

MSU Bicycle Facilities Plan

A project of

Campus Planning and Administration

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Prepared by:



THE GREENWAY COLLABORATIVE, INC.
Greenway, Trail, Open Space, and Non-motorized Planning

MSU Bicycle Facilities Plan: Plan Contents

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PLAN PURPOSE AND OVERVIEW

The purpose of this plan is to provide detailed information on the location and type of proposed bicycle facilities as well as detailed guidelines on how elements of the plan may be implemented. The recommendations are in accordance with the American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities and the Michigan Manual of Uniform Traffic Control Devices (MMUTC) requirements. This information is generated as part of the campus master plan update.

The bicycle facilities recommendations include, on-road bike lanes, off-road pathways, bicycle parking and wayfinding.

The recommendations are based on the best practices employed by other universities and communities around the country. Examples and background information are at the end of this report.



Pocket Bike Lane on West Circle Driver Near Abbot Entrance

Photo Credit: Heidi Potter

MSU Bicycle Facilities Plan: Proposed Facilities

- ❖ Plan Overview
- ❖ Quadrant Enlargements
- ❖ West Circle Detail
- ❖ Shaw Lane Alternatives
- ❖ Bike Lane Types

Key Elements:

- Providing a consistent system of safe bike lanes on campus roads.
- Improving bike lane treatments and transitions at intersections.
- Providing bike paths along major desired routes through campus open space.
- Improving pedestrian safety through separation of bicycles and pedestrians.
- Underscoring pedestrian's right-of-way where pedestrian and bicycle routes intersect or coincide.
- Identifying long-term bicycle parking options for future university consideration.

Signs:

■ Proposed Information Kiosk

Bicycle Parking:

✱ Bike Station

■ Bike Cages

● Covered Bike Parking

Bike Paths:

— Existing

— Proposed

Shared-use Paths:

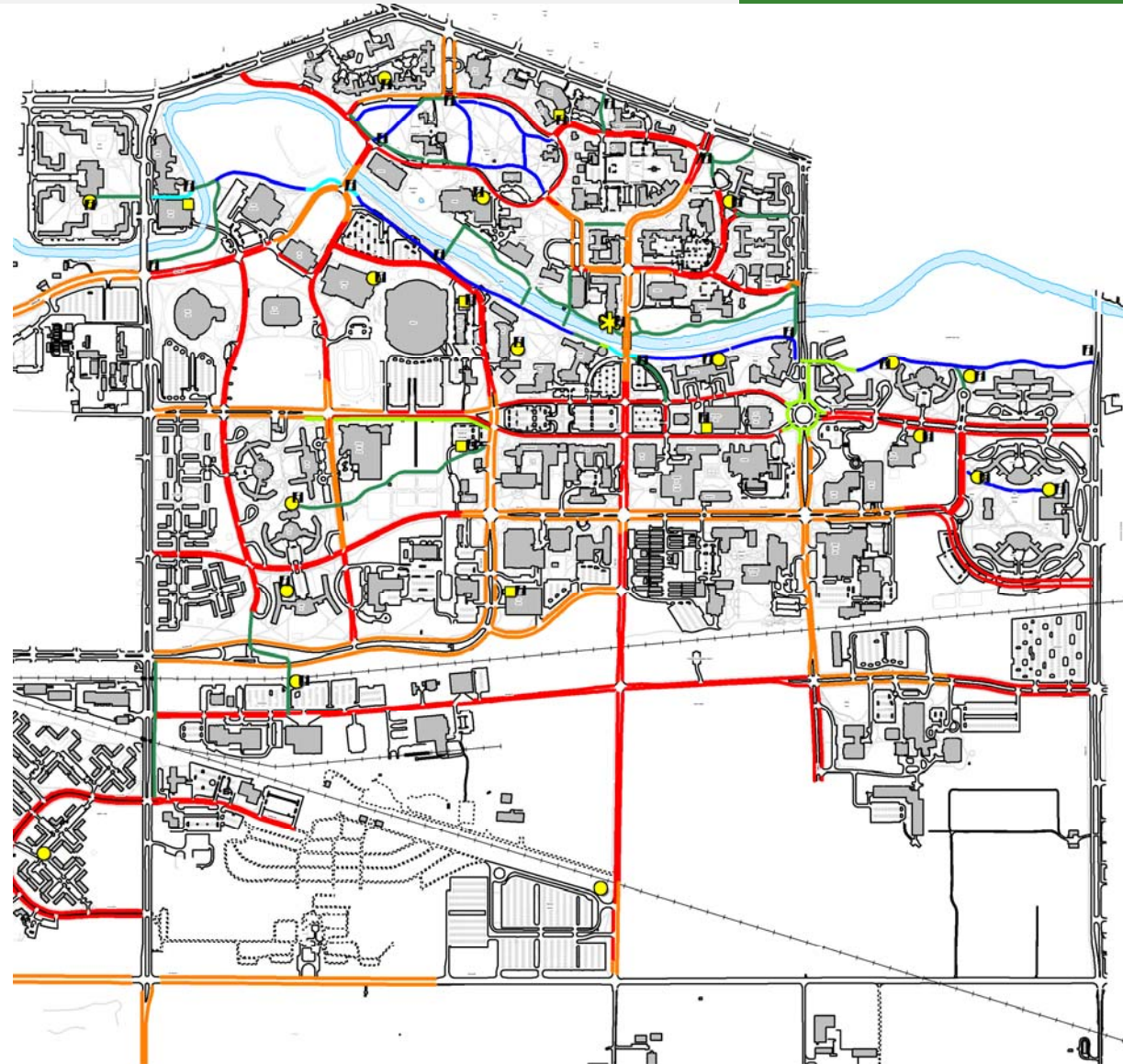
— Existing

— Proposed

On Road Bike Lanes:

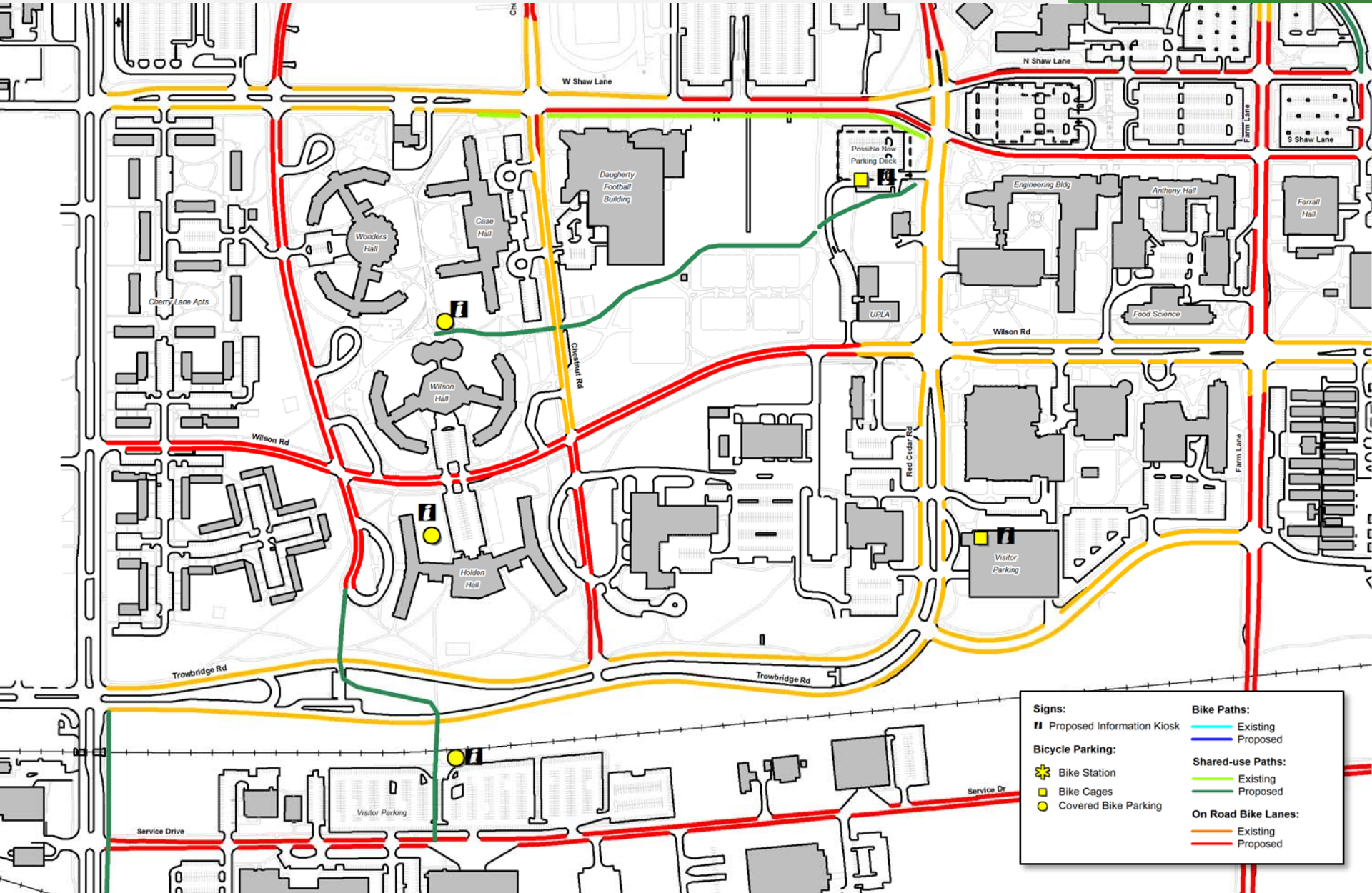
— Existing

— Proposed



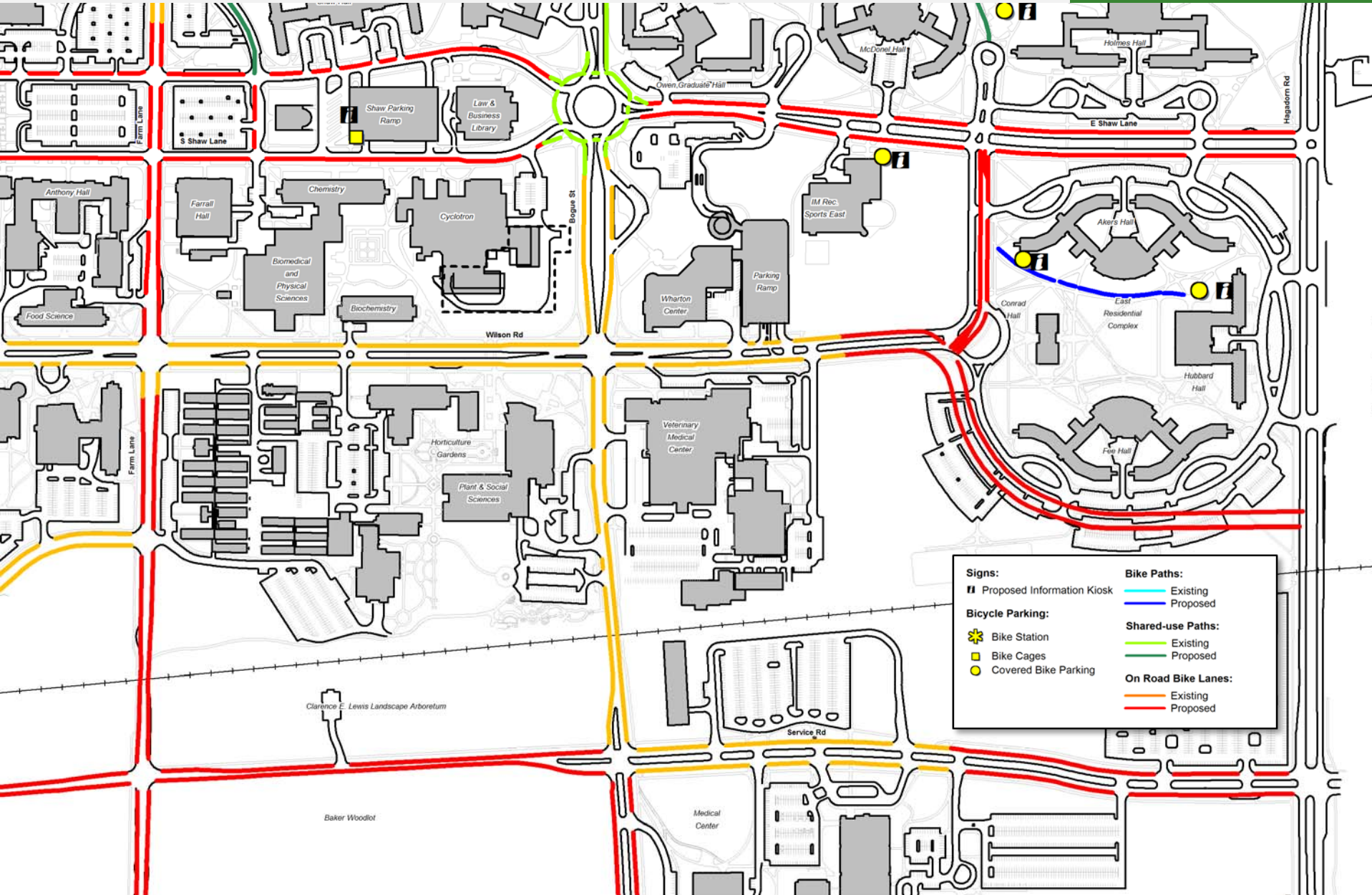
MSU has the potential to become a national model campus for bicycle transportation systems within 5 to 10 years.

