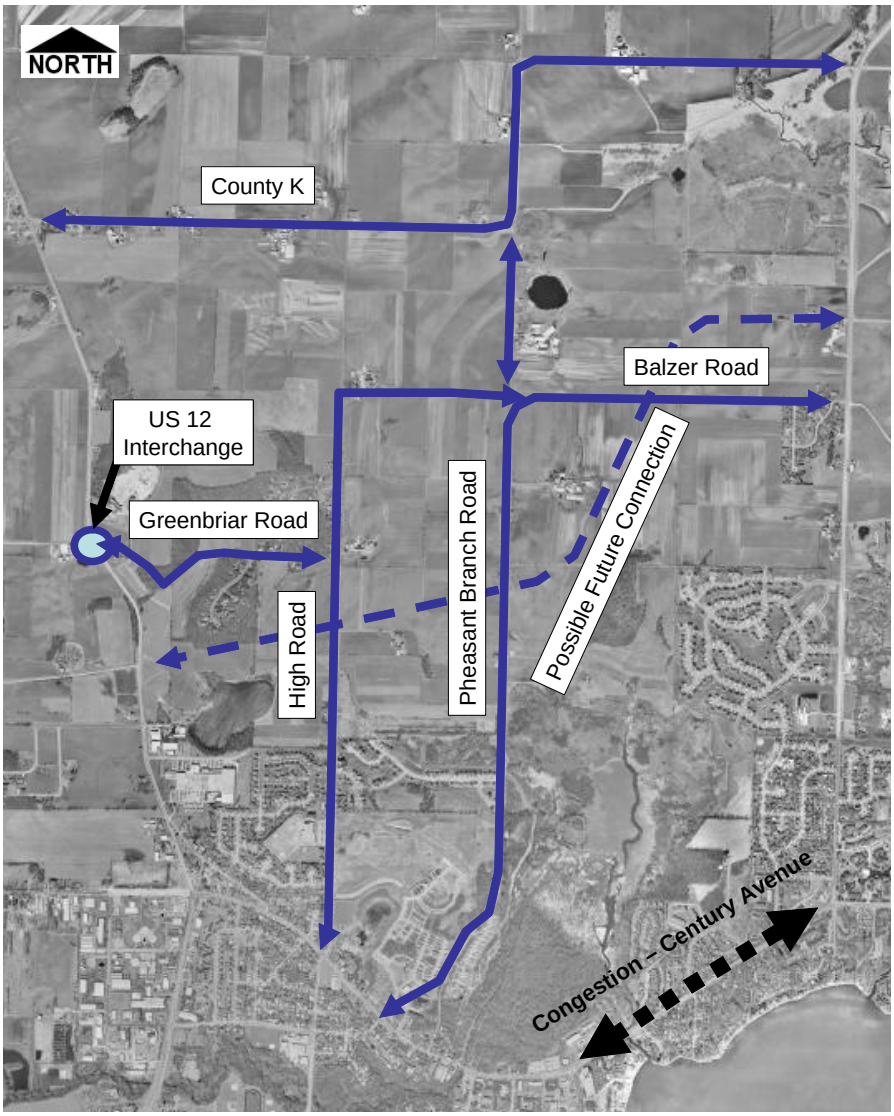

Figure 5.01-2 Routes Likely to Receive Diverted Century Avenue Traffic

Some drivers will travel at a different time, use a different mode, or eliminate their trip altogether. These responses to congestion will reduce motor vehicle travel demand until it equals the street capacity.

As congestion increases, political pressure to expand Century Avenue is likely to increase. Efforts to enhance alternative mobility options described in Chapter 6 could reduce this pressure. Pedestrian and bicycle safety would be a concern along this portion of Century Avenue because of the high vehicular volumes.

2) Six-Lane Street

Forecasted traffic volumes on this portion of Century Avenue are above typical four-lane street capacity thresholds. The most conventional way to fully accommodate these volumes would be expansion to a divided six-lane street. Removal or restriction of access at lower volume side streets would be recommended. Appendix C contains a schematic drawing of this typical section.

Expansion to a six-lane cross section will have high impacts. Many residential and perhaps a few commercial relocations would be required, potentially making expansion politically unfeasible as well. While a six-lane street will accommodate the forecasted traffic volumes, if connecting streets are not similarly upgraded congestion will remain. In particular, County M and County Q on the east end of this portion of Century Avenue are forecasted to carry volumes that are at or above the typical capacity for two-lane streets.

Even if County M and County Q are expanded, at some point traffic volumes will likely reach the capacity of a six-lane Century Avenue as well. This may occur after the planning horizon of this study (15 to 20 years).

c. Priority 3: Park Street/Gammon Road from University Avenue to Woodgate Road

1) Routine Maintenance and Safety Improvements

This portion of Park Street would remain a two-lane street. Only routine maintenance and safety improvements would be planned. The forecasted traffic volumes on this portion of Park Street are above the typical capacity of a two-lane street. These volumes would probably not be able to be fully accommodated.

Because of this, some drivers would elect to use a different route through adjacent neighborhoods. The streets most likely to receive traffic diverted from Park Street are shown in Figure 5.01-3 and they include:

- Stonefield Road.
- Old Middleton Road–Elmwood Avenue.
- Longmeadow Road–North Westfield Road–Parmenter Street.
- Fortune Drive–Sweeney Drive–Voss Parkway–Middleton Street–Parmenter Street.
- Cooper Avenue–Maple Street.
- North High Point Road.

Some drivers will travel at a different time, use a different mode, or eliminate their trip altogether. These responses to congestion will reduce motor vehicle travel demand on this section of Park Street until it equals the street capacity.

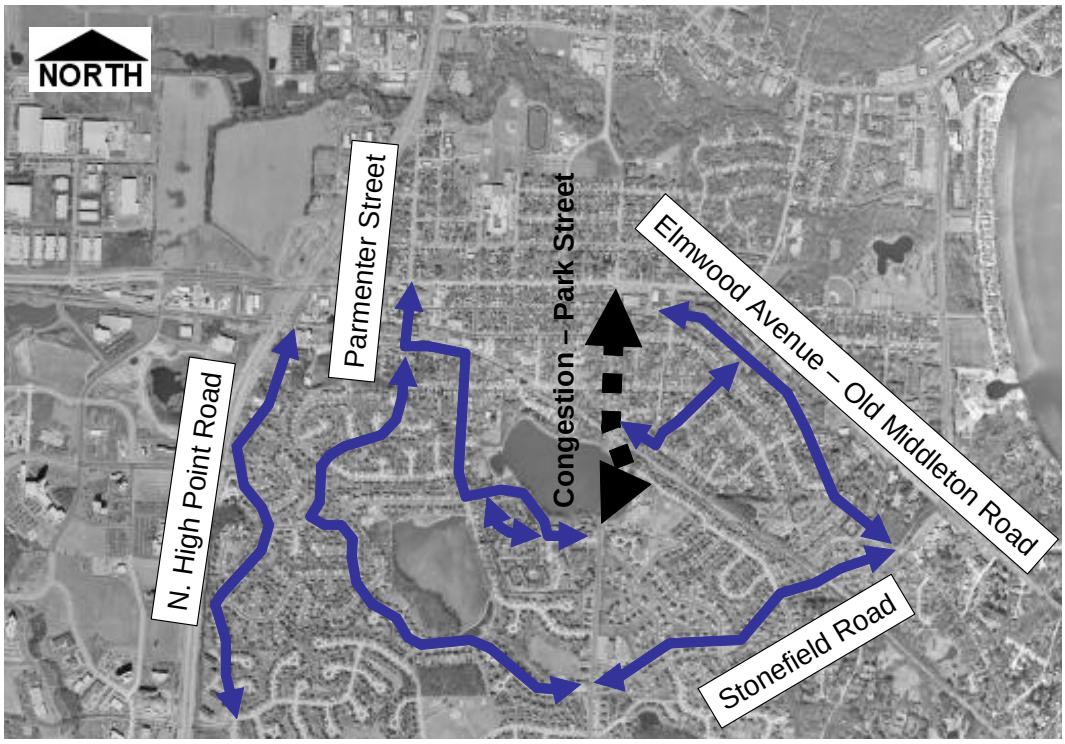

Figure 5.01-3 Routes Likely to Receive Diverted Park Street Traffic

As congestion increases, political pressure to expand Park Street is likely to increase. Efforts to enhance alternative mobility options described in Section 6 could reduce this pressure. Pedestrian and bicycle safety will continue to deteriorate along this portion of Park Street because of high vehicular volumes.

2) Three-Lane Street

As volumes near the capacity of this two-lane portion of Park Street, it will become nearly impossible to access the street by a left turn from a stop-controlled side street. Expansion to a three-lane section including a continuous center left-turn lane would increase vehicular capacity. A center turn lane provides refuge for left-turning traffic so the maneuver can be completed more safely in two stages, requiring a gap in only one direction of traffic at a time. It also allows left-turning traffic on the main road to depart the through traffic lanes and provides refuge for bicycles and pedestrians crossing the street.

This portion of the Park Street corridor may be able to be converted to provide a three-lane section through the elimination of on-street parking and the addition of appropriate pavement markings. Although the forecasted traffic volumes are above the typical three-lane street capacity, this option could extend the useful life of the corridor while producing minimal impacts on adjacent properties.

3) Undivided Four-Lane Street

Expansion to an undivided four-lane street to match the existing cross section south of Woodgate Road would provide limited relief from forecasted future congestion compared to a three-lane section. Appendix C contains a schematic drawing of a four-lane undivided typical section. On-street parking is not recommended.

Reducing the number of access points (driveways and side streets) where possible would also increase through motor vehicle capacity and improve safety. This can be accomplished through closure of low volume side street access points, prohibition of specific movements (such as allowing right-in/right-out access only), or control of driveway locations as property is redeveloped.

Impacts of the expansion may include some residential relocations, depending on the design of the cross section. If constructed to minimum recommended dimensions, a four-lane undivided street could be built within the existing right-of-way. Regardless of specific cross section, the forecasted traffic demand is near the capacity of a four-lane undivided street. Left turns onto Park Street and crossing maneuvers at stop controlled intersections will still be difficult. An additional signalized or roundabout-controlled intersection would be recommended between University Avenue and Woodgate Road (probably at South Avenue) to allow access to and from the adjacent residential neighborhoods and reduce Park Street's impact as a barrier to east-west movement through this portion of the City. Traffic signals on four-lane undivided streets do not operate well unless the mainline cross section is expanded at the intersection because of the need for shared lane groups (through/left and through/right).

4) Divided Four-Lane Street and/or Five-Lane Street

Expansion of Park Street to provide a median or a continuous center left-turn lane would be an effective way to increase vehicular capacity. As noted under the three-lane section option, a median or center turn lane provides refuge for left-turning traffic so the maneuver can be completed more safely in two stages, requiring a gap in only one direction of traffic at a time. It also allows left-turning traffic on the main road to depart the through traffic lanes and provides refuge for bicycles and pedestrians crossing the street. Reducing the number of access points (driveways and side streets) would also increase through motor vehicle capacity and improve safety. Appendix C contains a schematic drawing of this typical section. On-street parking is not recommended.

Impacts of the expansion would likely include some commercial and/or residential relocations. The forecasted traffic demand is near the lower end of assumed capacity of a four-lane divided street.

d. Priority 4: East-West Connection(s) from US 12 to County Q

1) Routine Maintenance and Safety Improvements

County K and the combination of Greenbriar Road, High Road, and Balzer Road would remain two-lane. These streets will see steady vehicular traffic growth as congestion on University Avenue and Century Avenue increases. Traffic forecasts indicate that these east-west connections between US 12 and County Q will grow in importance for local trips, similar to the changing role of Pleasant View Road on west side of Middleton and Madison. The forecasted traffic volumes on these streets will approach the typical capacity of two-lane rural roads. If capacity expansion is not planned, congestion will result and roundabout or traffic signal control will be needed at higher volume intersections such as Greenbriar Road and High Road, Balzer Road and Pheasant Branch Road, and Balzer Road and County Q.

As congestion increases, the concern for bicycle safety on these corridors will also increase. Since these are two-lane rural roads today, they lack pedestrian accommodations and pedestrians must share the road with vehicles.

2) Divided Four-Lane Street

The City is currently studying a proposed collector road connection from the Schneider Road/Parmenter Street intersection to the County Q/Oncken Road intersection (apart from the proposed North Mendota Parkway arterial) that will improve east-west traffic movement. The uncertain future of the Parkway suggests that any east-west collector constructed by the City should consider a four-lane section to provide additional capacity over a two-lane street. Appendix C contains a schematic drawing of this typical section.

A median would be an effective way to increase vehicular capacity, and it would delay the need for roundabout or traffic signal control at some intersections. Opportunities to minimize or eliminate access points (driveways and side streets) should be taken advantage of as each east-west four-lane corridor is planned.

If portions of future east-west corridors include existing rural roads, impacts of expanding these roads to a divided four-lane collector would be less than for more urbanized existing streets such as Park Street. Additional right-of-way would still be required, but fewer residential relocations would be needed.

e. Priority 5: County Q from Century Avenue to the north

1) Routine Maintenance and Safety Improvements

This section of County Q would remain a two-lane street. County Q will see steady vehicular traffic growth as development in Waunakee and on the north side of Middleton continues. Traffic forecasts indicate that even with the existing street network in place, County Q will carry up to 14,000 vehicles per day south of Balzer Road and more than 20,000 vehicles per day north of Balzer Road. This suggests that periods of significant congestion will occur. Century Avenue and County M on the north side of Lake Mendota will play a role in the vehicular travel demand placed on County Q. If capacity is added to Century Avenue and/or County M, traffic volumes on County Q will increase and political pressure for capacity expansion will follow.

As congestion on County Q grows, some drivers that have the option will likely elect to use a different route. The streets most likely to receive traffic diverted from County Q are shown in Figure 5.01-4. They are the same as those for Century Avenue and they include:

- Balzer Road to Pheasant Branch Road or High Road.
- Greenbriar Road and the US 12 Interchange.
- County K.
- Possible future east-west collector road (if constructed, it may include some portion of the roads mentioned above).
- North Mendota Parkway (if constructed, it may include some portion of the roads mentioned above).

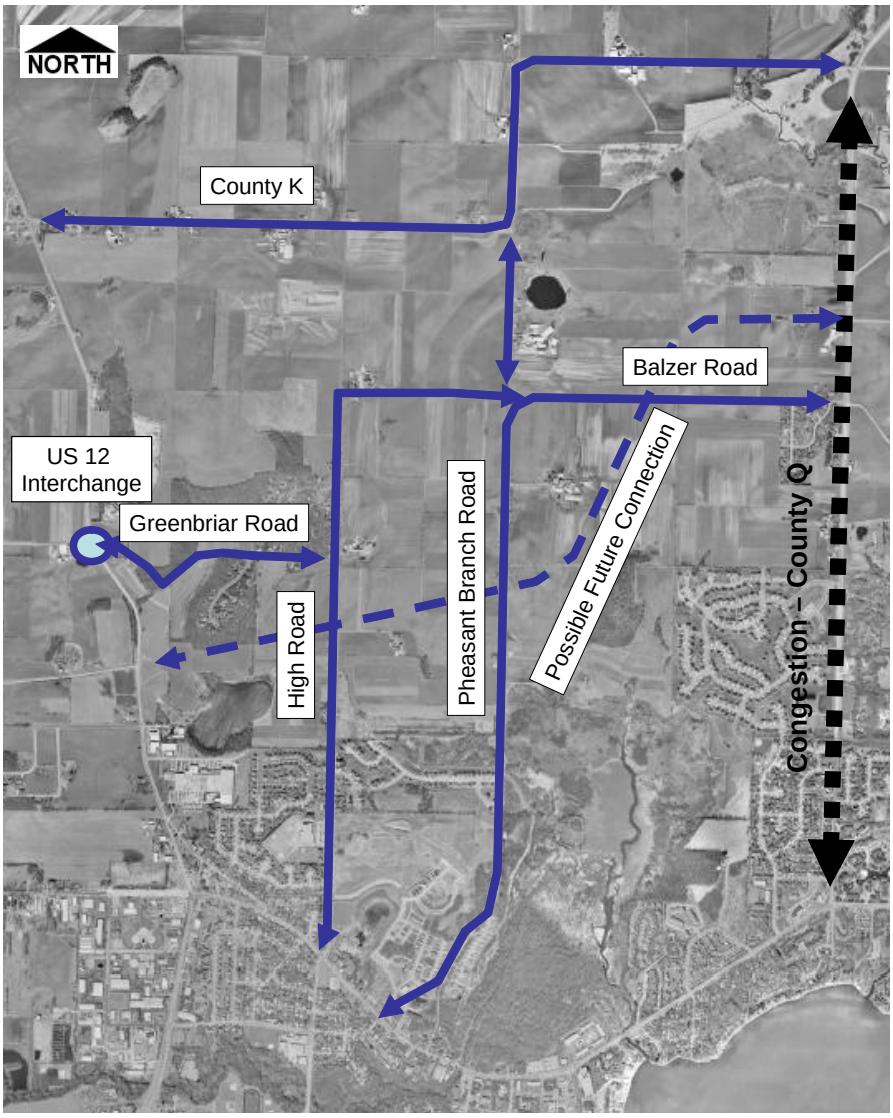

Figure 5.01-4 Routes Likely to Receive Diverted County Q Traffic

As congestion on this portion of County Q grows, some drivers will travel at a different time, use a different mode, or eliminate their trip altogether. These responses to congestion will reduce motor vehicle travel demand until it equals the street capacity.

