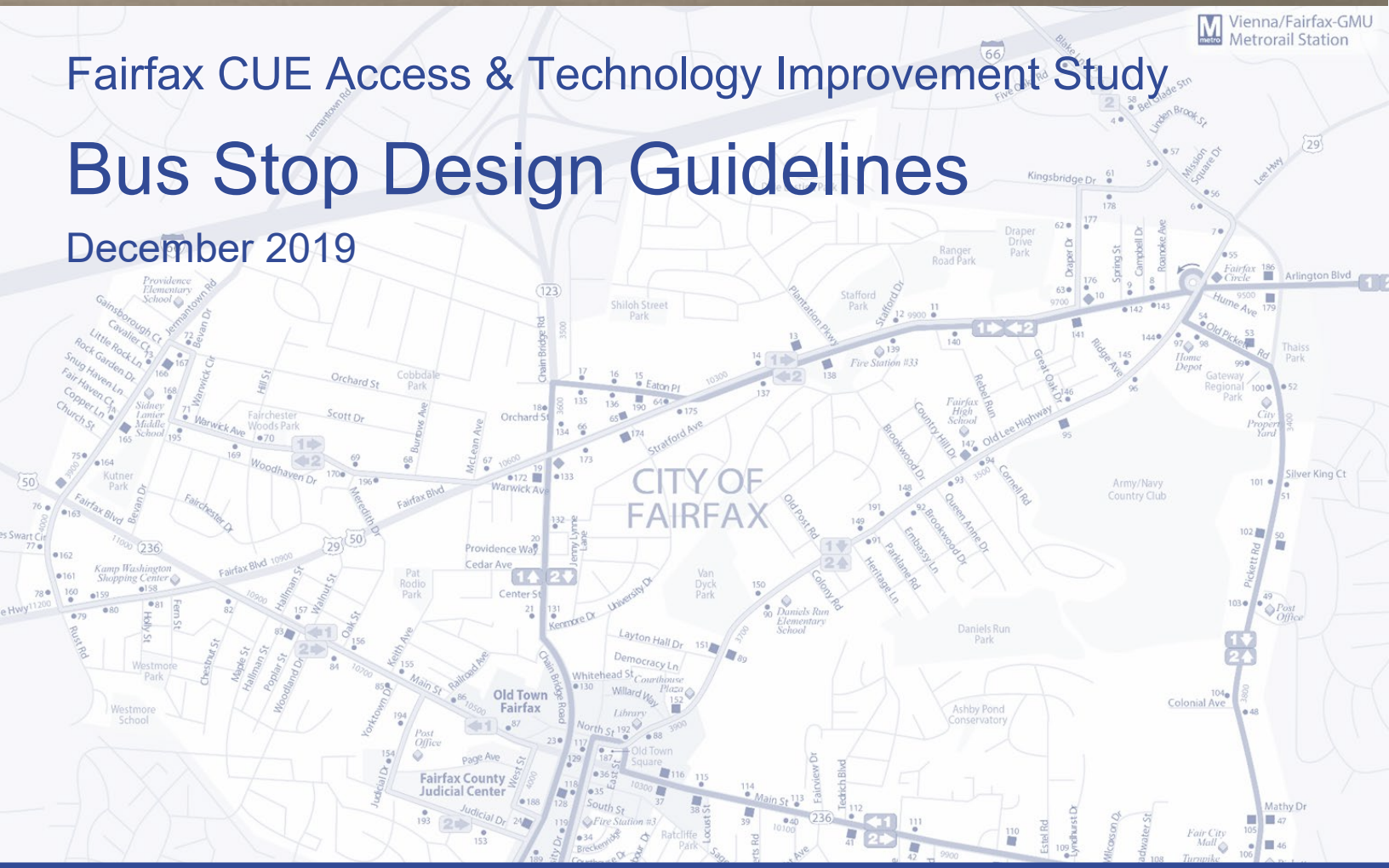
Fairfax CUE Access & Technology Improvement Study

Bus Stop Design Guidelines

December 2019



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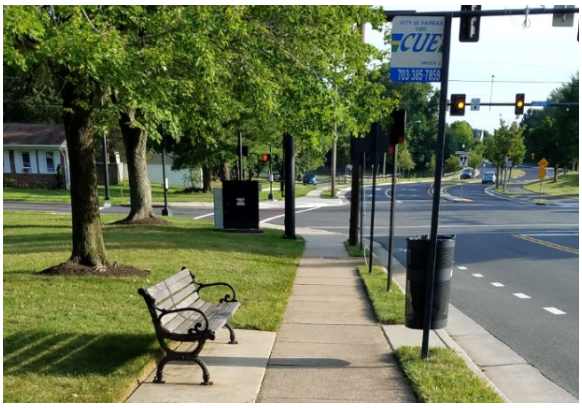
1 Introduction

Purpose and Need



Bus stops are a critical component of transit service. Not only do they serve the basic function of establishing locations for getting on and off the bus, but they also serve as the “front door” for the transit system, shaping perceptions about the system as a whole. Poorly designed stops create barriers and discourage use; conversely, if bus stops provide a welcoming and comfortable waiting environment, people will be more likely to use transit. Not surprisingly, research shows that “the quality of the customer experience while waiting for transit vehicles is a crucial determinant of both overall satisfaction and general community attitudes towards transit,” and that “the cost of better amenities is often more than offset by increased ridership".[1] Bus stops can be one of the most visible elements of a transit system, and well-designed stops can help enhance public perceptions of transit and raise awareness about the bus service itself.

These Bus Stop Design Guidelines are intended to inform the design of bus stops used by full-size transit buses on fixed-route service in the Fairfax CUE bus system. The Guidelines should be incorporated with other local plans and projects and should be used when designing any roadway or sidewalk improvements or transit-friendly developments in the CUE transit service area, whether projects are implemented by the public or private sector.

The development of these Bus Stop Design Guidelines is a key component of the Fairfax CUE Access & Technology Study, funded by the I-66 Commuter Choice Program as part of a larger project to implement bus stop improvements across the CUE bus system and make transit a more convenient and attractive option for commuters in the I-66 corridor. The study included public outreach and a survey to solicit input about bus stop needs and priorities and conducted a review of local plans and best practices to provide context and opportunities for bus stop improvement recommendations. More information about the study process can be found in the summary report and appendices. While the study’s first goal was to recommend targeted short term improvements to attract commuters, these Guidelines also provide the Fairfax CUE system with design standards and implementation recommendations to guide investments across the CUE system to benefit all passengers.

[1] “The Role of Transit Amenities and Vehicle Characteristics in Building Transit Ridership: Amenities for Transit Handbook,” Transportation Research Board, 1999.

General Design Principles

This Guidelines document provides detailed recommendations and standards for bus stop location selection and design. These recommendations are guided by federally mandated accessibility requirements and general design principles.

Accessibility Requirements

New or upgraded bus stops must meet the latest requirements for accessibility pursuant to the Americans with Disabilities Act (ADA) and the United States Access Board Public Rights-of-Way Accessibility Guidelines (PROWAG)[2]. While PROWAG has not been finalized, these guidelines are generally accepted as best practices and are recommended for all public and private projects in the City of Fairfax. "Universal design" principles[3] go beyond minimum accessibility requirements and recommend design practices that reduce barriers and make getting around easier for everyone.

For each bus stop, accessibility requirements include:

- A boarding/alighting area with a firm, even surface (no grass) that is at least 5' wide (parallel to the roadway) and 8' deep (perpendicular to the roadway) (a "landing pad" which can include sidewalk area)
- Cross slope of less than 2% (perpendicular to roadway)
- Continuous clear width of 4' for path of travel through or around the bus stop
- Accessible path of travel to and from a bus shelter or sign

Additionally, principles of universal design recommend:

- Clear zones for rear bus doors (generally 10' wide and 4' deep)
- Sufficient roadway length for all bus doors to be flush with curb
- Mechanism for the visually impaired to access information provided (raised lettering, text-to-speech, etc.)

Accessibility requirements and recommendations may require a larger bus stop footprint than existing conditions; sidewalk construction or expansion may also be required. The resulting improvements benefit all transit users, as well as improving basic access for those with limited mobility. More detail on accessibility requirements follows in the subsequent chapters of these Guidelines.

General Design Principles

In addition to making bus stops accessible to everyone, bus stop location and design decisions should first prioritize passenger safety, and then promote comfort, convenience, ease of use, and connections to the surrounding community. These general principles include:

- **Bus Stops should be Safe:** located in well-lit places near activity, not isolated, and with adequate space for passengers to wait away from pedestrian and street traffic.

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[2] https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines

[3] For a description of "universal design" concepts see the "Toolkit for the Assessment of Bus Stop Accessibility and Safety" (https://www.nadtc.org/resources-publications/toolkit-for-the-assessment-of-bus-stop-accessibility-and-safety/)

- **Bus Stops should be Convenient:** close to passenger destinations, including residences, jobs, and major destinations such as schools, social services or shopping destinations.
- **Bus Stops should be Comfortable:** designed with shelters, benches, lighting, trash receptacles, and other amenities to make waiting for the bus more comfortable.
- **Bus Stops should be Visible and Easily Identifiable:** located in visible and easily identifiable places, with clear lines of sight between passengers and bus drivers, and with recognizable CUE brand identification and common elements to encourage a sense of familiarity.
- **Bus Stops should be Informative:** provide basic, easy-to-understand information about the available transit services, such as schedules, maps, route information, real-time information, and information about the surrounding area.
- **Bus Stops should have Good Multimodal Connections:** located with safe, ADA-accessible pedestrian access to the surrounding area (pathways and crosswalks), as well as nearby bicycle infrastructure.
- **Bus Stops should be Integrated with their Surroundings:** designed to fit in with development projects, roads, and/or sidewalks, with cohesive forms and logical connections.

Guidelines Contents

The contents of these Guidelines are organized as follows:

- **Section 2: Bus Stop Siting and Footprint.** This section discusses the factors that affect bus stop locations including environmental context, location in relation to intersections, spacing between stops, and layout relative to travel lanes and other curbside uses.
- **Section 3: Bus Stop Tiers.** This section classifies CUE bus stops into different “tiers”, or stop types, from “basic” to “premium”, which each warrant different levels of amenities and investments based on several factors.
- **Section 4: Bus Stop Elements.** This section describes the range of amenities and features that can be constructed at different types of stops. This includes design guidelines for CUE bus stop elements at each “tier” of stop as well as additional amenities that can be considered based on the context at individual stops.
- **Section 5: System-Wide Opportunities.** This section discusses opportunities to improve the transit experience that are not specific to a stop or location, including technology, branding, and ongoing programming and maintenance.
- **Section 6: Implementation.** This section outlines recommendations for implementing the recommendations in these Guidelines, including updating and maintaining the CUE bus stop database, identifying opportunities for implementing bus stop improvements concurrently with other projects, estimating the cost of recommended bus stop investments, and prioritizing these investments within a recommended ongoing bus stop improvement program.

2 Bus Stop Siting and Footprint

There are several characteristics that affect the comfort and convenience of bus stops. The information in this chapter is intended for planning optimal bus stop locations and layouts for fixed-route service. This can be especially helpful when planning for an entire corridor or multiple stops surrounding new development, but also can be used for a single bus stop.

Considerations for choosing bus stop locations include existing conditions such as roadway type and width, transit service characteristics, and land use. These factors affect the way that bus stops should be spaced and designed to ensure comfort, short travel times, and overall network efficiency. Additional considerations that impact the safety, convenience, and accessibility of a stop include factors such as the placement relative to street intersections and placement relative to travel lanes and curbside uses. The following is an overview several factors that influence the placement of bus stops:

- Environmental context (land use and activity generators, roadway design and use, pedestrian and bicycle connections, and stop visibility)
- Location relative to street intersections (near-side, far-side, or mid-block)
- Location relative to the curb and curbside uses (in the travel lane, in the parking lane, at a curb bulb-out, in a bus bay, or adjacent to bike lanes
- Transit service context and stop spacing (boarding volumes, transfer opportunities, and optimal stop spacing)

Environmental Context

The environmental context of an area impacts bus stop placement. While other factors such as stop spacing and intersection configuration are important for bus operations, environmental factors, such as surrounding land use, street network, connectivity, and density, are additional important considerations for placement and design of bus stops.

Land Use/Activity Generators

Placing bus stops near activity centers, such as shopping areas, civic buildings, schools, medical centers, or multi-unit residential complexes attracts ridership by enhancing the convenience of transit service. In areas where there are several activities in close proximity, such as a block with several popular shopping destinations, bus stop placement will depend more on bus stop spacing, curbside space, and other factors. However, for major activity generators (such as large shopping centers, universities, or major transit stations), the stop should be located as close as possible to the entrance of the destination. When major new developments are planned along an existing bus route (such as in the City of Fairfax Activity Centers) or when a new bus route is created, the convenience to nearby land uses should be a critical factor in deciding bus stop locations.

Roadway Design and Use

The functional class designation of a roadway indicates the general characteristics of a roadway including its intended purpose and typical roadway speed. It can impact both design and operation of bus service

and stops. For example, streets with parking lanes may allow for curb extensions (also called bulb-outs), which can create more space for amenities at a stop or reduce the pedestrian crossing distance at an intersection. However, wider streets (with wider or more travel lanes) typically have higher speeds, which can make it harder for pedestrians to cross the roadway. Traffic speeds and volumes and available right of way may also impact decisions about whether a bus stop should include a bus pull-out or if the bus should stop in the travel lane. As such, adjacent roadway speed and width should be considered when locating and designing a bus stop.

Multimodal Connectivity

Most people are traveling to and from the bus stop as a pedestrian. Therefore, the conditions of the sidewalk and connections with the surrounding area are important and affect the prioritization of bus stop improvements.

At minimum, a stop should be universally accessible from the closest intersection. In addition, a safe, nearby street crossing with curb cuts for wheelchairs is required. Almost all riders will need to make round trips using a pair of bus stops (typically on opposite sides of the street), so ideally bus stops will be located near safe crosswalks. For denser areas where it is likely that many people visit multiple destinations in a single bus trip, priority should be given to making sure that there is an accessible path throughout the area. For bus stops which serve mostly a single destination, the focus can be on a path between that destination and the bus stop.

Bicycling and transit can complement each other, and the reach of the transit service can be greatly extended by providing connections so that people can combine these two modes in a single trip. Generally, bicycle lanes and separated paths increase bicycle usage by making riders safer and more comfortable. Wherever possible, bus stops should be placed close to this bicycle infrastructure, especially at places where a stop can facilitate bicycle connections to areas without transit service. In addition, some stops may warrant more bicycle parking. Bicycle racks on the front of buses (such as those provided on CUE buses) also facilitate transit/bicycle trips.

Community Demographics

Community demographics should be taken into account when considering the convenience of bus stop locations. Areas with relatively high shares of minority residents and/or low-income households are included as a factor in the classification and prioritization of bus stop facilities to ensure equitable access to transit and transit-related amenities. Additionally, communities with higher concentrations of households without vehicles may be a factor as these communities are more likely to use transit.

Stop Visibility

For safety reasons, bus stops should be located so that drivers are able to see passengers at the stop as they approach and so that passengers waiting at the bus stop can see bus drivers. As such, bus stops should not be located just after the rise of a hill, after bend of a road, or behind buildings or other obstructions.

