APPENDIX

Mobility Design Framework for Active Effingham

The purpose and intent of this design framework is to support future updates of the Effingham County design standards and zoning code through further development of context-sensitive design standards and guidelines for multimodal facilities according to the County's vision for a connected, safe, and equitable multimodal transportation system. The **Georgia Department of Transportation's (GDOT) Road and Street Design for Pedestrians**, the **GDOT Design Policy Manual[1],** and the **AASHTO "A Policy on Geometric Design of Highways and Streets, 'Green Book'"** should serve as guides for statewide and federal design guidance for active mobility facilities and features.

Design standards have been recommended based on the roadway functional class, improvement type, and intended corridor use. Functional classification may change over time as the corridor area evolves or improvements are made to the corridor.

The basic roadway functional classes are:

- Arterials: intended for high-volume, rapid, long-distance travel, connecting large urban areas and serving as major traffic corridors.
- Collectors: collect traffic from local streets and feed it into arterials; provide shorter distance mobility.
- Local Roads: primarily provide access to neighborhoods and developments; some of which may be unpaved.

Primary arterials in the county include US 80, SR 119, and SR 21. SR 119 is the primary arterial located in the middle of the county facilitating east-west connectivity between Guyton and Springfield. SR 21 bisects the county, providing north-south connectivity between Springfield and Rincon.

The **Active Effingham Multimodal Mobility Framework Plan** is intended to support the county in evaluating the current zoning code as well as design standards for the future Effingham County as envisioned in the Vision statement for the **Active Effingham Multimodal Mobility Framework Plan**.

This framework is informed by the National Association of City Transportation Officials' (NACTO) standards for designing for "All Users & All Abilities" and "Urban Bikeway Design Guide". These design standards consider all User Groups from those most vulnerable to those least vulnerable.

CONVENTIONAL BIKE LANES

Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and flows in the

[1] https://www.dot.ga.gov/PartnerSmart/DesignManuals/DesignPolicy/GDOT-DPM.pdf

same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge, or parking lane. This facility type may be located on the left side when installed on one-way streets or may be buffered if space permits. See contra-flow bike lanes for a discussion of alternate direction flow.

Bike lanes enable bicyclists to ride at their preferred speed without interference from prevailing traffic conditions. Bike lanes also facilitate predictable behavior and movements between bicyclists and motorists. Bicyclists may leave the bike lane to pass other bicyclists, make left turns, avoid obstacles or debris, and avoid other conflicts with other users of the street.

Conventional Bike Lane Benefits

- Increases bicyclists' comfort and confidence on busy streets.
- Creates separation between bicyclists and automobiles.
- Increases predictability of bicyclist and motorist positioning and interaction.
- Increases total capacities of streets carrying mixed bicycle and motor vehicle traffic.
- Visually reminds motorists of bicyclists' right to the street.

Typical Applications

- Bike lanes are most helpful on streets with ≥ 3,000 motor vehicle average daily traffic.
- Bike lanes are most helpful on streets with a posted speed ≥ 25 mph.
- On streets with high transit vehicle volume.
- On streets with high traffic volume, regular truck traffic, high parking turnover, or speed limit > 35 mph, consider treatments that provide greater separation between bicycles and motor traffic such as:
    - Left-side bike lanes
    - Buffered bike lanes
    - Cycle tracks

The desirable bike lane width adjacent to a curbface is 6 feet. The desirable ridable surface adjacent to a street edge or longitudinal joint is 4 feet, with a minimum width of 3 feet. In cities where illegal parking in bike lanes is an concern, 5 foot wide bike lanes may be preferred.

When placed adjacent to a parking lane, the desirable reach from the curb face to the edge of the bike lane (including the parking lane, bike lane, and optional buffer between them) is 14.5 feet; the absolute minimum reach is 12 feet. A bike lane next to a parking lane shall be at least 5 feet wide, unless there is a marked buffer between them. Wherever possible, minimize parking lane width in favor of increased bike lane width.

Bicycle lane word and/or symbol and arrow markings (MUTCD Figure 9C-3) shall be used to define the bike lane and designate that portion of the street for preferential use by bicyclists.

A solid white lane line marking shall be used to separate motor vehicle travel lanes from the bike lane. Most jurisdictions use a 6 to 8 inch line.