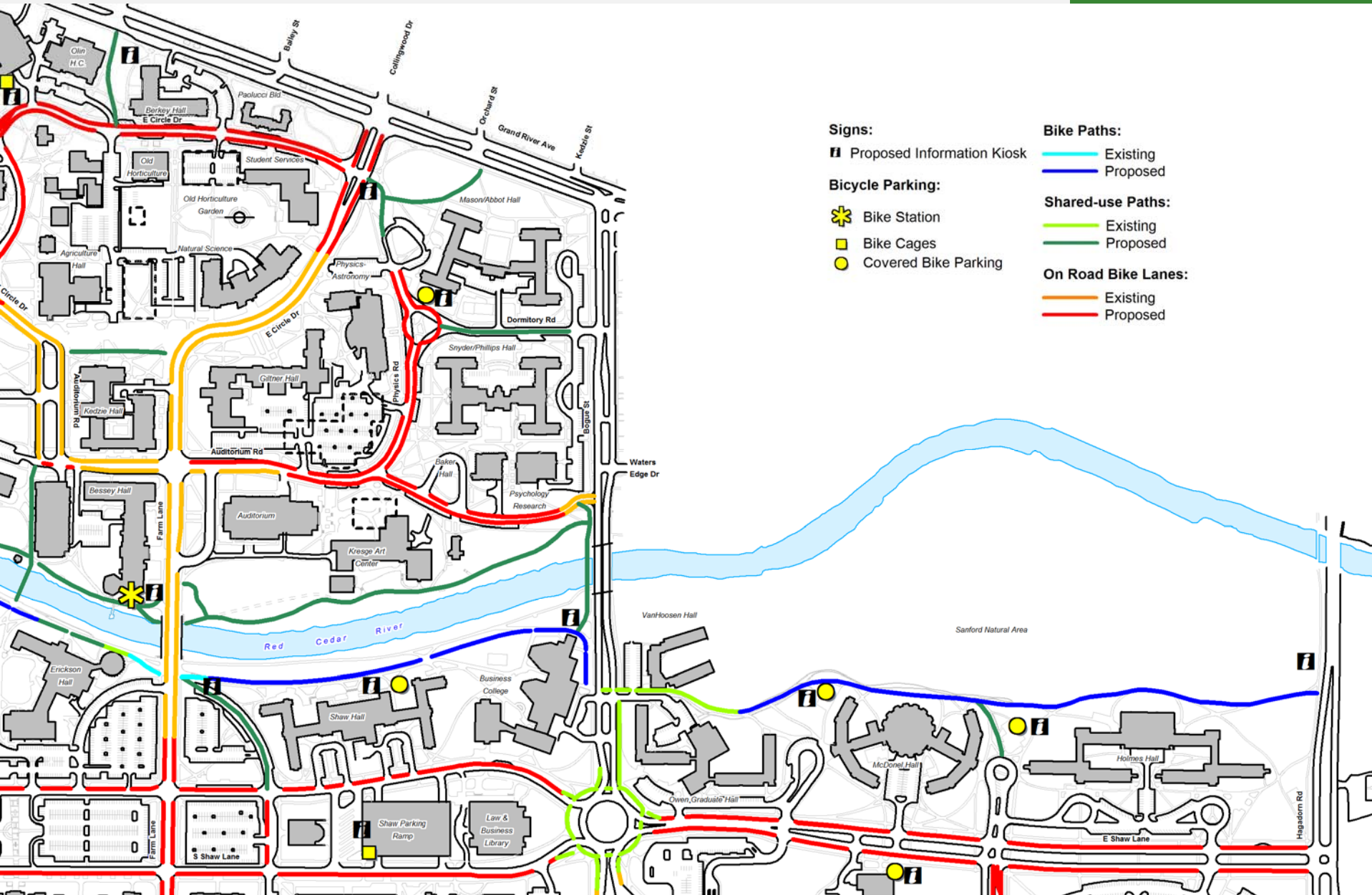
SOUTHWEST QUADRANT



Signs:	Bike Paths:
■ Proposed Information Kiosk	— Existing
Bicycle Parking:	— Proposed
⚙️ Bike Station	— Existing
● Bike Cages	— Proposed
● Covered Bike Parking	Shared-use Paths:
	— Existing
	— Proposed
	On Road Bike Lanes:
	— Existing
	— Proposed

SOUTHEAST QUADRANT

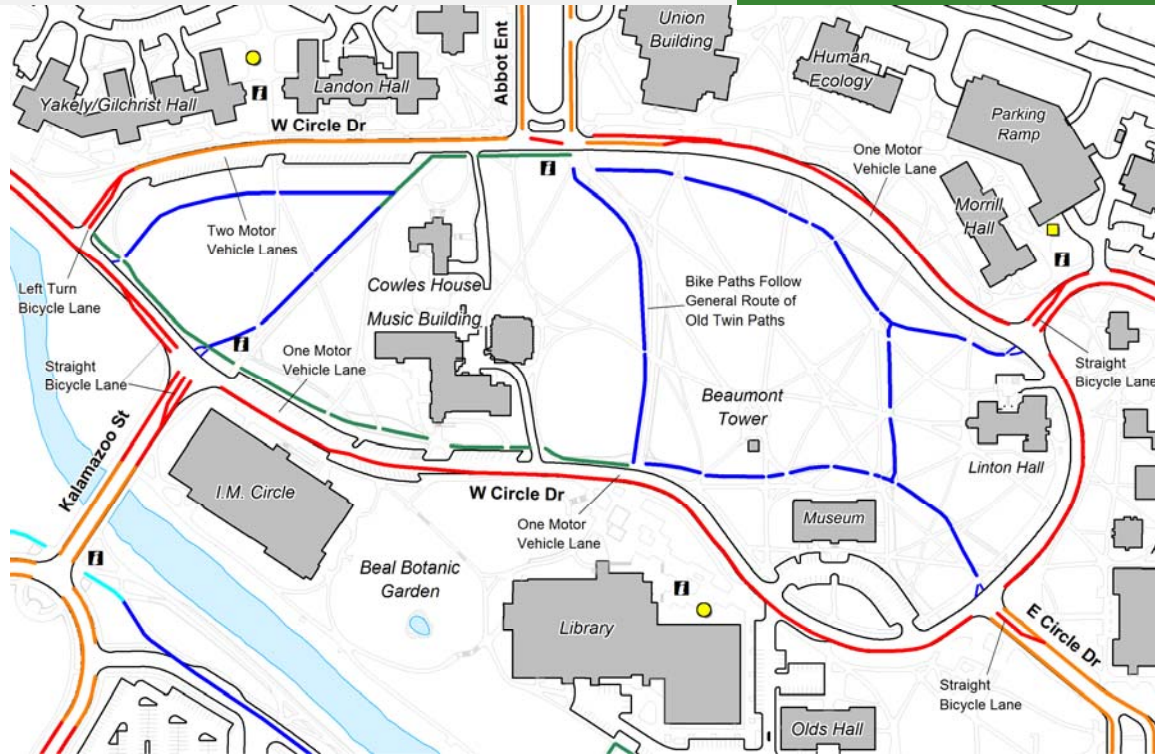




WEST CIRCLE DRIVE OVERVIEW

Key Elements:

- A Bike lane is provided all the way around West Circle Drive with flow of traffic.
- Off-road bike paths provide means of traveling north-south across West Circle and against the flow of traffic east-west.
- Create pocket bike lanes on streets intersecting West Circle Drive to minimize conflicts between right turning motorists and bicyclists continuing straight onto bike paths.
- The bike lane in front of I.M. Circle should be dashed and pulled as far away from the angle parking as possible. Signs and pavement markings should be utilized to warn motorists and bicyclists of the bike lane adjacent to the angle parking.
- Remove existing narrow one-way bike paths.



Signs:

- Proposed Information Kiosk

Bicycle Parking:

- Bike Station
- Bike Cages
- Covered Bike Parking

Bike Paths:

- Existing
- Proposed

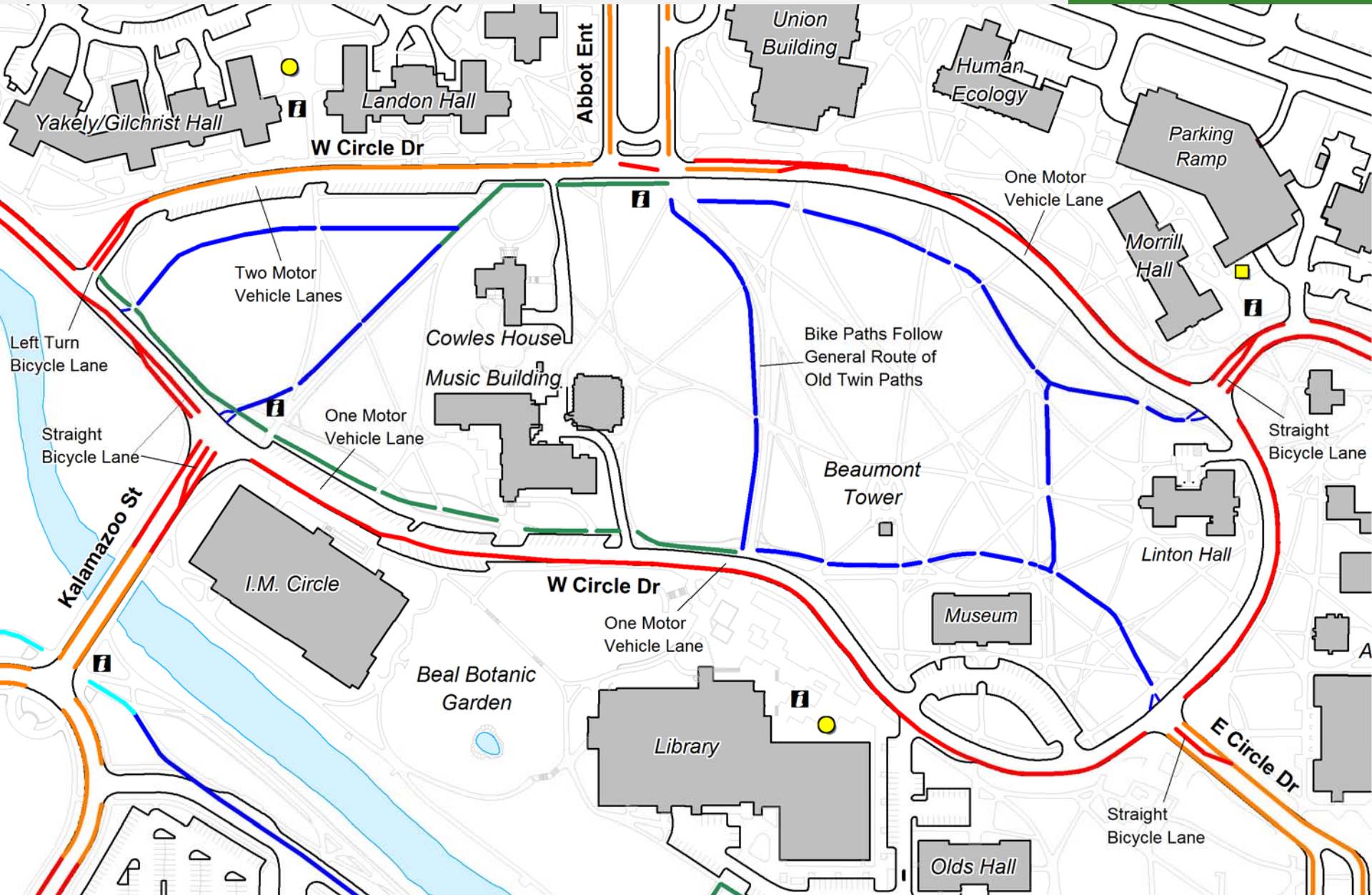
Shared-use Paths:

- Existing
- Proposed

On Road Bike Lanes:

- Existing
- Proposed

WEST CIRCLE DRIVE DETAIL

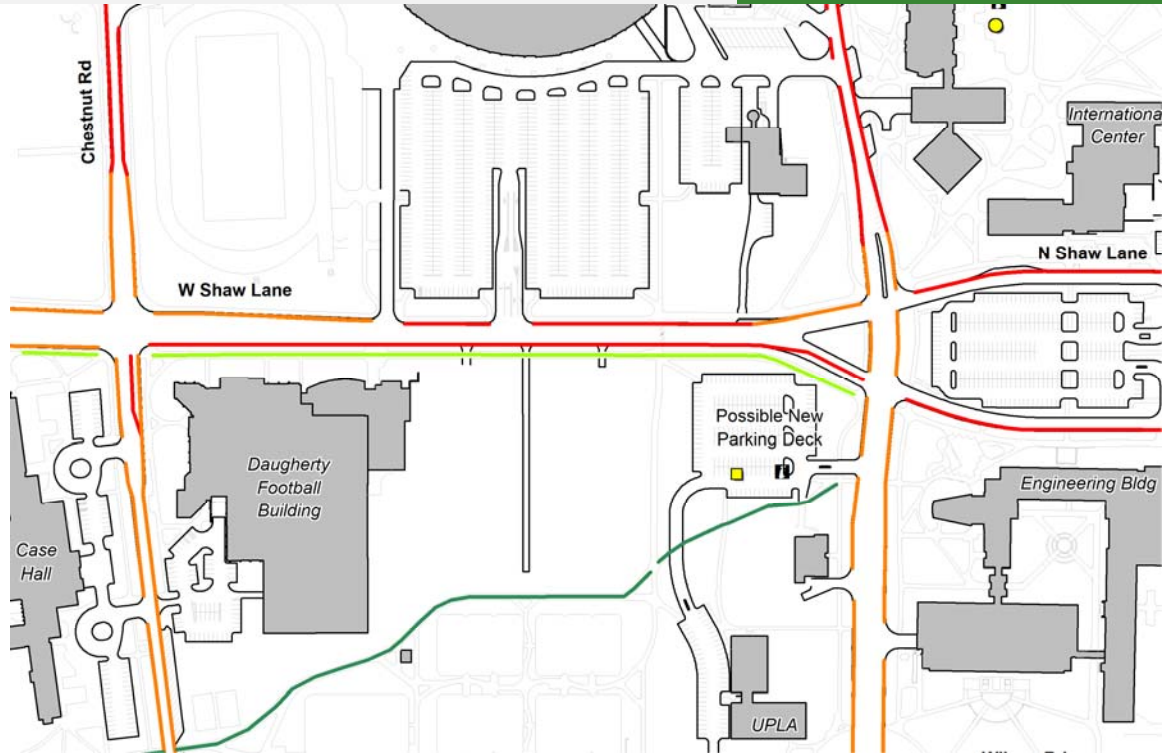


WEST SHAW LANE OVERVIEW

Three options exist for the segment of Shaw Lane between Chestnut and Red Cedar Roads:

1. Option one converts the four existing travel lanes to three and incorporates east- and west-bound bike lanes in the road.
2. Option two maintains the four travel lanes, reduces them to ten-feet wide, incorporates a west-bound bike lane and maintains the existing shared-use path for east-bound bikes and pedestrians.
3. Option three reduces the four travel lanes to a nine-foot width and incorporates both east- and west-bound bike lanes in the road by moving the northern curb line three feet to the north.