Visibility and sight obstructions can also affect passenger perceptions about the security of a bus stop. Landscaping, walls, and solid structures can provide hiding spaces and restrict sight lines for passengers, potentially negatively affecting passenger security (real and perceived). Conversely, stops with unobstructed views and good lighting, located near high-activity areas, can positively impact passenger security and comfort. These and other design principles (such as principles of Crime Prevention Through

Environmental Design (CPTED)) should therefore be carefully considered when placing and designing a bus stop.

Table 1: Summary of Environmental Context Factors for Bus Stop Locations

Factor	Best Practices
Land Use/ Activity Generators	▪ Locate near activity centers (retail, schools, residential complexes, etc.) ▪ Locate near entrance to major activity generators or centrally among many smaller activity generators
Roadway Design & Use	▪ Locate near protected street crossings for passengers ▪ Install curb bulb-outs where it is safe and efficient for the bus to stop in the travel lane (instead of pulling out of and reentering travel lanes)
Multimodal Connectivity	▪ Locate near accessible pedestrian pathways and safe passenger crossings ▪ Locate near bicycle and trail networks
Community Demographics	▪ Locate to maximize convenience for low-income, minority, or zero-car households
Stop Visibility	▪ Locate to maximize stop and passenger visibility for bus drivers ▪ Consider CPTED design principles to minimize sight obstructions and isolation and to maximize passenger security and comfort

Transit Service Context and Stop Spacing

In order to provide space for additional amenities, more room should be allotted at bus stops with a high volume of passenger boardings or significant transfer activity. Since passengers have less control over their waiting time at transfer points, features such as shelters, benches, and information kiosks can significantly improve the waiting experience. In addition to the bus stop footprint, stop spacing is a critical decision influenced by the type of transit service (such as local or express), transit operational goals, and the urban form.

Boarding Volume

Boarding volume, or the number of daily passengers getting on the bus at a stop, influences the level of amenities that are appropriate each bus stop and informs the stop footprint or dimensions. Boarding volume therefore impacts the recommended width of the bus stop and its adjacent sidewalk. Bus stops with higher passenger volumes should have a wider footprint in order to accommodate higher volumes of passengers boarding and alighting at the stop, as well as more amenities such as larger shelters and benches. The sidewalk adjacent to such high-volume bus stops should be 2’ to 7’ wider than the minimum ADA requirement in order to accommodate both pedestrians bypassing the stop and the high volume of passengers using the sidewalk to reach the bus stop.

Transfer Activity

At locations where transfer activity between routes is heavy, bus stops for intersecting routes should be shared or located as close to each other as possible to facilitate connections between routes. Additionally, stops with high transfer activity should have space for a high level of passenger amenities to improve the waiting experience. Where possible, bus schedules for connecting routes should be coordinated to minimize the wait time. If stops are shared by multiple routes, a larger footprint may also be needed to ensure space for multiple buses to access the stop at one time.

Stop Spacing

Stop spacing refers to the distance between bus stops along a route. Stop spacing affects overall travel time and, therefore, demand for transit. In general, the tradeoff is between closer stops with more convenient access and stops farther apart with higher travel speeds. Closely-spaced stops provide passengers with the convenience of a shorter walk to any bus stop, but may result in a longer ride if the bus must stop for passengers every few blocks. Stops spaced farther apart are less convenient, but if it supports service that operates more frequently or more predictably and reliably, many passengers may be willing to walk farther to access the stop. Stop spacing should be determined based on a transit agency's goals for a particular route – for example, closer spacing for local routes and longer spacing for limited service routes. Stop spacing may also be affected by urban form – for example, dense urban environments with more activity generators may warrant closer stops, and suburban or rural areas with few destinations may not benefit from frequent stops.

Generally, stop spacing recommendations for local service ranges from about 600-1,200 feet between bus stops (or about 4-8 stops per mile)[4]. The distance may vary based on transit goals and context, but generally seeks to balance the tradeoffs between accessibility and travel speeds. Finding suitable sites for bus stops may also necessitate altering the spacing significantly. In addition, there may be reasons for bus stops spacing to be modified, such as optimizing access at major transfer points and/or activity centers. There may also be places where bus stops should be further apart, particularly if there would be no boardings or alightings due to adjacent land uses.

If express or limited service bus routes are operated, stops should be spaced further apart. Some agencies recommend a spacing of 2-3 stops per mile for limited service routes.

Whenever possible, bus stop locations should be paired, so that people board and alight on opposite sides of the same street in the same vicinity when making a round trip. This allows the transit service to be more intuitive and maximizes convenience for the greatest number of users.

Table 2 outlines recommended spacing for CUE bus stops in different contexts.

Table 2: Recommended CUE Bus Stop Spacing

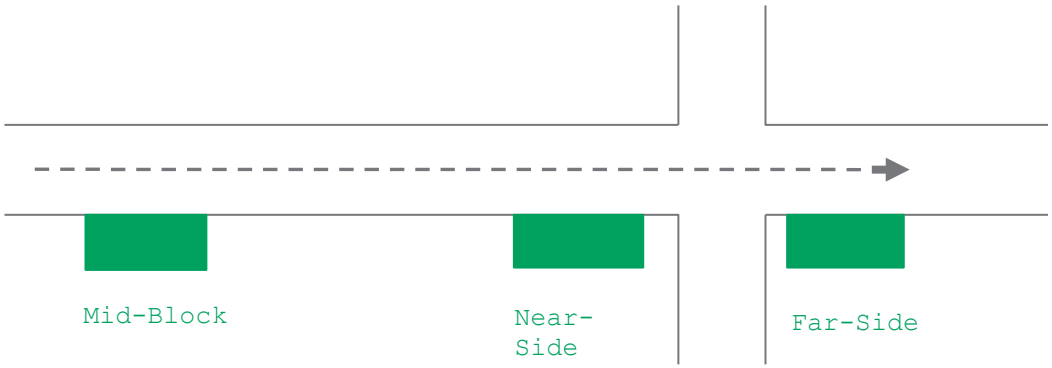
Service type / Urban form	Stop frequency (Spacing between stops)
Local Service (Urban/ in Activity Centers)	6-8 stops per mile (600-800 feet)
Local Service (Suburban/ outside Activity Centers)	4-6 stops per mile (800-1,200 feet)
Limited Service	2-3 stops per mile (1,800-2,600 feet)
Express / Commuter Service	Varies (depends on major destinations)

[4] For example, see WMATA's "Guidelines for the Placement and Design of Transit Stops", MBTA's "Bus Stop Design Guidelines", and TCRP Report 19 "Guidelines for the Location and Design of Bus Stops"

Location Relative to Intersection

Bus stop placement directly impacts the convenience and accessibility of the transit system. Determining the proper location of bus stops involves choosing between near-side, far-side and mid-block stops (Figure 1). While many other factors should be considered when choosing a bus stop location, including adjacent land use, space availability, and pedestrian access, the location of the stop relative to the intersection is an important consideration. There are advantages and disadvantages that should be considered with each option.

Figure 1: Near-Side, Far-Side, and Mid-Block Stops



Near-side

Near-side bus stops are located before an intersection, allowing passengers to load and unload while the vehicle is stopped at a red light or stop sign. Near-side bus stops can minimize interference when traffic is heavy on the far-side of an intersection. At stop-controlled locations, near-side stops eliminate “double stopping,” as passengers can board the bus during the stop. Additionally, at near-side stops, gaps in traffic flow are created for buses re-entering traffic at the intersection, and passengers access the bus closest to the crosswalk.

However, this stop configuration generates conflicts with right turning vehicles. Delays associated with loading and unloading passengers may lead to unsafe driving practices, where right turning vehicles drive around the bus to make a right turn in front of the bus. Additionally, buses serving near-side stops may restrict sight distances for crossing pedestrians and vehicles.

Far-side

Far-side bus stops are located after an intersection, allowing the bus to travel through the intersection before stopping to load and unload passengers. Far-side stops encourage pedestrians to cross more safely behind the bus. At a signalized intersection, gaps in traffic allow the bus to more easily reenter the travel lane. Far-side stops also require shorter deceleration distances. Far-side bus stops support the use of transit signal priority treatments, and if the bus pulls out of the travel lane, they take up the least amount of curbside space. Additionally, far-side stops provide additional right turn capacity at the intersection for other vehicles by eliminating bus blockage in the approach to the intersection.

However, during peak travel periods, when traffic is heavy and bus queuing is possible, intersections may be blocked by buses waiting to access a far-side bus stop. Queued buses may restrict sight distances for crossing pedestrians and vehicles. Additionally, stopping far-side after stopping for a red light may interfere with bus operations as well as general traffic flow.

Mid-block

Mid-block bus stops are located between intersections. Mid-block stops minimize sight distance problems for vehicles and pedestrians. Additionally, passenger waiting areas located mid-block often experience less pedestrian congestion than at intersections. A mid-block stop may also be more convenient or accessible to a major activity generator.

However, mid-block stops require both deceleration and acceleration areas, requiring additional distances for no parking restrictions or increased turnout construction costs if the bus pulls out of the travel lane to the stop. Mid-block stops also increase walking distances for passengers who need to cross the street at intersections, or result in passengers crossing the street mid-block.

Mid-block stops should generally be used under special circumstances, such as where large destinations justify high-volume access, where traffic conditions at the intersection conflict with both near and far-side stops, or when the distance between adjacent intersections exceeds stop spacing recommendations.

Table 3 summarizes the advantages and disadvantages of different stop locations relative to intersections.

Table 3: Advantages and Disadvantages by Stop Location

	Advantages	Disadvantages	Where Recommended
Near-Side Stop	▪ Minimizes interference when traffic is heavy on far side of intersection ▪ Allows bus boarding closest to crosswalk ▪ Pedestrians may cross while the bus is stopped ▪ The bus can pull away from curb and merge with traffic after the intersection ▪ Avoids double stopping ▪ Allows passengers to board/alight while the bus is stopped at a red light	▪ Increases sight line problems for crossing pedestrians ▪ Increases conflicts with right-turning vehicles passing and turning in front of the bus ▪ May result in stopped buses obscuring curbside traffic control devices and crossing pedestrians ▪ May block the through lane during peak periods with queuing buses ▪ May cause sight lines to be obscured for vehicles exiting the side street to the right of the bus	▪ Traffic is heavier on the far side of the intersection ▪ Pedestrian conditions are better on the near side ▪ Bus route continues straight through the intersection ▪ When a curb extension prevents vehicles from turning right directly in front of a bus ▪ Where the accumulation of buses at a far-side stop spill over into the intersection

	Advantages	Disadvantages	Where Recommended
Far-Side Stop	▪ Minimizes conflicts with turning vehicles and provides additional right turn capacity before the intersection ▪ Encourages pedestrians to cross behind the bus ▪ Creates shorter deceleration distances for buses and minimizes area needed for curbside bus zone ▪ Buses can take advantage of the gaps in traffic flow created at signalized intersections behind the stop	▪ May result in traffic queued into intersection when a bus is stopped in travel lane ▪ May obscure sight distance at the far-side crosswalk and for side streets ▪ Risk of conflicts if pedestrians or other vehicles move into the bus stop lane ▪ Can result in double-stopping and risks rear end collisions	▪ Traffic is heavier on the near side of an intersection ▪ Heavy right turns on major approach ▪ Pedestrian conditions are better on the far side ▪ Bus route requires a right or left turn ▪ Intersections with priority treatments including Queue Jump Lanes and TSP ▪ At complex intersections such as dual turn lanes (remove buses from the area of complicated traffic movements)
Mid-Block Stop	▪ Customer waiting areas may experience less pedestrian congestion ▪ Minimizes sight line obstructions for vehicles and pedestrians ▪ Minimizes conflicts with intersection traffic	▪ Requires greatest amount of curb space ▪ Encourages unsafe pedestrian crossing ▪ Increases walking distance to intersection crossing	▪ Traffic or pedestrian conditions at the intersection are not conducive to a stop ▪ Passenger generators are located mid-block ▪ Distance between intersections exceeds stop spacing recommendations ▪ A queue jump lane conflicts with a near or far-side stop

Curbside Bus Stop Configurations

A bus stop along the curb may be configured several different ways depending on the roadway design, stop location, and several other factors. A stop may be serviced from the travel lane, at a curb bulb-out in a parking lane, in a parking lane, in a bus bay, or on a shoulder. (Off-street bus stops such as at transit centers may use other configurations such as saw-tooth bus bays to use curbside space more efficiently for many buses. For the CUE bus system this type of stop configuration only exists at the Vienna Metrorail station and GMU transit center.)

There are advantages and disadvantages with different configurations. Buses stopping in a travel lane or at a bulb-out do not experience delays waiting to re-enter congested traffic. There is also less conflict with

parked vehicles. However, buses stopping in the travel lane may present potential conflicts and safety hazards for other traffic, particularly on higher speed roadways.

Buses pulling out of the travel lane to a parking lane, bus bay, or shoulder are better when the bus is likely to stop for a longer period of time (such as for high passenger volumes or driver layovers). However, a longer deceleration and acceleration area is required, and the length of the bus stop must be designated and enforced as a no parking area to ensure parked or stopped vehicles do not block the bus stop.

Figure 2 illustrates example layouts for several different configurations. Table 4 summarizes recommended bus stop lengths when the stop is designed to pull out of the travel lane. (This includes deceleration and acceleration areas).

Table 5 summarizes the advantages and disadvantages of different curbside configurations.