If capacity expansion is not planned, congestion will result and roundabout or traffic signal control will be needed at higher volume side streets such as Shorecrest Drive, Rolling Hill Drive, and Indigo Way to provide access into and out of residential neighborhoods. The upgraded intersection control will also improve bicycle and pedestrian safety.

2) Low-Build Street Expansion at Intersections

As volumes near the capacity of this portion of County Q, it will become nearly impossible to access the street by a left turn from a stop-controlled side street. The limited number of access points on this section of County Q indicate that expansion to a three-lane section with center left-turn lane throughout its length is not warranted. Instead, vehicular capacity could be increased by providing dedicated left-turn bays at access points with medians. The median provides refuge for left-turning traffic from the side street so the maneuver can be completed more safely in two stages, requiring a gap in only one direction of traffic at a time. It also provides refuge for bicycles and pedestrians crossing the street. The left-turn bay on County Q allows left-turning traffic on the main road to depart the through traffic lanes.

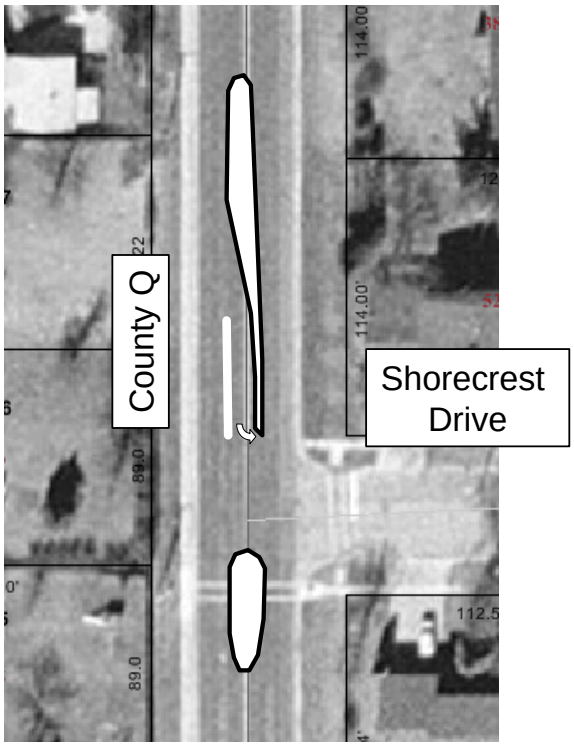

Figure 5.01-5 Dedicated Left-Turn Bay with Median on County Q

Construction of the medians will not require street widening at Rolling Hill Drive, Shorecrest Drive, or South Ridge Way. Figure 5.01-5 shows a schematic of the street modifications at one of these access points. Additional modification would be needed south of South Ridge Way to accommodate the access to PDQ. Although the forecasted traffic volumes are above the typical capacity of a two-lane street, this option could extend the useful life of the corridor while producing minimal impacts on adjacent properties.

3) Undivided Four-Lane Street

Expansion of County Q to an undivided four-lane street may not require right-of-way acquisition, depending on the cross section used. Impacts of the expansion in this area would be low and probably would not require any relocations.

Even with this capacity expansion, left turns onto County Q and crossing maneuvers at stop controlled intersections would still be difficult. At some point,

additional signalized or roundabout-controlled intersections would be needed. Traffic signals on four-lane undivided streets do not tend to operate well unless the mainline cross section is expanded at the intersection because of the need for shared-lane groups (through/left and through/right).

Approximately 515 feet north of Rolling Hill Drive, the right-of-way width increases from 80 feet to 120 feet and the corridor is currently more rural in nature. An undivided street would not be recommended in this section since expansion to a divided cross section would not be as cost prohibitive as it generally is within a more urbanized area.

4) Divided Four-Lane Street

Expansion of County Q to provide a median would be an effective way to increase vehicular capacity. As mentioned previously, a median provides refuge for left-turning traffic so the maneuver can be completed more safely in two stages, requiring a gap in only one direction of traffic at a time. It also allows left-turning traffic on the main road to depart the through traffic lanes and provides refuge for bicycles and pedestrians crossing the street. Reducing the number of access points (driveways and side streets) would also increase through motor vehicle capacity and improve safety. Appendix C contains a schematic drawing of this typical section.

Property impacts of the expansion would be higher between Century Avenue and a point approximately 515 feet north of Rolling Hill Drive than they would be farther to the north. The right-of-way width through the southerly area is between 72 and 80 feet. Depending on the cross section used, impacts of street expansion in this area may include some commercial relocations and would likely require residential relocations. North of Rolling Hill Drive the right-of-way width increases to 120 feet and the corridor is currently more rural in nature. A divided street would be recommended here since the property impacts of street expansion would not be as cost prohibitive.

The reduction in traffic congestion provided by a four-lane divided County Q will depend on whether or not Century Avenue and/or County M also undergo vehicular capacity expansion. If these streets remain at their current cross sections, they will reach an equilibrium point of congestion that will limit the vehicles they carry, and County Q will likely function well as a divided four-lane highway for a longer period of time (because of a “choking” effect from the streets feeding it). If these streets are expanded, particularly Century Avenue, vehicular volumes will likely approach the capacity of a divided four-lane County Q much more quickly.

f. Priority 6: Pleasant View Road from Old Sauk Road to US 14[1]

1) Routine Maintenance and Safety Improvements

Pleasant View Road would remain a two-lane street. Existing traffic leaving the business park and commercial land uses east of Pleasant View Road creates large queues on side streets and large platoons of mainline traffic. As development continues in Verona and on the southwest side of Madison, traffic congestion will continue to rise on Pleasant View Road. Although the traffic forecasts did not show a large increase in volumes on this street, this may be due to the demand model architecture and it is reasonable to expect that traffic will continue to grow on this increasingly important arterial.

As congestion grows, some drivers that have the option will likely elect to use a different route. North-south streets west of Pleasant View Road in the Town of Middleton are most likely to receive this diverted traffic. The few alternative routes east of Pleasant View Road already experience congestion.

If capacity expansion is not planned, congestion will result and roundabout or traffic signal control will be needed at Greenway Boulevard.

2) Divided Four-Lane Street

Planning for expansion of Pleasant View Road to a divided four-lane street has already begun. The wider right-of-way needs have been incorporated into new development along the corridor for a number of years. The divided street would be an effective way to increase vehicular capacity.

Property impacts of the expansion would be relatively low because of the planning that has already taken place. Few if any relocations would be required. Concerns may arise with the proximity of the church and cemetery at the Pleasant View Road/Old Sauk Road intersection, and with the small cemetery located farther to the north on the east side of Pleasant View Road at the original church site.

g. Priority 7: Additional Corridor Connections

1) No improvement to Arterial and Collector Connections

The general configuration of Middleton streets would remain as it exists today. Traffic forecasts indicate significant traffic growth on some streets intended to be low-volume local facilities.

[1] Note that as of 2005, the City of Middleton has jurisdiction over the full width of Pleasant View Road adjacent to Pleasant View Golf Course, and over the east half of Pleasant View Road north of the golf course. South of the golf course, Pleasant View Road is outside of Middleton's jurisdiction.

2) Improvement to Arterial and Collector Connections

Improving connections on arterial and collector streets to make travel more direct will relieve pressure on local streets. Opportunities to do so on east-west routes in Middleton are limited. On the north side of the City, Pheasant Branch Creek and surrounding natural areas and Bishop's Bay Golf Course present a barrier to a new connection, though the City is beginning a study of a new collector street along an extension of Schneider Road. Pheasant Branch Creek and Middleton High School make development of a new east-west corridor positioned between Century Avenue and University Avenue unrealistic. Finally, the circuitous, indirect layout of the streets in the neighborhoods on the south side of Middleton, east of the Beltline, provide little opportunity for improvement to east-west options. US 12 also provides a barrier to east-west movement throughout Middleton.

There are some limited opportunities for improvements to connections on north-south routes. US 12 serves as a regional route through the City. Roads that are adjacent and parallel to US 12 serve to provide access to local services and residences. Both of these parallel streets, Deming Way on the west and North High Point Road on the east, are relatively indirect. Moving farther from the highway, Pleasant View Road and Park Street/High Road are north-south arterials that will continue to see increased travel demand. The Gammon Road–Park Street–High Road corridor will become more critical as development continues on the north side of Middleton, the southwest side of Madison, and even in Verona and Waunakee. Following are two opportunities to improve connectivity on these routes:

- Pleasant View Road–Reconfigure the tee intersection at University Green to provide a low-speed curved alignment on Pleasant View Road and eliminate the stop sign control for southbound Pleasant View Road traffic. As discussed under Priority 7, Pleasant View Road is an increasingly important north-south street.

- Park Street–Provide the missing link of Park Street adjacent to Parisi Park. This will direct major north-south traffic through the signalized intersection of University Avenue and Park Street instead of the unsignalized intersection of University Avenue and Park Lawn Place.

One additional connection to consider would be the extension of Stonefield Road to Allen Boulevard via St. Dunstan's Drive. While this connection could relieve the Gammon Road–Park Street–University Avenue corridors, it is not included as a bullet point due to the impact it could have at the intersection of University Avenue and Allen Boulevard. This intersection, whether under signal or roundabout control, would need to be very large to accommodate a fourth leg with any significant traffic volume.

2. Intersection Expansion Options

a. Priority 1: Century Avenue and Allen Boulevard

1) Routine Maintenance and Safety Improvements

On one end of the spectrum of traditional capacity expansion is a no-build alternative. Only routine maintenance and minor safety improvements would be made. Traffic operations are currently failing for some movements during the PM peak hour. Choosing to forego capacity expansion will result in increasing delays and queue lengths for all movements. Eventually, people will begin altering their travel choices to avoid the intersection during the heaviest traffic periods.

The capacity of intersections is usually the controlling factor in determining the capacity of a street or road. Leaving major intersections such as Century Avenue and Allen Boulevard at existing capacity will limit the volume of traffic downstream of them. Periods of high congestion will grow in duration, and political pressure to expand the intersection will increase. Efforts to enhance alternative mobility options described in Section 6 could reduce this pressure.

Crash analysis of this intersection for the years 2000-2005 did not indicate a significant need for safety improvements. Crash trends should continue be analyzed periodically as traffic patterns, driver behavior, and the physical environment within and adjacent to the intersection are continually changing.

2) Signalized Intersection Capacity Expansion

The existing geometry of the Century Avenue and Allen Boulevard intersection requires the traffic signal to be split phased. Because of the shared through/left-turn lanes and the relatively small intersection footprint, opposing eastbound and westbound left turns are not able to operate simultaneously. To effectively add capacity, the intersection needs to be expanded to allow conventional signal phasing, ideally for both the east-west and north-south movements.

At a minimum, the expansion should add a second westbound exclusive left-turn bay and redesignate the existing westbound shared through/left lane to an exclusive westbound through lane. The expansion should also add an eastbound exclusive left-turn bay and redesignate the eastbound shared through/left-turn lane to an exclusive eastbound through lane. Additionally, the overall intersection footprint should be increased so vehicle paths for eastbound and westbound left turns do not conflict.

To maximize signal capacity, it is recommended that the northbound and southbound through movements be eliminated. This may require alternative access to land uses on the north side of Century Avenue, or even the relocation

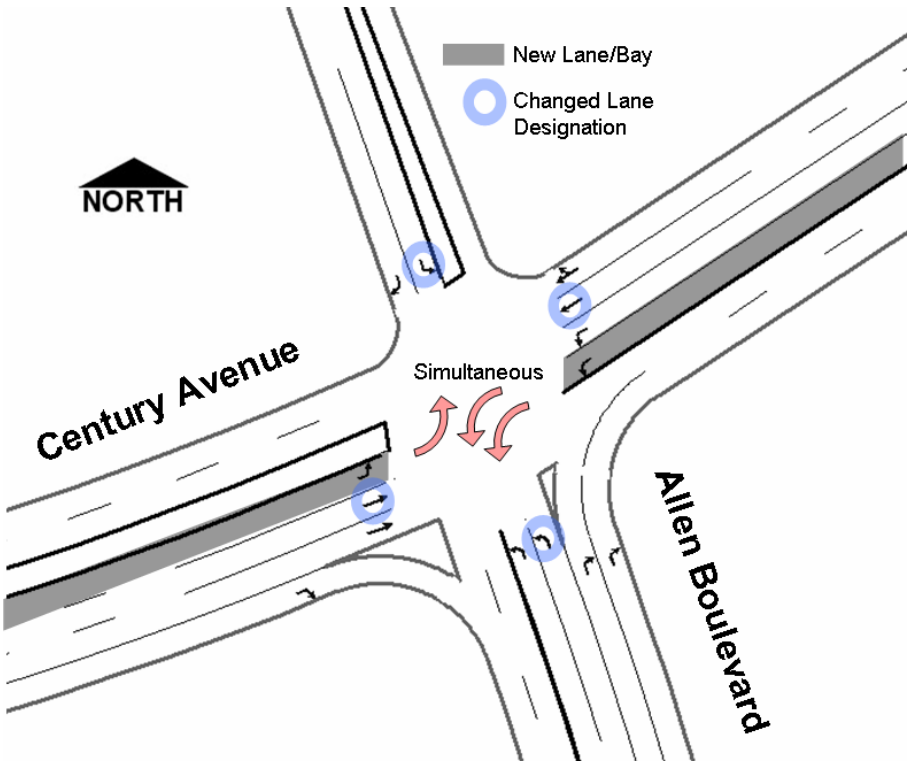

Figure 5.01-6 Signal Expansion at Century Avenue and Allen Boulevard

of these properties. Figure 5.01-6 schematically shows the capacity expansion that removes all shared lane designations.

Operations modeling indicates that the intersection configuration shown in Figure 5.01-6 would operate at LOS D overall with each individual movement at LOS D or better when accommodating the forecasted PM peak-hour traffic volumes. Significant queuing (500 to 1000 feet, similar to existing conditions) would still be likely during peak periods. If Century Avenue east of this intersection is expanded to a six-lane street, this intersection may need additional capacity to handle the resulting vehicular volumes.

Traffic signal capacity expansion nearly always improves motor vehicle operations at the cost of making pedestrian and bicycle travel less comfortable and less safe. The addition of bike lanes to Century Avenue could improve bicycle safety. Consideration of a parallel dedicated multiuse trail could also improve pedestrian and bicycle comfort. If future pedestrian and bicycle volumes warrant, a grade separated crossing could also be considered.

3) Conversion to a Modern Roundabout

A modern roundabout intersection at Century Avenue and Allen Boulevard could also accommodate the forecasted future traffic volumes. Both of the Century Avenue approaches would need to provide three-lane entries. Public acceptance of a roundabout with three-lane entries may be difficult to achieve until roundabouts with two-lane entries are more commonplace and familiar to road users. The three-lane entries could be flared from two lanes upstream of the roundabout. The Allen Boulevard and Allen Court approaches would be two-lane entries. Each of the four exits would be two-lane. A right-turn bypass lane would be needed for northbound traffic. Figure 5.01-7 shows a schematic of the roundabout.

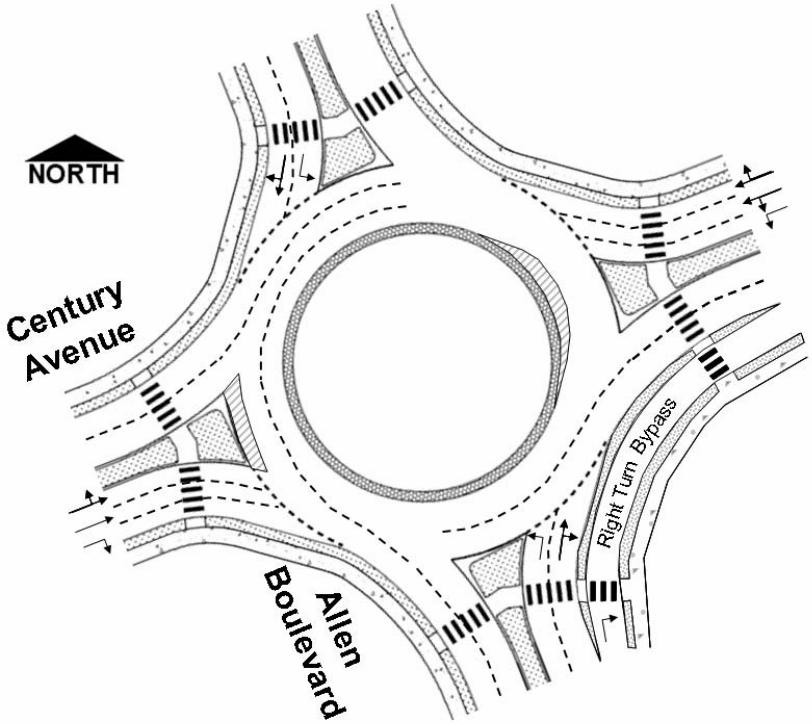

Figure 5.01-7 Modern Roundabout at Century Avenue and Allen Boulevard

Operations modeling using RODEL software indicates the roundabout would operate at LOS C overall with the forecasted PM peak-hour traffic volumes. Delays and queuing for eastbound vehicles are high because of the large volume of westbound left-turning traffic. The overall operations can be improved if a right-turn bypass lane is added for eastbound traffic. However, bypass lanes are typically recommended only where they are absolutely necessary. Since the roundabout would be expected to operate acceptably without the bypass, it is not recommended and is not shown in Figure 5.01-7. If Century Avenue east

of this intersection is expanded to a six-lane street, this roundabout may need additional capacity resulting in a relatively complex layout.