Maintenance

- Lane lines and stencil markings should be maintained to clear and legible standards.
- Bike lanes should be plowed clear of snow by crews.
- Bike lanes should be maintained to be free of potholes, broken glass, and other debris.
- Utility cuts should be back-filled to the same degree of smoothness as the original surface. Take care not to leave ridges or other surface irregularities in the area where bicyclists ride.
- If chip sealing, consider providing new surfacing only to the edge of the bike lane. This results in a smoother surface for bicyclists with less debris. Sweep bike lanes clear of loose chip in the weeks following chip sealing.
- If trenching is to be done in the bike lane, the entire bike lane should be trenched so that there is not an uneven surface or longitudinal joints.

LEFT-SIDE BIKE LANES

Left-side bike lanes are conventional bike lanes placed on the left side of one-way streets or two-way median divided streets.

Left-side bike lanes offer advantages along streets with heavy delivery or transit use, frequent parking turnover on the right side, or other potential conflicts that could be associated with right-side bicycle lanes. The reduced frequency of right-side door openings lowers dooring risk.

Left-Side Bike Lane Benefits

- Avoids potential right-side bike lane conflicts on streets.
- Improves bicyclist visibility by motorists by having the bike lane on the driver's side.
- Provides consistent facility configuration in locations where right-side travel lanes are subject to rush hour parking restrictions and other flexible uses.
- Minimizes door zone conflicts next to parking because of fewer door openings on the passenger side of vehicles.
- Fewer bus and truck conflicts as most bus stops and loading zones are on the right side of the street.

Typical Applications

- On one-way streets or median-divided streets with frequent bus stops or truck-loading zones on the right side of the street.
- On streets with high parking turnover.
- On streets with rush hour parking restrictions.
- On streets with high volumes of right turn movements by motor vehicles.
- On streets with a significant number of left-turning bicyclists.
- On streets where traffic enters into an add lane on the right-hand side, as from a freeway off-ramp.
- For favorable alignment to connect to a path, two-way cycle track, or other bicycle facility.
- Signage should accompany left-side bicycle lanes to clarify proper use by bicyclists and may be effective in reducing wrong-way riding. Modified MUTCD R3 series sign shown.

CYCLE TRACKS

A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. A cycle track is physically separated from motor traffic and distinct from the sidewalk. Cycle tracks have different forms but all share common elements—they provide space that is intended to be exclusively or primarily used for bicycles and are separated from motor vehicle travel lanes, parking lanes, and sidewalks. In situations where on-street parking is allowed cycle tracks are located to the curbside of the parking (in contrast to bike lanes).

Cycle tracks may be one-way or two-way, and may be at street level, at sidewalk level, or at an intermediate level. If at sidewalk level, a curb or median separates them from motor traffic, while different pavement color/texture separates the cycle track from the sidewalk. If at street level, they can be separated from motor traffic by raised medians, on-street parking, or bollards. By separating cyclists from motor traffic and through intersection treatments[2], cycle tracks can offer a higher level of security than bike lanes and are attractive to a wider spectrum of the public.

[2] https://nacto.org/publication/urban-bikeway-design-guide/intersection-treatments/cycle-track-intersection-approach/

One-Way Protected Cycle Tracks

One-way protected cycle tracks[3] are bikeways that are at street level and use a variety of methods for physical protection from passing traffic. A one-way protected cycle track may be combined with a parking lane or other barrier between the cycle track and the motor vehicle travel lane. When a cycle track is elevated above street level it is called a raised cycle track and different design considerations may apply.

One-Way Protected Cycle Track Benefits:

- Dedicates and protects space for bicyclists to improve perceived comfort and safety.
- Eliminates risk and fear of collisions with overtaking vehicles.
- Reduces risk of 'dooring' compared to a bike lane and eliminates the risk of a doored bicyclist being run over by a motor vehicle.
- Prevents double parking, unlike a bike lane.
- Low implementation cost by making use of existing pavement and drainage and by using parking lanes as a barrier.
- More attractive for bicyclists of all levels and ages.