Figure 2: Example Layouts for Curbside Bus Stops[5]

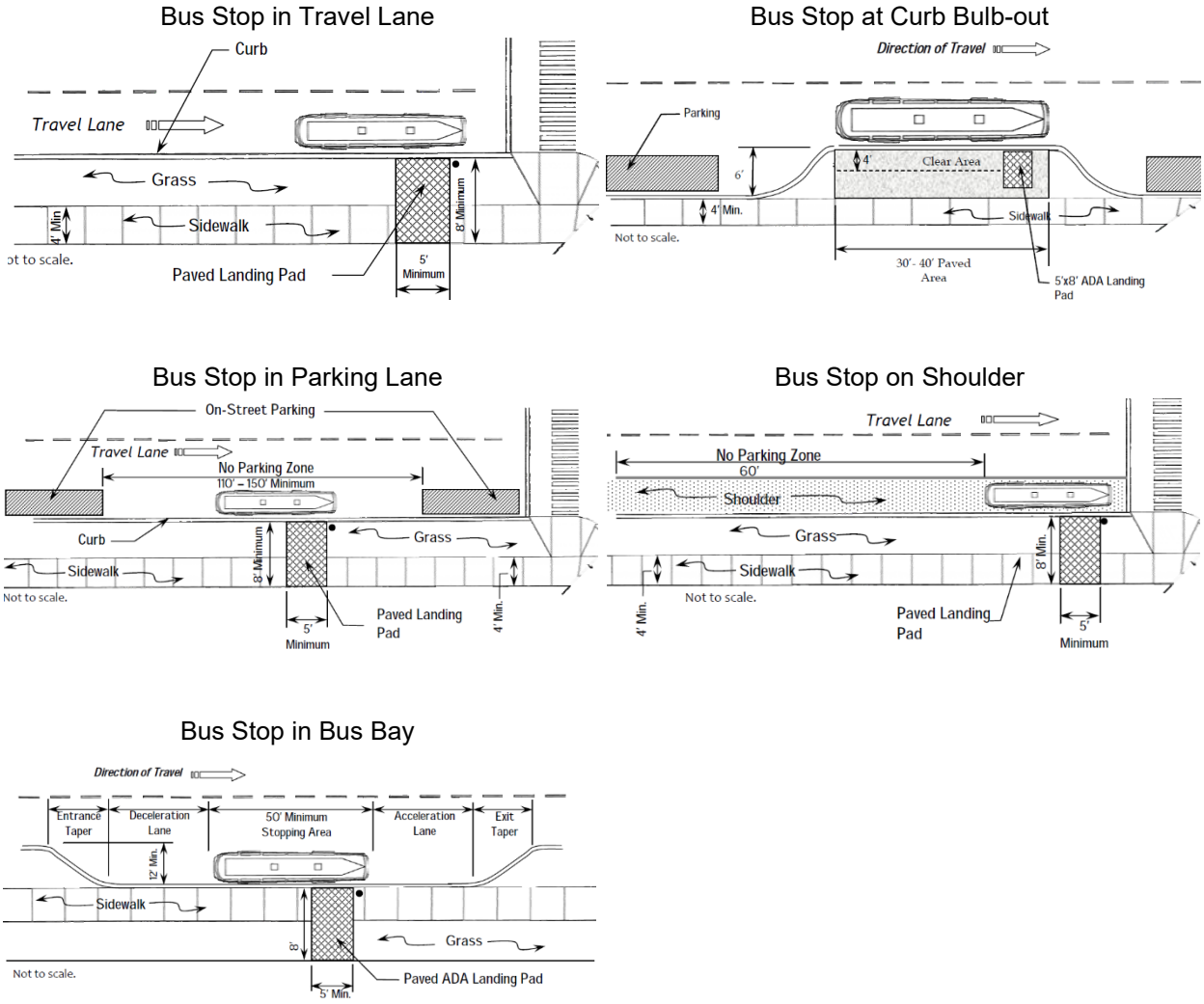


Table 4: Recommended Minimum Length and Width by Stop Type

Stop Location/Type	Length	Notes
Far-Side (out of travel lane)	70’	Far-side stops located after a turn should have an additional 20’ length
Near-Side (out of travel lane)	90’	
Mid-Block (out of travel lane)	110’	

[5] Image source: WMATA’s “Guidelines for the Design and Placement of Transit Stops”

Stop Location/Type	Length	Notes
In Dedicated Lane	40’	Shorter stop since bus does not need to weave in and out from travel lane
Adjacent to Protected Bicycle Lane / at Curb Bulb-out	40’	“Floating” bus stop or bus stop “island”; bus usually stops in travel lane

Table 5: Advantages and Disadvantages of Curbside Bus Stop Layouts

Stop Type	Advantages	Disadvantages
In Travel Lane	▪ Minimum design requirements ▪ No delays caused by a need to reenter the travel lane	▪ May present safety hazard with high speed traffic (45mph or more) ▪ May present traffic conflicts if bus stops in lane for a long time
At Bulb-out	▪ No delays caused by a need to reenter the travel lane ▪ Reduces impact on parking lanes ▪ Provides traffic calming ▪ Reduces crossing distance when extended to crosswalk	▪ Requires additional design and construction ▪ May present safety hazard with high speed traffic (45mph or more) ▪ May present traffic conflicts if bus stops in lane for a long time
In Parking Lane	▪ Reduces conflicts with through traffic ▪ Allows bus to stop longer for high passenger volumes or layovers	▪ Requires designation and enforcement of no parking area ▪ Requires more space for deceleration and acceleration ▪ May cause delays when bus must wait to reenter the travel lane
On Shoulder	▪ Reduces conflicts with through traffic ▪ Allows bus to stop longer for high passenger volumes or layovers	▪ Requires designation and enforcement of no parking area ▪ Requires more space for deceleration and acceleration ▪ May cause delays when bus must wait to reenter the travel lane
In Bus Bay	▪ Reduces conflicts with through traffic ▪ Allows bus to stop longer for high passenger volumes or layovers	▪ Requires additional right of way and construction ▪ Requires more space for deceleration and acceleration ▪ May cause delays when bus must wait to reenter the travel lane

Coordination with Other Curbside Uses

In addition to considering how bus stop configurations are coordinated with the travel lane, coordination with other curbside uses must also be considered, including driveways, parking lanes, and bicycle lanes.

Driveways

The total length for a bus stop includes space for the bus to approach and depart, and there is nothing wrong with a driveway being in those areas needed for the bus to pass as it pulls out of or back into the travel lane. However, it is best not to have the bus blocking a driveway while stopped for boarding and alighting. If absolutely necessary due to other constraints, a bus could block a small residential driveway, since there will only be occasional conflicts, but this will not work for busy commercial driveways.

Parking

As noted above, on-street parking may surround the bus stop in some locations and compete for available curb space. When these conflicts exist, the impact to on-street parking can be somewhat offset by increasing the space between bus stops. Alternatively, a curb extension may also be developed in order to leave more on-street parking in place and accommodate a bus stop in the travel lane.

Loading zones and taxi or ride-hailing service drop-off and pick-up zones are similar to on-street parking with relation bus stop planning. In areas where curbside spaces is in high demand for multiple uses, additional planning may be needed to minimize conflicts.

Bike Lanes

Bus stops may conflict with curbside bike lanes, as the bus frequently pulls up to the curb, blocking the bike lane. Ideally a protected bike lane would be separated from vehicle travel lanes, and bus stops can be located on floating islands between the bike lane and the travel lane. This eliminates conflicts between bikes and buses, but creates conflict points where pedestrians must cross the bike lane to access the bus stop. Where buses must cross over un-protected bike lanes, the conflict is between the bus and bicycles. In either case, clear striping and signage should be provided to warn all users about shared lanes and conflict points.

If bus stops are being improved but locations are remaining the same, typically some notification about the project and construction impacts will suffice. This should include notice to transit users, direct abutters, and notification of neighborhood business and community groups.

Optimizing Bus Stop Locations

As new bus stops are created, the above guidelines and factors should be considered when determining the best locations and layouts for each stop. Other opportunities to evaluate the location of individual bus stops may arise when private or public projects are designed.

It can be easier to retain existing bus stop locations in many cases, since bus passengers and the adjacent businesses, residents and landowners are familiar with the stop. However, existing stops may benefit from optimizing the spacing and locations, with potential improvements to accessibility, pedestrian connectivity, and transit and roadway operations. CUE should consider optimizing groups of bus stops along corridors or within activity centers, particularly when there are major transit service changes or when relocation of stops can be coordinated with other sidewalk, roadway or development projects.

In many cases, there are certain existing or planned locations for bus stops that stand out as being particularly important. This can be due to existing use, activity centers, transfer opportunities, or other conditions. Once these critical locations are settled, the remaining stops in the corridor can be planned for optimal spacing.

When bus stop locations will be changed, including additions, eliminations and/or relocations, it is recommended that the public is involved early enough so that their feedback can be incorporated into the final design and implementation. The outreach should include transit users whose experience will be directly affected, but also the surrounding communities which will be impacted.

For location changes, concerns from the public often include walking distance to stops, the effect on street parking, and the impact on adjacent properties. In many cases, conflicting needs must be balanced, and it is good to allow for time to make revisions to the bus stop plan. While universal consensus on exact locations is rare, the public process can still result in much greater support for the final outcome, since the community's local knowledge and input was incorporated.

3 Bus Stop Tiers

Bus stops can be located in a wide variety of settings, and not all stops need the same types of amenities. Some stops, such as those with very high ridership or located near major destinations, may call for enhanced amenities like screens with real-time information, bicycle parking, and investments in placemaking, while others may only need essential elements like a current bus stop sign, lighting, and accessibility features. In order to guide decisions about which elements or amenities to include at different types of bus stops, CUE bus stops were classified into four "tiers," or stop types, based on criteria including existing use (boardings) and potential demand (demographics, transfer opportunities, and land use). Each bus stop was scored with points for the criteria they meet, and assigned to tiers based on these points (Table 7).

The "tiers" also provide recommendations for the minimum level of amenities needed. All bus stop improvements should meet ADA requirements and ensure that the stop is visible at night (either with ambient street or pedestrian scale lighting, or with lighting at the stop). All stops should also have basic signage and trash receptacles. Bus stops in higher level tiers (with higher demand) should provide more amenities. Additional amenities may be included at any stop based on the specific local context and community priorities.

Each of the four stop tiers and the amenities they include are summarized below and in Table 6. More detail about stop elements and specific models are described further in the Bus Stop Design Guidelines in Appendix A.

Tier 1: Premium Bus Stop (6 points or more)

Tier 1 bus stops warrant the highest levels of amenities based on their higher boardings, ability to serve minority and low-income populations, proximity to Activity Centers, proximity to increased density near major developments, and connections to other transit services. As major bus stops in the CUE system, Tier 1 stops should include a shelter, security lighting (either with freestanding light poles or built into the shelter itself), seating, trash receptacles, and service information in the form of posted schedules, a system map, and a real-time information screen.

Tier 1 stops may also be candidates for additional elements such as space for bikeshare, scooters, and other shared mobility options, as well as covered/sheltered bike racks, public art, and other investments in placemaking.

Tier 2: Major Bus Stop (3 to 5 points)

Tier 2 bus stops are not necessarily CUE's highest profile stops, but still warrant a significant level of amenities for passenger comfort and convenience based on higher existing and potential demand. Tier 2 stops should include a shelter, seating, lighting (if there is not an existing source of light that illuminates the stop), trash receptacles, and posted schedules and system map.

Tier 3: Moderate Bus Stop (2 points)

Tier 3 includes bus stops that do not qualify as Tier 1 or 2 but still have some potential for increased use. Tier 3 stops should include seating, trash receptacles, lighting, and pole-mounted schedule information.

Tier 4: Basic Bus Stop (0 to 1 points)

Tier 4 includes all remaining bus stops that do not qualify as Tier 1, 2, or 3. Based on the scoring criteria, these stops have fewer than 20 daily boardings and meet just one or none of the scoring measures. Tier

4 stops require the minimum level of amenities that should be included for all tiers of bus stops (ADA compliant landing pads, bus stop signs, lighting, and a trash receptacle).

Table 6: Minimum Bus Stop Elements to Include for Each Bus Stop Tier

Bus Stop Element	Tier 1 Premium Stop 6+ points	Tier 2 Major Stop 3-5 points	Tier 3 Moderate Stop 2 points	Tier 4 Basic Stop 0-1 points
ADA Compliant Landing Pads	✓	✓	✓	✓
Bus Stop Sign	✓	✓	✓	✓
Trash Receptacle	✓	✓	✓	✓
Lighting	✓	✓	✓	✓
Seating	✓	✓	✓	
Posted Schedules	✓	✓	✓	
Shelter	✓	✓		
Posted System Map	✓	✓		
Real-Time Arrival Display	✓			
Bicycle Rack	✓			

Note: Check marks indicate which elements are the minimum required elements for stops at each tier. Additional elements above and beyond the requirements for each tier can be included as desired and based on available resources.

Tier Scoring Criteria

Each CUE bus stop was classified in one of the four tiers based on five scoring criteria defined below and summarized in Table 7, with higher scores indicating that significant bus stop amenities are warranted and lower scores indicating that only basic stop amenities are needed. The tier scoring factors include:

- **Number of Weekday Boardings:** Ridership is the most important factor in determining the level of amenities that may be needed at a bus stop. Boarding volume, or the number of daily passengers getting on the bus at a stop, determines the size and quality of amenities that are appropriate at a bus stop.
- **Minority and Low-Income Population:** Stops are prioritized if they serve a census block group with either minority or low-income population above the citywide average.
- **Transfers to Other Transit Services:** Stops are prioritized if they provide a transfer between CUE Gold and Green routes, or if they serve other transit providers in addition to CUE, such as Metrobus or Fairfax Connector.
- **Local Activity Centers:** The City of Fairfax's 2035 Comprehensive Plan identifies key Activity Centers as areas where the City wants to encourage pedestrian-oriented, mixed-use development. Bus stops that are adjacent to or within these Activity Center development areas

are prioritized for higher-quality amenities to promote transit and multimodal travel in these key areas.

- **Proposed or Planned Development:** Several major new developments are currently proposed, planned, under construction, or recently completed. These present an opportunity to generate CUE ridership by new residents or employees, as well as a chance to leverage increased densities and mixed-use and transit-supportive development. Amenities at these stops can reinforce these efforts and make transit a more attractive option.

Table 7: Recommended Scoring Criteria for Bus Stop Tier Classification

Tier Classification Criteria	Points Awarded
Number of Weekday Boardings	5 points if 50 or more daily boardings 4 points if 30-49 daily boardings 3 points if 20-29 daily boardings
Minority and Low-Income Population	1 point if either minority or low-income population in the surrounding census block groups is greater than the Fairfax citywide average
Transfers to Other Services	1 point if stop is served by both a Gold route and a Green route and/or by other transit services (e.g. WMATA, Fairfax Connector)
Fairfax Local Activity Centers	1 point if stop is located near a designated Fairfax Local Activity Center district
Major New Development	1 point if stop is located within 500 feet of a major development

4 Bus Stop Elements

Waiting is a significant part of every transit trip. Well-designed bus stops enhance the transit experience, decrease perceived wait times for transit services, and can contribute to increased ridership. Conversely, poorly designed bus stops can decrease customer satisfaction, make transit less attractive to potential new customers, and potentially make waiting at stops unsafe for riders. Investing in high quality bus stops is often a low-cost, high-reward strategy for transit operators.

Developing clear and practical guidelines for amenities at bus stops can provide the structure and process needed to improve overall transit system quality. No matter how many riders use a bus stop on a given day, each stop requires certain key design elements to be safe, accessible, reliable, and comfortable for passengers. As ridership at a given stop increases, agencies can install additional amenities that enhance the overall transit experience. By formalizing the amenity installation process, agencies can set clear goals for stop quality and provide justification for how and when bus stop upgrades occur. Bus stop amenities are outlined below, with example photos, descriptions, and specific guidelines for the CUE bus system. Table 8 at the end of this chapter summarizes the CUE standards for each element.

Accessibility Requirements

As previously described in the general design principles, bus stops must meet minimum accessibility requirements any time they are installed or upgraded. This includes a landing pad (described below), a 4-foot wide path through the stop for pedestrians to bypass the stop, and an accessible path to any of the bus stop elements provided. Bus stop information should also meet accessibility requirements.

Passenger Landing Pads

Description

As discussed previously, paved passenger waiting areas are required at each bus stop to provide a safe, comfortable waiting area and promote access for all transit users, including those who are mobility impaired. According to ADA standards issued by the U.S. Department of Transportation (DOT), all new or upgraded bus stops are required to have a front landing pad constructed that meets the following criteria:

- Provide a firm, stable surface
- Provide a clear length of 96 inches (8’) minimum, measured perpendicular to the curb, and a clear width of 60 inches (5’) minimum, measured parallel to the roadway
- The slope of the landing pad parallel to the roadway shall be the same as the roadway, to the maximum extent possible
- The cross slope perpendicular to the roadway cannot exceed 1:48 (approx. 2%)

A rear clear zone free of obstructions such as utility poles, signs, trees, and newspaper boxes should also be provided at each bus stop to accommodate boardings and alightings occurring at the rear door of the vehicle. Since the position of the rear door may vary somewhat on various bus types, the rear door clear zone is recommended to be 10’ wide (parallel to the roadway), and 4’ deep (perpendicular to the

roadway). A landing pad is not required at rear doors but is preferred for passenger comfort. The landing pad may include part of the sidewalk.