Typically, corridors should maintain a consistent type of intersection control. Traffic signals are most efficient when they are part of a coordinated signal system. A roundabout will meter traffic flow and disrupt the platooning that coordinated signal systems are based on. Additionally, roundabouts operate best when arrivals are somewhat random on all approaches. Large vehicle platoons arriving from an upstream signal can cause fluctuations in roundabout operations that are difficult to predict. In this particular instance, the intersection spacing on Century Avenue and Allen Boulevard is sufficient to allow an isolated roundabout to be constructed at this intersection without the corresponding need to convert adjacent intersections on each corridor to roundabouts.

Although roundabouts are typically perceived as less safe for pedestrians than signals, studies show that the opposite is true. They can, however, be more difficult to negotiate for mobility-impaired pedestrians.

b. Priority 2: University Avenue and Parmenter Street

1) Routine Maintenance and Safety Improvements

For the no-build alternative, only routine maintenance and minor safety improvements would be made. Existing traffic operations are within acceptable thresholds, but the City is beginning to receive complaints about westbound left turns, especially during the PM peak hour. Additionally, crash analysis for the years 2000-2005 suggests that safety is a concern at this location. Traffic forecasts indicate a sharp increase in travel demand on University Avenue, and operations modeling of future conditions suggests that the intersection will fail, with westbound movements in particular suffering extreme delays and queuing. Left turns from University Avenue may need to be prohibited during peak periods to improve safety and allow both lanes to accommodate through traffic. Creating a coordinated traffic signal system on University Avenue from Deming Way to Parmenter Street could also benefit vehicular traffic flow, though heavy congestion will still be present during some portions of a typical day. Coordination between Middleton and the Wisconsin Department of Transportation (WisDOT) would be required, since some of these intersections are under WisDOT jurisdiction. If the capacity is not significantly increased, people will begin altering their travel choices to avoid the location during the heaviest traffic periods.

The periods of high congestion will grow in duration, and political pressure to expand the intersection will likely increase. Efforts to enhance alternative mobility options described in Section 6 could reduce this pressure. The readily apparent property impacts associated with intersection expansion at this location may also limit the intensity of public demands to do so.

The intersections on University Avenue/US 14 at Deming Way, the eastbound US 12 Ramps, the westbound US 12 Ramps/Cayuga Street, and at Parmenter Street should be considered together as improvements are planned. Changes to any of these intersections will affect the others. It should be noted that WisDOT has jurisdiction over the US 14/Deming Way and US 14/University Avenue/US 12/Cayuga Street intersections.

2) Signalized Intersection Capacity Expansion

The existing geometry of the University Avenue and Parmenter Street intersection limits the eastbound and westbound through vehicle capacity. The shared through/left-turn lanes operate as defacto exclusive left-turn lanes during periods of heavy traffic because drivers of left turning vehicles block through movements while waiting to identify an acceptable gap in which to complete their turn. To effectively add capacity, the intersection needs to be expanded to allow exclusive lanes. This expansion should also reduce crash rates.

Forecasted PM peak-hour traffic volumes suggest the need for dual exclusive westbound left-turn lanes. This also requires two lanes departing the intersection southbound. An exclusive eastbound left-turn lane is recommended. Dual southbound right-turn lanes and an additional lane departing the intersection westbound are needed to accommodate large volumes traveling southbound on Parmenter Street that are destined for the Beltline. Figure 5.01-8 schematically shows the expanded intersection.

Operations modeling indicates that with the forecasted PM peak-hour volumes, the intersection configuration shown in Figure 5.01-8 would operate at LOS D overall. Some movements would operate at LOS E during peak periods. Significant queuing (500 to 800 feet, more than twice the existing queue lengths) would still be likely for eastbound and westbound traffic during peak periods. If University Avenue east and west of this intersection is expanded to a six-lane street, this intersection may need additional capacity to handle the resulting vehicular demand.

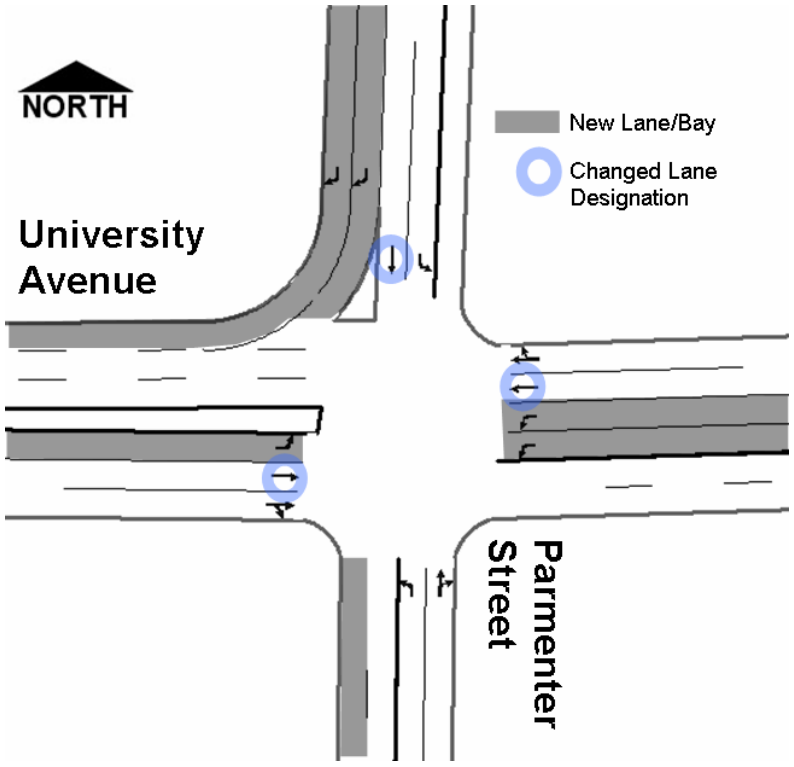

Figure 5.01-8 Signal Expansion at University Avenue and Parmenter Street

Traffic signal capacity expansion nearly always improves motor vehicle operations at the cost of making pedestrian and bicycle travel less comfortable and less safe. Considering the importance of a safe pedestrian crossing on University Avenue to route students to and from Middleton High School, an upgrade at the intersection with Bristol Street (roundabout or traffic signal control) should be considered.

This stretch of University Avenue will experience heavy congestion during peak traffic periods even after capacity expansion, as will all arterials feeding Madison. Capacity gained through intersection expansion will, at some point, be filled.

3) Conversion to a Modern Roundabout

A modern roundabout intersection at University Avenue and Parmenter Street would be able to accommodate the forecasted future traffic volumes. Roundabouts also tend to reduce overall crash rates, and significantly reduce injuries and fatalities compared to signalized intersections. The westbound University Avenue approach would need to provide a three-lane entry. Public acceptance of a roundabout with a three-lane entry may be difficult to achieve until roundabouts with two-lane entries are more commonplace and familiar to road users. The three-lane entry could be flared from a two-lane section upstream. The eastbound University Avenue and northbound Parmenter Street approaches would need to provide two-lane entries. The southbound Parmenter Street approach could be a single lane entry but would require a right-turn bypass lane. The University Avenue exits would be two-lane, while the Parmenter Street exits would be single lane. Figure 5.01-9 shows a schematic of the roundabout.

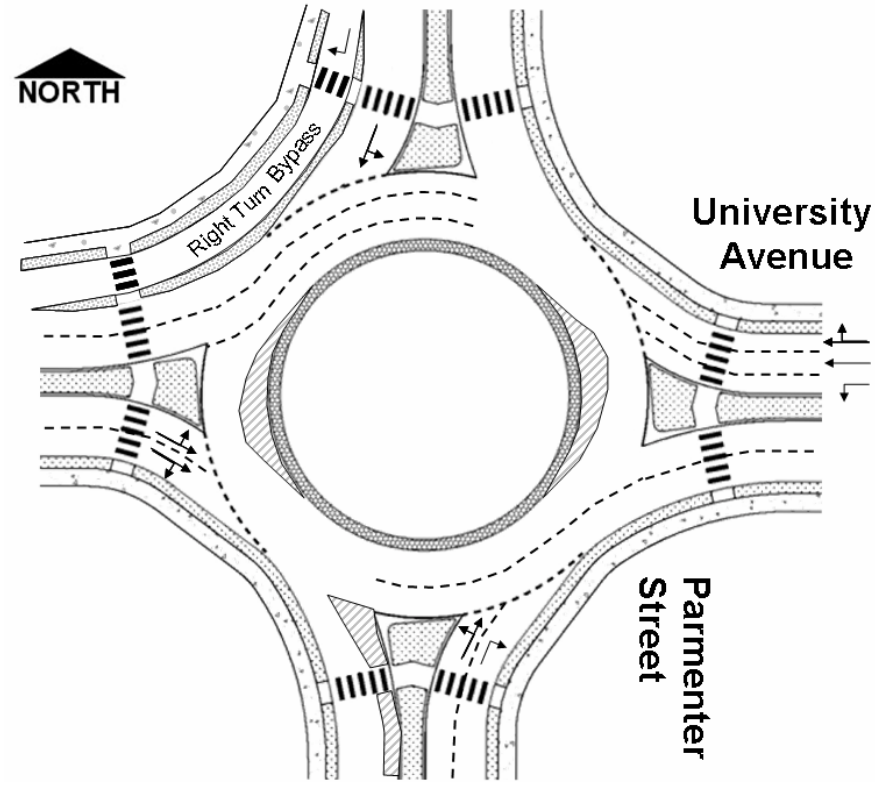

Figure 5.01-9 Modern Roundabout at University Avenue and Parmenter Street

Operations modeling using RODEL software indicates that the roundabout would operate at LOS B overall with the forecasted PM peak-hour traffic volumes. Delays and queuing are heaviest for westbound vehicles, but each are much improved compared to traffic signal control. If University Avenue east and west of this intersection is expanded to a six-lane street, this roundabout may need additional capacity resulting in a relatively complex layout.

As noted previously, corridors should typically maintain a consistent type of intersection control. If implementation of a roundabout at the intersection of University Avenue and Parmenter Street were proposed, it should be accompanied by construction of roundabouts at the Deming Way, eastbound US 12 ramps, and westbound US 12 ramps/Cayuga Street intersections as well. This will require close coordination between Middleton and WisDOT since these other intersections are under WisDOT jurisdiction.

Although roundabouts are typically perceived as less safe for pedestrians than signals; studies show that the opposite is true. They can, however, be more difficult to negotiate for mobility-impaired pedestrians.

c. Priority 3: University Avenue and Park Street

1) Routine Maintenance and Safety Improvements

For the no-build alternative, only routine maintenance and minor safety improvements would be made. There is discussion of recommended interim safety improvements on page 2-10. Existing traffic operations are within acceptable thresholds, although queuing on the south approach can be heavy. Crash analysis indicates that from 2000 to 2005 this intersection sometimes exceeded the crash rate threshold established by WisDOT for consideration of safety improvements. Elimination of the northbound shared through/left turn lane should reduce crashes, although traffic operations will suffer if intersection expansion (on the south approach at a minimum) does not accompany this lane configuration change. Traffic forecasts indicate continued increases in demand on both University Avenue approaches and the northbound Park Street approach. If Park Street is connected to the north adjacent to Parisi Park, southbound demand would be expected to increase. It will also continue to increase as turns from Park Lawn Place onto University Avenue become more difficult.

Operations modeling of the future PM peak-hour volumes suggests that the intersection will fail and that the northbound movements in particular will experience high delays and large queues. Westbound left turns will reach volumes that are typically accommodated with dual left-turn lanes. If the capacity is not significantly increased, people will begin altering their travel choices to avoid the location during the heaviest traffic periods.

The periods of high congestion will grow in duration, and political pressure to expand the intersection will increase. Efforts to enhance alternative mobility options described in Section 6 could reduce this pressure.

2) Signalized Intersection Capacity Expansion

The existing geometry of the University Avenue and Park Street intersection provides a shared northbound through/left-turn lane. This configuration likely contributes to the notable crash rates at this intersection. The City currently receives complaints about confusion for northbound and southbound traffic arising from the position of the lanes relative to one another. The northbound shared through/left-turn lane is positioned where an exclusive left-turn lane would typically be. This forces northbound through traffic to traverse the intersection on a skew. It also does not intuitively convey to southbound left turning vehicles that they must yield to through traffic in this lane. Additionally, shared through/left turn lanes at signalized intersections tend to increase rear-end crashes.

Currently, northbound and southbound through movements are relatively low. This allows the signal to operate without split phasing for north-south traffic. As volumes increase, however, split phasing may become necessary for safety reasons. Split phasing is an inefficient use of green time and will not be able to accommodate forecasted traffic volumes.

To effectively add capacity, the intersection needs to be expanded to provide additional lanes. Forecasted PM peak-hour traffic volumes suggest the need for dual exclusive westbound left-turn lanes. This also requires two lanes departing the intersection southbound. Dual left-turn lanes should also be provided for northbound traffic, along with an exclusive right-turn lane. Dual exclusive eastbound left-turn lanes have also been shown. While forecasted PM peak hour eastbound left-turn volumes are not above the typical threshold for providing dual left-turn lanes, this movement could increase if the Park Street connection adjacent to Parisi Park is completed. Additionally, since there is a need for dual opposing (westbound) left-turn lanes, the addition of a second exclusive eastbound left-turn lane requires minimal additional impact while allowing more efficient signal operation. This configuration requires two lanes departing the intersection northbound. Figure 5.01-10 schematically shows the expanded intersection.

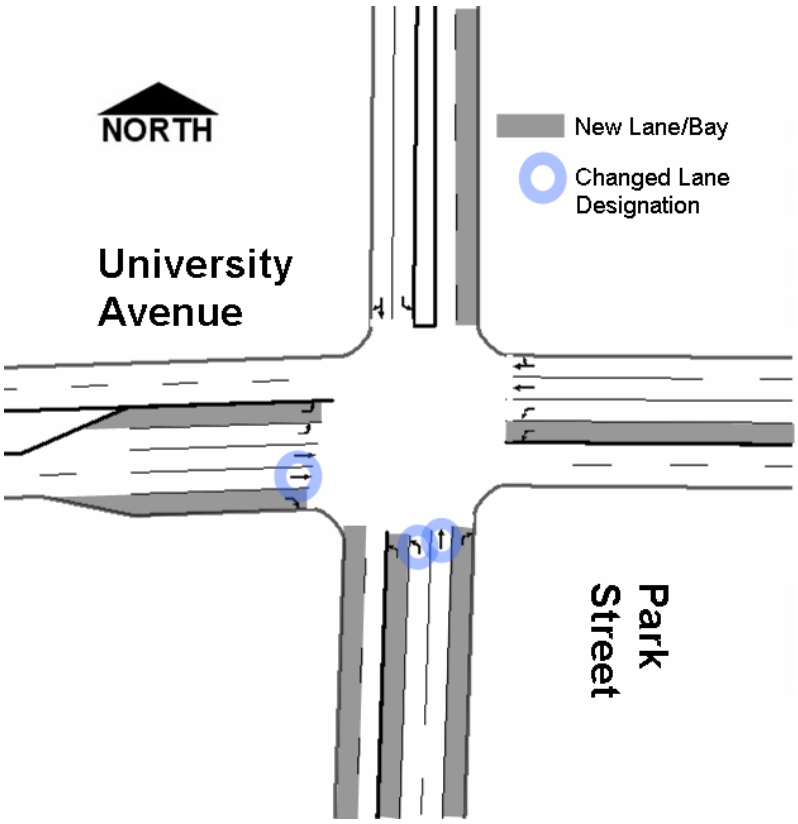

Figure 5.01-10 **Signal Expansion at University Avenue and Park Street**

Operations modeling indicates that with the forecasted PM peak-hour volumes, the intersection configuration shown in Figure 5.01-10 would operate at LOS D overall. Some movements, however, would likely operate at LOS E during peak periods, and a few may operate at LOS F. Queuing of 300 to 700 feet (compared to about 300 to 400 feet today) would be anticipated during peak periods. If University Avenue east and west of this location is expanded to a six-lane street, this intersection may need additional capacity to handle the resulting vehicular volumes.

Traffic signal capacity expansion nearly always improves motor vehicle operations at the cost of making pedestrian and bicycle travel less comfortable and less safe. Considering the importance of a safe pedestrian crossing on University Avenue to route students to and from Middleton High School and other destinations, an upgrade at the intersection with Bristol Street (roundabout or traffic signal) should be considered.

This stretch of University Avenue will experience heavy congestion during peak traffic periods even after capacity expansion, as will all arterials feeding Madison. Capacity gained through intersection expansion will, at some point, be filled.

3) Conversion to a Modern Roundabout

A modern roundabout intersection at University Avenue and Park Street would be able to accommodate the forecasted future traffic volumes. Roundabouts also tend to reduce overall crash rates, and significantly reduce injuries and fatalities compared to signalized intersections. The eastbound and westbound University Avenue approaches would need to provide three-lane entries. Public acceptance of a roundabout with three-lane entries may be difficult to achieve until roundabouts with two-lane entries are more commonplace and familiar to road users. The northbound and southbound Park Street approaches could be two-lane entries. No right-turn bypass lanes would be needed. Each of the four exits would be two-lane. Figure 5.01-11 shows a schematic of the roundabout.