Typical Applications

- Streets with parking lanes.
- Streets on which bike lanes would cause many bicyclists to feel stress because of factors such as multiple lanes, high traffic volumes, high-speed traffic, high demand for double parking, and high parking turnover. While there are no US standards for bicyclist and motor vehicle volumes that warrant cycle tracks, several international documents provide basic guidance (see references below).
- Streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments.
- Along streets with high bicycle volumes.
- Along streets with high motor vehicle volumes and/or speeds.
- Special consideration should be given at transit stops to manage bicycle & pedestrian interactions.

Bicycle lane word, symbol, and/or arrow markings (MUTCD Figure 9C-3) shall be placed at the beginning of a cycle track and at periodic intervals along the facility based on engineering judgment.

[3] https://nacto.org/publication/urban-bikeway-design-guide/cycle-tracks/one-way-protected-cycle-tracks/

If pavement markings are used to separate motor vehicle parking lanes from the preferential bicycle lane, solid white lane line markings shall be used. Diagonal crosshatch markings may be placed in the neutral area for special emphasis. See MUTCD Section 3B.24. Raised medians or other barriers can also provide physical separation to the cycle track.

ADA/PROWAG Considerations

When providing accessible parking spaces alongside cycle tracks, the following general considerations are recommended to accommodate persons with disabilities in the design of one-way and two-way protected cycle tracks. Local parking regulations and roadway context may vary considerably.

- A widened buffer space may be used to accommodate a side mounted vehicle ramp or lift so that it will not protrude into the cycle track and become a hazard to bicyclists. Additional buffer space may be challenging to achieve with limited right-of-way.
- Mid-block curb ramps may be provided near marked accessible parking spaces, or curb ramps may be provided at a consistent interval along the cycle track to provide additional egress points for wheelchair users to gain access to the sidewalk. Mid-block curb ramps may also offset inconveniences in curbside freight delivery crossing the cycle track.
- Roadway cross-slopes should be considered across the cycle track during design as slopes exceeding two percent will create difficulty for bicyclists and some disabled users.
- If a large percentage of Taxi or Paratransit services exist along the cycle track, consider providing periodic loading zones to allow the vehicles to pull out of the travel lane.
- If used, consider the placement of bollards in the buffer area so as not to impede access by disabled users. Individuals with sight impairments may lack familiarity with this roadway configuration. Outreach and education for sight-impaired individuals is advised to ensure that these individuals have a better understanding of changes to the roadway alignment. Select design elements, such as tactile surfaces may help reinforce these measures.

Maintenance

- Cycle tracks should be maintained to be free of potholes, broken glass, and other debris.
- Snow removal and street sweeping may require special equipment. This is the case if the combined width of the cycle track and buffer, or the cycle track width inside of the raised curb is too narrow for existing street maintenance equipment.
- Street sweeping may have to be done more frequently than on streets, especially during the fall, because the lack of the sweeping effect of motor traffic, together with the canyon profile of a cycle track, tends to hold leaves and other debris.

- Snow removal procedures should minimize the creation of snowbanks in the buffer zone because snowmelt flowing across the cycle track can freeze at night, requiring frequent salting to avoid hazardous conditions.
- Snow removal may be simplified by putting the cycle track at sidewalk level or by constructing a raised median between the parking lane and the cycle track. Care should be taken to make physically separated cycle tracks accessible by street maintenance equipment, otherwise, street sweeping and/or snow removal will need to be done with specialized equipment.
    - Consider restricting parking at a regularly scheduled time of the week or day to facilitate snow removal and street cleaning.
    - Bollards or flexible delineators may be removed in winter to provide improved access by snow removal equipment.

If trenching is to be done in the cycle track, the entire facility should be trenched so that there are no uneven surface or latitudinal joints.

TWO-WAY CYCLE TRACKS

Two-way cycle tracks[4] (also known as protected bike lanes, separated bikeways, and on-street bike paths) are physically separated cycle tracks that allow bicycle movement in both directions on one side of the road. Two-way cycle tracks share some of the same design characteristics as one-way tracks but may require additional considerations at driveway and side-street crossings.

A two-way cycle track may be configured as a protected cycle track—at street level with a parking lane or other barrier between the cycle track and the motor vehicle travel lane—

[4] https://nacto.org/publication/urban-bikeway-design-guide/cycle-tracks/two-way-cycle-tracks/

and/or as a raised cycle track[5] to provide vertical separation from the adjacent motor vehicle lane.