CUE Standards

The landing pad is the top priority for new or upgraded CUE bus stops in order to comply with mandates and provide universal access. The standard for CUE bus stop landing pads is to meet the minimum ADA requirements described above.

Figure 3: CUE Bus Stops with Paved Passenger Landing Areas

Bus Stop Signs

Description

Bus stop signs are the most basic element of a bus stop and are vital to the transit customer experience. Bus stop signs should include information that helps riders use available transit services and should present a uniform brand identity (**Error! Reference source not found.**). This basic information includes route numbers and names, the destination of the routes, and a phone number and/or website to call for additional assistance. Many systems now also include a stop ID number, which can be used to access real-time schedule information via text message or an automated phone system. All bus stops should have a consistently maintained bus stop sign.

Transit signs should have letter styles, design, and color choices that are unique to the transit system and consistent with the transit agency's brand so that passengers can easily identify bus stops. Customer information on the signs, as discussed earlier, should be legible and clear for all users, including people with disabilities. According to ADA requirements, letters and numbers should have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10[6],[7]. The characters and background of signs should be contrasting and should have a non-glare finish. When possible, double-sided signs should be used, so the sign is visible from both directions.

[6] https://www.nadtc.org/wp-content/uploads/NADTC-Toolkit-for-the-Assessment-of-Bus-Stop-Accessibility.pdf

[7] TCRP Report 19, 1996

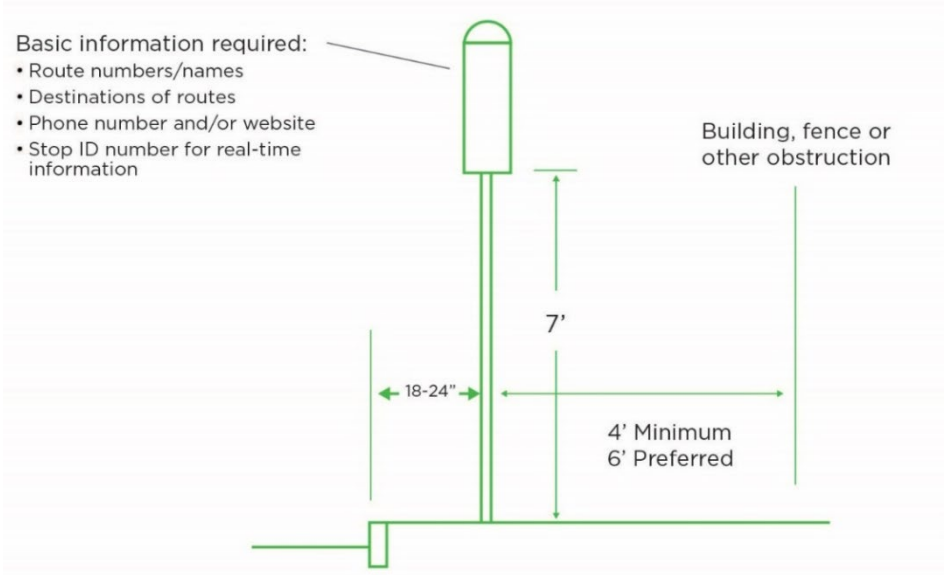
Figure 4: Bus Stop Signage (Portland, OR and Austin, TX)

Bus stop signs should be installed at a standard height, so as to be more recognizable. The bottom of the sign should be at least 80” from the ground, so as not to cause a hazard for pedestrians walking nearby. The top of the sign should be no higher than 120” from the ground, so that the sign is readable to everyone, including those in wheelchairs. The front sign should be placed at a 90-degree angle, perpendicular to the curb line, while the rear sign (where installed) should be placed at a 60-degree angle to the curb.

Whenever possible, bus stop signs should be mounted on their own post, in order to maintain bus stop identity and to provide a recognizable pole, such as a square post perforated by holes down its length, for those with visual impairments. However, sometimes this may not be possible due to the large number of sign and utility poles already present in the area.

All sign posts should be installed approximately 18” (12” minimum) from the edge of the roadway in order to prevent collisions with vehicles, including bus mirrors. Additionally, bus stop signposts must not interfere with providing a safe and accessible pedestrian path of travel at the bus stop (**Error! Reference source not found.**).

Figure 5: Bus Stop Sign Information and Placement



CUE Standards

Currently, there are two bus stop flag designs at CUE bus stops (Figure 6). The majority of the signs are square and display the route and CUE's phone number. A small number of signs were replaced with a rectangular sign with additional information including the stop ID for use in the NextBus app. Both signs include the CUE logo. The information on the newer rectangular sign may be somewhat confusing due to different text sizes. Some of the older signs have faded and may be more difficult to read (particularly on signs with yellow text for the Gold routes).

CUE staff are evaluating branding options and will develop an updated sign design to be used at all stops. At minimum, the signs will include the CUE logo, website, phone number, and route names. Additional information such as route destinations and NextBus information may be included. The text will be formatted so that it meets accessibility requirements, and information will be laid out according to a hierarchy to make CUE bus stops easily recognizable and to make key information about the routes and service clear and easy to read.

Figure 6: CUE Bus Stop Flag Signs Currently in Use

Trash Receptacles

Description

Trash receptacles provide a convenience for waiting riders and help to reduce the amount of trash left on buses and on the street. Trash receptacles should be within easy reach of the bus stop waiting area, but not block sidewalk traffic or pedestrian access to buses. If the stop has a shelter, the trash receptacles can be integrated with the shelter. In busier areas (and where pick-up is scheduled on a regular basis), a recycling receptacle can also be provided to collect newspapers and/or bottles and cans.

CUE Standards

Three styles of trash receptacle currently exist at CUE bus stops (Figure 7):

- Concrete freestanding receptacles
- Pole-mounted receptacles
- Aluminum freestanding receptacles

Freestanding receptacles typically require a 2'x2' footprint. Both freestanding and pole-mounted trash receptacles should be clear of the 5'x8' bus stop landing pad to ensure adequate clearance for wheelchair ramp deployment and a fully accessible boarding and alighting area.

The CUE standard for new or upgraded bus stops is to use aluminum freestanding trash receptacles at higher-tiered stops (paired with shelters), similar to the style included in the Old Town Fairfax Historic Overlay District Streetscape Standards[8]. At lower-tiered stops without shelters, pole-mounted receptacles should be used. New concrete freestanding trash receptacles should not be installed.

Figure 7: Trash Receptacles at CUE Bus Stops. (Left: Concrete; Center: Pole-Mounted; Right: Aluminum "Old Town Square" Style)

Lighting

Description

Adequate lighting is important for passenger comfort and security as well as for visibility of waiting passengers to the bus and other oncoming traffic, particularly at night and during inclement weather. Many roads that may be comfortable during the day have little or no pedestrian lighting, making them difficult, uncomfortable, or unsafe for pedestrians to navigate at night and making it more difficult for bus drivers to see riders who are waiting at unlit bus stops.

Bus stops may be lit externally by overhead streetlights or pedestrian-scale lighting along the sidewalk. If street or sidewalk lighting does not exist or is not sufficient, lights can be mounted at the shelter on poles or within a shelter. When possible, efforts should be made to reduce the presence of shadows and dark enclosures in and around the bus stop.

CUE Standards

Almost all bus stops in the CUE bus system are served after dark and should be located where they will be illuminated at night. Recommended lighting levels are discussed in a report by the American Public

[8] Old Town Fairfax Historic Overlay District Streetscape Standards, pages 58 through 59: https://www.fairfaxva.gov/home/showdocument?id=14020

Transit Association (APTA)[9] and in the "Toolkit for the Assessment of Bus Stop Accessibility and Safety"[10]. Lighting at CUE stops should ideally be supplied by an overhead streetlight or pedestrian-scale streetlight. If that is not possible, lighting should be installed at the stop, either via mounted lights or within shelters.

The City of Fairfax adopted the Old Town Fairfax Historic Overlay District Streetscape Standards in July 2019. These establish design guidelines for Old Town Fairfax, including design specifications for streetscape elements such as street lighting. When installing freestanding light fixtures at bus stops, the style of pedestrian lighting described in the Old Town Fairfax Streetscape Standards should be used.[11] At stop locations where electrical connections are not present or would be challenging or prohibitively expensive to install, freestanding solar-powered lighting fixtures are another acceptable option for lighting at bus stops.

Figure 8: Street Lighting in Old Town Fairfax (Left); Solar-Powered Light in Portland, OR (Center); First Light Technologies (Right)

In addition to (or instead of) freestanding light fixtures at or near bus stops, lighting can be installed inside shelters themselves (see **Error! Reference source not found.**). New shelters do not need to be installed; rather, current CUE bus shelters can be retrofitted with interior lighting units.

Figure 9: Bus Shelter Interior Lighting (Left: Champaign, IL; Right: Fairfax/Vienna-GMU Metrorail Station)

[9] https://www.apta.com/wp-content/uploads/Standards_Documents/APTA-SS-SIS-RP-001-10.pdf

[10] https://www.nadtc.org/wp-content/uploads/NADTC-Toolkit-for-the-Assessment-of-Bus-Stop-Accessibility.pdf

[11] Old Town Fairfax Historic Overlay District Streetscape Standards, pages 65 through 69: https://www.fairfaxva.gov/home/showdocument?id=14020

Once bus stop lighting is installed, it is important to ensure that all bus stop lights work. Since customers may not always report lighting issues, the City of Fairfax should conduct an evening audit of bus stops at least annually to ensure that bus stop lights are working properly. This can be done with a quick drive-by inspection and reporting of problem stops.

Seating

Description

Seating at bus stops significantly enhances the experience of waiting for a bus. Benches are the most typical type of seating, but alternatives such as low walls can also be used. Seating design should not encourage loitering, but should also be comfortable for riders. Seating should be incorporated within shelters when possible. Seating exposed to the elements can sometimes be placed under trees or near buildings to provide shade.

CUE Standards

CUE bus stops that do not warrant a shelter but do warrant seating should a freestanding bench should be installed using the style defined in the City's Old Town Fairfax Historic Overlay District Streetscape Standards (see **Error! Reference source not found.**).[12] Seating should also be included at all bus stops with a shelter, typically installed in the interior of the shelter. Currently, CUE bus shelters include a bench inside the shelter (see **Error! Reference source not found.**). While shelter seating currently uses traditional bench-style seating, there are also options that have seat dividers and can be installed with CUE standard shelters (see **Error! Reference source not found.**).

Figure 10: Existing Bench at CUE Bus Stop; Example of Recommended Bench Style in Old Town Square

[12] Old Town Fairfax Historic Overlay District Streetscape Standards, pages 38 through 40: https://www.fairfaxva.gov/home/showdocument?id=14020

Figure 11: Interior Shelter Seating at CUE Bus Stops


Figure 12: Interior Shelter Seating Options with Seat Dividers


Posted Schedule Information

Description

Schedule information can be provided at bus stops to help reduce some of the uncertainty associated with taking a bus. This can include the full schedules for all stops on the routes that serve that stop, or a condensed schedule may be provided that only shows scheduled arrival times for the individual stop. An even more condensed schedule may simply show typical headways during certain times of day (such as buses arriving every 30 minutes during peak times and every hour during off-peak times). The amount of detail that can be shown largely depends on how much display space is available and how complicated the schedules are. The amount of detail displayed should also be clear and user-friendly to ensure that passengers can easily understand the information and trust that it is reliable.

CUE Standards

CUE currently includes posted schedules along with a system map at shelters. At stops that do not have a shelter but warrant some level of public information, CUE should consider installing pole-mounted schedules that display scheduled arrival times at that stop (or for the nearest preceding timepoint). Some stops currently shared by CUE and WMATA Metrobus service already have posted schedule information for Metrobus routes (see **Error! Reference source not found.**, center photo).

Figure 13: Pole-Mounted Schedules (Arlington, VA and Fairfax, VA); CUE System Map and Schedule Information (Fairfax, VA).

Shelters

Description

Bus shelters protect transit riders from the elements, provide seating for waiting passengers, and help to identify stop locations. Aside from buses, they are one of the most visible elements of a transit system. As such, attractive and well-designed shelters can help enhance public perceptions of transit and function as advertisements for available services.

Shelters typically have at least two walls, a roof, seating, and a clear space for customers using a wheelchair. Bus shelters should provide a clear line of sight to approaching buses. In order to make sure shelters are accessible, the concrete pad supporting the shelter should be flush with the surrounding sidewalk. In addition, a clear zone for wheelchairs of at least 30” x 48” must be maintained, clear of benches or other obstructions.

The design factors to be considered when choosing or designing a bus shelter include:

- Strength and durability of structure and materials
- Resistance of materials and paint treatment to weather conditions, graffiti, cutting, fire and other forms of vandalism

- Potential greenhouse effect of roof design during hot weather
- Existence of, or provision of external lighting in the area, and provision of internal lighting for the shelter
- Appropriateness of the design to the neighborhood
- Required dimensions of the concrete pad to ensure wheelchair accessibility
- Accommodation of trash can and newspaper boxes within the location design
- Easy maintenance of the shelter and other amenities
- Semi-transparent enclosure that allows a bus operator to see inside the shelter

In addition to standard shelters, many private shelter suppliers develop more specialized, high-tech shelters. Several companies now design solar-powered shelters, which can include maps, LED lighting, Wi-Fi, advertisements, and bus arrival displays. Bus shelters can also be designed to include heating activated by a push button.

CUE Standards

The City of Fairfax uses the Slimline Gable model manufactured by Brasco for all bus stop shelters (see examples in Figure 14). Installation details are included in the City's Public Facilities Manual[13].

Figure 14: Fairfax CUE Bus Shelters

Some CUE bus stops are located on streets with very narrow sidewalks or limited space available for a standard shelter. This poses a challenge if the location merits a shelter based on stop characteristics or community interest. In this situation, the City can consider installing a narrower cantilevered shelter to provide basic coverage with a smaller footprint. However, Brasco does not produce a cantilevered shelter in the Gable style similar to existing CUE shelters, and installing this type of shelter would necessitate using a different style where needed (see Figure 15).

[13] City of Fairfax Public Facilities Manual, Detail 409-01, Bus Shelter Installation Detail: https://www.fairfaxva.gov/government/public-works/public-facilities-manual

Figure 15: Cantilevered Shelter Styles for Narrow Rights of Way. Left: Portland, OR. Right: Bay Harbor, FL.

Posted System Maps

Description

Transit system maps can assist passengers in determining the best routing for their trip, including identifying transfer locations. System maps can also act as low-cost advertising and help potential customers understand how they can use transit services. Some agencies opt to provide maps displaying their entire network, while others tailor the maps based on stop location. For example, an agency may opt to only show the bus routes than can be accessed using the services available at a given stop. Most high ridership stops, especially stops that are major transfer locations, should have some form of transit system map.

CUE Standards

Today, a system map is posted inside shelters at CUE stops. This should continue to be standard practice.