All options will require future traffic studies and coordination with campus-wide long-range road system plans.



Signs:

 Proposed Information Kiosk

Bicycle Parking:

-  Bike Station
-  Bike Cages
-  Covered Bike Parking

Bike Paths:

-  Existing
-  Proposed

Shared-use Paths:

-  Existing
-  Proposed

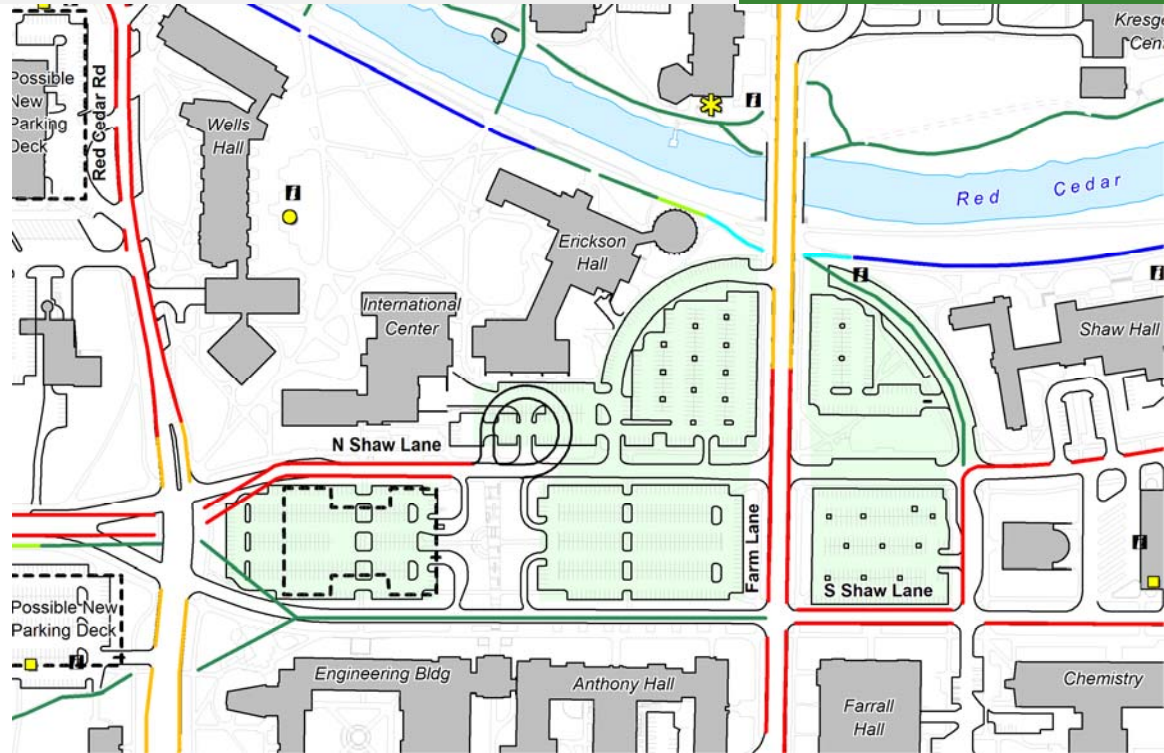
On Road Bike Lanes:

-  Existing
-  Proposed

NORTH AND SOUTH SHAW LANE – ALTERNATE ONE

Key Elements:

- Alternate B assumes North and South Shaw are closed to through traffic as per the Campus 2020 Master Plan.
- Bicycle and pedestrian traffic are directed towards the signals at Red Cedar River bridge and South Shaw Lane.
- A proposed bike path follows the route of South Shaw Lane



Signs:

i Proposed Information Kiosk

Bicycle Parking:

***** Bike Station

■ Bike Cages

● Covered Bike Parking

Bike Paths:

— Existing

— Proposed

Shared-use Paths:

— Existing

— Proposed

On Road Bike Lanes:

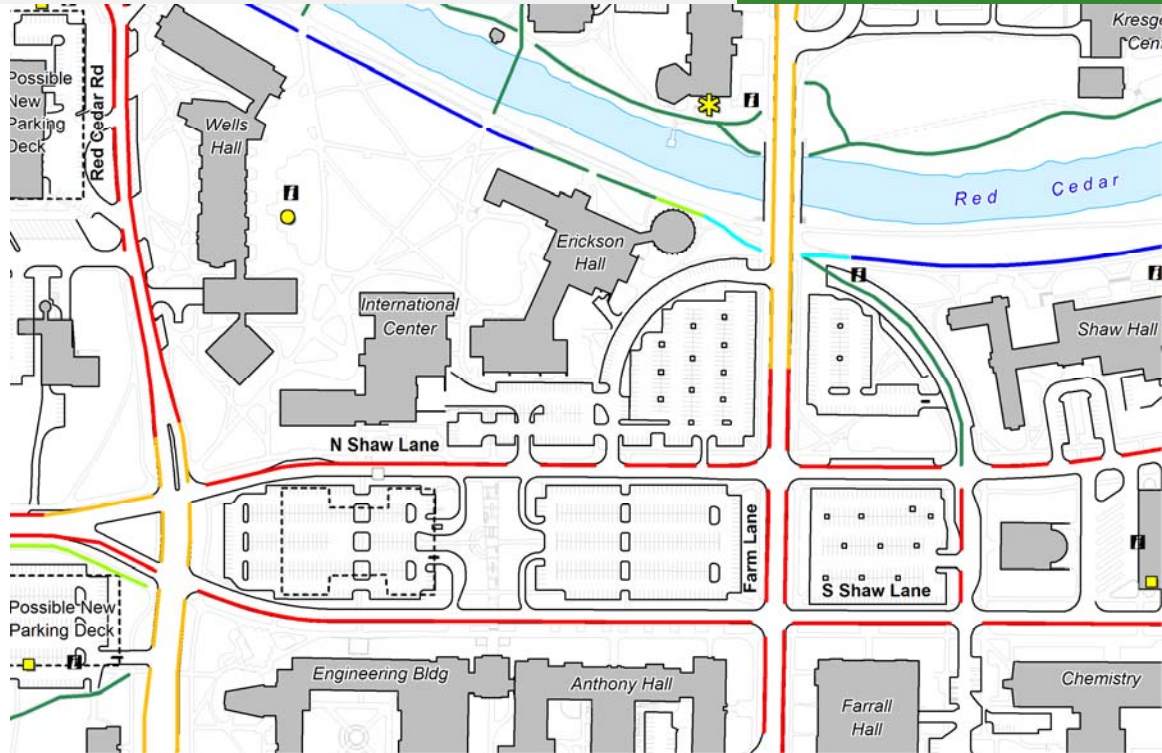
— Existing

— Proposed

NORTH AND SOUTH SHAW LANE – ALTERNATE TWO

Key Elements:

- The plan assumes North and South Shaw remain open to traffic.
- Bike lanes are added to North and South Shaw Lane by narrowing existing motor vehicle lanes.
- North and South Shaw Lanes may be kept at two through lanes or one through lane with designated left turn lanes into the parking lot (see sketch below).



Signs:

- i** Proposed Information Kiosk

Bicycle Parking:

- * Bike Station
- Bike Cages
- Covered Bike Parking

Bike Paths:

- Existing (Cyan line)
- Proposed (Blue line)

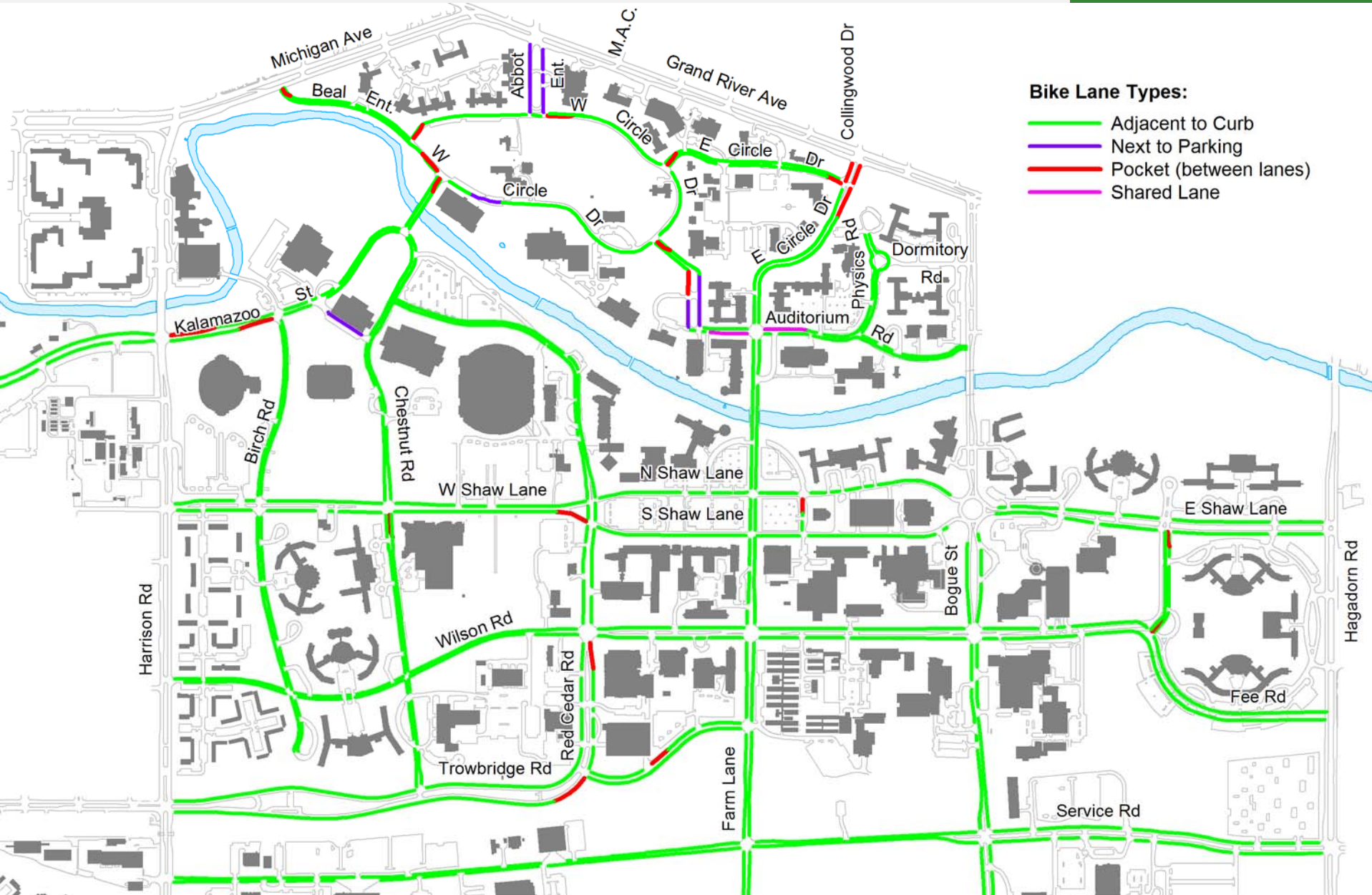
Shared-use Paths:

- Existing (Light Green line)
- Proposed (Dark Green line)

On Road Bike Lanes:

- Existing (Orange line)
- Proposed (Red line)