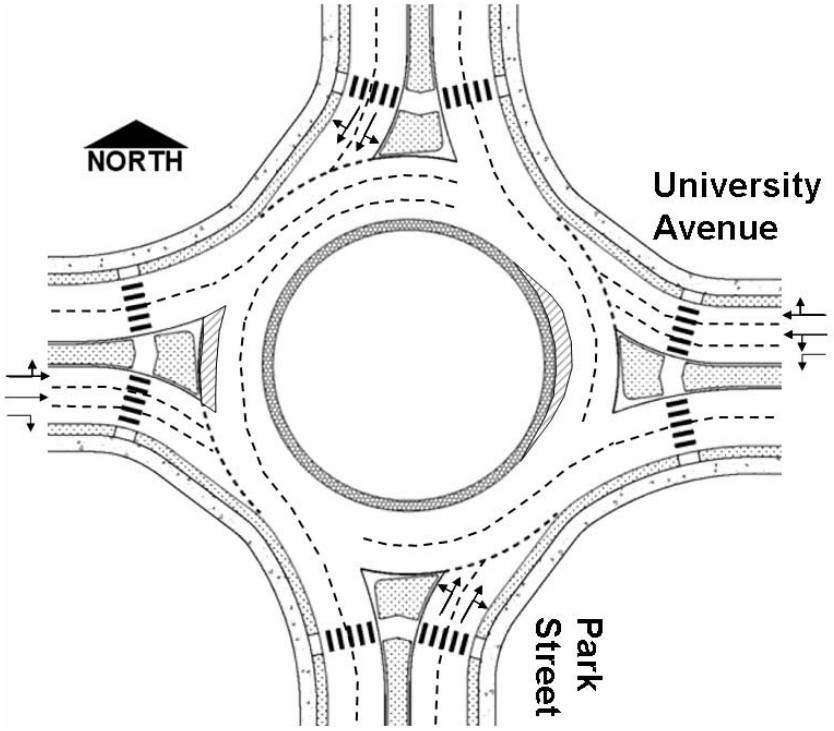

Figure 5.01-11 Modern Roundabout at University Avenue and Park Street

Operations modeling using RODEL software indicates that the roundabout would operate at LOS B overall with the forecasted PM peak-hour traffic volumes. Delays and queuing are minimal for all approaches compared with those anticipated under traffic signal control. If University Avenue east and west of this intersection is expanded to a six-lane street and/or Park Street north and south is expanded to a four-lane street, this roundabout may need additional capacity resulting in a relatively complex layout.

As noted previously, corridors should typically maintain a consistent type of intersection control. In this case, the spacing of major intersections on both University Avenue and Park Street would allow an isolated roundabout to be constructed at this intersection without the corresponding need to convert adjacent intersections on each corridor to roundabouts. If stop-controlled intersections adjacent to the University Avenue and Park Street intersection were upgraded, they should use the same type of control (whether traffic signals or roundabouts).

Although roundabouts are typically perceived as less safe for pedestrians than signals; studies show that the opposite is true. They can, however, be more difficult to negotiate for mobility-impaired pedestrians.

d. Priority 4: University Avenue and Allen Boulevard

1) Routine Maintenance and Safety Improvements

For the no-build alternative, only routine maintenance and minor safety improvements would be made. Existing traffic operations are within acceptable thresholds. Traffic forecasts indicate continued increases in demand on all of the intersection approaches. Operations modeling of the future PM peak-hour volumes suggests that the intersection will operate at LOS E overall, and turning movements on University Avenue will fail. If the capacity is not increased, people will begin altering their travel routes to avoid the location during the heaviest traffic periods.

The periods of high congestion will grow in duration and political pressure to expand the intersection will increase. Efforts to enhance alternative mobility options described in Section 6 could reduce this pressure.

Crash analysis of this intersection for the years 2000-2005 did not indicate a significant need for safety improvements. Crash trends should continue be analyzed periodically as traffic patterns, driver behavior, and the physical environment within and adjacent to the intersection are continually changing.

2) Signalized Intersection Capacity Expansion

Increases in both eastbound left turns and opposing westbound traffic will require dual exclusive eastbound left-turn lanes. Forecasted westbound right-turn volumes suggest the need for a free-flow right turn. This will require the addition of a departing northbound travel lane to allow westbound right turns to operate simultaneously with eastbound left turns. Figure 5.01-12 schematically shows the expanded intersection. Note that this intersection is currently controlled by the City of Madison.

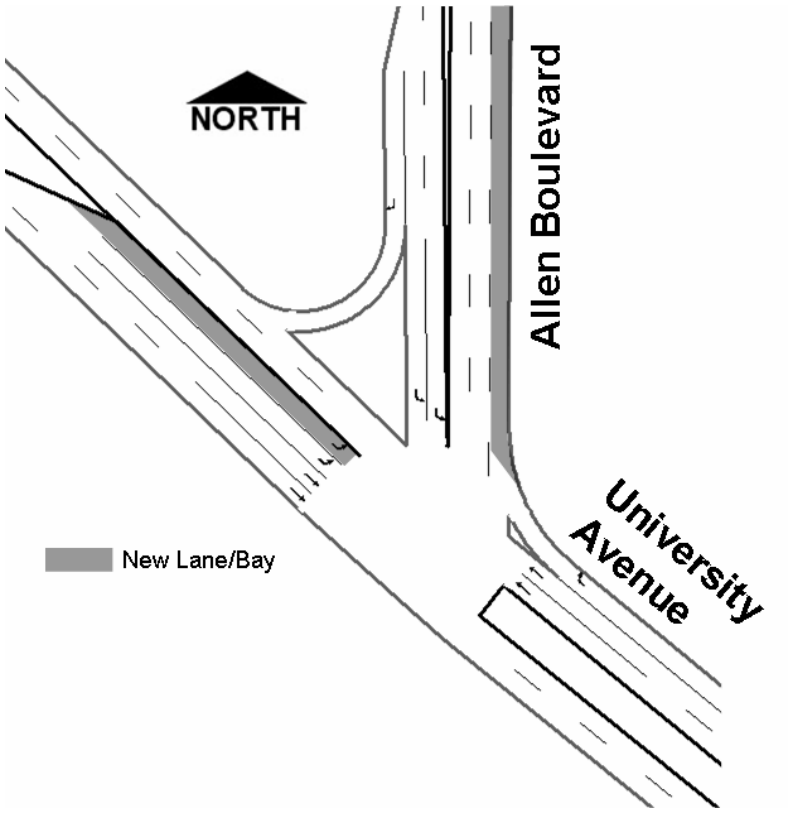

Figure 5.01-12 Signal Expansion at University Avenue and Allen Boulevard

Operations modeling indicates that with the forecasted PM peak-hour volumes, the intersection configuration shown in Figure 5.01-12 would operate at LOS C overall. Each movement would operate at LOS D or better during peak periods. Westbound right turns will be steady, and pedestrian or bicycle crossings of this movement will require that vehicular traffic stop, resulting in a shockwave effect on westbound University Avenue. Aside from the rolling queue effect resulting from interruptions in westbound right-turning traffic, queues should be reasonable and generally less than 300 feet for all movements. If University Avenue east and west of this location is expanded to a six-lane street, this intersection may need additional capacity to handle the resulting vehicular volumes.

The extension of Stonefield Drive to this intersection via St. Dunstan's Drive would negatively impact traffic operations. Even with minor volumes on the south approach, the need to accommodate the northbound movements with additional signal phases would likely result in LOS F operations for the southbound left turn movements. Overall intersection operations could fall to LOS E, or even LOS F if significant traffic were to use the Stonefield Road connection.

Traffic signal capacity expansion nearly always improves motor vehicle operations at the cost of making pedestrian and bicycle travel less comfortable and less safe. This stretch of University Avenue will experience heavy congestion during peak traffic periods even after capacity expansion, as will all arterials feeding Madison. Capacity gained through intersection expansion will, at some point, be filled.

3) Conversion to a Modern Roundabout

A modern roundabout intersection at University Avenue and Allen Boulevard would be able to accommodate the forecasted future traffic volumes. Each of the three approaches would need a two-lane entry. Right-turn bypass lanes would be needed for westbound University Avenue and southbound Allen Boulevard traffic. The eastbound and westbound University Avenue exits would be two-lane and the northbound Allen Boulevard exit would be a single lane. Figure 5.01-13 shows a schematic of the roundabout.

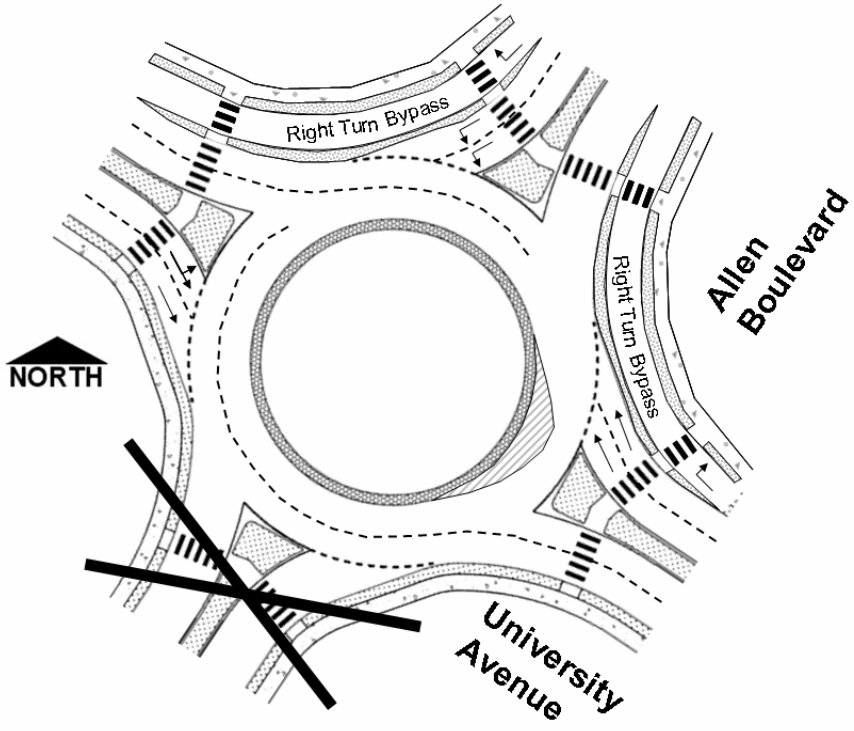

Figure 5.01-13 Modern Roundabout at University Avenue and Allen Boulevard

Operations modeling using RODEL software indicates that the roundabout would operate at LOS A overall with the forecasted PM peak-hour traffic volumes. Average delays are under 15 seconds and queues are three vehicles or less for all three approaches. If University Avenue east of this intersection is expanded to a six-lane street, this roundabout may need additional capacity.

The extension of Stonefield Drive to this intersection via St. Dunstan's Drive would impact the roundabout design needed to accommodate future traffic volumes. Roundabout design and operation is heavily dependant on the turning patterns at the subject intersection. If northbound volumes were relatively low, it is likely that a two-lane entry could be added and the roundabout would operate acceptably. Additional investigation would be needed to forecast traffic volumes that would travel on an extended Stonefield Road corridor.

As mentioned previously, corridors should typically maintain a consistent type of intersection control. In this case, the intersection spacing on both University Avenue and Allen Boulevard would allow an isolated roundabout to be constructed at this intersection without the corresponding need to convert adjacent intersections on each corridor to roundabouts. Modern roundabouts are designed to provide approach angles very near 90 degrees. The skew of the existing intersection would make conversion to a roundabout difficult and would require significant realignment of at least one of the approaches. If stop-controlled intersections adjacent to the University Avenue and Allen Boulevard intersection were upgraded, they should use the same type of control (whether traffic signals or roundabouts).

Although roundabouts are typically perceived as less safe for pedestrians than signals; studies show that the opposite is true. They can, however, be more difficult to negotiate for mobility-impaired pedestrians.

e. Priority 5: Century Avenue and County Q/Hedden Road

1) Routine Maintenance and Safety Improvements

For the no-build alternative, only routine maintenance and minor safety improvements would be made. Existing traffic operations are generally within acceptable thresholds, although some movements operate at LOS E during the heaviest traffic. Forecasts and planned land use suggest that demand will continue to rise on Century Avenue, County Q, and County M. Operations modeling of the future PM peak-hour volumes suggests that the intersection will operate at LOS F overall, and westbound movements will fail. If the capacity is not increased, people will begin altering their travel choices to avoid the location during the heaviest traffic periods.

The periods of high congestion will grow in duration, and political pressure to expand the intersection will rise. Efforts to enhance alternative mobility options described in Section 6 could reduce this pressure.

Crash analysis of this intersection for the years 2000-2005 did not indicate a significant need for safety improvements. Crash trends should continue be analyzed periodically as traffic patterns, driver behavior, and the physical environment within and adjacent to the intersection are continually changing.

2) Signalized Intersection Capacity Expansion

Adding an additional exclusive eastbound left-turn lane and increasing the storage for this movement will increase capacity at the intersection. This will require the addition of another departing northbound travel lane. Additionally, considering the high volume of southbound left-turning traffic during the morning peak-hour that exists today, and the forecasted future afternoon eastbound left turning traffic, a free-flow southbound right-turn lane is expected to be needed as well. This will require an additional travel lane on Century Avenue departing the intersection westbound. Figure 5.01-14 schematically shows the expanded intersection.

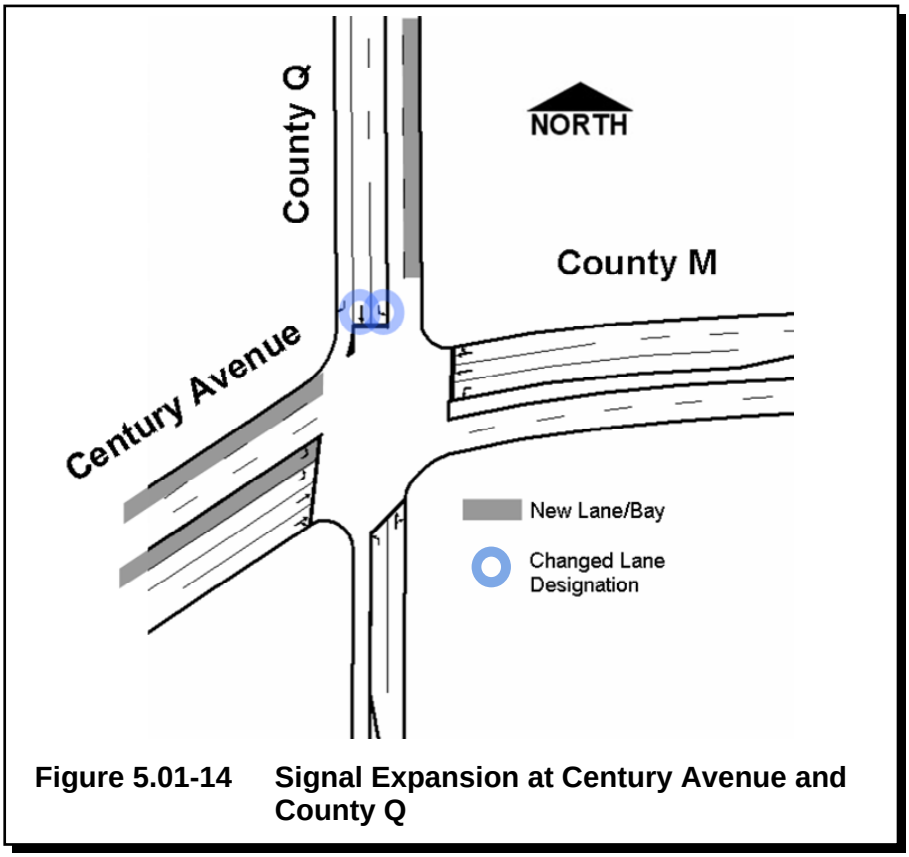

Figure 5.01-14 Signal Expansion at Century Avenue and County Q

Operations modeling indicates that with the forecasted PM peak-hour volumes, the intersection configuration shown in Figure 5.01-14 would operate at LOS D overall. Each movement would operate at LOS D or better during peak periods. Queuing should be generally less than 300 feet for all movements except westbound through, which has projected queues over 400 feet during the future PM peak hour. These queues are less than the existing condition, except for the westbound through which currently has queue lengths of under 400 feet. If Century Avenue west of this location or County Q to the north is expanded to a higher capacity street, this intersection may need additional capacity to handle the resulting vehicular volumes.

Traffic signal capacity expansion nearly always improves motor vehicle operations at the cost of making pedestrian and bicycle travel less comfortable and less safe.

3) Conversion to a Modern Roundabout

A modern roundabout intersection at Century Avenue and County Q able to accommodate the forecasted future traffic volumes was investigated. Even with three-lane entries for both eastbound and westbound traffic, modeling indicated that the roundabout would fail. Eastbound traffic is too heavy to be served by a three-lane entry. It is highly unlikely that political acceptance of a four-lane entry is feasible in the near future. This could change, however, depending on the rate at which roundabouts are constructed in the area, their relative complexity, and to what degree they are publicly accepted.

f. Priority 6: US 14/University Avenue and US 12 Ramps

1) Routine Maintenance and Safety Improvements

For the no-build alternative, only routine maintenance and minor safety improvements would be made. Note that these intersections are under WisDOT jurisdiction. Existing traffic operations are well within acceptable thresholds. Traffic forecasts indicate continued increases in demand on US 14/University Avenue and on US 12. Operations modeling of the future PM peak-hour volumes suggests that both intersections will operate at LOS D overall, with multiple movements experiencing LOS F conditions. Modeling indicates a general lack of capacity on University Avenue in this area with queues building throughout the analysis period. If the street and intersection capacity is not increased, people will begin altering their travel choices to avoid the location during the heaviest traffic periods.

The periods of high congestion will grow in duration, and political pressure to expand the intersection will increase. Efforts to enhance alternative mobility options described in Section 6 of this report could reduce this pressure.

The intersections on University Avenue/US 14 at Deming Way, the eastbound US 12 Ramps, the westbound US 12 Ramps/Cayuga Street, and at Parmenter Street should be considered together as improvements are planned. Changes to any of these intersections will affect the others. This will require close coordination between Middleton and WisDOT since the intersections are under varying jurisdictions.