Real-Time Passenger Information Screens

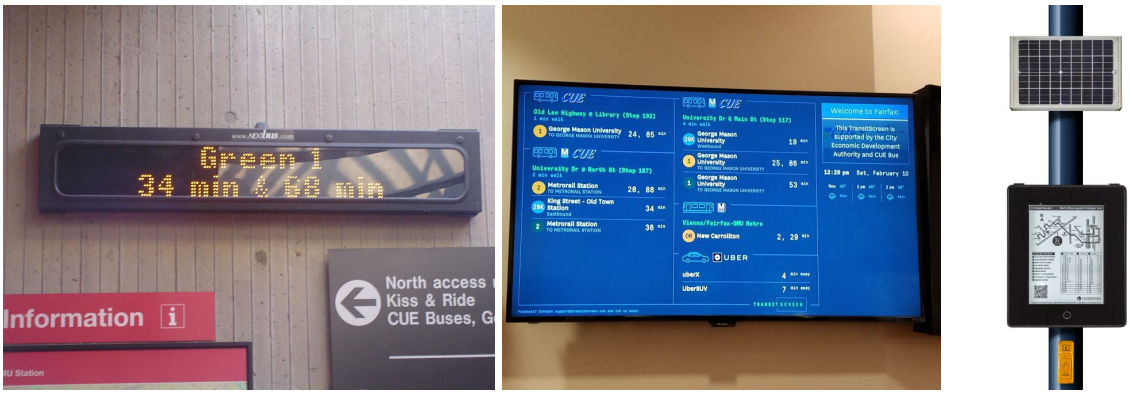
Description

Electronic message boards that provide real-time schedule and route information have been implemented by many transit systems at key bus stops. Real-time arrival information provides customers with an increased sense of confidence in using the bus. They are useful for riders who do not own a smartphone and can increase the perception of a bus stop as a permanent piece of infrastructure. Real-time signage also increases awareness of available transit service and may contribute to increased ridership. These screens are especially useful for busy stops with multiple routes, as even riders who can access such info on their phones will find it easier to see available options on a larger screen.

Real-time information screens can also be utilized to enhance security by displaying real time messages for emergencies, detours, or missing persons alerts. Consideration should also be given to strategies meant to reduce vandalism and theft of the boards, such as co-location with CCTV systems.

There are a variety of real-time information screen technologies, such as LED signs, “e-paper” screens, and high-definition monitors often used to display multimodal transit information, advertisements, and other information (see examples in Figure 16). The type of sign selected may depend on a number of factors such as where the sign will be located, durability requirements if it will be exposed to weather, and how the sign will be powered and connected to the real-time data.

Figure 16: Example Images of Real-Time Transit Information Screens (Left: CUE NextBus sign at Vienna Metro; Center: City of Fairfax Transit Screen at the Regional Library; Right: “E-paper” transit information display)



Multimodal screens tend to be installed in private businesses, underground transit stations, or other indoor locations where they are not exposed to weather, but as technology improves they may be installed at more outdoor locations. Multimodal screens may display information relevant to the specific location including (but not limited to):

- Bus schedule information
- Current bike sharing information
- Current car sharing information
- News/weather/time information
- Transit service alerts

CUE Standards

The City of Fairfax currently has digital signage with real-time information for CUE bus arrivals installed at six bus stops (such as in Figure 17) and at the Vienna Metrorail station. CUE’s existing digital signs are LED signs operated by NextBus as part of CUE’s real-time information service. Going forward, digital real-time arrival displays should continue to be installed at stops that are classified as Tier 1. CUE may continue to install similar LED NextBus signs or may explore alternatives for outdoor stops such as e-paper displays.

Figure 17: Real-Time Arrival Information Display at CUE Bus Stop

Bicycle Parking

Description

Bicycle racks help provide an additional way for passengers to access bus service (**Error! Reference source not found.**). Bike racks can range from basic designs to complex shapes that act as a type of public art. Association of Pedestrian and Bicycle Professionals (APBP) bicycle parking guidelines stress the importance of a bicycle frame being able to be supported by the rack in two places for resisting theft[14]. Bicycle racks typically require at least a 6'x3' footprint, including the space for two bicycles (but not including bicycle maneuvering space). Additionally, if multiple bicycle racks are installed, they must be placed at least 3 feet apart to allow convenient access.

CUE Standards

The City's Old Town Fairfax Historic Overlay District Streetscape Standards define specifications for the style and installation of bicycle racks in Old Town Fairfax, which can be referred to for bicycle racks at CUE bus stops elsewhere in the City (see **Error! Reference source not found.**).[15]

[14] https://www.fhwa.dot.gov/publications/research/safety/pedbike/05085/pdf/lesson17lo.pdf

[15] Old Town Fairfax Historic Overlay District Streetscape Standards, pages 41 through 43: https://www.fairfaxva.gov/home/showdocument?id=14020

Figure 18: Left: Bicycle Racks at Bus Stop (Springfield, MA); Right: Bicycle Rack in Old Town Fairfax Streetscape Standards

Additional Optional Amenities and Elements

Other amenities or bus stop elements may be desired at individual bus stops, based on the specific context of a given stop. These elements include in-street bus pads, bus stop pavement markings, charging stations, public art and placemaking elements, and “mobility hub” elements. These types of elements are not recommended at specific tiers of stops, but may be desired in certain locations. For example, a neighborhood or business district may wish to use placemaking elements at a bus stop to create a visible community hub. As another example, the street maintenance department may benefit from installing a concrete bus pad at a stop where frequent braking by buses and large trucks damages the pavement more quickly than normal wear and tear. The sections below describe each element, but a design standard is not established for CUE as these elements may be implemented on a case-by-case basis and should be designed to fit the specific context.

Bus Pads

Bus pads are located in the roadway at bus stops. Bus pads are typically constructed in concrete in order to reduce the occurrence of asphalt distortion at bus stops, which occurs when asphalt is warped by the weight and heat generated by braking buses. The issue of asphalt distortion is pronounced at high-volume bus stops and at near-side stops in mixed traffic where trucks may add to wear. As such, bus pads are generally warranted only at high-activity stops where asphalt may exhibit significant wear and tear.

When installed at bus stops out of the travel lane, bus pads should have a minimum width of 8.5 feet to accommodate both wheels of a bus, and should be wider at locations where the bus does not consistently pull fully to the curb (Figure 19). At places where the bus stops in the travel lane, the bus pad should extend across the full width of the lane. Bus pad length should be determined based on the length of the stop’s full bus zone including the deceleration and acceleration areas.

Figure 19: Examples of Bus Pads (Philadelphia, PA and Seattle, WA)

Pavement Markings

Pavement markings can play an important role in bus stop delineation in locations where there are multiple or conflicting curbside users (such as in a parking lane). Stop delineation designates the area that a bus will need to enter and leave a bus stop, and helps to ensure that this area is not blocked by other vehicles. Appropriate pavement markings can reduce motorist confusion, allow for safer and more efficient use of the roadway, and help facilitate stop accessibility. The overall marked area should be sufficient to accommodate all bus-related activities (entering, stopping and exiting).

In many instances, it may be desirable to paint a white box that clearly delineates the footprint of the bus stop on the roadway. The words “BUS” or “BUS STOP” should also be painted on the pavement in order to clearly signify that the space is a designated bus stop (Figure 20).

Figure 20: Example of White Bus Stop Markings (Boston, MA)

For bus stops in bus lanes, or where additional emphasis is desired, red or terra cotta colored pavement is the preferred coloring for pavement markings, as it highlights the prominence of the transit system while also becoming the standard color for visually delineating space dedicated to transit (Figure 21). There are several options available for coloring pavement, including paint, thermoplastic, methyl methacrylate, and embedded color where asphalt or concrete is mixed with a red pigment. When possible, embedded color is preferable as it lasts longer than other methods of pavement coloring.

Figure 21: Examples of Red Bus Lanes and Bus Stops (Washington, DC and Everett, MA)

Pavement markings require periodic maintenance if they are to remain effective. Ideally, this is performed at the same time as other roadway pavement markings are updated. The responsibility for maintenance should be addressed prior to making the decision to install markings.

Charging Stations

Several companies design benches and solar-powered charging stations that can be used to charge phones and real-time arrival information at bus stops. Charging stations can make bus stops more user-friendly and make waiting for the bus a more enjoyable experience. Charging stations, such as the solar-powered Soofa bench and charging station shown in Figure 22, may be appropriate amenities for bus stops that are part of a mobility hub or in other gathering areas where people may be waiting for a period of time (such as at a park or in the lobby of a busy building).

Figure 22: Soofa Solar-Powered Bench that Charges Phones

Public Art and Placemaking

Public art and placemaking elements can dramatically enhance bus stop attractiveness and transform a bus stop into a neighborhood landmark or anchor. This is especially true for busier stops, where the amount of activity means that the bus stop will be a notable space in the community. Many stops are located adjacent to retail businesses or other activity generators. Ideally, the design of a bus stop is coordinated with the neighborhood. Where possible, additional community space near the bus stop can provide room for seating, activities, or events.

As a center of activity, the bus stop may be an appropriate place for a large sign or other design element which can be seen from a distance and marks the neighborhood nexus. This can assist with wayfinding for both motorists and pedestrians, as well as raise the profile of the CUE system.

Public art also provides an opportunity to involve the community in the design of their transit system. Art can be incorporated into individual bus stops in a variety of ways or can be designed and implemented systematically across many stops. Examples include:

- Large scale art installations at individual bus stops
- Incorporation of artwork in a standard bus stop/bus shelter design that is utilized throughout the system
- Art panels designed to fit alongside other system signage, such as transit maps
- Custom bus stop furniture, including benches

Some agencies opt to involve the community in public art design, for example through art competitions and coordination with local business groups and schools. APTA published a report on the integration of public art into transit systems that summarizes best practices such as setting clear criteria for artists and involving the community[16].

Figure 23: Examples of Public Art at Bus Stops (Portland, OR and Bethesda, MD)

To some extent, bus stop art and other placemaking elements can reflect the surrounding context, as long as this does not detract from transit system branding and consistency. For example, bus shelters or benches can be customized to reflect a location in a historic district. In many cases, historical information about the community can appear on a panel on the bus shelter or nearby. Areas surrounding bus stops can include things like a self-serve book exchange, which can be used by transit users as well as others. Generally, the activity at well-used bus stops can enhance the safety of the surrounding area (and contribute to local business sales), while the surrounding area activity can reinforce safety for people waiting at the bus stop. This synergy means that the bus stop will be viewed as an important community asset, and in turn facilitate support for bus service.

[16] https://www.apta.com/wp-content/uploads/Standards_Documents/APTA-SUDS-UD-RP-007-13.pdf

Park space can be useful as an adjacent land use to busy bus stops by providing additional space for transit users, as well as facilitating interaction among those using the bus and others using the park. This can be another way to integrate bus stops with the surrounding community.

Mobility Hubs

Mobility hubs are centers of multi-modal transportation, linking transit, active transportation, and car commutes and increasing the appeal of using shared modes. Located around transit stations and key neighborhood locations, mobility hubs offer a density of transportation options at specific locations, often combined with other public, commercial, or residential amenities. Hubs can be large or small depending on the needs of the surrounding communities and networks. The goals of mobility hubs are to:

- Create convenient, safe, and accessible connections between different modes of transportation at one location.
- Showcase the appeal of using public transit, biking, or other shared modes over driving private vehicles and increase the ability of residents to not own a personal car.
- Provide a neighborhood gathering space for commercial and residential life (potentially combined with elements of placemaking).

Many cities around the United States have developed mobility hubs, either from scratch or through gradual improvements to existing stations and park and ride lots. The concept of mobility hubs has evolved over the years due to changing technology trends: from a connection point between transit and cars with good wayfinding signage to a nexus of many modes, including new emerging mobility and connectivity through Wi-Fi and smartphones.

Mobility Hub Elements

The design and offerings of each mobility hub depends on location, need, existing infrastructure, and many other variables. Mobility hubs typically contain some combination of the following elements:

Public Transit	Private Vehicles	Bike Infrastructure	Shared Mobility	Other Amenities
▪ Buses, bus rapid transit, light rail, subway, commuter rail ▪ Static transit information (schedules, maps, etc.) ▪ Real-time signage for wait times and delay alerts ▪ Transit store, kiosk, fare machines	▪ Parking lot or garage (or a “park and ride”) ▪ Pick-up/drop-off area (or a “kiss and ride”) ▪ Electric vehicle charging	▪ Bike racks, covered storage ▪ Bike repair stands ▪ Lockers, showers	▪ Bike-share, scooter-share ▪ Car-share ▪ Ride-hail (TNCs and taxis) pick-up/drop-off area	▪ Restrooms, waiting area ▪ Wi-Fi, charging stations ▪ Commercial services (newspaper box, retail, dry-cleaning, café, etc.) ▪ Transit-oriented and mixed-use developments ▪ Wayfinding to nearby destinations

Mobility hubs often require coordination with a variety of partners. Examples include other transit systems (to coordinate transfers), planning and public works departments (to provide space for other mobility options and ensure transit-oriented development is allowed in zoning codes), private developers (to orient buildings towards the mobility hub and provide additional amenities), and private businesses (to provide convenient services).

In some locations a mobility hub can provide a connection from lower-density areas that do not support frequent transit. For example, a mobility hub can provide private vehicle parking for a park-and-ride option, or it can be a connection to microtransit services.

