# Curbside Design Improvements for Eugene Area Bus Stops

**Natalie Sandberg**

## Background

The foundation for creating safe and efficient community linkages is the transportation system. An efficient transportation system addresses issues related to dependence on vehicles and can improve linkages between and within heavy activity areas. By enhancing transportation linkages, citizens may view walking, biking, and riding public transportation systems as viable alternatives to driving a personal vehicle. Currently, the City of Eugene is designed to make cars the most efficient mode of transportation.

The City of Eugene is updating its 20-year Transportation System Plan (TSP) to improve its current system over the next 20 years.[1] Phase I of this plan focuses on identifying transportation system needs for the future. Phase II began spring 2013 and includes gathering and refining recommendations, and creating the plan. The intended result of this project is to create a comprehensive, multimodal transportation plan for the City of Eugene.

The following proposal for curbside design discusses potential improvements for access to transit in the City of Eugene to promote bus ridership and to create efficiencies that result in better linkages between activities for bicyclists and pedestrians. This project focuses on priority safety and access improvements such as roadside improvements, ADA access, crossing improvements including improved crosswalks, curb extensions, bike and parking access improvements, and passenger facility improvements such as significant destination and transfer points, shelters, seating and lighting.

[1] The City of Eugene, "City of Eugene Transportation System Plan." Last modified 2013. Accessed December 12, 2013. http://www.centrallanertsp.org/EugeneTSP

## Definitions for Curbside Design

Curbside design is intended to address all aspects of the interface between a transit stop and the community it serves. It is the space reserved for passengers to wait for and board a transit vehicle, as well as the connectivity between this space and nearby development. The intent of curbside design is to provide for the mobility needs of a city's residents, businesses, and visitors by supporting a safe, accessible, and efficient transportation system. Curbside design considers types of bus stops, location, facility design, and other passenger amenities. To provide background for my analysis of the City of Eugene's transit system, I provide the following descriptions and usage rationales for these curbside design considerations.

### Bus Stop Types

*Far-side stop:* refers to a stop that occurs just after a bus crosses through an intersection. It is advantageous because passengers can more easily and safely maneuver behind the bus, the right-hand turn lane is not blocked; therefore intersection movement is much easier to predict.[2]

Figure 1: Far-side Stop

*Near-side stop:* refers to a stop that occurs just before a bus reaches an intersection.[3] Advantages are that the passengers can board and alight closer to a sidewalk.

Figure 2: Near-side Stop

[2] SEPTA, "SEPTA Bus Stop Design Guideline." Last modified October 2012. Accessed December 8, 2013. http://www.septa.org/reports/pdf/SEPTA-Bus-Stop-Design-Guidelines-2012.pdf

[3] *Ibid*

*Midblock stop:* refers to a stop that occurs when a bus stops between intersections. This format is ideal for busier stops, because it allows for a large space for waiting and alighting passengers.[4]

Figure 3: Midblock Stop

**Bus Stop Location**

Bus stops come in all shapes and sizes, rural and urban. The following is a brief list of the most common locations for urban bus stops:

*Curbside or shoulder stop:* this is the simplest form of stop, with the bus residing in the travel lane, parking lane or shoulder of the road while halted. These types of stops are easy for bus operators to maneuver and therefore create minimum time delays. They are also the most flexible, as they are easy to relocate and move.

Nonetheless, there are some other considerations when creating curbside bus stops. This type of stop should not be located on a road with a speed limit that is higher than 40 mph, and there should be adequate curb clearance to accommodate the wheelchair accessibility technology of the bus. Proximity to controlled intersections and availability of pedestrian facilities should also be taken into account. [5]

*Curb Extension Stops:* a curb extension (or "bus bulb") is best used in areas where the speed limit is less than 30 mph, pedestrian traffic is high or in places where the sidewalk is narrow and more space is needed for passengers getting on and off of the transit system.[6] This

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[4] *Ibid*

[5] Washington Metropolitan Area Transit Authority, "Guidelines for the Design and Placement of Transit Stops." Last modified 2009. Accessed December 10, 2013. http://www.wmata.com/pdfs/planning/WMATA%20GuidelinesDesign%20and%20Placement%20of%20Transit%20Stop.pdf

[6] SEPTA, "SEPTA Bus Stop Design Guideline." Last modified October 2012. Accessed December 8, 2013. http://www.septa.org/reports/pdf/SEPTA-Bus-Stop-Design-Guidelines-2012.pdf

format allows for less interference with the pedestrian traffic on the sidewalk and it provides a larger waiting area with the potential space for amenities, like a stop shelter.