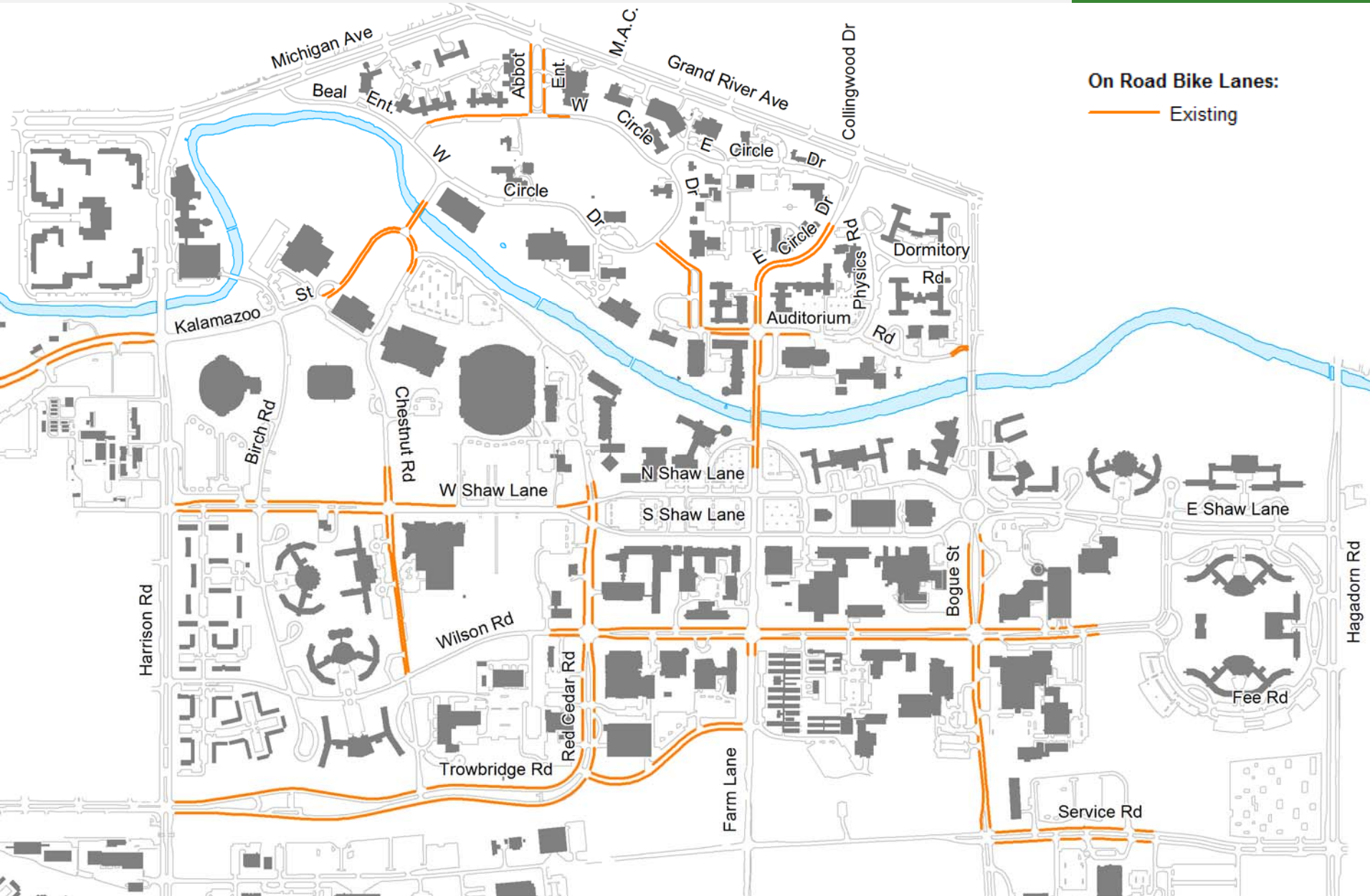
BIKE LANES BY TYPE



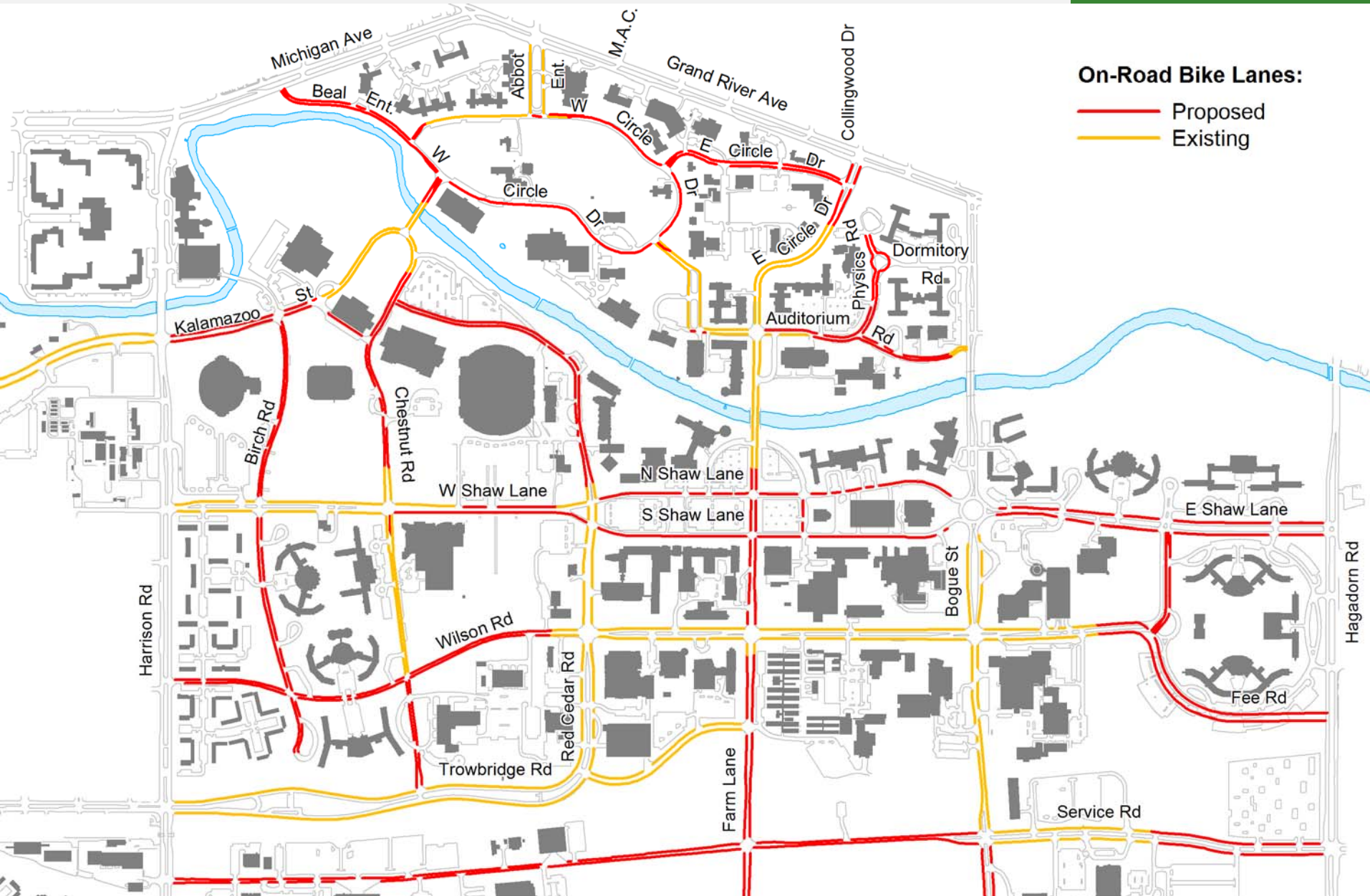
MSU Bicycle Facilities Plan: Existing Conditions & Proposed Construction Program

- ❖ Existing Bike Lanes
- ❖ Road Reconstruction Program
- ❖ Proposed Road Modifications

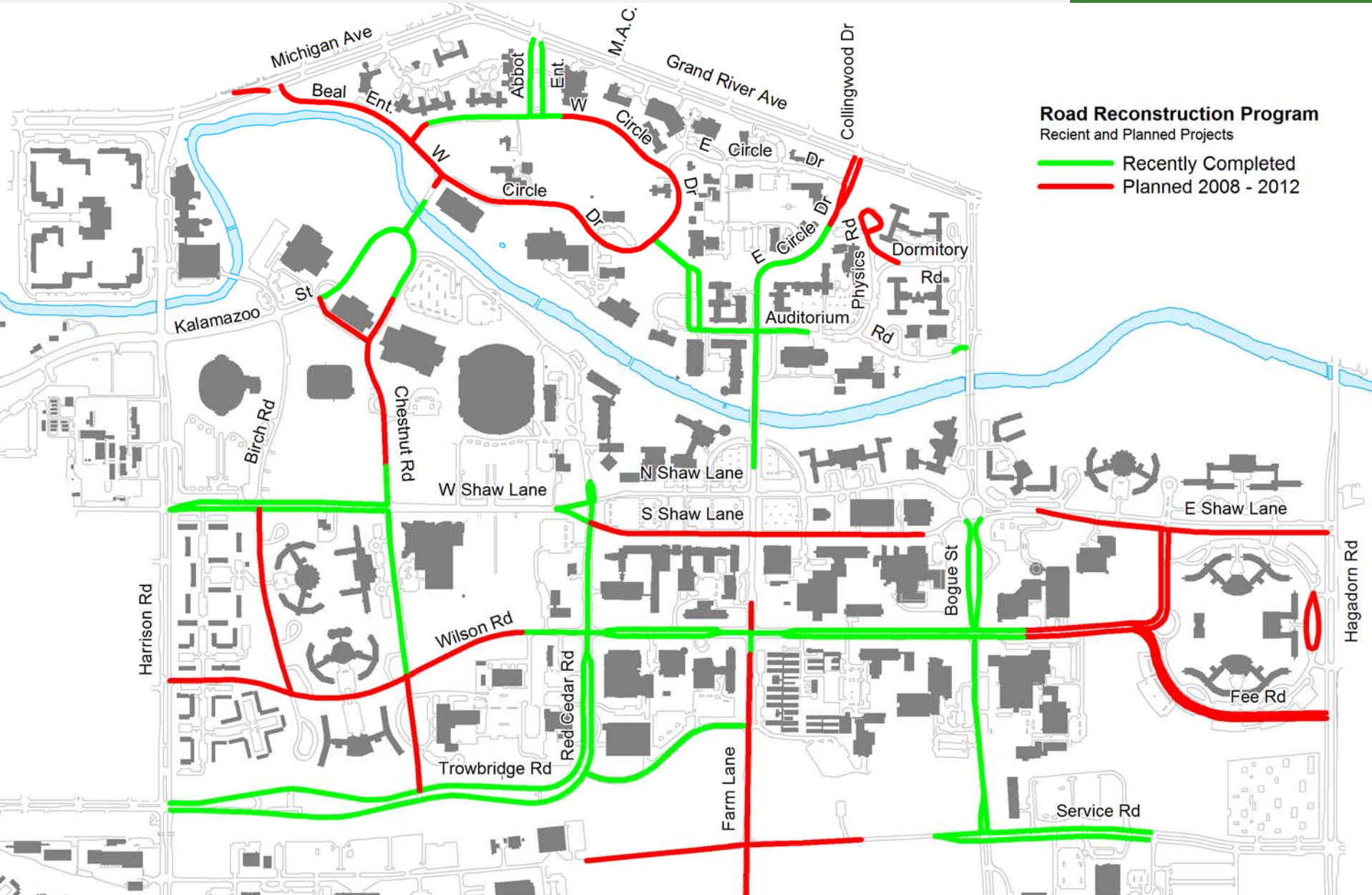
EXISTING BIKE LANES



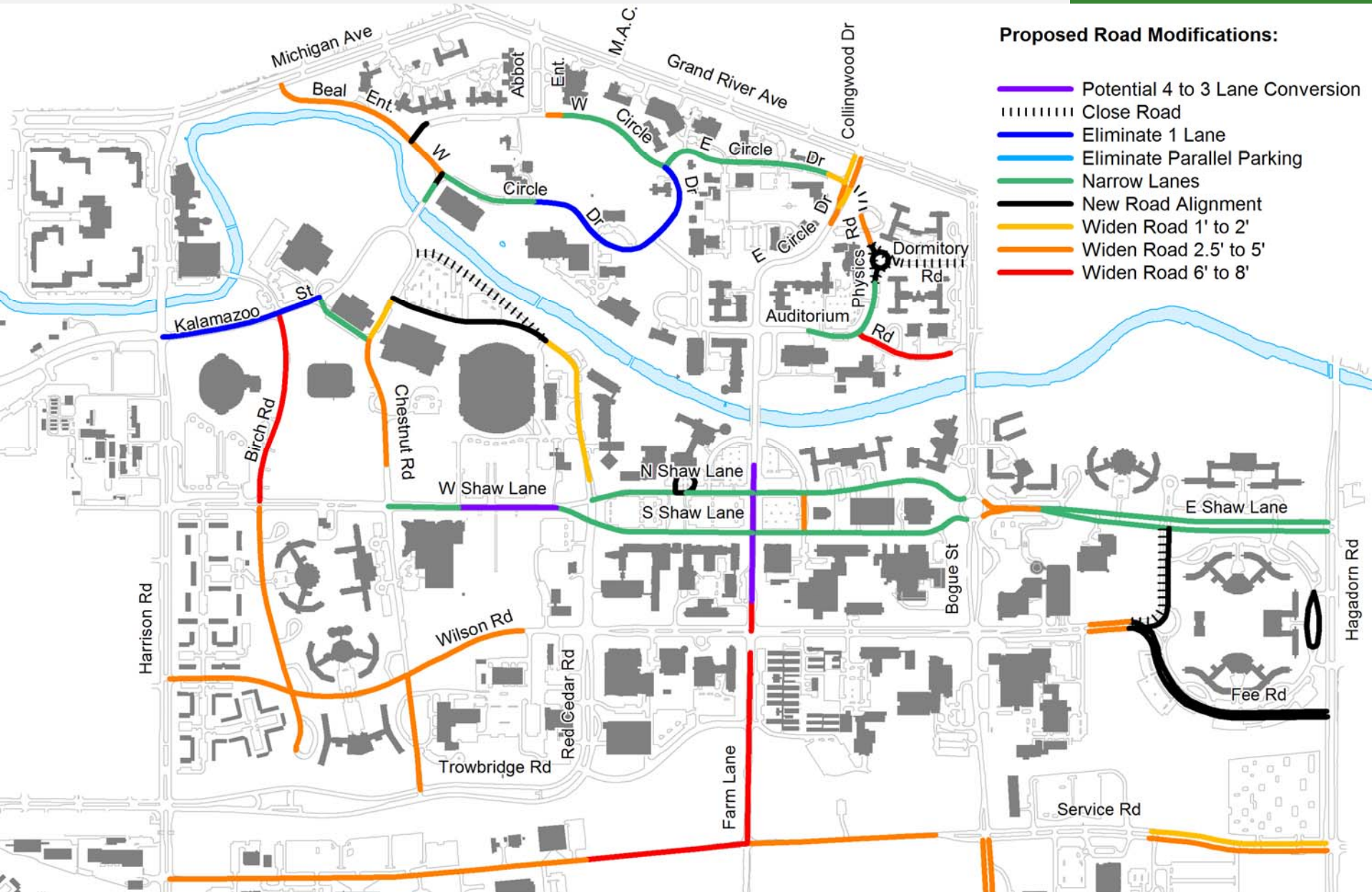
EXISTING AND PROPOSED BIKE LANES



ROAD RECONSTRUCTION PROGRAM



PROPOSED ROAD MODIFICATIONS



MSU Bicycle Facilities Plan: Recommended Guidelines

- ❖ Bicycle Lanes
- ❖ Bike Lanes at Intersections
- ❖ Bicycle Paths
- ❖ Shared Use Paths
- ❖ Addressing Conflict Areas
- ❖ Orientation Signs
- ❖ Bicycle Parking

RECOMMENDED GUIDELINES

Overview:

- This section is organized into three main headings to describe each set of guidelines.
- **Issues** for each of the plan elements are defined to describe the problems associated with the current condition.
- **Recommendations** are stated to provide guidelines for best practices in accordance with MMUTCD standards and AASHTO guidelines.
- **Applications** state where the guideline can be applied on the MSU campus.