Two-Way Cycle Track Benefits

- Dedicates and protects space for bicyclists by improving perceived comfort and safety. Eliminates risk and fear of collisions with overtaking vehicles.
- Reduces risk of 'dooring' compared to a bike lane and eliminates the risk of a doored bicyclist being run over by a motor vehicle.
- On one-way streets, reduces out-of-direction travel by providing contra-flow movement.
- Low implementation cost when making use of existing pavement and drainage and using parking lanes or other barriers for protection from traffic.
- More attractive to a wide range of bicyclists at all levels and ages.

Typical Applications

- On streets with few conflicts such as driveways or cross-streets on one side of the street.
- On streets where there is not enough room for a one-way cycle track on both sides of the street.
- On one-way streets where contra-flow bicycle travel is desired.
- On streets where more destinations are on one side thereby reducing the need to cross the street.
- On streets with extra right-of-way on one side.
- To connect with another bicycle facility, such as a second cycle track on one side of the street.
- Along streets on which bike lanes would cause many bicyclists to feel stress because of factors such as multiple lanes, high traffic volumes, high-speed traffic, high incidence of double parking, and high parking turnover.
- On streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments.
- Along streets with high bicycle volumes.
- Along streets with high motor vehicle volumes and/or speeds.

[5] https://nacto.org/treatments/cycle-tracks/raised-cycle-tracks/

- Special consideration should be given at transit stops to manage bicycle and pedestrian interactions.

If configured on a one-way street, a "ONE WAY" sign (MUTCD R6-1, R6-2) with "EXCEPT BIKES" plaque shall be posted along the facility and at intersecting streets, alleys, and driveways informing motorists to expect two-way traffic.

ADA/PROWAG Considerations

Two-way cycle tracks have similar ADA/PROWAG considerations as one-way protected cycle tracks and raised cycle tracks depending on the configuration. The wider overall facility width of two-way cycle tracks may simplify accommodating disabled users.

Maintenance

- Two-way cycle tracks should be maintained to be free of pavement damage, broken glass, and other debris.
- Two-way cycle tracks have similar maintenance requirements to one-way protected cycle tracks and raised cycle tracks depending on the configuration.

INTERSECTION TREATMENTS

Designs for intersections[6] with bicycle facilities should reduce conflict between bicyclists (and other vulnerable road users) and vehicles by heightening the level of visibility, denoting a clear right-of-way, and facilitating eye contact and awareness with competing modes. Intersection treatments can resolve both queuing and merging maneuvers for bicyclists and are often coordinated with timed or specialized signals.

The configuration of a safe intersection for bicyclists may include elements such as color, signage, medians, signal detection, and pavement markings. Intersection design should take into consideration existing and anticipated bicyclist, pedestrian, and motorist movements. In all cases, the degree of mixing or separation between bicyclists and other modes is intended to reduce the risk of crashes and increase bicyclist comfort. The level of treatment required for bicyclists at an intersection will depend on the bicycle facility type used, whether bicycle facilities are intersecting, the adjacent street function, and land use.

BIKE BOXES

A bike box[7] is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. Benefits of bike boxes include:

- Increases visibility of bicyclists.

[6] https://nacto.org/publication/urban-bikeway-design-guide/intersection-treatments/bike-boxes/
[7] https://nacto.org/publication/urban-bikeway-design-guide/intersection-treatments/bike-boxes/

- Reduces signal delay for bicyclists.
- Facilitates bicyclist left turn positioning at intersections during red signal indication. This only applies to bike boxes that extend across the entire intersection.
- Facilitates the transition from a right-side bike lane to a left-side bike lane during red signal indication. This only applies to bike boxes that extend across the entire intersection.
- Helps prevent 'right-hook' conflicts with turning vehicles at the start of the green indication.
- Provides priority for bicyclists at signalized bicycle boulevard crossings of major streets.
- Groups bicyclists together to clear an intersection quickly, minimizing impediments to transit or other traffic.
- Pedestrians benefit from reduced vehicle encroachment into the crosswalk.

Typical Applications

- At signalized intersections with high volumes of bicycles and/or motor vehicles, especially those with frequent bicyclist left-turns and/or motorist right-turns.
- Where there may be right or left-turning conflicts between bicyclists and motorists.
- Where there is a desire to better accommodate left-turning bicycle traffic.
- Where a left turn is required to follow a designated bike route, access a shared-use path, or when the bicycle lane moves to the left side of the street.