Table 8: Summary of CUE Standards for Bus Stop Elements

Tier	Element	Standards or Guidelines	Specifications / References	Example Images
Tiers 1-4 (all stops)	ADA Compliant Landing Pads	▪ Bus stop landing pads shall be ADA compliant (see PROWAG for details) ▪ Landing pads at busier stops may be larger	PROWAG, R308 https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines	
	Bus Stop Sign	▪ Bus stop signs shall be ADA compliant (see PROWAG for details) ▪ Bus stop shall display information that includes (but is not limited to) the CUE logo, website, and phone number, the route name and destination, and the stop ID number ▪ The City shall develop an updated design that shall be used at all bus stops	TBD PROWAG, R211, R410 https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines	TBD
	Trash Receptacle	▪ At stops with shelters: free-standing aluminum cans similar to the style identified in the Old Town Fairfax Streetscape Standards (OTFSS) ▪ At stops without shelters: pole-mounted cans similar to the style at existing CUE stops	With shelters: OTFSS, p. 58 https://www.fairfaxva.gov/home/showdocument?id=14020 Without shelters: Similar to existing pole-mounted trash receptacles at CUE stops Example: https://www.uline.com/BL_1182/Pole-Wall-Mount-Trash-Cans	

Tier	Element	Standards or Guidelines	Specifications / References	Example Images
	Lighting	▪ Preferred lighting: Street or pedestrian-scale lighting adjacent to the stop similar to the style identified in the OTFSS or Public Facilities Manual (PFM) ▪ Alternate lighting: Solar-powered lighting at stop or in-shelter	Preferred: OTFSS, p. 65 https://www.fairfaxva.gov/home/showdocument?id=14020 Preferred: PFM 2.1 Street Lighting Specifications https://www.fairfaxva.gov/government/public-works/public-facilities-manual Alternate Examples: https://www.brasco.com/products/solstop/solstop/ https://www.brasco.com/products/solar-powered-solutions/lighting/eclipse-light/ https://www.sepco-solarlighting.com/solar-bus-stop-shelter-lighting	
Tiers 1-3	Seating	▪ At stops with shelters: attached benches similar to the style in existing CUE shelters ▪ At stops without shelters: freestanding bench similar to the style identified in the OTFSS ▪ Alternate: a bench may be pole mounted and may incorporate other elements	With shelters: attached to shelter similar to existing. Example: https://www.brasco.com/products/street-furniture/benches/wall-mounted-2/ Without shelters: OTFSS, p. 38 https://www.fairfaxva.gov/home/showdocument?id=14020 Alternate Examples: https://www.brasco.com/products/street-furniture/benches/solstop-bench/ https://simmeseat.com/	
	Posted Schedules	▪ At stops with shelters: System maps and full schedules shall be posted similar to existing CUE shelters ▪ At stops without shelters: pole-mounted schedules	With shelters: system map and full schedule similar to existing. Example: https://www.brasco.com/products/wayfinding-signage/information-displays/display-case/ Without shelters: Pole-mounted examples: https://www.brasco.com/products/wayfinding-signage/information-displays/schedule-holder/	

Tier	Element	Standards or Guidelines	Specifications / References	Example Images
		may be installed that display the arrival times at the nearest timepoint before the stop		
Tiers 1-2	Shelter	▪ Transit shelters shall be ADA compliant (see PROWAG for details) ▪ Transit shelters shall comply with current PFM specifications ▪ Alternate: where space does not allow a full shelter, a shelter with a smaller footprint may be considered	PROWAG, R308 https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines PFM detail 409-01 https://www.fairfaxva.gov/government/public-works/public-facilities-manual Alternate Examples: https://www.shelterstore.co.uk/cantilever-bus-shelters http://www.handi-hut.com/catalog.php?category=4	
	Posted System Map	▪ A system map shall be posted in shelters similar to existing CUE shelters	With shelters: system map and full schedule similar to existing. Example: https://www.brasco.com/products/wayfinding-signage/information-displays/display-case/	
Tier 1	Real-Time Arrival Display	▪ Preferred: Digital LED signs similar to the existing style at CUE stops ▪ Alternate: High definition information screens that allow for multiple routes, multimodal information, advertising, and other information may be considered based on	Preferred: LED signs. Example: https://transignllc.com/products/led-destination-signs/ Alternate Example: https://www.connectpointdigital.com/digital-bus-stop/	

Tier	Element	Standards or Guidelines	Specifications / References	Example Images
		maintenance needs and other factors		
	Bicycle Rack	▪ Preferred: U-rack similar to the style identified in the OTFSS; installation shall follow Association of Pedestrian and Bicycle Professionals (APBP) or similar guidelines ▪ Alternate: bike racks with artistic elements may be considered for approval but must meet APBP or similar guidelines	Preferred: OTFSS, p. 65 https://www.fairfaxva.gov/home/showdocument?id=14020 APBP bicycle parking guidelines: https://www.apbp.org/Publications	

5 System-wide Opportunities

In addition to maximizing the visibility, functionality, and comfort of individual bus stops, there are a number of system-wide opportunities to raise awareness about and improve the passenger experience in the bus system as a whole. Opportunities discussed in this section include transit system branding, real-time information technology, fare payment options, mitigation of construction project impacts on bus stop access, and ongoing maintenance and evaluation programs.

Transit System Branding

A brand is an agency's identity and aesthetic, and a reflection of its values. Similar to consumer products or services, a strong sense of identity for a transit system reinforces a user's confidence that the service is a well-known, accepted part of the community. Branding raises awareness about the system, even among those who do not use transit themselves, and can thereby create greater support for the system. A strong brand will also encourage ridership by making the CUE system more recognizable and user-friendly, especially for the occasional rider.

Consistency is important: the transit customer should experience the same logo, colors, and names whether they are accessing information on a website or a smartphone app, riding in a CUE bus, or trying to find the correct bus stop. The system should feel unified even though it is spread over a large geographic area. Wayfinding signs, maps, and other materials for CUE should include the standard logo and colors even if they are installed by others or are on property that is owned by others (such as in lobbies of transit-oriented or transit supportive developments or as part of wayfinding systems in activity centers).

When creating or updating a brand, a transit agency must answer three questions:

- What values should the brand convey? Some typical brand values for transit agencies include reliability, convenience, comfort, environmental friendliness, and freedom (to work, read, etc.). Values can be ideas that the agency thinks are important (for example, "cool" is one of Los Angeles Metro's core values), or they can be benefits that customers will get from using the service (such as King County Metro's branding strategy reminding people that riding transit frees up their commute time).
- Why should people care? The second question facing an agency focuses more on the story the brand should carry. What is the narrative of the transit agency? How is the brand a part of or separate from that narrative? All internal and external-facing publications should work to tell this story through graphic and visual messaging.
- Is the branding strategy authentic? Because branding campaigns are aimed at attracting and keeping new riders, it is not enough for an agency to simply change the image of a transit service. If there are aspects of service that are discouraging potential riders from using transit, it is essential to address those issues in conjunction with a branding campaign. A transit agency must be the brand it says it is.

Branding at Bus Stops

Branding at bus stops serves as both information and advertising. Clear and uniform branding across bus stops indicate where customers can catch a bus and where that bus will take them. Service branding at a bus stop also helps to advertise the existence of transit service, and an effective brand will communicate what the service is and why it may be appealing to potential riders.

Figure 24: Examples of Transit System Branding at Bus Stops

Branding on Buses, Maps, and Other Materials

The CUE brand is also visible on the outside of the transit buses, on printed maps and schedules, and on marketing materials (such as banners and table covers for events and branded giveaways such as pens and tote bags). All of these items contribute to the visibility and familiarity of the bus system, and the brand should be consistent across all materials. Maps and schedules should also be consistent with bus stop signs – for example, if the name or location of a bus stop changes, this should be updated on maps and schedules.

CUE should evaluate its existing brand and determine what minor or major rebranding may help communicate CUE's values and information effectively. Minor rebranding may simply involve updating the layout of the bus stop flags (as discussed in the previous chapter) and seeking ways to make the brand more visible in more locations (such as in shelters and wayfinding signs). If CUE determines that the existing brand does not effectively convey the system's values and benefits to the community, a major rebranding effort should be undertaken. A major rebranding would impact many types of equipment and materials that would subsequently need to be updated, including (but not limited to) bus stop signs, maps and schedules, and design details on transit buses. Therefore CUE should consider the funding needed to implement a major rebranding effort.

Mitigation During Construction

Construction activity on roadways or sidewalks, whether due to bus stop improvements, roadway projects, property development, or other causes, can be very disruptive to bus passengers and operations. Construction-related obstacles can unexpectedly prevent some people from being able to board or alight from buses, and therefore individuals with limited mobility or other disabilities may not be able to use transit service at all. Every effort should be made to ensure that safe, accessible bus stops are provided at all times, even when locations need to be temporarily shifted due to construction activity.

The duration of particular bus stop impacts can range from a few hours to months or years, depending on the scope of the construction project in the area. At all times, it is paramount that everyone is aware of the correct bus stop location, including:

- Bus passengers
- Bus operators
- Motorists
- Police
- City construction inspectors
- Residents and businesses in the vicinity

The temporary bus stop location should be indicated by signage, and these signs should be as consistent as possible with typical signage for regular bus stops, including the CUE logo. The signs should be posted so that they can be seen from a distance, as the construction activity will make it more challenging to navigate the area. Wayfinding signage should also be placed where a bus stop has been temporarily eliminated, giving directions to the new stop.

Information about the temporary location should be distributed to bus operators and bus passengers through all of the information channels available, including alert systems and phone apps. For longer-term projects, it is best to fully program the temporary location as a regular bus stop in all information systems. Once the construction has ended, it is equally important to inform everyone that the bus stop has returned to its original location, and remove any signs which state otherwise.

Finding temporary locations for bus stops can be challenging, since construction often has other impacts in the vicinity and there will usually be less space available. However, even if there is no nearby alternative, it is important not to eliminate bus stops for a long period of time. As much as possible, temporary bus stops should be as safe, convenient, and fully accessible as regular stops. If the bus cannot pull next to the sidewalk at a particular location, then a temporary platform should be provided so that the wheelchair ramp on the bus can still safely deploy at the stop (Figure 25). For individuals with visual impairments or limited mobility, the construction environment is already very challenging. Ensuring that there are good bus stop locations and accurate information about those locations is critical.

Ideally, the specifications for temporary bus stops are included in construction documents for roadway and sidewalk projects, so that the contractor is fully responsible for maintaining stops as noted above. All parties involved should work together to make sure there are good bus stop locations, just as they would manage other impacts of construction.

Figure 25: Example of a Temporary Bus Stop (Portland, OR)

Ongoing Maintenance Programs

In addition to maintaining bus stop access during construction projects, bus stops require ongoing maintenance and evaluation. Periodic evaluations include asset condition and stop accessibility evaluations and lighting audits. Maintenance includes regular trash and recycling collection, bus stop cleaning, minor repairs and upkeep of all the elements, and updates to posted service information.

Evaluation Programs

The implementation chapter of this report discusses two types of evaluation to conduct prior to initiating a major bus stop improvement program. First, the accessibility of each stop should be audit and the bus stop database should be updated with more details to track which stops require accessibility upgrades. At the same time, this audit should include an evaluation of the condition of the existing assets. This will provide a baseline to determine which stops, and which elements at stops, require replacement or repairs. Ideally this audit of accessibility and asset conditions will be conducted on a regular basis to maintain a current database. At minimum this audit should be conducted prior to major investments.

The other type of recommended evaluation program is a lighting audit. As discussed in the implementation chapter, bus stops served in the evenings (all CUE bus stops) should be evaluated at night to determine where low lighting levels and poor visibility exist. This will help prioritize lighting upgrades. A lighting audit should also be conducted periodically to identify maintenance needs as well as lighting gaps.

Maintenance Programs

CUE should periodically review bus stop maintenance programs and policies to plan for needs in the operating budget and ensure that bus stops are attractive and comfortable to passengers. Maintenance

programs should include trash and recycling collection, bus stop cleaning, and minor repairs and refurbishement of all of the bus stop elements. Bus operation plans should anticipate necessary costs such as repair of vandalized shelters or refurbishment of public art. Programs such as an “adopt a stop” program can help support maintenance needs (in addition to giving residents, business owners and other community members a sense of ownership of stops in their community).

6 Implementation

The information in the preceding chapters provides guidance to ensure that bus stops will be designed for safety, comfort, and accessibility. It is equally important to have a program for ongoing improvement and maintenance of bus stops, so that high-quality designs can actually be implemented. This chapter summarizes key implementation steps and considerations, including:

- Prioritizing investments with objective criteria and scoring methodologies,
- Conducting a bus stop accessibility audit and updating the bus stop database,
- Identifying funding sources and other implementation opportunities, and
- Developing realistic cost estimates.

Prioritizing Investments

CUE currently serves 194[17] bus stops, and the City of Fairfax must be strategic about investing in bus stop improvements as resources become available. For this reason, a bus stop prioritization methodology was developed to evaluate and identify bus stops to prioritize for improvement projects, regardless of bus stop tier and level of amenities.

Investment priority scoring is based on the following factors:

- **Daily Passenger Activity:** Total weekday boardings and alightings at a stop. Bus stops that experienced the largest ridership volumes should be a higher priority for addressing improvement needs sooner than later. Bus stop tier criteria considered weekday boardings only, as more enhanced facilities benefit passengers who are waiting to board a bus; in contrast, accessibility improvements and other basic upgrades benefit both boarding and alighting passengers.
- **Planned Development:** When major new developments are built, this provides an opportunity to attract new residents or employees to ride CUE. The design of new mixed-use and transit-supportive developments can also incorporate transit stop improvements. Amenities at these stops can reinforce these efforts and make transit a more attractive option.
- **Minority and Low-Income Population:** Stops are prioritized if they serve a census block group with either minority or low-income population above the citywide average.
- **Existing Conditions:** Stop conditions should be evaluated periodically, and stops in “poor” conditions (with accessibility barriers or amenities in poor condition) should be prioritized ahead of stops that are in good condition.

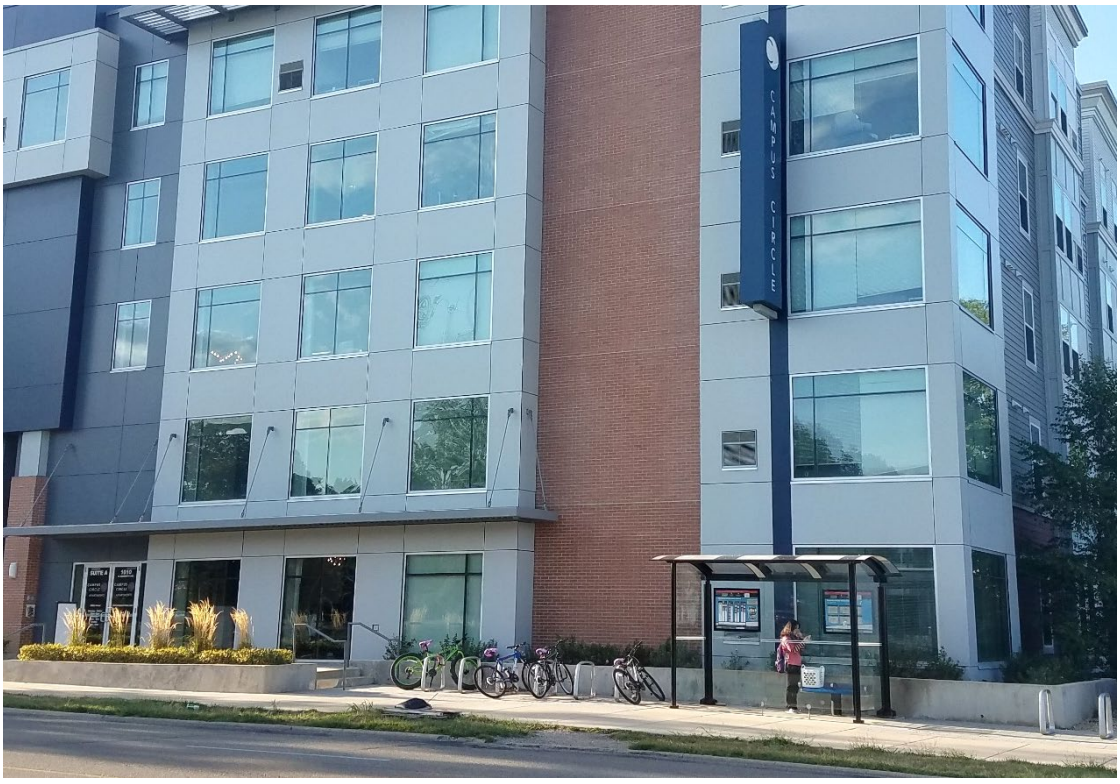
[17] This includes CUE stops at George Mason University and at the Vienna/Fairfax-GMU Metrorail Station. These two stops were excluded from consideration for the prioritization process, since they are the property of GMU and WMATA, respectively, The remaining 192 stops were prioritized for investment as part of this study.