Separate Bicycle and Pedestrian Paths at Bogue Street

Photo Credit: Steve Troost, MSU Campus Planning and Administration

Issues:

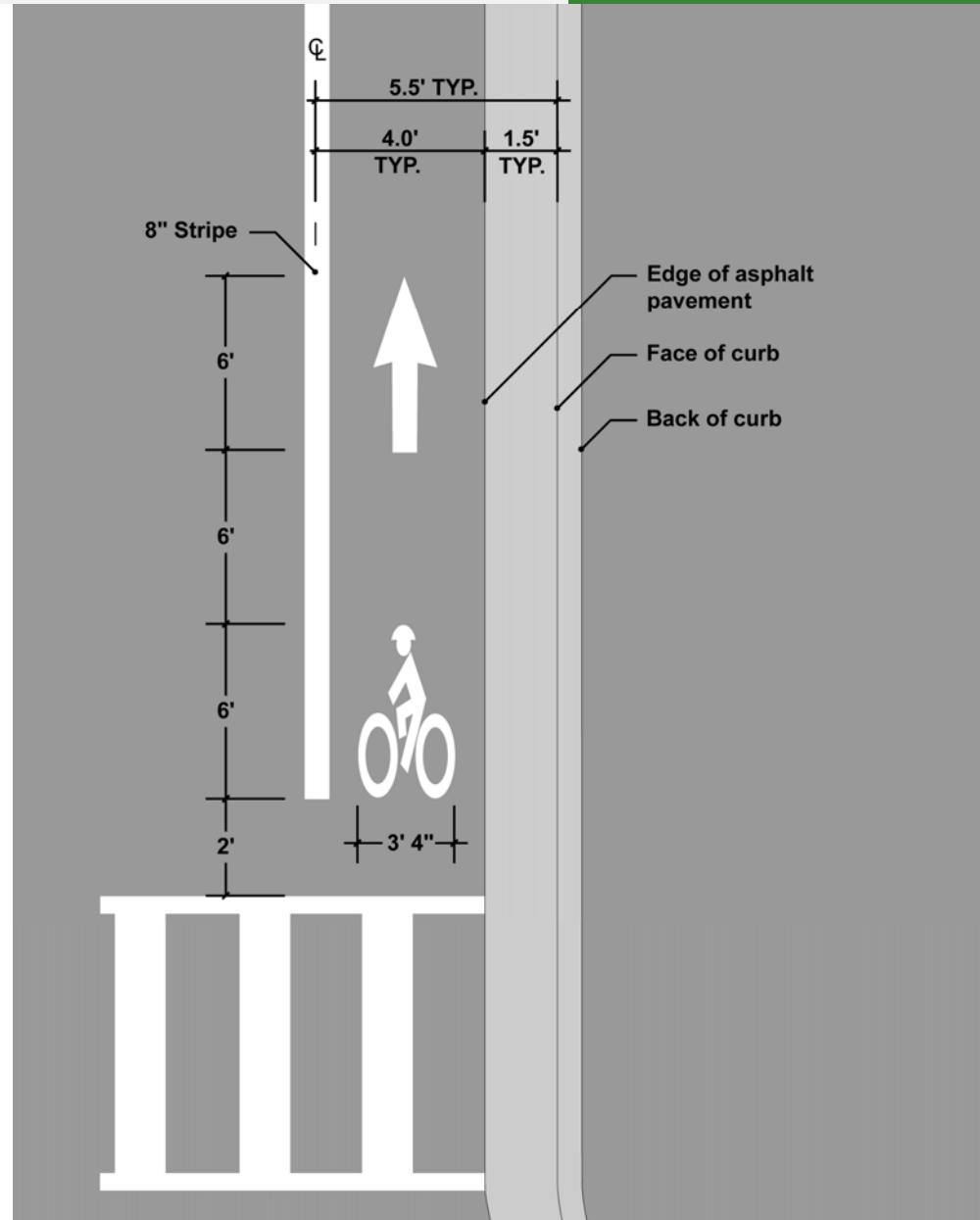
- Need to illustrate the purpose of the lane to all motorists.
- Need to illustrate the correct direction of travel to bicyclists who may be unfamiliar with bicycle lanes.

Recommendations:

- AASHTO guidelines call for a 5' minimum width as measured from the center of the edge stripe to the face of the curb with a 3' minimum riding surface outside of the gutter.
- A 5.5' wide bike lane is recommended for most roads on campus to increase the comfort level of novice bicyclists. With MSU's typical 1.5' wide gutter, this results in a 4' wide asphalt riding surface.
- Where the ADT volumes are over 15,000 in the adjacent lane, a 6' wide lane is recommended.
- Use an 8" wide white edge stripe to increase bike lane visibility.

Application:

- Bicycle lanes should be incorporated on most roads with over 2,500 ADT.
- Bike symbol and arrow pavement markings should be used at every intersection.



BICYCLE LANE NEXT TO PARKING GUIDELINES

Issue:

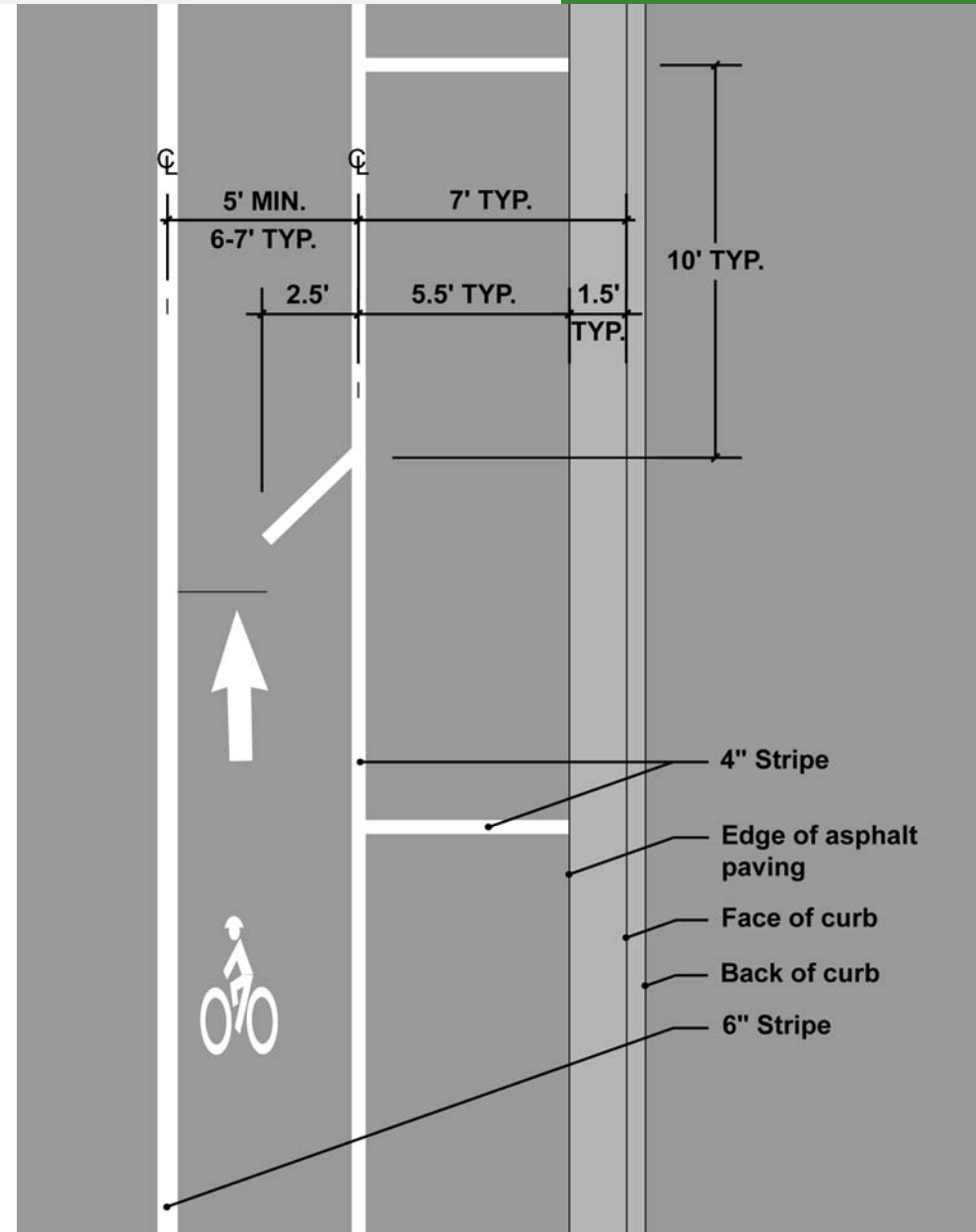
- Opening car doors are a hazard for bicyclists who ride close to parked vehicles – want to encourage bicyclists to ride outside the “door zone”
- Bike lanes are still beneficial even when next to parallel parking.

Recommendations:

- Stripe outside edge of parking to encourage parking close to curb.
- Provide 6' to 7' wide bike lane where room permits.
- A 5' wide bike lane may be used where space is constrained and parking and travel lanes are at minimum widths.
- Cross hatch the “door zone” with pavement markings and place bicycle symbol and arrow to the outside of the bicycle lane to encourage safe bicycling lane position.
- Include information on bicycling next to parked cars in campus bicycle safety information materials.

Application:

- On all roads with bicycle lanes and on-street parallel parking.
- The Cross hatch in the “door zone” is NOT a standard marking included in MMUTCD. To utilize this marking MSU needs to request from FHWA permission to conduct an experiment with this marking. More information on the experimentation process can be found in Section 1A.10 of MMUTCD.



Issue:

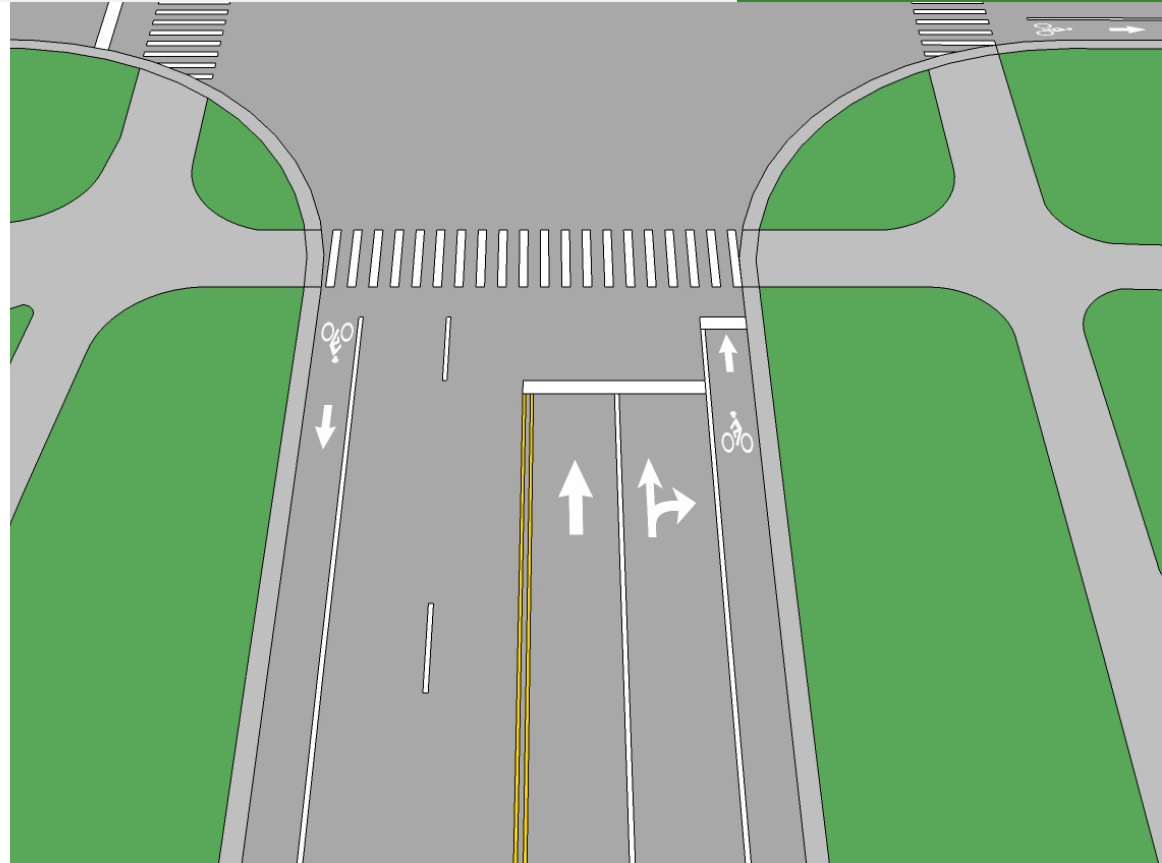
- Right turning vehicles conflict with bicycles proceeding straight through an intersection.