- When the dominant motor vehicle traffic flows right and bicycle traffic continues through (such as a Y intersection or access ramp).

Design Guidance

A box formed by transverse lines shall be used to hold queuing bicyclists, typically 10-16 feet deep. Deeper boxes show less encroachment by motor vehicles.

Stop lines shall be used to indicate the point behind which motor vehicles are required to stop in compliance with a traffic control signal. See MUTCD 3B.16.

Pavement markings shall be used and centered between the crosswalk line and the stop line to designate the space as a bike box. The marking may be a Bike Symbol (MUTCD 9C-3A) or Helmeted Bicyclist Symbol (MUTCD 9c-3B.)

In cities that permit right turns on red signal indications, a "No Turn on Red" sign shall be installed overhead to prevent vehicles from entering the Bike Box.

Maintenance

Colored pavement surfaces may be costly to maintain, especially in climates prone to snow/ice.

The placement of markings between tire tracks will reduce wear.

COMBINED BIKE LANE/TURN LANE

A combined bike lane/turn lane places a suggested bike lane within the inside portion of a dedicated motor vehicle turn lane. Shared lane markings or conventional bicycle stencils with a dashed line can delineate the space for bicyclists and motorists within the shared lane or indicate the intended path for through bicyclists. This treatment includes signage advising motorists and bicyclists of proper positioning within the lane.

When configured on a cycle track corridor, the combined lane is commonly called a mixing zone and is intended to minimize conflicts with turning vehicles at intersections as an alternative to an exclusive bike signal phase.

Benefits

- Preserves positive guidance for bicyclists in a situation where the bicycle lane would otherwise be dropped prior to an intersection.
- Maintains bicyclist comfort and priority in the absence of a dedicated bicycle through lane.
- Guides bicyclists to ride in part of the turning lane, which tends to have lower speed traffic than the adjacent through lane, allowing higher speed through traffic to pass unimpeded.

- Encourages motorists to yield to bicyclists when crossing into the narrow right-turn lane.
- Reduces motor vehicle speed within the right turn lane.
- Reduces the risk of 'right hook' collisions at intersections.

Typical Applications

- On streets where there is a right turn lane but not enough space to maintain a standard-width bicycle lane at the intersection.
- On streets where there is no dedicated right turn lane, but on which high volumes of right turning traffic may cause conflicts between motorists and bicyclists.
- On cycle track corridors where there is a dedicated turn lane on the side of the street with the cycle track, but where a separate bike signal phase is not appropriate or feasible.
- May not be appropriate at intersections with very high peak automobile right turn demand.

ROUNDABOUTS

Roundabouts are a form of intersection control in common use throughout the world. Pedestrians are accommodated by crossings around the perimeter of the roundabout. By providing space to pause on the splitter island, pedestrians can consider one direction of conflicting traffic at a time, which simplifies the task of crossing the street. The roundabout should be designed to discourage pedestrians from crossing to the central island, e.g., with landscape buffers on the corners. Pedestrian crossings are set back from the yield line by one or more vehicle lengths to:

- Shorten the crossing distance compared to locations adjacent to the inscribed circle.

- Separate vehicle-vehicle and vehicle-pedestrian conflict points; and
- Allow the second entering driver to devote full attention to crossing pedestrians while waiting for the driver ahead to enter the circulatory roadway.

If sidewalks on the intersecting roads are adjacent to the curbs, this setback may require the sidewalks to deviate from a straight path. This is not the case if sidewalks are separated from the curbs by a generous landscape buffer.[8]

Designing a roundabout is a complex combination of space and volume of travel. The American Association of State Highway and Transportation Officials (AASHTO) produced the Guide for the Development of Bicycle Facilities, 4th Edition which offers specific design guidance for incorporating pedestrian and bicycle facilities.

[8] Robinson, Bruce et al. "Roundabouts: An Informational Guide." NCHRP Report FHWA-RD-00-67 1-277, Federal Highway Administration, McLean, VA: 2000. https://nacto.org/wp-content/uploads/2015/04/round-abouts_informational_guide_fhwa.pdf