2) Signalized Intersection Capacity Expansion

Traffic forecasts indicate the westbound US 14/University Avenue to eastbound US 12 will be a very heavy movement. A third travel lane will be needed to accommodate the total westbound demand. Ideally, a third travel lane would be provided eastbound on US 14 as well to accommodate AM peak-hour traffic. Dual left-turn lanes would be needed for both northbound Cayuga Street traffic and westbound US 12 exiting traffic. A dual right turn would be needed for westbound vehicles at the westbound US 12 ramp terminal. For the proposed expansion, the southbound through movement from the westbound US 12 ramp terminal/Cayuga Street intersection was eliminated. This is currently a minor movement and would reduce the overall cross section needed on this approach. Figure 5.01-15 schematically shows the expanded intersection.

Operations modeling indicates that with the forecasted PM peak-hour volumes, the eastbound US 12 configuration shown in Figure 5.01-15 would operate at LOS C and the westbound US 12 intersection as shown would operate at LOS D. Some movements, however, would still operate at LOS F. The total vehicular demand is near capacity even for the large intersections proposed. Queue lengths will fluctuate and may occasionally reach upstream intersections. A coordinated signal system from Deming Way to Parmenter Street will help reduce queuing, but overall, this stretch of US 14/University Avenue will remain congested during the heaviest traffic periods even after capacity expansion of the intersections.

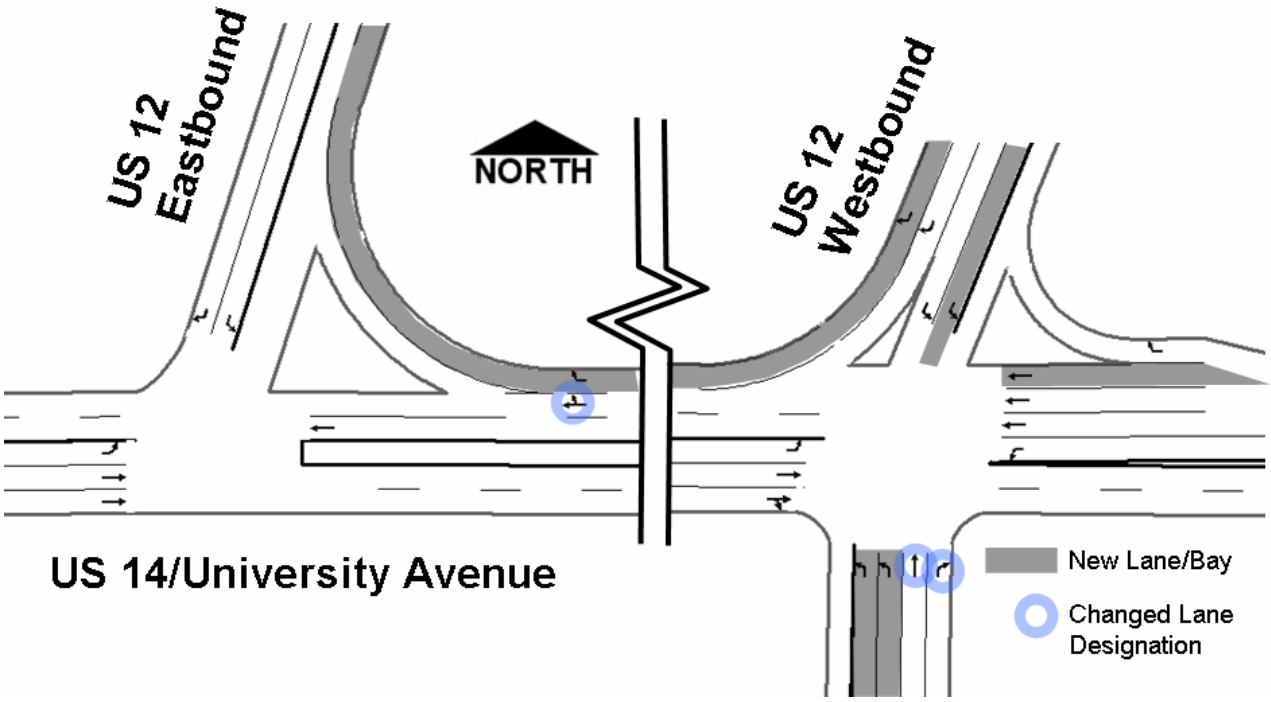

Figure 5.01-15 Signal Expansion at University Avenue and US 12 Interchange

Traffic signal capacity expansion nearly always improves motor vehicle operations at the cost of making pedestrian and bicycle travel less comfortable and less safe. This stretch of University Avenue will experience heavy congestion during peak traffic periods even after capacity expansion, as will all arterials feeding Madison. Capacity added through intersection expansion will ultimately be filled.

3) Conversion to a Modern Roundabout

Modern roundabout intersections at US 14/University Avenue and US 12 are able to accommodate the forecasted future traffic volumes.

At the eastbound US 12 intersection, each of the three approaches would need a two-lane entry. A right-turn bypass lane would be needed for westbound University Avenue traffic. The eastbound University Avenue and westbound US 14 exits would be two-lane and the eastbound US 12 on-ramp exit would be a single lane.

At the westbound US 12/Cayuga Street intersection, the westbound University Avenue entry would need to be three-lane. Public acceptance of a roundabout with a three-lane entry may be difficult to achieve until roundabouts with two-lane entries are more commonplace and familiar to road users. The remaining three entries would be two-lane. Right-turn bypass lanes would be needed for westbound and southbound traffic. The exits to Cayuga Street and the westbound US 12 on-ramp would be single lane, and the remaining two exits would be two-lane. Figure 5.01-16 shows a schematic of these roundabouts.

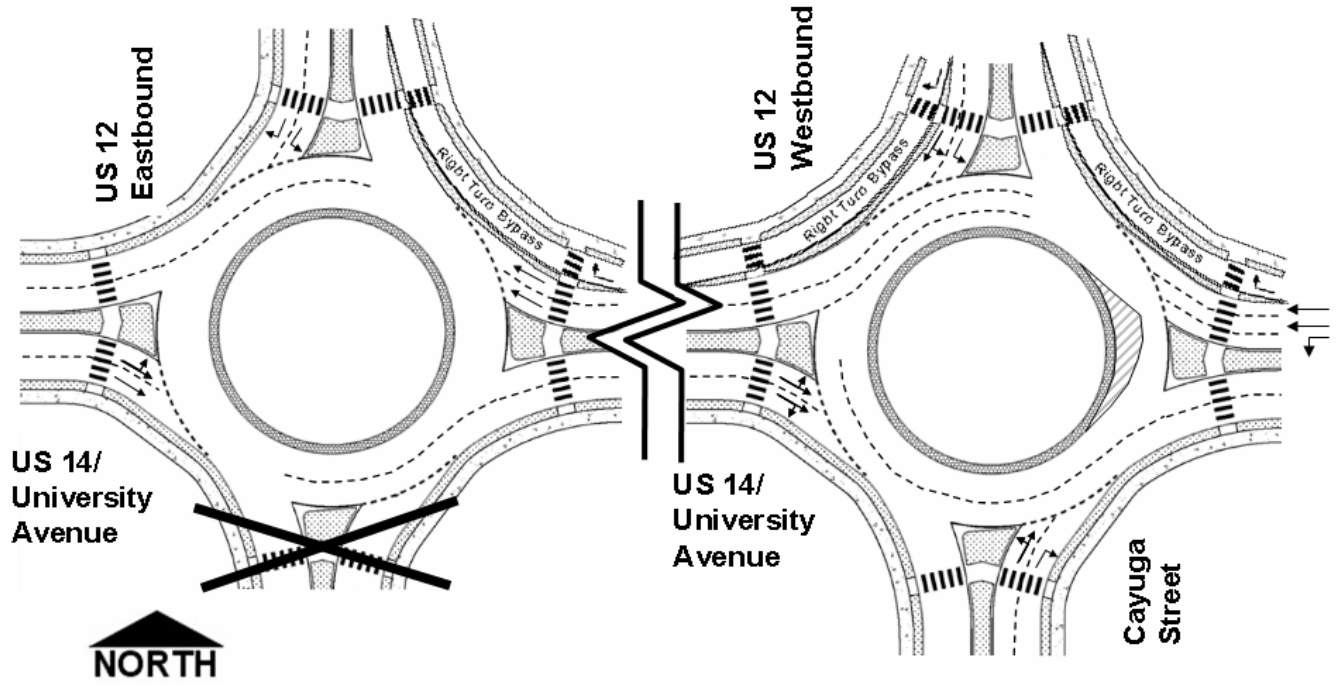

Figure 5.01-16 Modern Roundabouts at US 14/University Avenue and US 12 Ramps

Operations modeling using RODEL software indicates that both roundabouts would operate at LOS A overall with the forecasted PM peak-hour traffic volumes. Average delays are under 20 seconds and queues are from two to seven vehicles on every approach of both intersections. If US 14 west of this intersection and University Avenue east of this intersection are expanded to a six-lane street, these roundabouts may need additional capacity. In this case, the US 12 westbound ramps/Cayuga Street roundabout layout could become relatively complex.

As previously mentioned, corridors should typically maintain a consistent type of intersection control. If implementation of roundabouts at the US 14/University Avenue and US 12 interchange intersections were proposed, it should be accompanied by construction of roundabouts at the Deming Way and Parmenter Street intersections as well. This would require close coordination between Middleton and WisDOT.

Although roundabouts are typically perceived as less safe for pedestrians than signals; studies show that the opposite is true. They can, however, be more difficult to negotiate for mobility-impaired pedestrians.

g. Priority 7: US 14 and Pleasant View Road

1) Routine Maintenance and Safety Improvements

For the no-build alternative, only routine maintenance and minor safety improvements would be made. Note that this intersection is currently under WisDOT jurisdiction. Existing traffic operations are within acceptable thresholds. Traffic forecasts indicate continued increases in demand, particularly on US 14. Operations modeling of the future PM peak-hour volumes suggests that the intersection will operate at LOS E overall, with some movements experiencing LOS F conditions. Northbound Pleasant View Road experiences the poorest operations of the four approaches. If the capacity is not increased, people will begin altering their travel choices to avoid the location during the heaviest traffic periods.

The periods of high congestion will grow in duration and political pressure to expand the intersection will increase. Efforts to enhance alternative mobility options described in Section 6 could reduce this pressure.

2) Signalized Intersection Capacity Expansion

As Pleasant View Road's importance as a north-south route continues to grow, the intersection of US 14 and Pleasant View Road will need to be reconstructed. Heavy volume on US 14 will require that green time given to Pleasant View Road be minimized. Improvements should provide dual exclusive left-turn lanes, dual

through lanes, and an exclusive right-turn lane for northbound and southbound movements. This assumes that Pleasant View Road has been upgraded to a four-lane facility. Figure 5.01-17 schematically shows the expanded intersection.

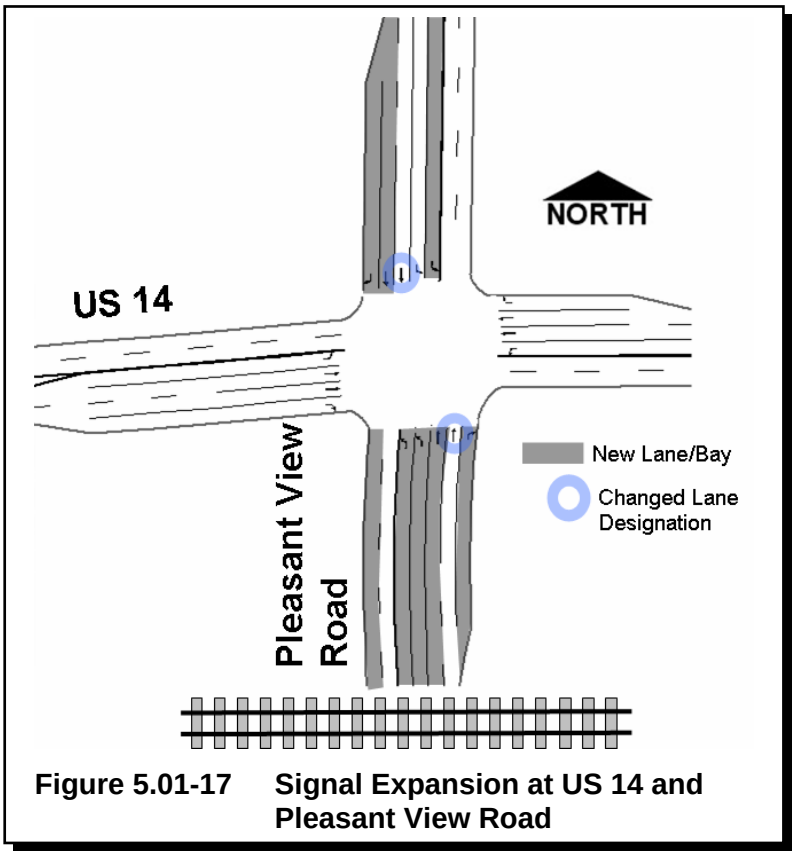

Figure 5.01-17 Signal Expansion at US 14 and Pleasant View Road

Operations modeling indicates that with the forecasted PM peak-hour volumes, the intersection configuration shown in Figure 5.01-17 would operate at LOS D overall. Some movements would operate at LOS E during peak periods. Westbound traffic will be heavy in the afternoon, and queues may reach 700-feet or more. This is significantly longer than existing queues, which are generally under 200 feet. If US 14/University Avenue west and east of this location is expanded to a six-lane street, this intersection may need additional capacity to handle the resulting vehicular volumes. Due to the proximity of the railroad tracks south of the existing intersection, railroad preemption would be recommended for this signal.

Traffic signal capacity expansion nearly always improves motor vehicle operations at the cost of making pedestrian and bicycle travel less comfortable and less safe. As the City grows, the Pleasant View Road corridor will become more urban and less rural, and pedestrian and bicycle use will become more important. This should be considered if capacity expansion of the corridor and intersection are proposed.

3) Conversion to a Modern Roundabout

A modern roundabout intersection at US 14 and Pleasant View Road would be able to accommodate the forecasted future traffic volumes. Each of the approaches would need a two-lane entry. A right-turn bypass lane would be needed for westbound US 14. Each of the exits would be two-lane. Figure 5.01-18 shows a schematic of the roundabout.

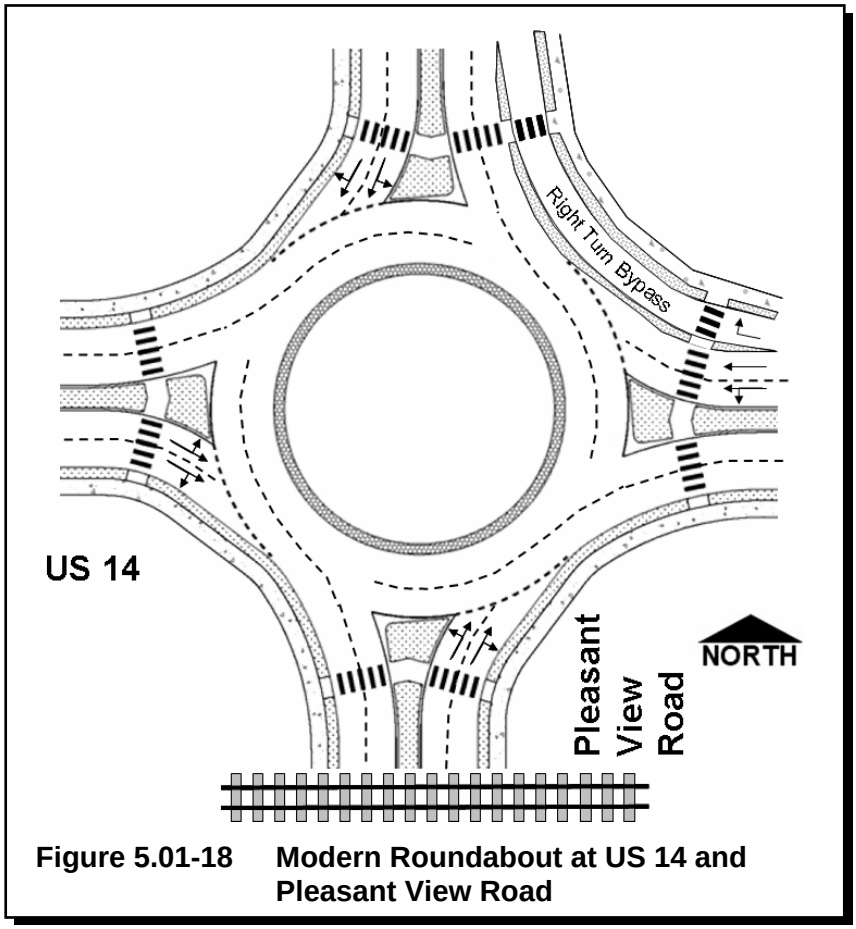

Figure 5.01-18 Modern Roundabout at US 14 and Pleasant View Road

Operations modeling using RODEL software indicates that the roundabout would operate at LOS A overall with the forecasted PM peak-hour traffic volumes. Average delays are 21 seconds or less and queues are seven vehicles (approximately 175 feet) or less. If US 14 east of this intersection is expanded to a six-lane street, this roundabout may need additional capacity.

Currently, the existing railroad tracks located approximately 115 feet south of the intersection are seldom used. If train activity were expected to significantly increase in the future (such as through implementation of commuter rail service), the roundabout operations could be impacted. A train preventing traffic from exiting the circulating roadway southbound could cause the roundabout to lock

up. Further investigation would be needed to comment on the impacts of this occurrence and the time it would take to dissipate the queued traffic.