If a curb extension is combined with a crosswalk, it has the added benefits of shortening the crossing distance for pedestrians and making them more visible to oncoming traffic. Curb extensions are most appropriately used in areas where there is more than one traffic lane, so that the bus stopping will not impede traffic flow.[7]

*Bus Bays:* this type of bus stop is completely off-street. These are best used in areas where the speed limit exceeds 40 mph and the dwell time of buses exceeds 30 seconds. These are also great for those buses that have short layovers, or in areas where multiple buses must be bayed at the same time. [8]

**Facility Design**

Curbside bus stop design should include three basic features: a level loading area, an adjacent waiting area, and an accessible pedestrian path. The appropriate size and amenities of the stop can then be determined by assessing local needs and passenger volume information.

Curbside design should also include an easily visible sign element, with route numbers and the company information clearly listed. The Washington Metropolitan Area Transit Authority recommends that sign posts be 2 to 4 feet from the face of the curb. Information cases are also recommended, particularly at busier stops. However, even at the most remote stops, it is recommended that at minimum, the transit agency should post a small sign indicating estimated times of arrival for each route.[9] *See the left model of Figure 4 for an example of basic signage.*

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[7] *Ibid*
[8] *Ibid*
[9] Washington Metropolitan Area Transit Authority, "Guidelines for the Design and Placement of Transit Stops." Last modified 2009. Accessed December 10, 2013. http://www.wmata.com/pdfs/planning/WMATA%20GuidelinesDesign%20and%20Placement%20of%20Transit%20Stop.pdf

*ADA Accessibility:* "Inaccessible transit stops prevent people with disabilities from using fixed route transit services, thereby limiting their mobility."[10] Compliance with ADA codes is the law; ADA codes are the minimum standards set for accessibility for disabled persons. It is to be noted that while they are the law, they are not necessarily "best practices."[11]

ADA guidelines require that each stop have a landing pad of 5 feet by 8 feet, with the 5 feet parallel to the curb. A pedestrian path of 4 feet or wider must also be connected to the bus stop landing pad. Universal design concepts are further guidelines that are not enforced by law. These concepts go above and beyond the minimum requirements set by ADA standards. Universal design is intended to create environments that are usable by *all* people, with considerations for people with disabilities built into its concept.[12]

*Lighting:* The Universal Design paradigm also includes amenities that are useful to all riders, such as lighting. Lighting at a bus stop adds visibility for passengers with sight impairment, makes passengers more visible to bus drivers at night, and also adds to the level of night-time security for passengers traveling alone. Lighting should be placed so that it will not be later blocked by mature vegetation, and wherever possible it should be installed at height levels that resist vandalism.[13]

*Signage:* Recommended basic signage requirements include the number of routes as illustrated below in Figure 4. Sign A.1 is the most basic, with 1 to 2 routes servicing the stop. These types of signs list the routes, company name, and contact information on the central sign, also include a lower mounted estimated time of arrival list. Bus stop signage should be easily

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[10] Wu, Wanyang, Albert Gan, Cevallos Fabian, and David L. Shen. "Selecting Bus Stops for Accessibility Improvements for Riders with Physical Disabilities."*Journal of Public Transportation*. no. No. 2 (2011): 133-149.
[11] Altom, Billy. Toolkit for the Assessment of Bus Stop Accessibility and Safety, "Oregon Department of Transportation." Last modified 2011. Accessed December 10, 2013. http://www.oregon.gov/ODOT/PT/docs/ada/ada-bus-stop-toolkit-aug2011.pdf
[12] *Ibid*
[13] APTA Standards Development Program, "Bus Stop Design and placement Scurity Considerations." Last modified 26 of June, 2010. Accessed December 2, 2013.