Recommendation:

- Advance the stop bar of the bicycle lane 6' so that the bicyclist is more visible to right turning vehicles.

Application:

- Advanced bike lane stop bars are recommended for controlled intersections with bike lanes that do not have a designated right-turn lane.
- This application should only be used where there are low volumes of right- turning vehicles. Consider using a designated right-turn lane with a pocket bike lane with higher right-turn volumes to reduce conflicts between bicyclists and right-turning vehicles.



Notes:

The illustration above shows how an advance stop bar may be incorporated into a typical intersection.

Issues:

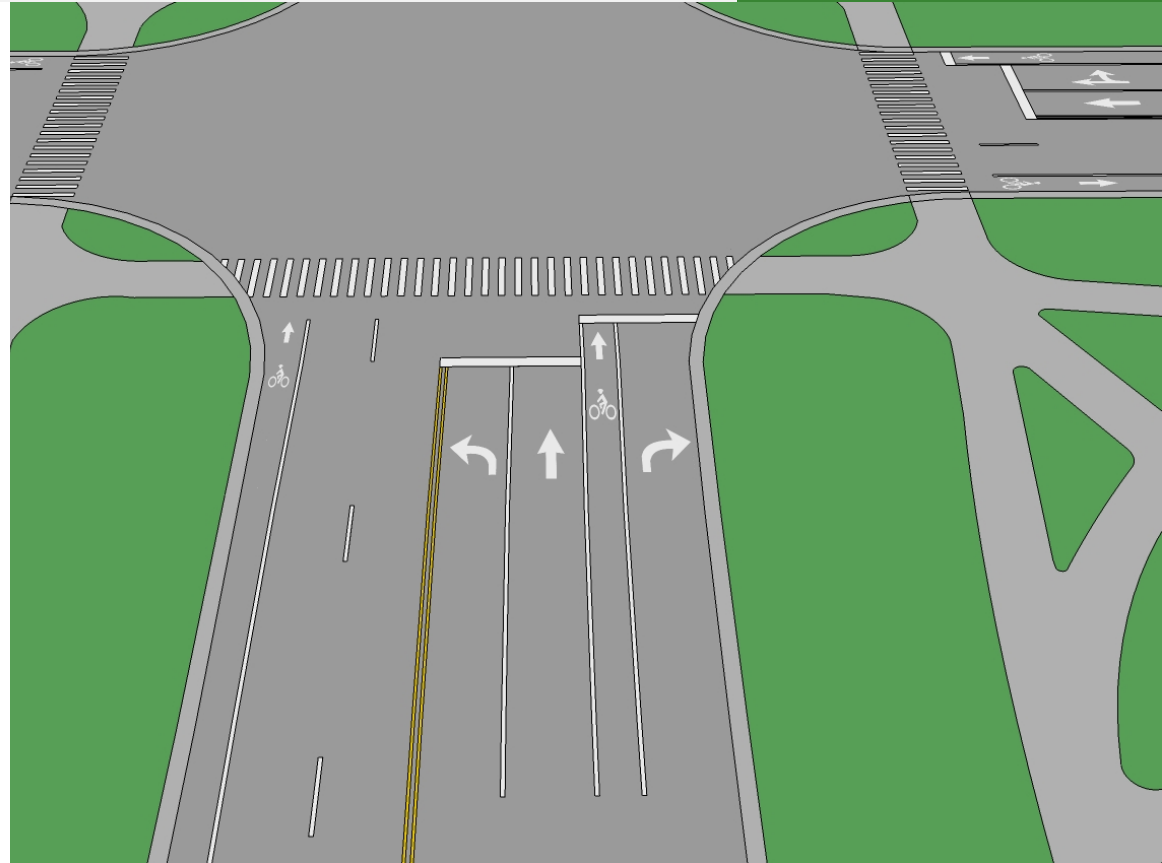
- Right-on-red turning vehicles often advance beyond other stopped vehicles to improve their view of traffic and block the crosswalk.

Recommendations:

- A through bike lane must be placed to the left of a right turn only lane.
- Advance the stop bar for the right turn only lane and the bicycle lane.

Application:

- A pocket bike lane is recommended for all signalized intersections with designated right-turn lanes.
- Given the inherent conflict between right-turning vehicles and straight through bicyclists, designed right turn lanes should be considered for intersections with fewer right-turning vehicles then would typically be seen warranting a right-turn lane.



Notes:

The illustration above shows how a pocket bike lane may be incorporated into a typical intersection with a designated right turn lane.

Issues:

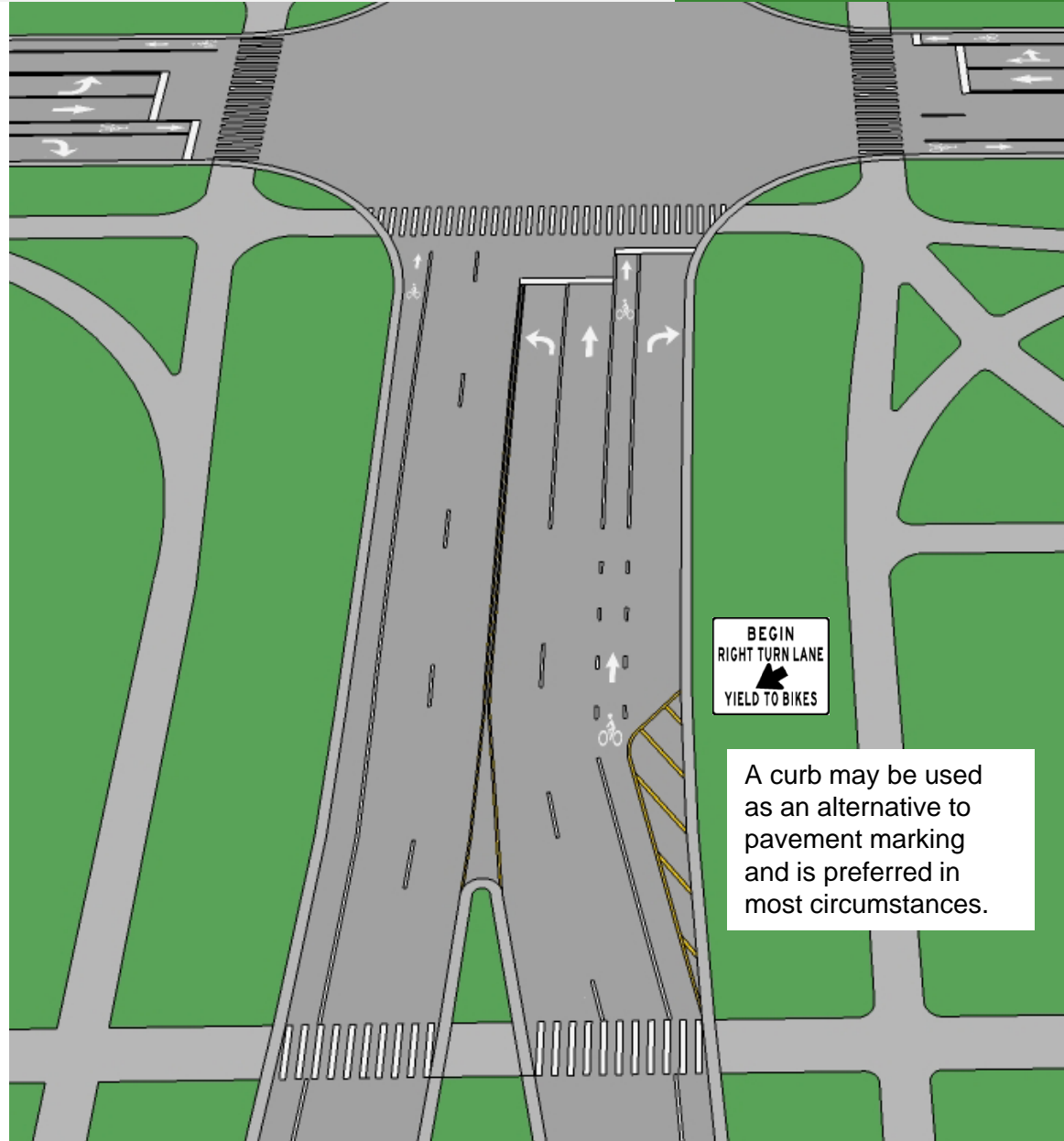
- When utilizing a pocket bike lane, right turning vehicles and through bicyclists must change positions prior to the intersection.
- State law requires that motorists must yield to bicyclists.

Recommendations:

- Motorists are required to make a deliberate turning movement to cross the bicycle lane rather than having proceed straight across a bicycle lane into a turning lane.
- Dash bike lane pavement marking across transition zone.

Application:

- This pocket lane transition guideline is recommended for all intersections with designated right-turn lanes.
- The illustration to the right shows how the transition to the pocket bike lane on Red Cedar should be handled at the Wilson Road intersection.



A curb may be used as an alternative to pavement marking and is preferred in most circumstances.

Issues:

- At some intersections there is limited room for designated straight or turn bicycle lanes.
- Bicyclists should be encouraged to use the correct lanes (left turn, straight, or right turn) so their movements are not in conflict with motorists.

Recommendations:

- Dash in bike lane within existing designated straight or turn lanes.

Application:

- Shared turn lanes are applicable at all intersections with designated right-turn lanes where designed straight through bike lane is not feasible.
- Shared turn lanes may also be used for selected left-turn lanes as well.
- The shared turn lane is NOT a standard marking included in MMUTCD. To utilize this marking MSU needs to request from FHWA permission to conduct an experiment with this marking. More information on the experimentation process can be found in Section 1A.10 of MMUTCD.



Notes:

The illustration above shows the Auditorium and Farm Lane intersection with suggested pavement marking modifications.

BIKE LANES AT ROUNDABOUT GUIDELINES

Issues:

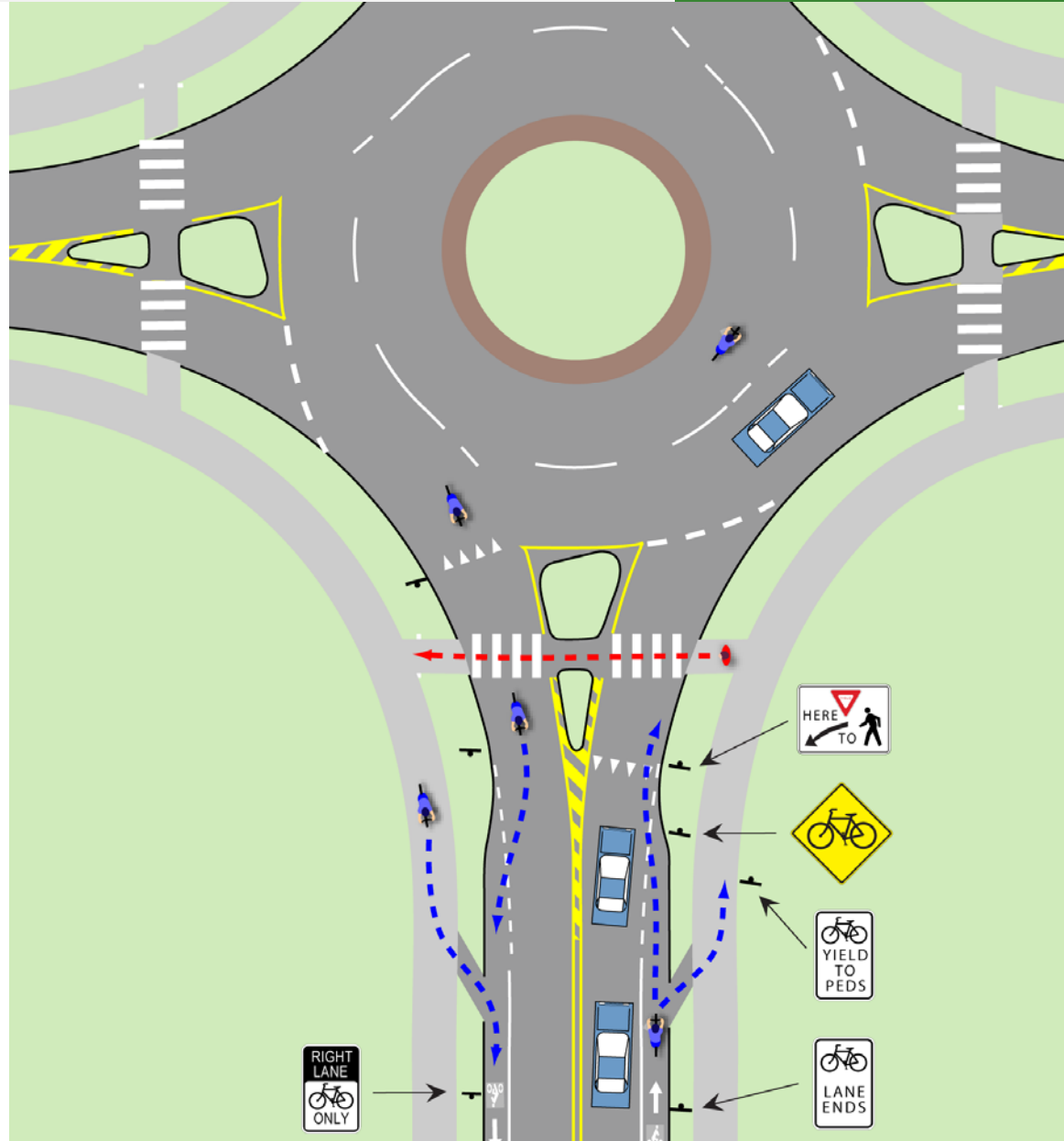
- Some bicyclists feel comfortable mixing with traffic in a roundabout, while others do not.
- If cyclists choose to leave the roadway their use of the sidewalk creates conflicts with pedestrians.