Table 9: Recommended Scoring System for Bus Stop Prioritization

Prioritization Criteria	Points Awarded
Total Daily Passenger Activity Sum of Weekday Boardings and Alightings	5 points if sum is greater than 50 4 points if sum is 30 to 49 3 points if sum is 20 to 29
Planned Development	1 point if stop is located within 500 feet of a major new development
Minority and Low-Income Population	1 point if either minority or low-income population in the surrounding census block groups is greater than the Fairfax citywide average
Existing Conditions	1 point if bus stop condition rating is “poor”

Although the scoring system described above considers the investment priority for all bus stops, specific circumstances such as planned roadway projects and new developments present an opportunity to improve some existing bus stops with separate funding sources. The City of Fairfax can leverage these opportunities to accelerate bus stop improvements in a cost-effective way while incorporating enhancements into the larger project’s design process and maximizing the opportunity to attract riders from new developments. Planned new development and roadway construction should always incorporate the improvement of adjacent existing bus stops, even if a stop does not otherwise have a high prioritization ranking. Unlike many other communities, CUE service is operated by the City, making the City uniquely positioned to coordinate new development, roadway projects, and bus stop enhancements to maximize the benefit to the community.

Figure 26: Bus Stop and New Development (Urbana, IL)



Bus Stop Audit and Database Maintenance

CUE produced a Bus Stop Database for this study which includes physical characteristics for every stop (such as the presence of a shelter or seating and its location relative to an intersection), stop activity (the number of daily passenger boardings and alightings), and the context at and surrounding the stop (such as connections to other transit services, neighborhood demographics such as the proportion of minority and low-income residents, and proximity to City-designated Activity Center land use areas). This database should be maintained as capital projects are completed and updated in tandem with short-range transit plan updates (approximately every five years).

Prior to implementing a funding program (as well as part of periodic updates), a full accessibility audit and existing conditions assessment should be undertaken for all CUE bus stops. This involves a site visit to each stop and is labor-intensive, but is the only way to collect critical information for budgeting, planning, and establishing priorities. There is a balance regarding how much information should be collected by the field surveyors during this inventory process. Once bus stop improvements move to the design and construction phase, another site visit will invariably be needed, so there is no need to collect data for engineering. The focus should be on photographs, measurements, and notes which can be consistently collected, and on data which would be useful to know for all stops in the entire CUE system.

Appendix D: Recommended Checklist for Bus Stop Accessibility Audit shows a recommended checklist for the field visits as part of the bus stop inventory. This list can be modified based on priorities, and/or converted for digital data entry on handheld units by the field surveyors. The main intent is to confirm the exact coordinates of the stop, stop length, running slope (parallel to the roadway), cross slope (perpendicular to the roadway), and location and condition of bus stop elements. The surveyor supplements these measurements with photos from multiple angles and notes about any conditions which would inform the need for and cost of improvements to the stop. With fairly minimal training, surveyors can complete the field work in an average of 15 minutes per stop. For safety and accuracy of data, it is best to have surveyors travel in teams of two. One option to control survey costs is to have much of the field work completed by interns or students taking related undergraduate or graduate courses, supported by in-house transit agency staff. A cost estimate with reasonable assumptions for the bus stop inventory is shown below.

Table 10: Bus Stop Audit Cost Estimates

Item for Bus Stop Inventory	Cost
Surveyor training (estimate 5 hours at $20/hour x 2 surveyors)	$200
Field work per stop (0.25 hour at $20/hour x 2 surveyors)	$10 per stop
Multiply by approximately 200 stops — Subtotal	$2,000
Add 25% for travel and data transfer	$500
Add 30% for training and supervision	$600
Add 25% for data compilation	$500
Add 30% for project management/admin	$600
Equipment – digital levels, measuring wheels, GPS, vehicles, tablets, safety vests	$10,000
Estimated Total	$14,400

The bus stop survey will reveal sites where shelters will likely not be feasible due to physical constraints, and can contribute to decisions about consolidating, eliminating, and/or relocating some stops. With regard to rating conditions at each stop, a suggested scoring system is shown below:

- Score of 5 points = Stop is already fully accessible and in excellent condition
- Score of 4 points = Good condition, functionally accessible, deficiencies are minor
- Score of 3 points = Fair condition, some significant issues for safety and/or accessibility
- Score of 2 points = Poor condition, not accessible, very significant problems
- Score of 1 point = Very poor condition, difficult for anyone to use stop

Funding Options and Implementation Opportunities

CUE should identify funding sources to implement a certain number of bus stop improvements each year. Some funding is available through the I-66 Commuter Choice program to implement improvements at stops serving I-66 corridor commuters (as noted in the introduction and accompanying reports). Other funding sources may include a mix of local funding and state assistance, or commitments from development projects that impact traffic and transit services or support potential increased demand for transit.

In addition to an annual funding program, the City of Fairfax should incorporate transit improvements in any roadway or sidewalk improvement project adjacent to a CUE route. Roadway corridor projects are an ideal opportunity to optimize bus stop locations and design and construct high quality bus stops. Because the City of Fairfax operates CUE as well as implementing roadway projects, it is uniquely positioned to proactively coordinate bus stop improvements for maximum efficiency and cost-effectiveness, as well as improving pedestrian accessibility near bus stops.

Cost Estimates

Implementing bus stop improvements is often more expensive than many people expect. In particular, ADA accessibility requirements for an 8’ wide landing pad by the front door of the bus means that some significant concrete construction may be needed at some stops. If the landing pad is part of the sidewalk and the sidewalk is substandard (for example with a substandard cross-slope), some sidewalk repairs may also be needed. It is possible that a relatively large area (as much as 200 square feet) needs improvement in order to have all grade changes be gradual and provide enough space. Some stops may also need to be lengthened so that buses can align fully against the curb when stopped.

Before finalizing a multi-year bus stop improvement program, it is recommended that stops be evaluated for potential consolidation or relocation. Consideration should be given to eliminating or relocating stops with the following characteristics, especially if nearby alternatives exist:

- Stop is just after the crest of a hill
- Stop is just after the curve of a road
- Stop has very little passenger activity
- Stop spacing does not meet CUE guidelines
- Stop would be very difficult to make fully accessible, due to obstructions, driveways and/or severe slope issues

Cost estimates in this section have been prepared as planning-level order-of-magnitude estimates for use in prioritizing funding as it is appropriated. Cost estimates were developed based on an evaluation of a

selection of sample stops. Each bus stop in the CUE system has unique features, and these estimates are not intended to apply wholesale to every stop under each tier. The quantities have been prepared based on reviewing the sites through available internet roadway views and applying engineering judgement to determine approximate limits of work. The unit prices have been established based on research from various sources from different projects in the transportation and institutional industries as well as specific vendor correspondence on specialty type items. The cost estimates include preliminary engineering, construction, construction inspection, and an overall contingency. The cost estimates do not include costs for permitting, utility and right-of-way impacts. The estimates assume that these bus stop improvements will be individually competitively bid; if the city bundles sites together, the overall costs should be reduced based on the economy of scale.

Upon future selection of bus stops for actual design and construction development, the cost estimates should be re-developed based on survey, right-of-way, and utility data collection along with final design engineering and permitting.

Stop elements and cost estimates for a sample selection of stops are provided on the following page, in addition to drawings that illustrate how potential improvements could be implemented at these stops with different tiers of improvements. Detailed cost estimates for these sample stops can be found in Appendix E Example Cost Estimates.

Figure 27: Example Stop Improvement Cost Estimates[18]

Stop Element	Fairfax Blvd at Pickett Rd (186) (Tier 1)	Lee Highway at Rust Rd (79) (Tier 1)	Jermantown Rd at Gainsborough Ct (73) (Tier 2)
Shelter - Standard	$13,000	$13,000	$13,000
Bench	$1,400	$1,400	$1,400
Trash Receptacle	$150	$150	$150
Bike Rack	$330	$330	—
Bus Stop Flags/Signage	$700	$700	$700
Advertising Sign / Poster / Sticker	$300	$300	$300
Real Time Information Screen	$1,000	$1,000	—
Street Lighting	$5,400	$5,400	$5,400
Street Lighting 2" PCV Conduit	$2,400	$1,200	$2,400
Trench Excavation ECI-1	$1,000	$500	$1,000
Electric Connection	$3,000	$3,000	$3,000
Concrete Pad	$8,525	$11,625	$2,325
Fine Grading	$68	$99	$88
Aggregate Base - 4"	$878	$1,284	$234
Excavation (Sidewalk)	$900	$1,350	$240
Embankment (Common Earth)	$39	$69	$191
4" Yellow Pavement Marking Line (Solid)	$60	$60	$60
4"Yellow Pavement Marking Line (Dashed)	$30	$30	$30
Pavement Marking Message (Bus & Stop)	$800	$800	$800
Clearing	—	—	—
Seeding / Sodding	$595	$866	$616
Subtotal	*$47,574*	*$50,163*	*$31,934*
Erosion & sediment control (5%)	$2,379	$2,508	$1,597
Maintenance of Traffic (10%)	$4,757	$5,016	$3,193
Miscellaneous items (10%)	$4,757	$5,016	$3,193
Subtotal	*$59,468*	*$62,703*	*$39,917*
Mobilization (10%)	$5,947	$6,270	$3,992
Subtotal	*$65,415*	*$68,973*	*$43,909*
Preliminary engineering (10%)	$6,541	$6,897	$4,391
Construction engineering (12%) & contingency (20%)	$20,933	$22,072	$14,051
Total	$86,000	$91,000	$63,000

[18] Example cost estimates and concept plans reflect draft tiers, which may change based on changes to service, ridership, or the surrounding context. No examples were developed for Tier 3 as this concept was developed near the end of the study process.

Stop Element	Main St at Lyndhurst Dr (109) (Tier 2)	Main St at Fairfax Bldg (87) (Tier 4)	Fairfax Blvd at Denny's (173) (Tier 4)
Shelter - Standard	$13,000	—	—
Bench	$1,400	—	—
Trash Receptacle	$150	—	—
Bike Rack	—	—	—
Bus Stop Flags/Signage	$700	$350	$700
Advertising Sign / Poster / Sticker	$300	—	—
Real Time Information Screen	—	—	—
Street Lighting	$5,400	—	—
Street Lighting 2" PVC Conduit	$1,440	—	—
Trench Excavation ECI-1	$600	—	—
Electric Connection	$3,000	—	—
Concrete Pad	$5,890	$310	$1,705
Fine Grading	$176	$3	$16
Aggregate Base - 4"	$611	$39	$208
Excavation (Sidewalk)	$640	$40	$240
Embankment (Common Earth)	$67	$11	$11
4" Yellow Pavement Marking Line (Solid)	$60	$60	$60
4"Yellow Pavement Marking Line (Dashed)	$30	$30	$30
Pavement Marking Message (Bus & Stop)	$800	$800	$800
Clearing	$5,969	—	—
Seeding / Sodding	$1,232	$21	$112
Subtotal	*$45,843*	*$1,664*	*$3,882*
Erosion & sediment control (5%)	$2,292	$83	$194
Maintenance of Traffic (10%)	$4,584	$166	$388
Miscellaneous items (10%)	$4,584	$166	$388
Subtotal	*$57,303*	*$2,080*	*$4,853*
Mobilization (10%)	$5,730	$208	$485
Subtotal	*$63,034*	*$2,288*	*$5,338*
Preliminary engineering (10%)	$6,303	$229	$534
Construction engineering (12%) & contingency (20%)	$20,171	$732	$1,708
Total	$90,000	$4,000	$8,000