As mentioned previously, corridors should typically maintain a consistent type of intersection control. In this case, the intersection spacing on both US 14 and Pleasant View Road would allow an isolated roundabout to be constructed at this intersection without the corresponding need to convert adjacent intersections on each corridor to roundabouts. If the stop-controlled intersection of Pleasant View Road and University Green were upgraded, it should use the same type of control as the US 14 and Pleasant View Road intersection (whether traffic signals or roundabouts).

Although roundabouts are typically perceived as less safe for pedestrians than signals; studies show that the opposite is true. They can, however, be more difficult to negotiate for mobility-impaired pedestrians.

h. Priority 8: US 14 and Deming Way

1) Routine Maintenance and Safety Improvements

For the no-build alternative, only routine maintenance and minor safety improvements would be made. Note that this intersection is currently under WisDOT jurisdiction. Existing traffic operations are well within acceptable thresholds. Traffic forecasts indicate continued increases in demand, particularly on US 14. Operations modeling of the future PM peak-hour volumes suggests that the intersection will operate at LOS D overall, with some movements experiencing LOS F conditions. Traffic demand at this intersection is highly dependent on the upstream US 14 intersections to the east (US 12 ramps) and west (Pleasant View Road). If the capacity is increased at these intersections, the intersection of US 14 and Deming Way will operate poorly without a similar expansion.

2) Signalized Intersection Capacity Expansion

Heavy volume on US 14 will require that green time given to Deming Way be minimized. Improvements would provide dual exclusive left-turn lanes, dual through lanes, and an exclusive right-turn lane for northbound and southbound movements. This assumes that Deming Way has been upgraded to a four-lane facility, at least in the vicinity of this intersection. Figure 5.01-19 schematically shows the expanded intersection.

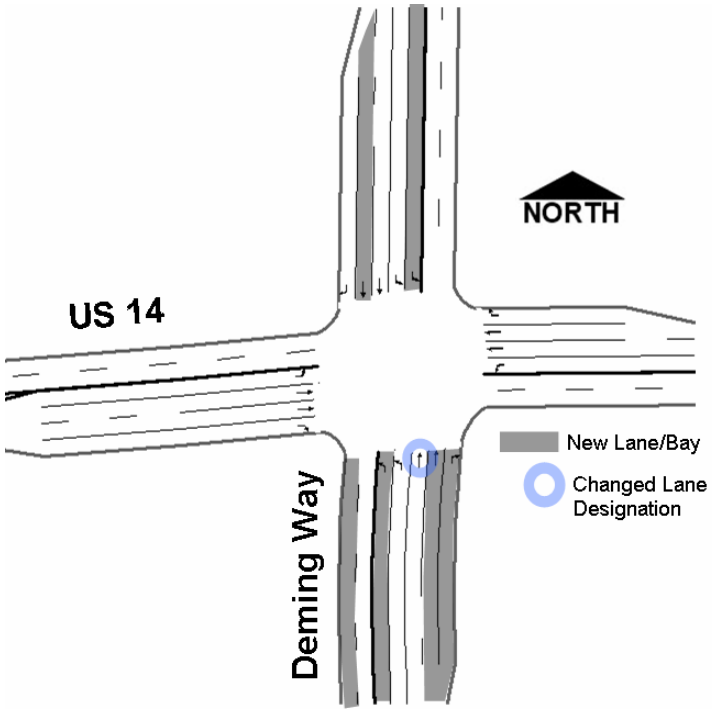

Figure 5.01-19 Signal Expansion at US 14 and Deming Way

Operations modeling indicates that with the forecasted PM peak-hour volumes, the intersection configuration shown in Figure 5.01-19 would operate at LOS D overall. Each individual movement would operate at LOS D or better. Queues would reach 200 to 400 feet in the afternoon on each approach. This is approximately double today's queue lengths. If US 14 east and west of this location is expanded to a six-lane street, this intersection may need additional capacity to handle the resulting vehicular volumes.

Existing constraints to the south of this intersection will influence the decision of whether or not to expand it in the future. First, railroad tracks cross Deming Way approximately 300 feet south of the northbound stop bar. Due to the proximity of the tracks, railroad traffic signal preemption would be recommended. Second, the railroad crossing is approximately 15 feet above the intersection, resulting in longitudinal grades on Deming Way that reach 6 percent. Finally, two accesses to existing businesses exist. On the west side of Deming Way there is an access to Mounds approximately 100 feet south of the northbound stop bar. On the east side of Deming Way, there is an access to a car wash approximately 250 feet south of the northbound stop bar. Each of these constraints will make expansion of the intersection more costly.

Traffic signal capacity expansion nearly always improves motor vehicle operations at the cost of making pedestrian and bicycle travel less comfortable

and less safe. The mixed land uses north and south of US 14 imply that bicycle and pedestrian travel will be important along Deming Way. This should be considered if capacity expansion is proposed.

3) Conversion to a Modern Roundabout

A modern roundabout intersection at US 14 and Deming Way would be able to accommodate the forecasted future traffic volumes. Each of the approaches would need a two-lane entry. A right-turn bypass lane would be needed for westbound US 14. Each of the exits would be two-lane, except the northbound Deming Way exit, which would be a single lane. Figure 5.01-20 shows a schematic of the roundabout.

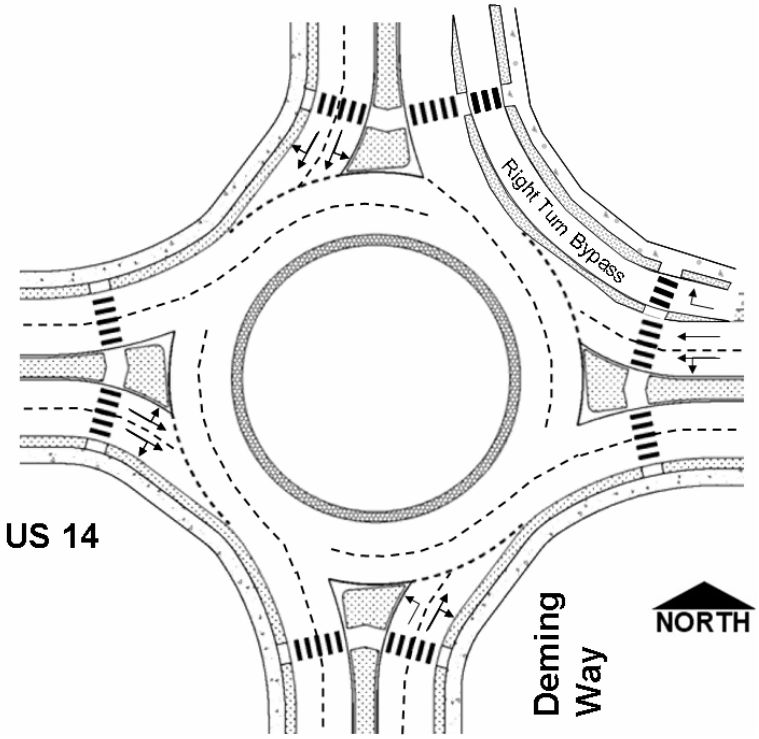

Figure 5.01-20 Modern Roundabout at US 14 and Deming Way

Operations modeling using RODEL software indicates that the roundabout would operate at LOS B overall with the forecasted PM peak-hour traffic volumes. Average delays are 30 seconds or less and queues reach 12 vehicles (approximately 300 feet) on the westbound US 14 approach. If US 14 east and west of this intersection is expanded to a six-lane street, this roundabout may need additional capacity.

Existing constraints to the south of this intersection will influence the decision of whether or not to expand it in the future. First, railroad tracks cross Deming Way approximately 300 feet south of the northbound stop bar. The proximity of the tracks could influence operations of a roundabout, particularly if train traffic on the tracks increases in the future. Additional investigation would be needed to comment on the specific impacts to roundabout operations. Second, the railroad crossing is approximately 15 feet above the intersection, resulting in longitudinal grades on Deming Way that reach 6 percent. Finally, two accesses to existing businesses exist. On the west side of Deming Way there is an access to Mounds approximately 100 feet south of the northbound stop bar. On the east side of Deming Way, there is an access to a car wash approximately 250 feet south of the northbound stop bar. Each of these constraints will make expansion of the intersection more costly.

As previously mentioned, corridors should typically maintain a consistent type of intersection control. If implementation of roundabouts at the US 14 and Deming Way intersection were proposed, it should be accompanied by construction of roundabouts at the US 12 interchange and the Parmenter Street intersections as well.

Although roundabouts are typically perceived as less safe for pedestrians than signals; studies show that the opposite is true. They can, however, be more difficult to negotiate for mobility-impaired pedestrians.

i. Priority 9: Greenway Boulevard and North High Point Road and US 12/14 Interchange

The close spacing of the US 12/14 ramp terminals and North High Point Road may cause problems in the future. While the operations modeling did not indicate significant PM peak-hour concerns, it can be expected that the limited signal timing options provided by the intersection spacing may result in difficulties in the future. Reconfiguration of the three intersections may or may not be needed.

B. Nontraditional Capacity Expansion

Nontraditional traffic management solutions include modifications that seek to add vehicular capacity to Middleton streets other than those included under traditional capacity expansion. They are categorized into corridor and intersection alternatives.

1. Corridor Modifications

a. Grade-separated streets

When at-grade intersections cannot accommodate traffic demand, grade-separated streets are sometimes the next step. Campus Drive in Madison is an example of such a strategy. It is a grade-separated stretch of road that was constructed to alleviate traffic congestion on University Avenue near the UW-Madison campus.

University Avenue and Century Avenue are two corridors for which an expansion to a grade-separated facility could be justified by forecasted traffic volumes. Necessary relocations, construction costs, and political acceptance may make this type of solution impossible.

b. Reversible Lanes

On corridors with highly directional flow, reversible lanes can be used to provide additional capacity for the dominant direction of travel. Specialized pavement marking, signage, and overhead signal indications are typically used to denote the direction of travel for the reversible lane throughout the day. Figure 5.01-21 shows a reversible lane on a corridor in Los Angeles, California.

Figure 5.01-21 Reversible Lane in Los Angeles, California

US 14/University Avenue traffic experiences moderate peak-hour directionality toward Madison in the morning and out of Madison in the evening. A center reversible lane could be constructed to add capacity to these movements during the morning and evening peaks and be used as a center left-turn lane during off-peak periods. Implementation of a reversible lane corridor would require reconstruction of US 14/University Avenue and modifications at all the major intersections. Political acceptance may be difficult, however, if congestion continues to increase, it may ease local skepticism.

Century Avenue between Allen Boulevard and County Q has more significant peak-hour directionality than University Avenue and may benefit more from a reversible center lane. The profile of Century Avenue and the difference in elevation of the lanes in each direction of travel would make implementation more difficult, however.

2. Intersection Modifications

a. Elimination of Left-Turn Movements

At intersections where opportunities to provide exclusive left-turn lanes are limited, shared through/left-turn lanes are needed. For safety reasons and to increase throughput, left turns are sometimes prohibited during peak traffic periods at such intersections. This is typically done through traditional signage or with blankout signs (see Figure 5.01-22).

Figure 5.01-22 Blankout Sign

Elimination of left turns increases an intersection's through capacity but limits the street system's vehicular mobility. It is typically done only when there are other opportunities to make the desired movement nearby.

The intersection of University Avenue and Parmenter Street is one location where prohibition of peak-hour left turn movements could improve traffic operations and safety. Implementing the prohibition would likely be met with local resistance.

b. Alternative Left Turn Accommodations

Several intersection designs have been developed to relocate left turn movements away from major intersections or allow them to operate in conjunction with opposing traffic. Typically, the increase in intersection capacity is offset by increased right-of-way requirements, indirect minor movements, complex (and sometimes confusing or unfamiliar) layouts, and pedestrian and bicycle concerns regarding comfort and safety. Following is a discussion of these intersection treatments:

- Median U-Turn Intersection–These intersections are used frequently in Michigan on major thoroughfares. They increase capacity at an intersection by requiring left-turn movements to instead be completed by a combination of a u-turn maneuver and a right-turn maneuver. Figure 5.01-23 shows a schematic of this type of intersection.

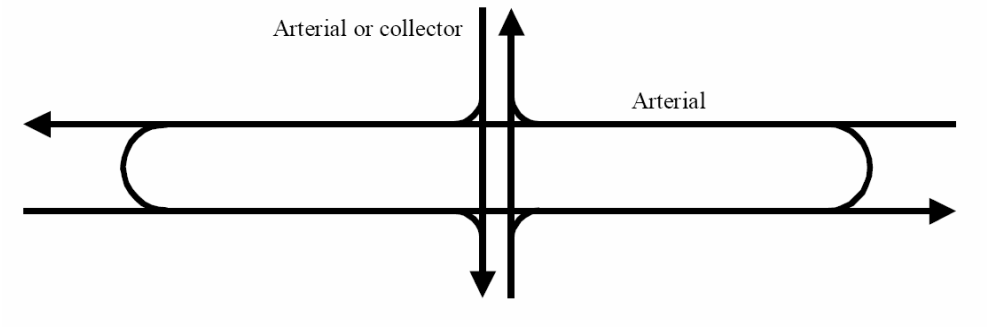

Figure 5.01-23 Median U-Turn Intersection

Advantages to this intersection type include increased overall vehicular capacity, decreased conflict points at the subject intersection, and decreased stops per vehicle. Disadvantages include the additional travel required for left-turning vehicles and the associated delay and the wide right-of-way needed to accommodate u-turn maneuvers by trucks (increasing costs to implement, pedestrian crossing distances, etc.).

Currently, none of Middleton's arterial streets would accommodate a median u-turn configuration without corridor reconstruction to provide a sufficiently wide median.

- Bowtie Intersection–These intersections are operationally identical to the median u-turn configuration. The difference is that a roundabout intersection is provided to allow the downstream u-turn maneuver. Figure 5.01-24 shows a schematic of this type of intersection.

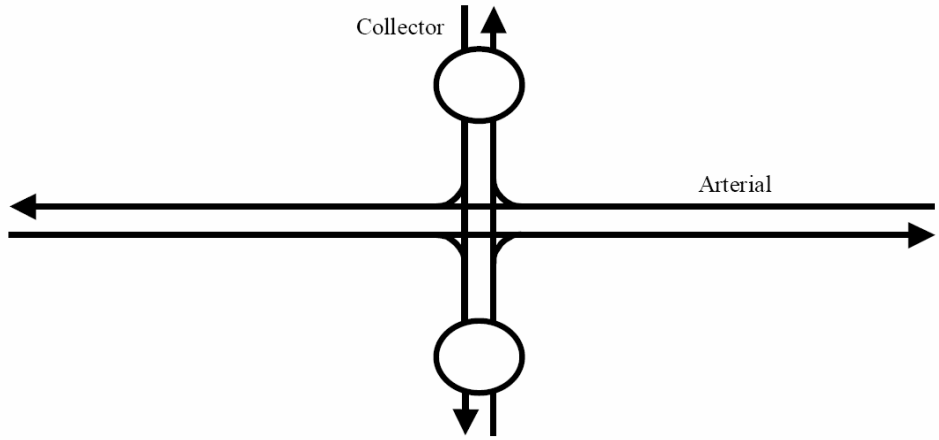

Figure 5.01-24 Bowtie Intersection

Advantages to this intersection type include increased overall vehicular capacity, reduced conflict points at the subject intersection, narrow right-of-way requirements (except at the roundabout intersections), and short and simple pedestrian crossing at the subject intersection. Disadvantages include the additional travel and the associated delay required of left-turning vehicles and impacts associated with roundabout construction on the minor street.

Intersections at which a bowtie configuration may be warranted and could be considered include University Avenue and Parmenter Street and University Avenue and Park Street. Right-of-way would need to be acquired to construct the minor street roundabout intersections and relocations may be needed as a result.

- Superstreet Intersection–These intersections allow left turns from the main street at the expense of prohibiting direct left turn and through movements for the minor street. These minor street movements must instead turn right and complete a downstream u-turn maneuver. This configuration allows the major street left turns to operate simultaneously with the minor street traffic. Figure 5.01-25 shows a schematic of this type of intersection.

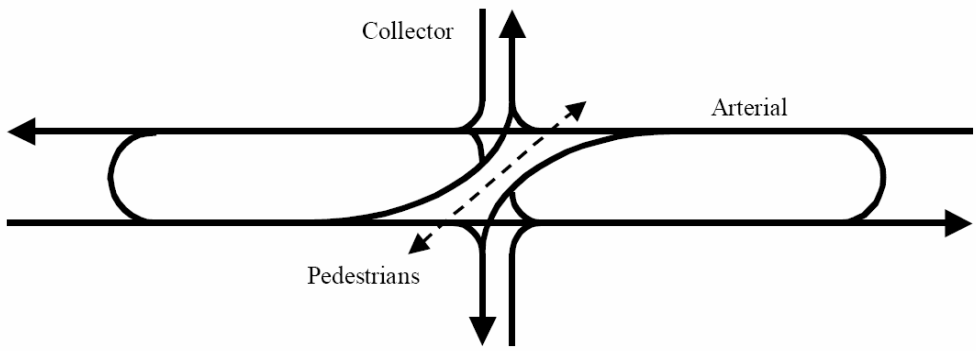

Figure 5.01-25 Superstreet Intersection

Advantages to this intersection type include increased overall vehicular capacity, and reduced conflict points. Disadvantages include indirect minor street movements and the associated delay, wide right-of-way needed to accommodate u-turn maneuvers by trucks, and indirect pedestrian crossings for some movements.

Currently, none of Middleton's arterial streets would accommodate a Superstreet configuration without corridor reconstruction to provide a sufficiently wide median.