Recommendations:

- Allow on or off-road choices for cyclists.
- Dash end of bike lanes and add bike warning signs for bicyclists who choose to bicycle through the roundabout.
- For bicyclists who exit the roundabout, utilize signage that requires bicyclists to yield to pedestrians on sidewalk.

Application:

- This recommendation can be used for all roundabouts and traffic circles.



SHARED-USE PATH GUIDELINES

Issues:

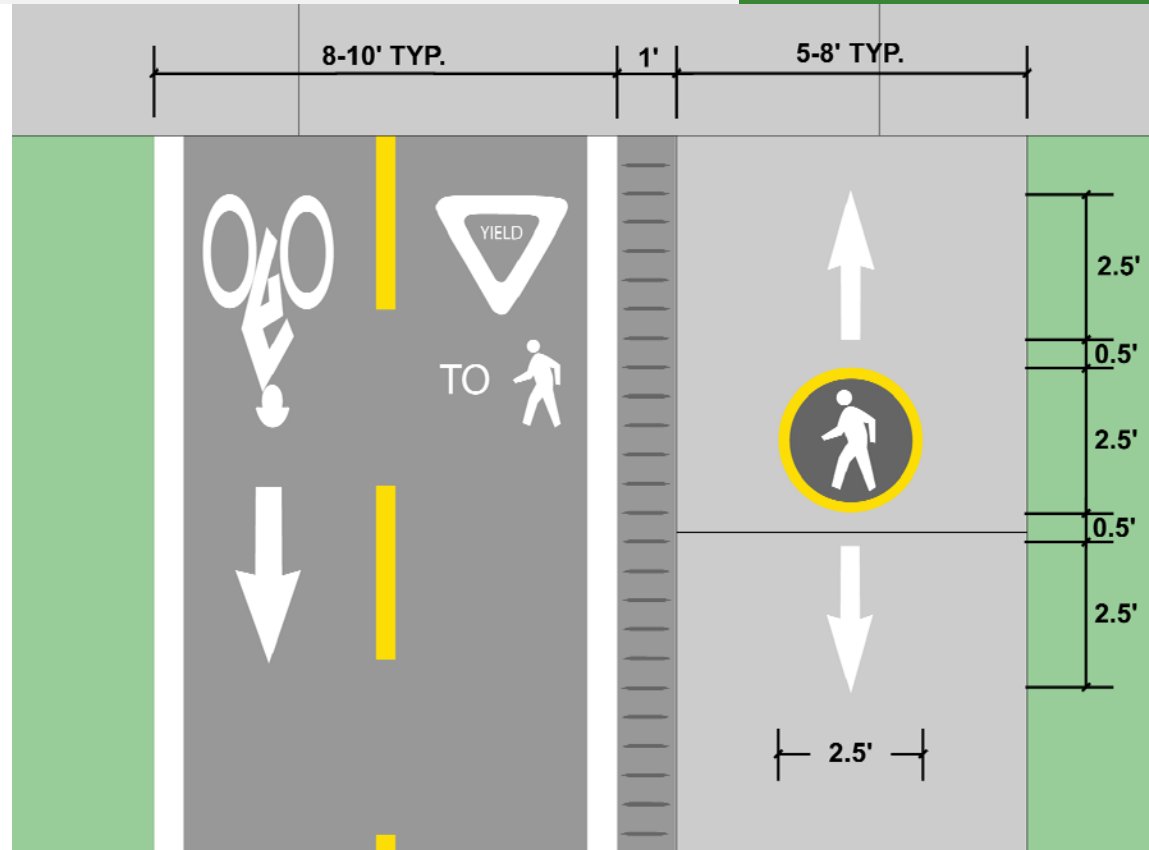
- High speed bicyclists and pedestrians sharing the same pathway have the potential for serious injury crashes unless separated.
- For pedestrians with vision impairments bicycle and pedestrian portions of a pathway should be delineated by strongly contrasting colors and a tactile surface.
- There are off-road corridors on campus with substantial bicycle and pedestrian travel without sufficient room for separate pathways.

Recommendations:

- A 12' to 18' wide shared-use pathway with an 8' to 10' wide asphalt bikeway immediately adjacent to a 5' to 8' wide concrete walkway.
- Provide detectable warning between pathways through textured thermoplastic and/or imprinted asphalt (mini rumble strip).
- The bicycle portion of the pathway should be marked the same as the bicycle path (see previous page).

Application:

- Shared-use paths are recommended for high demand corridors away from roadways where space does not allow for a separate bicycle path.



Note:

There are no current standards or guidelines for a detectable warning strip between the pedestrian walkway and the bikeway. This strip should be unique from the standard detectable warnings used at the base of sidewalk ramps. However, the detectable warning should not be so roughly textured as to cause a bicyclists to loose control of their bicycle if they were to ride on the surface or to create a tripping hazard for pedestrians. It may be prudent to experiment with a variety of treatments working in conjunction with MSU's Resource Center for Persons with Disabilities.

Issues:

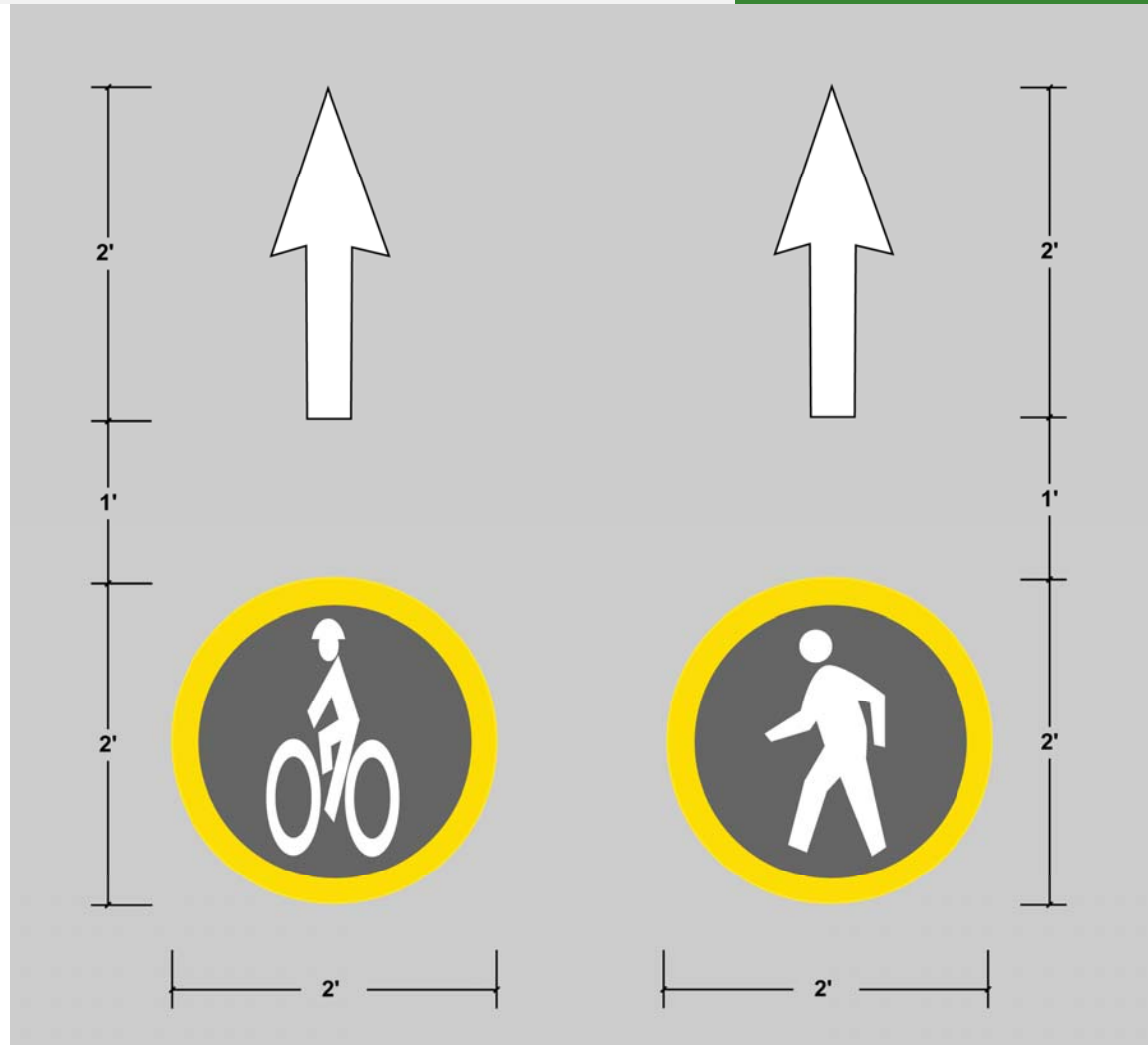
- There will be areas where bicycles and pedestrians can not be separated into distinct pathways due to space limitations such as on bridges or narrow paths.

Recommendations:

- Provide general guidance on the preferred flow of pathway or bridge users through pavement markings.
- Use standard symbols with a dark background and highlighted edge to provide high contrast markings on light colored concrete.

Application:

- This guideline is applicable on existing facilities where lane demarcations are not practical or feasible, which are typically concrete pavements.
- These markings may also be used on asphalt pavement. In such cases the dark backgrounds may be omitted.



For the pedestrian icon, two arrows may be used pointing in opposite directions to indicate a pedestrian only path. See application on next page for example. For the bicycle icon, only one directional arrow should be used.

Issue:

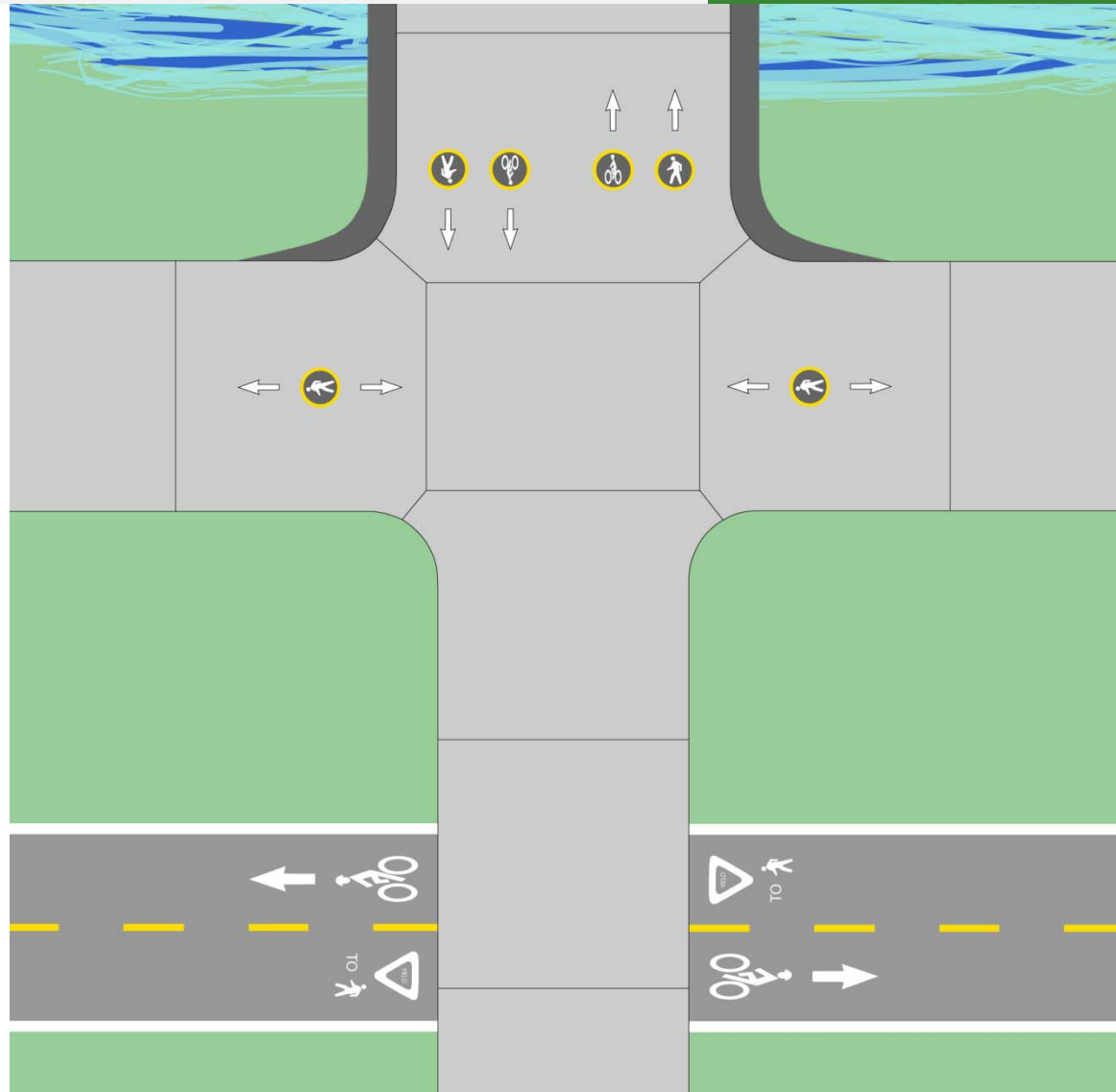
- The intersection of bridges, pedestrian pathways and bicycle paths will result in mixing of pedestrians and bicyclists.
- Bridge railings may be lower than desired for adjacent bicycle use.