Figure 28: Fairfax Boulevard at Pickett Road (Stop #186) – Tier 1

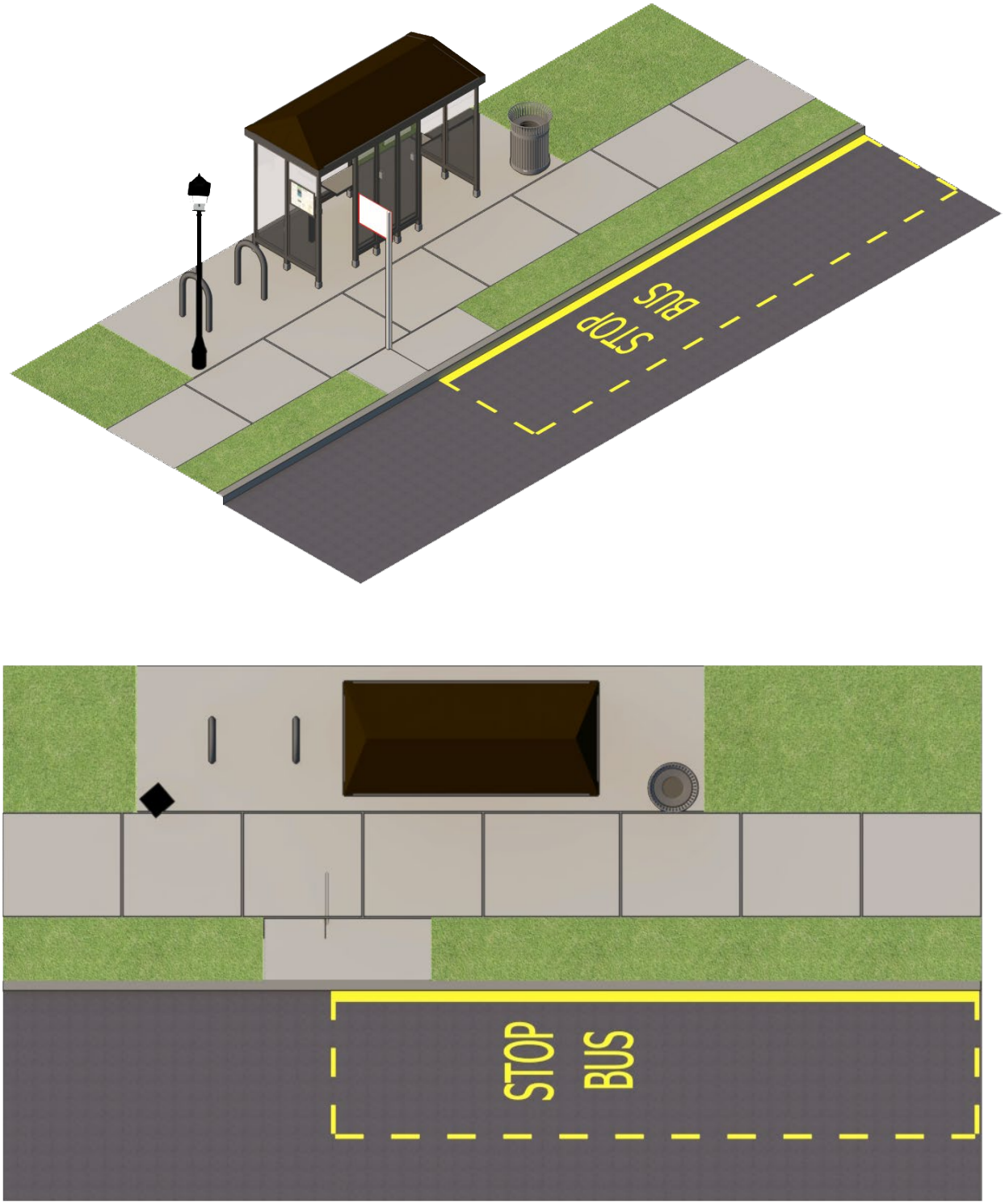


Figure 29: Lee Highway at Rust Road (Stop #79) – Tier 1

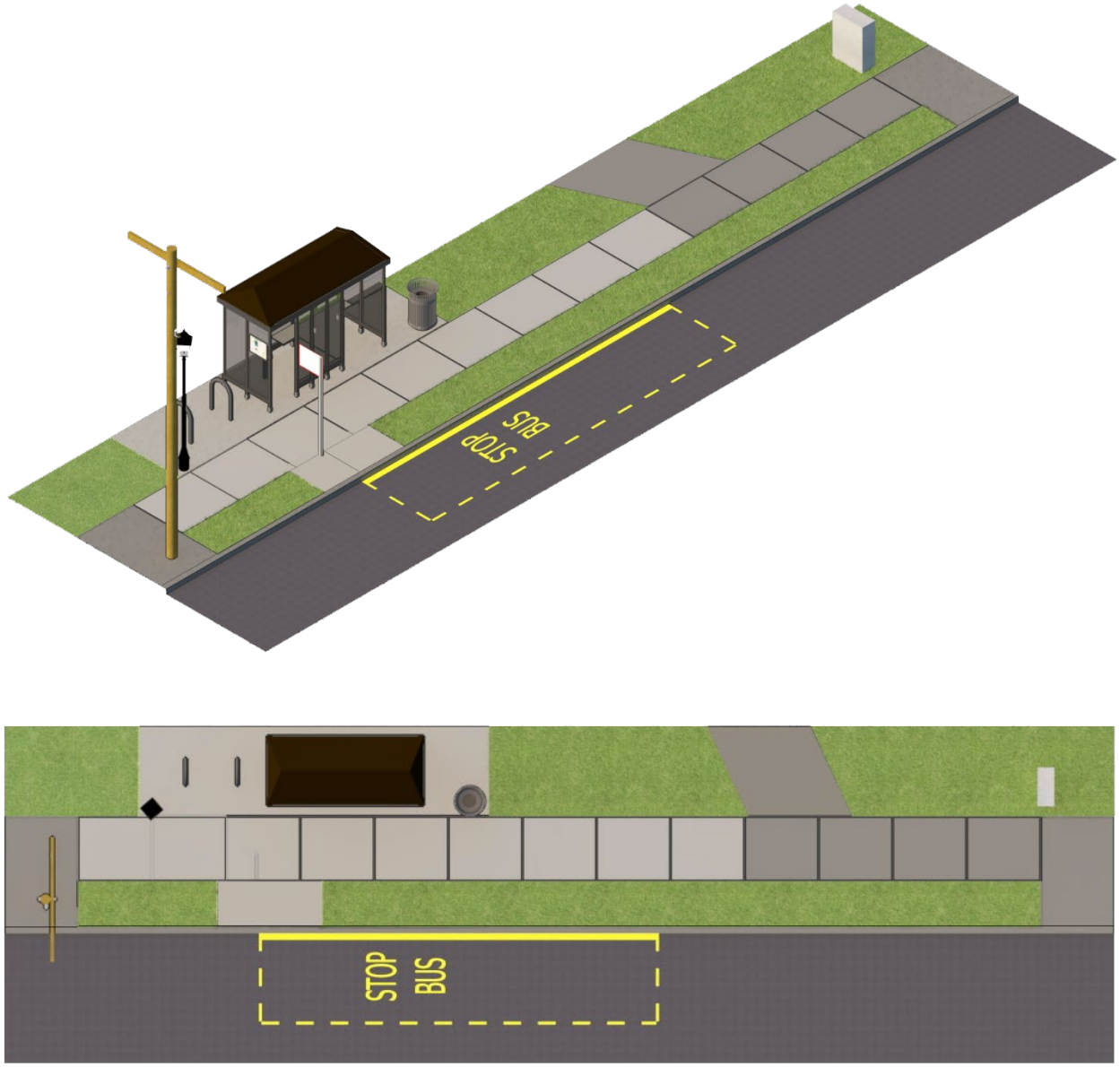


Figure 30: Jermantown Road at Gainsborough Court (Stop #73) – Tier 2

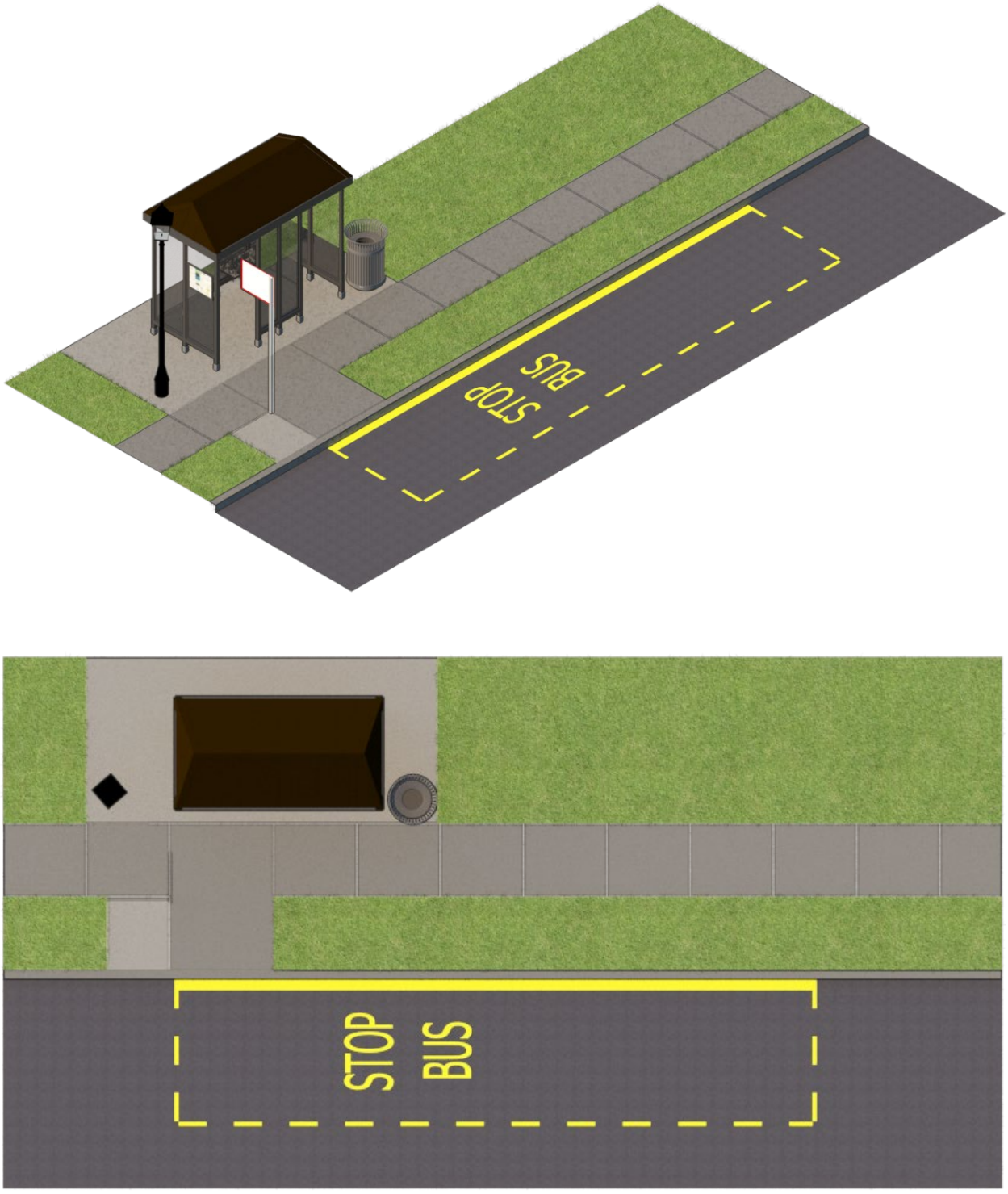


Figure 31: Main Street at Lyndhurst (Stop #109) – Tier 2

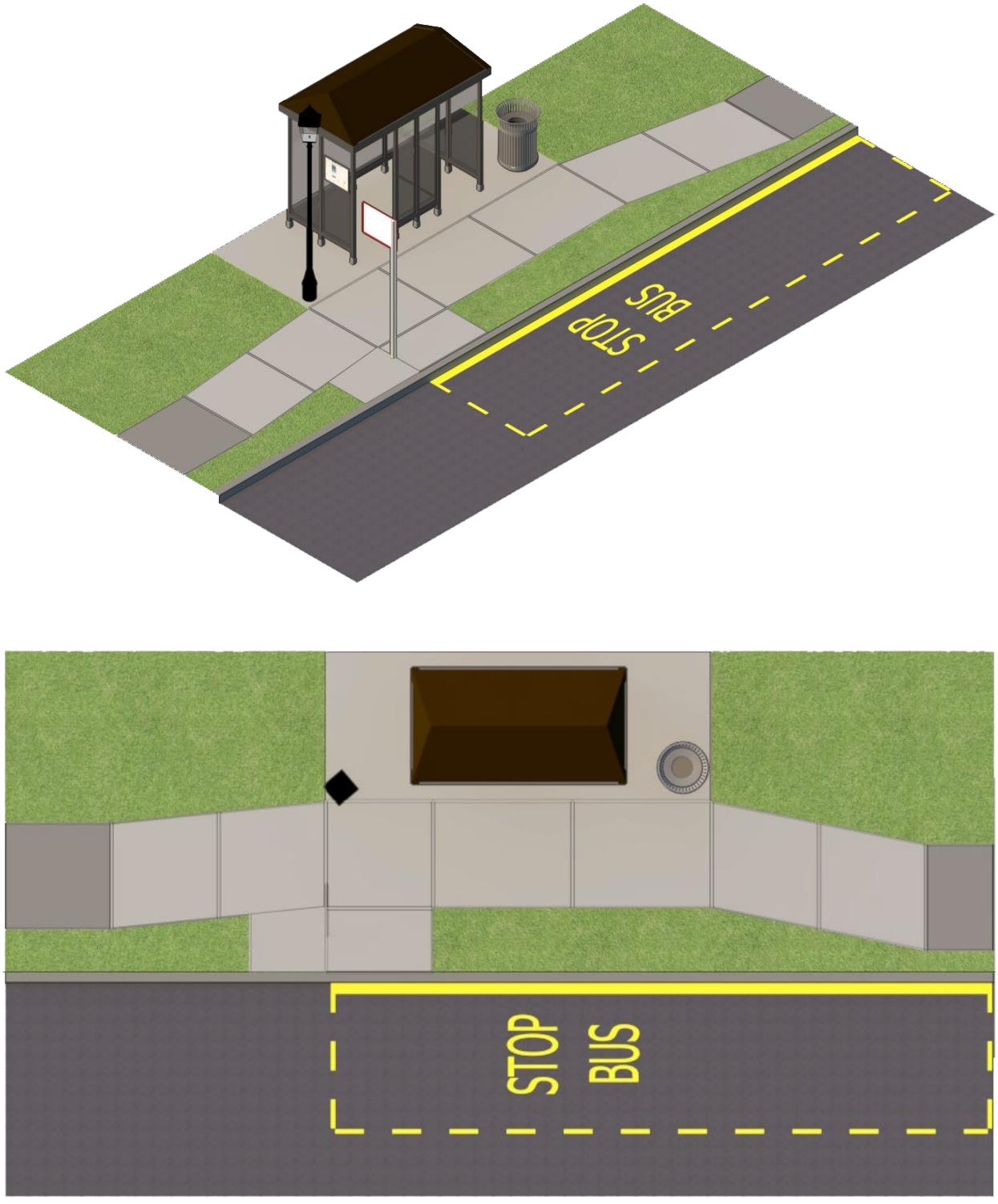


Figure 32: Main Street at Fairfax Building (Stop #87) – Tier 4

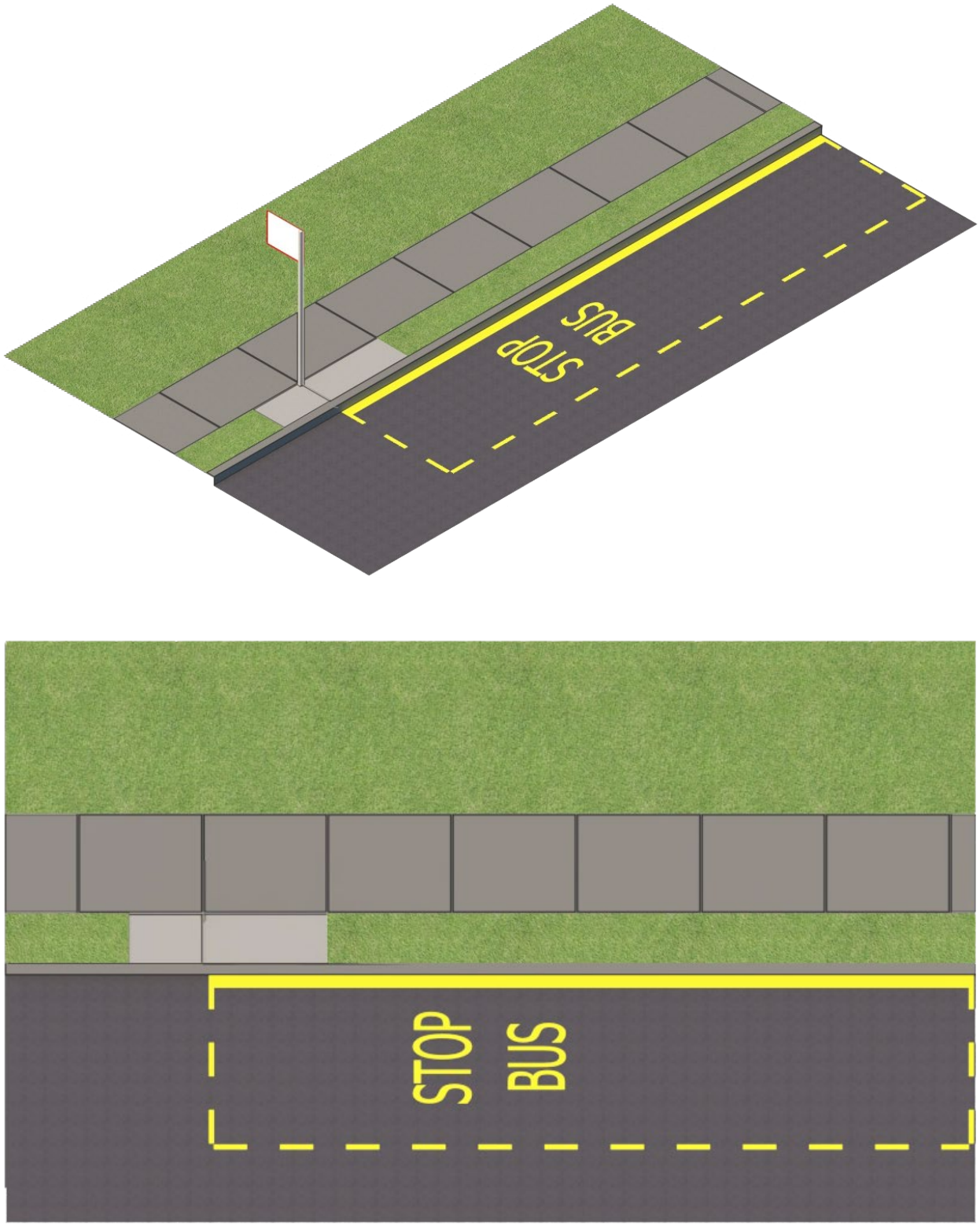


Figure 33: Fairfax Boulevard at Denny's (Stop # 173) – Tier 4