- Continuous Flow Intersection–These intersections provide another means of simplifying traffic signal timing and thereby improving operations. This intersection directs left turning traffic to the right of opposing vehicles upstream of the subject intersection. This allows left turns to operate simultaneously with opposing through vehicles. This can be done only on the major street, or on both the major and minor streets. Figure 5.01-26 shows a schematic of this type of intersection with advance left turn crossovers shown only on the major street.

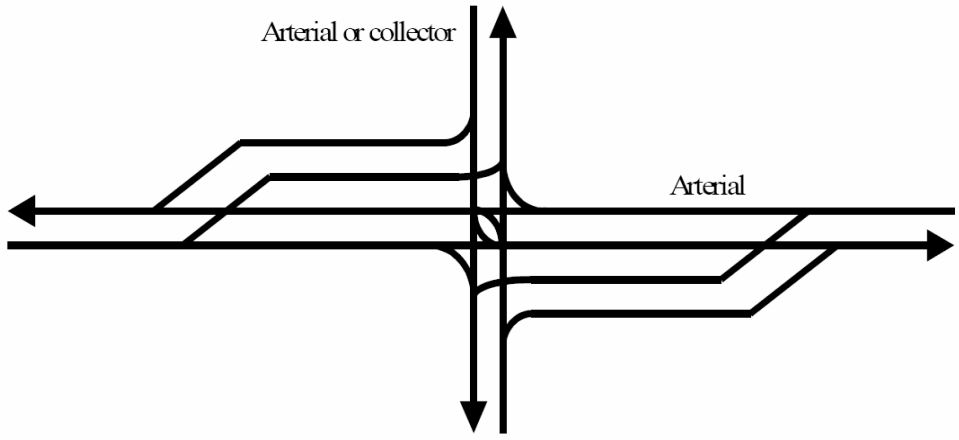

Figure 5.01-26 Continuous Flow Intersection

Advantages to this intersection type include increased overall vehicular capacity, reduced conflict points, and reduced travel time with higher volumes. Disadvantages include driver confusion, complicated bicycle and pedestrian crossings, a large intersection footprint (particularly if both streets use the crossover treatment), and limited ability to provide full access to adjacent parcels.

Construction of a continuous flow intersection at most locations in Middleton would require significant right-of-way acquisition and probably would not be a comparable alternative to traditional intersection capacity expansion options. The only exception would be locations at which even traditional capacity expansion will have significant impacts, such as Century Avenue and Allen Boulevard, or University Avenue and Parmenter Street.

- Single-Quadrant Intersection–These intersections remove left turns at the subject intersection and require them to be made by traveling through two adjacent intersections. Figure 5.01-27 shows a schematic of this type of intersection.

  Advantages of this intersection type include increased overall vehicular capacity, and reduced conflict points at the subject intersection. Disadvantages include increased travel and delay for some movements and the right-of-way required for the connector street.

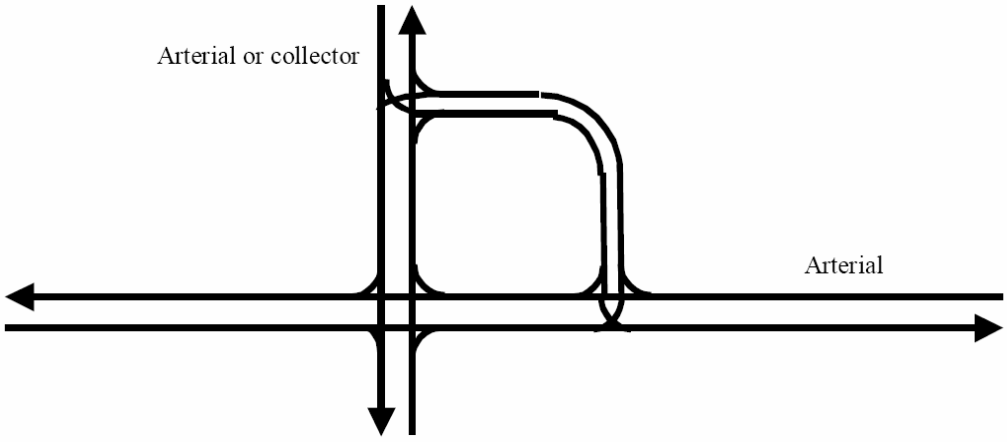

Figure 5.01-27 Single-Quadrant Intersection

5.02 OPINIONS OF PROBABLE COSTS FOR TRAFFIC MANAGEMENT SOLUTIONS

A. Traditional Motor Vehicle Capacity Expansion

1. Corridor Expansion Options

Table 5.02-1 lists the Opinions of Probable Costs (OPC) to implement various methods of traditional capacity expansion on the corridors in Middleton. Note that the options for reconfigured pavement marking on Park Street and addition of dedicated turn bays with median treatments on County Q are not included. Costs for these projects would be minimal compared to the costs of total reconstruction shown in the table. The estimates include intersection costs for signal equipment and capacity expansion (materials and labor), but they do not consider relocations and right-of-way costs that may result if intersection geometry significantly exceeds the existing corridor width. The corridors are listed by their relative priority with University Avenue representing the highest priority. More detailed information including the number of anticipated relocations is included for each of the scenarios in Appendix D. Note that an OPC was not developed for a six-lane University Avenue corridor, due to its length (2 miles) and varying existing roadway cross sections. This cross section would be recommended to be constructed from Cayuga Street to Allen Boulevard at a minimum, but it would ideally extend from west of Pleasant View Road through the US 12 interchange as well. Preparation of an OPC for a project of that scale is beyond the scope of this Traffic Management Plan (TMP).

Corridor (Length)	Proposed Roadway Type	Opinion of Probable Cost			
		Minimum ROW	Cost	Desirable ROW	Cost
University Avenue - Cayuga Street to Park Street (0.63 Miles)	5-Lane w/ TWLTL	77 feet	$ 3.2 Million	92 feet	$ 6.9 Million
	4-Lane Divided	86 feet	$ 6.9 Million	104 feet	$ 10.2 Million
Century Avenue - Allen Boulevard to County Q (0.92 Miles)	6-Lane Divided	108 feet	$ 4.6 Million	136 feet	$ 7.5 Million
Park Street - University Avenue to Woodgate Road (0.47 Miles)	4-Lane Undivided	66 feet	$ 1.2 Million	86 feet	$ 3.4 Million
	5-Lane w/ TWLTL	77 feet	$ 2.7 Million	100 feet	$ 7.0 Million
	4-Lane Divided	86 feet	$ 3.6 Million	112 feet	$ 7.5 Million
East-West Connection on North Side of City - Greenbriar Rd. to High Rd. to Balzer Rd. (2.61 Miles)	4-Lane Divided			122 feet	$ 8.6 Million
County Q - Century Avenue to Balzer Road (1.5 miles)	4-Lane Undivided	67 feet	$ 4.4 Million	86 feet	$ 4.6 Million
	4-Lane Divided	86 feet	$ 4.8 Million	112 feet	$ 7.3 Million
Pleasant View Road - US 14 south to City Limits (0.95 Miles)	4-Lane Divided	88 feet	$ 2.9 Million	112 feet	$ 3.4 Million

Table 5.02-1 Opinions of Probable Cost for Corridor Expansion

2. Intersection Modification Options

Table 5.02-2 lists the OPC to implement various intersection modifications. The top five intersections are listed from highest to lowest priority. Some more detailed OPC information is included in Appendix D. These values are based on conceptual design only and should be used with caution.

Intersection	Proposed Improvement Type	OPC
Century Avenue and Allen Boulevard	Signalized	$1,000,000
	Roundabout	$800,000
University Avenue and Parmenter Street	Signalized	$4,300,000
	Roundabout	$4,300,000
University Avenue and Park Street	Signalized	$2,800,000
	Roundabout	$2,500,000
University Avenue and Allen Boulevard	Signalized	$800,000
Century Avenue and County Q	Signalized	$1,000,000

Table 5.02-2 Opinions of Probable Cost for Intersection Modifications

B. Alternative Capacity Expansion

Opinions of probable cost for the alternative capacity expansion strategies were not prepared as part of this TMP.

SECTION 6
MOBILITY SOLUTIONS

6.01 MOBILITY SOLUTION TYPES

From a Mobility perspective, solutions to Middleton's anticipated transportation system needs involve the movement of people and goods, not just the movement of motor vehicles. Reducing motor vehicle congestion can be accomplished not only by increasing street capacity but also by encouraging more efficient use of existing capacity (by increasing average vehicle occupancy, for example) and encouraging the use of alternative travel modes. Limiting geometric expansion of streets and intersections where appropriate treats alternative modes more equally with motor vehicles and increases community mobility. Following is a selective list of strategies to accomplish these goals and discussion of their applicability in Middleton. Additional strategies are available but are less feasible for Middleton.

A. Improvements to Middleton's Bicycle and Pedestrian System

Section 2 of this Transportation Network Plan includes a description of Middleton's current (2005) pedestrian and bicycle system. Continued planning and construction of connections within the system will make nonmotorized travel more convenient and, therefore, attractive to Middleton residents. Increased use of the bicycle and pedestrian system can not only reduce traffic congestion but can also improve the physical health of citizens and encourage stronger and more livable neighborhoods by fostering communication among residents. Strand Associates consulted Middleton's Bicycle and Pedestrian Plan adopted in 1999 as well as bicycle/pedestrian system plans for the Middleton area prepared by Dane County, the Madison Area MPO, and land use planning consultants working for the City. Figure 6.01-1 shows the resultant recommended bicycle/pedestrian system plan.

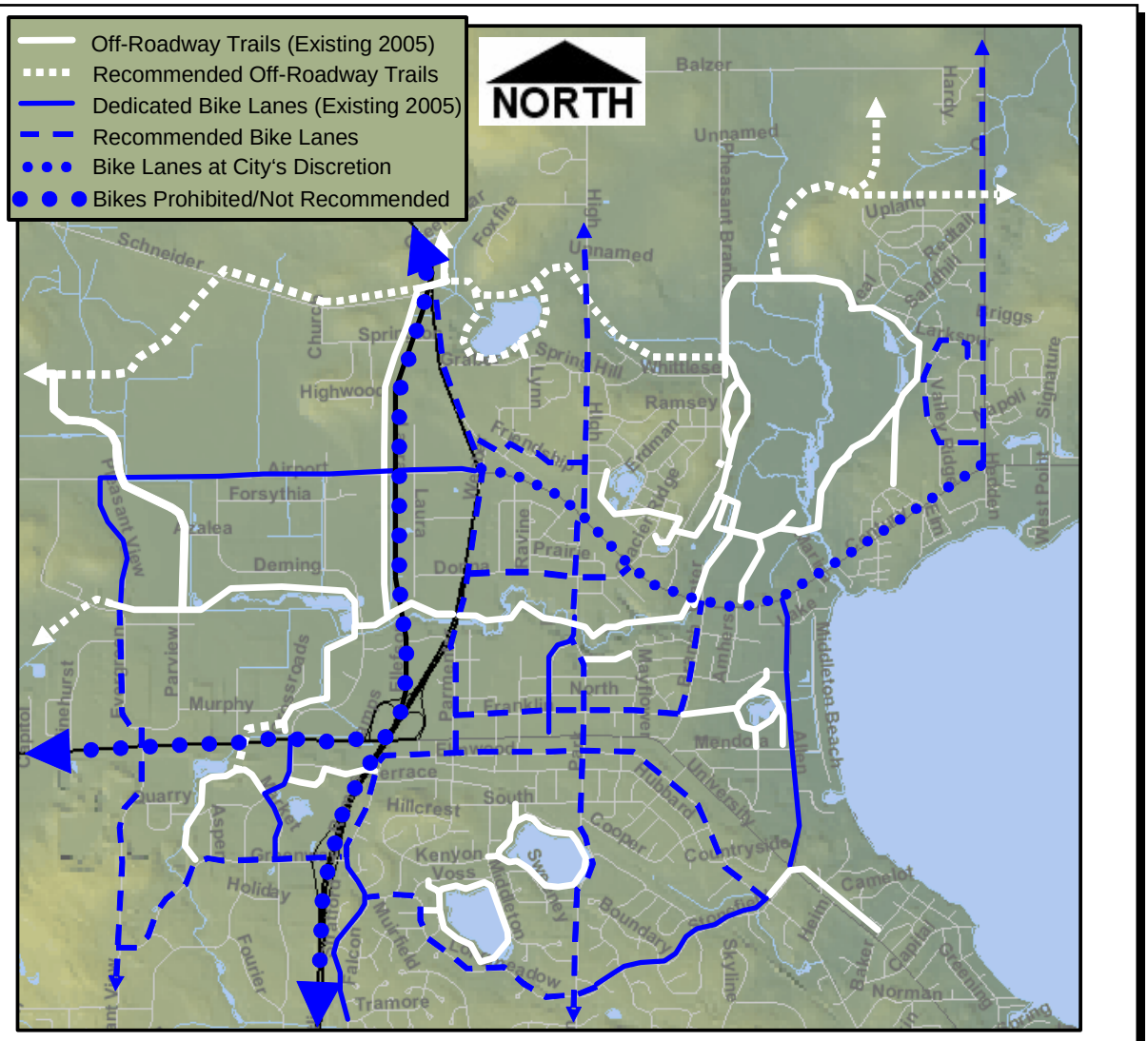

Figure 6.01-1 Recommended Middleton Bicycle and Pedestrian System Plan

The plan shown in Figure 6.01-1 supplements the extensive off-street multiuse trail system with on-street dedicated bicycle lanes on many of Middleton's collector streets. Additionally, many of the neighborhood streets within the City are well-suited to bicycle travel because of their wide cross sections and low vehicular volumes. Continued coordination with the City of Madison's Bicycle and Pedestrian Coordinator is important so the two systems provide maximum connectivity.

B. Expansion of Madison Metro Transit Bus Service

Middleton has been proactive in advocating and subsidizing Madison Metro Transit service within city limits. As congestion increases and the cost of driving a motor vehicle increases, transit ridership will likely continue to increase. Providing transportation options is important in minimizing traffic congestion.

As development continues, transit service should be considered early in the planning process. As part of the City's approval process, proposed development representatives should be required to coordinate with Madison Metro Transit. Where transit service is appropriate, the parties developing the land should provide for appropriate transit accommodations such as bus stop locations on new streets and bus shelters. When planning bus stop locations, it is generally safer for pedestrians and better for traffic operations to have the bus stop on the far side of intersections.

C. Commuter Transit Advocacy

The City of Madison's current long-range transportation plan (Transport 2020) includes a proposed commuter rail system into and out of downtown Madison. Service to Middleton is proposed with stations at Greenway Station and in downtown Middleton. The City of Middleton should advocate the commuter rail project as it would likely provide significant relief to the University Avenue corridor during peak periods of travel. Adding this type of transit service typically reduces equilibrium congestion on parallel routes. Congestion is not eliminated, but it is less severe and has a shorter duration than it would without transit. Additionally, Middleton residents directly benefit from a safe, fast, and relatively inexpensive alternative to driving in and out of downtown Madison.

D. Transportation Demand Management Plans

Middleton should consider requiring large traffic generators (> 500 peak hour trips) to complete a Transportation Demand Management (TDM) Plan as part of the approval process. TDM plans outline specific goals in the reduction of peak-hour single occupant vehicle trips and provide strategies to achieve these goals. TDM plans are typically required as a condition of development approval by a Planning Commission or similar body. Most often they are considered for large employers, however, developments consisting of multiple small-scale employers (100-499 peak hour trips) can be required to form a Transportation Management Association (TMA) and share the responsibilities of TDM implementation. TDM is not limited to specific commute trip reduction strategies–requiring pedestrian and bicycle friendly site design, integration of transit service, and mixed-use development can be effective TDM strategies in and of themselves. Monitoring and enforcement of TDM strategies varies and can range from requiring employers or TMAs to submit yearly status reports to City officials to simply requiring that any future development submit or amend applicable TDM plans prior to design and construction.

Specific strategies that best fit the Mobility Perspective of transportation solutions are:

- Implementing and/or encouraging the use of Rideshare Programs–These programs can directly reduce single occupant vehicle commute trips.

- Parking Management and Pricing–Limiting the availability and/or controlling the cost of parking is one of the most effective ways to influence travel behavior. In lieu of charges to employees for monthly parking, some programs offer a monetary stipend for commuters who do not drive to work (known as Parking Cash Out).

- Encouraging, Facilitating, and/or Providing Incentives to using Alternative Modes of Travel–This can be done in a variety of ways such as providing bus passes to employees and

providing covered bicycle parking, showers and locker room facilities to encourage pedestrian and bicycle commuting.

There are many more TDM strategies and each plan should be site-specific and should recommend those that are likely to be sustainable and effective. A successful TDM program can reduce the traffic impact of a development. An effective citywide policy on TDM can be a means to reduce traffic congestion throughout Middleton. Table 6.01-1 shows the range of reductions in commuter trips that various TDM strategies can produce.

TDM Strategy	Typical Trip Reduction
Rideshare Vehicle with Preferential Parking	5–10 percent
100 percent Transit/Rideshare Subsidy	5–15 percent
50 percent Transit/Rideshare Subsidy	5–10 percent
Vanpool Program	5–10 percent
Showers and Lockers Provided at Work	2–5 percent
Guaranteed Ride Home Program	2 percent
Onsite Childcare	5 percent

Table 6.01-1 Approximate Trip Reductions for Various TDM Strategies

E. High Occupancy Vehicle Priority

Providing priority within the traffic stream to High Occupancy Vehicles (HOV) can encourage car pooling and transit ridership and reduce congestion. In Middleton, University Avenue, and to a lesser degree Century Avenue, would be effective corridors for such a strategy. Implementation of HOV priority would be politically difficult in that significant investment in infrastructure would be required (corridor expansion to provide dedicated lanes, expanded intersections to allow queue bypassing, and construction of park and ride facilities).