Recommendation:

- Use icons to direct bicyclists toward center of the bridge to distance themselves from low bridge railings and pedestrians viewing river.
- Indicate to bicyclists leaving the pathway that they must yield to pedestrians.
- For new construction special pavement such as a textured concrete may be used to highlight the conflict area.

Application:

- Pedestrian icon may be used to indicate pedestrian only use of particular walkway adjacent to bike paths.
- Pedestrian icon is also applicable where bridges are too narrow for lane delineation.



Issues:

- There is a need to provide visitors, new faculty, staff and students with orientation.
- There is also a need to show how campus bicycle system links into surrounding communities.

Recommendation:

- Provide orientation signs at key bicycle facility junctures and adjacent to key bicycle parking facilities.
- Create a format that may be changed quickly and inexpensively as facilities will change rapidly over the next five years.

Application:

- Throughout campus.



University of Wisconsin, Madison Wisconsin

The information kiosk should use the same graphic as the bicycle facilities map distributed to students. It also includes an inset map of the surrounding areas.

Issue:

- There is a desire to park as close to a destination as possible.

Recommendations:

- Continue to provide inverted “U” bike parking at dispersed locations adjacent to building entrances.
- The bike parking is generally uncovered but covered is desirable especially where large concentration or high demand makes it more practical or desirable.
- Coordinate location with bike lanes, bike paths and shared-use paths.

Application:

- Throughout campus.



Issues:

- Items such as lights, bags, seats and front wheels are often stolen from locked bicycles
- Some bicyclists are willing to pay a premium for better and more secure parking

Recommendations:

- Maximize space via racks and hanging
- Provide on a first-come, first served basis
- Restrict access via a personal access code or card.
- Additional security may be provided through video surveillance

Application:

- Existing and proposed parking decks.



Photo Credit: Ann Forsyth, used with permission via University of Minnesota's Metropolitan Design Center

A bike cage in Almere, Netherlands.

COVERED BIKE PARKING GUIDELINES

Issues:

- Bicycles stored outside during the winter often rust and are abandoned in the spring.

Recommendations:

- Provided covered bike parking at key locations throughout campus.
- A variety of covered bike parking configurations may be utilized.
- Ideal if combined with secured bicycle storage.

Application:

- Adjacent to residence halls.



Photo Credit: Ann Forsyth, used with permission via University of Minnesota's Metropolitan Design Center

Covered bike parking in Almere, Netherlands.



Issue:

- Bicycle commuters desire secure, covered parking.

Recommendations:

- Provide bike lockers for faculty, staff and student bicycle commuters.
- Lockers may be rented by the year where the renter has a key. Typical rental rates are between \$60 and \$100 a year.
- Alternatively on-demand bike lockers may be provided using a debit card such as the Bike Link system.
- Lockers should be grouped wherever possible.
- Locate lockers in covered locations wherever possible.

Application:

- Locate adjacent to buildings based on surveys of students, faculty and staff.



Ann Arbor, Michigan

An interior diagonal divider and doors on both ends permit two bikes per box. This box is located under the overhang of a parking deck.

Issues:

- Without access to convenient bicycle maintenance, bicycles in poor repair are left unused or abandoned.
- Long distance bicycle commuters prefer to shower and change clothes at their destination.
- Visitors, students, faculty and staff may have a need for long or short term rental of a bicycle.

Recommendations:

- Provide a staffed centralized bike station that provides bike repair, bike rental, showers and lockers. This may involve relocating the existing MSU Bikes' facility adjacent to one of the central intramural buildings.
- Coordinate the location with major transit routes.
- Fees may be on a one-time use basis or on a membership basis.

Application:

- Centralized location for main facility.
- Expand MSU Bikes' satellite repair shops in dormitories.



New Bike Station Chicago, Illinois

Bike stations are growing in popularity around the country and overseas. Typically the most expensive aspect is providing showers and lockers. By building adjacent to an existing intramural facility a bike station could be constructed rather economically.

MSU Bicycle Facilities Plan: Appendix

- ❖ Why Bike Lanes
- ❖ Bicycle Facility Examples:
 - Bike Lanes Next to Parking Examples
 - Bicycle Path Examples
 - Shared Use Path Examples
 - Addressing Conflict Area Examples
 - Covered Bicycle Parking Examples
- ❖ Bike Shed with Lockers Guidelines
- ❖ Contra-flow Bike Lane Guideline

Key Issues:

- Motorists are not looking for bicyclists on sidewalks. This is especially true when bicyclists are traveling opposite of the flow of traffic.
- The majority of bicycle crashes occur when motorists hit a sidewalk bicyclist crossing an intersecting driveway or street.
- Bicycles are vehicles and need to be treated as such. Their typical speeds range from 8 to 20 MPH and require time and distance to stop.
- Pedestrian safety and comfort is compromised by bicyclists using the sidewalk.
- Bicycling on the sidewalk is generally slower than bicycling on the roadway. This is due to:
 - the presence of pedestrians, and
 - motorists that block the sidewalk or crosswalk.
- Bicycle lanes are successful because they place bicycles in the field of vision of motorists.



The photograph above illustrates how a bicyclist riding on a sidewalk, opposite the flow of traffic, is outside the field of vision of a motorist turning right from an intersecting roadway. Also, the photograph illustrates how a motorist, who pulls forward past the stop bar to look for a gap in traffic, often blocks a crosswalk.

Bike lanes are the current best practice for almost all scenarios to reduce the number of crashes involving motorists and bicyclists.

BICYCLE LANES NEXT TO PARKING EXAMPLES

Key Issues:

- AASHO guidelines call for a 5' minimum bike lane width when next to parallel parking.
- Opening car doors present a hazard to cyclists who ride too close to parked cars.
- While bicycle lanes next to parallel parking is not ideal, it can work.
- Encourage cars to park as close to curb as possible by minimizing the width of pavement markings.
- Educate cyclists to ride outside of the "door zone."



Downtown Cambridge, Massachusetts



In this example in Chicago, IL there is a potential conflict between bicyclists and car doors. Chicago however, experienced improved bicycle safety over no bike lanes even with 5' wide bike lanes.

Issues:

- There are potential conflicts between bicycles going opposite directions.
- Adequate space is necessary to operate a bicycle.
- It is necessary to make a distinction between a bicycle-only path and a typical walkway or pathway.
- Obstructions such as signs, trees and lighting should be set back at least 2' from the edge of the pathway.
- Pavement markings should be used to delineate directional lanes.



University of Wisconsin - Madison, Wisconsin

A bicycle path parallel to pedestrian path separated by a landscape zone. Both paths are constructed of asphalt.

SHARED-USE PATH EXAMPLE

Issues:

- There is potential for conflicts between bicyclists and pedestrians.
- Adequate space is necessary to operate a bicycle.
- Pedestrians with vision impairments should be able to detect the edge of pedestrian path.



Photo Credit: Kevin Krizek, used with permission via University of Minnesota's Metropolitan Design Center

Minneapolis, Minnesota

A shared-use path with a typical pavement marking scenario. Note that only a white edge stripe is used to delineate the bicycle portion of the path from the pedestrian portion.

Issues

- There will be areas where separation of pedestrians and bicyclists is impractical for a variety of reasons
- Pedestrians should typically have the right-of-way to bicyclists



A recently completed path intersection in Victoria, British Columbia, Canada.

Where multiple paths intersect a special pavement is introduced in an attempt to convey without signage that no one path has ROW and that this condition is different than the one previous.

COVERED BIKE PARKING EXAMPLE

Issues:

- Taller structures obstruct views of campus
- Items may still be stolen from locked bicycles
- Potential green roof application
- Higher security may be provided via video surveillance



Photo Credit: Ann Forsyth, used with permission via University of Minnesota's Metropolitan Design Center

Covered bike parking with a green roof in Hammarby Sjöstad, Stockholm, Sweden.

BIKE SHED WITH LOCKERS GUIDELINES

Recommendation:

- Low profile bike sheds with a green roof.
- Chain link fenced single bike compartments .
- Door locks with individuals own lock – U Lock compatible.
- Sides constructed of materials complementing adjacent structures and landscape.

Application:

- Place in centralized locations near residence halls and remote parking lots.
- Older residence halls without bike rooms should be a first priority.



The proposed bike shed is a low profile structure so as to not disrupt views of buildings and the landscape. The Bike Shed has a green roof to further minimize its visual impact as well as to reduce impervious surfaces.

The bike shed may be constructed in many configurations. The sheds may be constructed back to back or in any length.

As the bike sheds will be premium parking locations, their cost may be off-set by a special yearly permit that must be clearly visible when parked in the shed. Violators may be easily impounded on site.

CONTRA-FLOW BIKE LANE GUIDELINES

Issue:

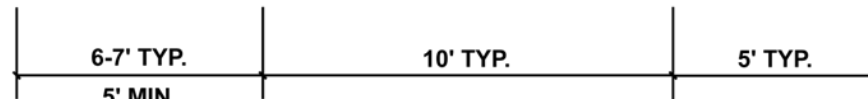
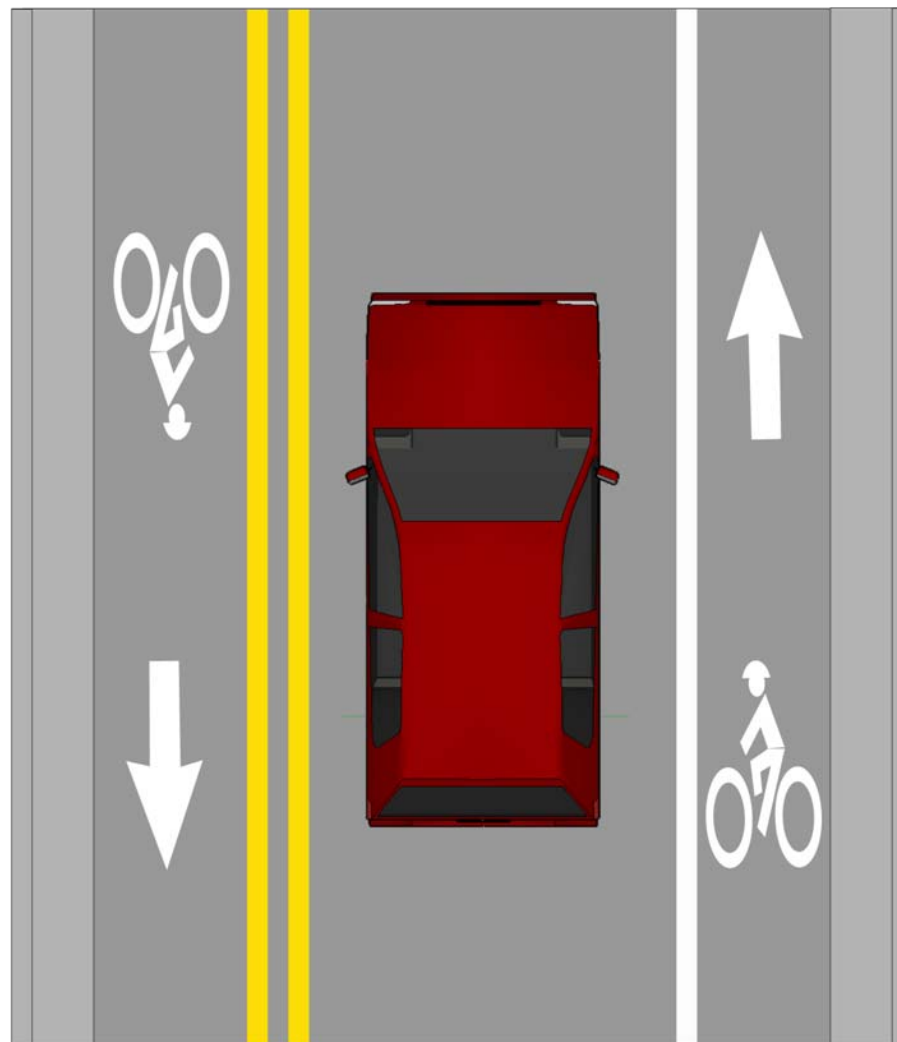
- One-way streets may cause bicyclists significant out-of-direction travel thus discouraging bicycle use and/or encouraging sidewalk riding or wrong-way travel on roadways.

Recommendation:

- Permit two-way travel for bicyclists using standard lane markings while restricting motorized travel to one direction.

Application:

- Use where practical to minimize the use of bike paths and shared-use paths parallel to roadway.
- Do not use a contra-flow bike lane adjacent to on-street angle or parallel parking.
- Use in conjunction with a standard bike lane where it is possible to minimize bicyclists using incorrect bike lane.
- Ideal use are on one-way streets with few intersecting streets or driveways.



MSU Bicycle Facilities Plan: Questions or Comments

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