F. Traffic Calming

Part of this Traffic Management Plan is creation of a Neighborhood Traffic Management Plan (NTMP). Middleton's NTMP establishes the process by which local residents can request traffic calming measures on their streets. Implementation of retrofitted calming measures combined with integration of traffic calming into new developments, where appropriate, can result in smoother traffic flow and more optimal speeds on lower-volumes streets. These conditions improve neighborhood mobility and livability.

G. Access Management

The number and spacing of access points on arterial streets is directly proportional to crash rates and traffic congestion. Incidents cause major delays on congested streets. Restricting high conflict maneuvers (most often left turns leaving a side street or driveway) or ideally eliminating access points is an effective way to reduce crashes, reduce roadway friction, and thereby reduce congestion.

SECTION 7
ACCESSIBILITY SOLUTIONS

7.01 ACCESSIBILITY SOLUTION TYPES

From an Accessibility perspective, solutions to Middleton's anticipated transportation system needs involve not only the movement of people and goods but also the ability for people to reach or secure desired goods and services. This perspective attempts to treat different modes of travel equally and considers substitutes for travel a suitable means of improving access. Following is a selective list of strategies that fit the Accessibility perspective of transportation management and discussion of their applicability in Middleton. Additional strategies are available but less feasible for Middleton.

A. Transportation Demand Management Plans

As noted in Section 6, Middleton should consider requiring large traffic generators to complete a TDM Plan. TDM plans outline specific goals in the reduction of peak-hour single occupant vehicle trips and provide strategies to achieve these goals. Among the strategies that best fit the Accessibility Perspective of transportation solutions are:

- Flextime: Companies that allow their employees to begin work early or finish work late allow commuters the option of driving to work outside of the typical morning and/or evening peak periods of travel. Shifting some of the travel demand outside of these peaks can reduce congestion. Allowing more flexibility in employee schedules also makes it easier for commuters to match transit and rideshare schedules, allowing more people to use alternate modes.

- Telework: If possible, allowing employees to work from home can directly reduce travel demand.

There are many more TDM strategies and each plan should be site-specific and should recommend those that are likely to be sustainable and effective. A successful TDM program can reduce the traffic impact of a development. An effective citywide policy on TDM can be a means to reduce traffic congestion throughout Middleton.

B. Smart Growth

Middleton is currently working on a comprehensive plan to meet the requirements of Wisconsin's smart growth law. The link between land use planning and transportation system efficiency is direct. Lower-density, automobile-dependent land use tends to increase total traffic congestion. Although higher density urban areas tend to have lower traffic speeds, suburban areas tend to have higher traffic delay per capita because of increased travel distances and minimal alternate mode options. Table 7.01-1 compares Smart Growth land use patterns and Sprawl land use patterns.

Land Use Characteristic	Smart Growth	Sprawl
Density	Higher-density, clustered activities.	Lower-density, dispersed activities.
Land use mix	Mixed land use.	Homogenous (single-use, segregated) land uses.
Scale	Human Scale. Smaller buildings, blocks, and roads. Careful detail since people experience the landscape up close, as pedestrians.	Large scale. Larger buildings, blocks, wide roads. Less detail, since people experience the landscape at a distance, as motorists.
Public services (shops, schools, parks)	Local, distributed, smaller. Accommodates walking access.	Regional, consolidated, larger. Requires automobile access.
Transport	Multi-modal transportation and land use patterns that support walking, cycling, and public transit.	Automobile-oriented transportation and land use patterns, poorly suited for walking, cycling, and transit.
Connectivity	Highly connected roads, sidewalks, and paths, allowing relatively direct travel by motorized and nonmotorized modes.	Hierarchical road network with numerous loops and dead-end streets, unconnected sidewalks and paths, with many barriers to non-motorized travel.
Street design	Streets designed to accommodate a variety of activities, integrated traffic calming.	Streets designed to maximize motor vehicle traffic volume and speed.
Planning process	Planned and coordinated between jurisdictions and stakeholders.	Unplanned with little coordination between jurisdictions and stakeholders.
Public Space	Emphasis on the public realm (streetscapes, pedestrian environment, public parks, public facilities).	Emphasis on the private realm (yards, shopping malls, gated communities, private clubs).

Source: Victoria Transport Policy Institute

Table 7.01-1 Characteristics of Smart Growth and Sprawl Land Use Patterns

Planning for mixed use developments with office, commercial, and residential uses within one area can reduce travel demand and traffic congestion. Mixing land uses can help link trips (providing more than one destination within a development), increase transit service efficiency, and facilitate walking and bicycling. Following is a list of Smart Growth practices.[1] Middleton has already implemented many of them.

- Develop comprehensive strategic community development plans.
- Take advantage of existing community assets.
- Mix land uses.
- Create a range of housing opportunities and choices.
- Foster “walkable,” close-knit neighborhoods.
- Promote distinctive, attractive communities with a strong sense of place, including the rehabilitation and use of historic buildings.

[1] Source: Victoria Transport Policy Institute

- Preserve open space, farmland, natural beauty, and critical environmental areas.
- Provide a variety of transportation choices.
- Make development decisions predictable, fair, and cost-effective.
- Locate employment within existing developed areas and set land aside for commercial and industrial areas within the City.
- Encourage citizen and stakeholder participation in development decisions.
- Insure that transportation and land use policies are coordinated.
- Coordinate Smart Growth efforts with Madison and Dane County.

Comprehensive implementation of Smart Growth planning initiatives can reduce total per capita automobile travel by 20 to 40 percent. It can increase economic productivity by reducing overhead costs associated with public services, such as water and sewer service, roads, and schools. Families in Smart Growth communities typically spend significantly less money on surface transportation costs, benefit from lower per capita traffic fatalities, and enjoy reduced crime rates because of increased community cohesion. Smart Growth communities balance service to motor vehicles and other modes.

SECTION 8
CONCLUSIONS AND RECOMMENDATIONS

8.01 CONCLUSIONS

The City of Middleton, like most communities in Dane County, is experiencing a high degree of development pressure. In addition to internal development pressure, the physical location of the City of Middleton with respect to the Madison metropolitan area suggests that motor vehicle traffic volumes and congestion will continue to grow. Various perspectives exist regarding management of traffic congestion and travel demand. The most efficient way to maintain a viable transportation network in Middleton will involve a comprehensive and multifaceted approach that recognizes each of the three perspectives described in this report: traffic management, mobility, and accessibility.

8.02 RECOMMENDATIONS

A. Traffic Management Solutions

One part of a comprehensive package of solutions to Middleton's existing and forecasted transportation network needs involves Traffic Management solutions. The majority of these solutions will likely be through traditional motor vehicle capacity expansion. While this capacity expansion will directly benefit Middleton residents, it should be noted that it also benefits the traveling public that moves through Middleton from various origins to various destinations. One effect of increasing capacity on through routes will be that the costs associated with living farther from work are reduced. In other words, increased capacity on University Avenue makes it more attractive for a commuter to choose to live in Cross Plains or Black Earth while working in downtown Madison.

Political pressure and safety concerns will likely cause Middleton to continue to increase capacity where it is most economically efficient. Today, most intersections operate relatively well, even during peak traffic periods. In the near future, however, many are expected to begin operating poorly. Additionally, Middleton's most important travel corridors are likely to see steady increases in traffic volumes. Planning recommendations for motor vehicle capacity expansion are noted below. The list includes the four highest priority corridors in Middleton. Additional discussion of anticipated needs and possible Traffic Management solutions is included in Sections 3 and 5, respectively.

1. University Avenue Corridor

The University Avenue corridor is the most important transportation corridor in the City of Middleton. It is one of the most heavily traveled of any of Middleton's Principal Arterial (nonfreeway) streets and it is the only direct link from Middleton to downtown Madison and the University of Wisconsin-Madison. While traffic forecasts indicate that a six-lane facility may be justified, it is unlikely that the impacts of corridor expansion or one-way pair implementation will be viewed as acceptable by Middleton residents.

We recommend a "narrow roads, wide nodes" approach to the corridor. University Avenue would retain four basic travel lanes, with intersections expanded to accommodate larger traffic volumes. This approach recognizes that avoiding major corridor vehicular capacity expansion on University Avenue is a trade-off that treats bicycle and pedestrian traffic more equally with

vehicular traffic. This will help preserve long-term mobility within the City. The portion of University Avenue from Parmenter Street to Park Street should be modified in some regard to reduce future safety and congestion concerns. Ideally, a four-lane divided or five-lane section with a two-way left-turn lane would be provided. If this is not feasible, we recommend reducing side street and driveway access to right-in/right-out only and expanding the Bristol Street intersection to provide traffic signal or roundabout control. Additionally, the following intersections should be planned for expansion as discussed in Section 5:

- US 14 and Pleasant View Road
- US 14 and Deming Way
- US 14/University Avenue and the US 12 Interchange
- University Avenue and Parmenter Street
- University Avenue and Park Street
- University Avenue and Allen Boulevard

Care should be taken in any of the above projects to consider impacts to pedestrian and bicycle use of the corridor. If not properly designed, the University Avenue corridor could become a major barrier to mobility within the City.

2. Century Avenue Corridor

The Century Avenue corridor between Allen Boulevard and County Q provides a transportation “isthmus” between Lake Mendota and the Pheasant Branch Conservancy. It is an important link between the northeast and central portions of Middleton. Similar to University Avenue, traffic forecasts indicate vehicular traffic demand that exceeds typical four-lane road capacity. However, impacts associated with a significantly expanded corridor may be met with resistance from local residents.

We recommend expansion of the Allen Boulevard and County Q intersections as discussed in Section 5 of this report, coupled with access management on Century Avenue between these intersections. This would involve restricting left turns out of driveways and unsignalized side streets. This strategy may require traffic signal or roundabout control to be added at the Elm Street intersection because of a lack of options for leaving this neighborhood westbound. Alternatively, traffic could be permitted to turn right and perform a u-turn maneuver at a downstream unsignalized intersection.

3. Park Street/Gammon Road/High Road Corridor

This corridor will serve an increasingly important function as a north-south travel route as development continues on the northeast side of Middleton. Planning to accommodate the travel demand along this corridor should include expansion of the Park Street and University Avenue intersection and construction of the Park Street link adjacent to Parisi Park.

The Park Street cross section south of University Avenue should be considered for expansion to a four-lane divided section that would restrict left turns from driveways. Side-street left turns onto Park Street could remain. At least one additional intersection is recommended for signal or roundabout control, with Hubbard Avenue and South Avenue being the best candidates. Removal of on-street parking is recommended.

4. East-West Connection(s) from US 12 to County Q

This proposed connection is important from a regional and local standpoint. Century Avenue will need relief in carrying east-west traffic. The conceptually planned North Mendota Parkway could provide this relief, but the future of this proposed roadway is uncertain. The City should begin planning a roadway with a divided four-lane boulevard section that connects US 12 and County Q. This connection should not be confused with the North Mendota Parkway as it is not intended to carry regional traffic.

B. Mobility Solutions

The second part of a comprehensive package of solutions to Middleton's existing and forecasted transportation network needs involves Mobility solutions. These solutions are generally most effective when applied consistently and Citywide. They focus on improving transportation options available to residents.

Planning recommendations for implementation of Mobility solutions are noted below. The list includes the highest priority solution types and how they apply to Middleton. Additional discussion of anticipated needs and possible Mobility solutions is included in Sections 3 and 6, respectively.

1. Improvements to Middleton's Bicycle and Pedestrian System

Expanding and increasing connections within the bicycle and pedestrian system is one of the best ways to increase mobility within a community. As discussed in Section 6, Middleton has done a good job of planning a comprehensive system thus far. Recommendations for continued improvements are shown in Figure 8.01-1.

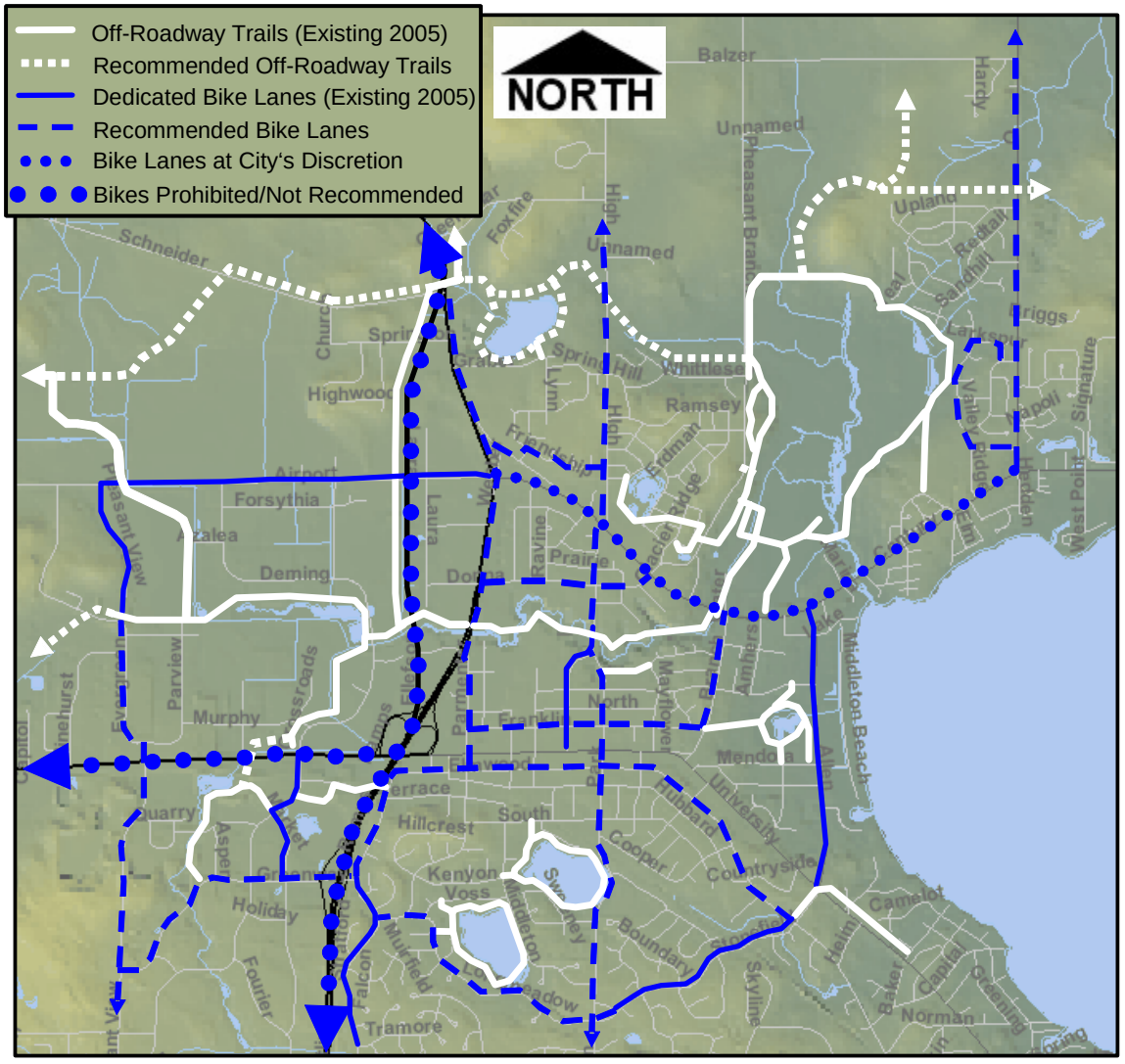

Figure 8.01-1 Recommended Middleton Bicycle and Pedestrian System Plan

2. Citywide Transportation Demand Management (TDM)

Requiring large employer-based traffic generators to complete a TDM plan can help reduce peak-period single occupant vehicle trips. TDM is most effective when applied across an entire community. The City of Madison is beginning to require TDM as large developments or redevelopment proposals appear before the Planning Commission. Middleton should begin requiring the same.

3. Access Management

As noted under the recommendations for Traffic Management solutions, access control should be implemented as much as practical on Middleton's most important transportation corridors. These include University Avenue, Century Avenue (between Allen Boulevard and County Q), Park Street/Gammon Road/High Road, and the future connection between US 12 and County Q. Access control would seek to alter direct access to these corridors as follows, listed from most effective to marginally effective:

- Close access completely (generally only possible with a commercial property that has an existing second access on an adjacent side street)
- Relocate access to a side street
- Combine access points
- Restrict access to right-in/right-out movements only
- Restrict access to right-in/right-out/left-in movements only

Access management is much easier to apply to new corridors than it is to existing ones. Opportunities do arise to alter access as properties redevelop.

4. Continued Advocacy for Improvements to Transit Service

Madison Metro Transit currently serves the City of Middleton. Continued service and expansion as appropriate will help reduce long-term overall congestion. Implementation of the commuter rail proposal contained in the City of Madison's long-range transportation plan, Transport 2020, will directly benefit the City of Middleton by reducing travel demand on its most important travel corridor, University Avenue. Middleton should consider supporting improvements to existing transit and expansion of services.

C. Accessibility Solutions

The final part of a comprehensive package of solutions to Middleton's existing and forecasted transportation network needs involves increasing Accessibility. We recommend continued and expanded application of Smart Growth practices within Middleton. The City has already put many Smart Growth practices to use and should continue to do so. Continuing to plan mixed use developments that try to balance accessibility between motorized and nonmotorized modes is key. Also important is continued protection of open space, farmland, and environmental corridors that border Middleton.