visible to the user and the driver, should display the routes and company name and should be 2' to 4' from the curb face.[14]

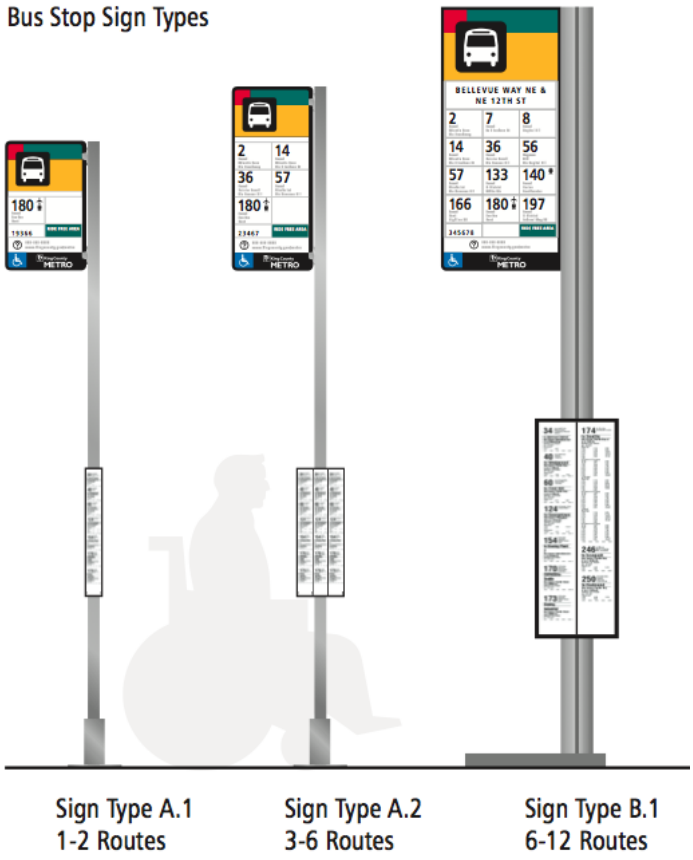


**Figure 4: Bus Stop Signs**

*Sidewalks:* footpaths are considered part of the transit system; they should be direct, safe, and easy to use.[15] When designating a new stop, walking distance and clarity of footpaths should be an early consideration to ensure pedestrian safety and to create smooth linkages between pedestrian traffic and use of the transit system. An example of this put into practice is occurring in New York City (NYC). The NYC Department of Transportation (NYC DOT) is implementing a new initiative called Sidewalks to Buses which provides sidewalks and other

[14] BC Transit Authority, "Infrastructure Design Guidelines." Last modified 2010. Accessed December 2, 2013.
[15] Howell, David. "Best Plans Begin at the Bus." *Professional Engineering*. (1999): 16-17.

pedestrian safety features to improve access to bus stops. The plan states that installations of new sidewalks, crosswalks and bus waiting areas will facilitate walking and transit use.[16]

**Passenger Amenities**

Although not required, passenger amenities can help enhance the visibility of transit in a corridor and raise general awareness of transit as a mobility option; this, in turn, may increase ridership and profitability.[17] When designed appropriately, they can also add to the character of a neighborhood and be viewed as a community asset, rather than as an eyesore or second thought.

*Shelters:* this form of "street furniture" provides protection from the elements as a passenger waits. They should be constructed of durable materials and provide a 360 degree view.[18] Shelters should be seriously considered to encourage ridership, particularly in climates such as Oregon where inclement weather is common. One consideration that makes shelters more viable is charging for bus stop shelter advertisements. This can help to mitigate the cost of these structures, and over time continued funds


**Figure 5: Shelters**

[16] New York City Department of Transportation, "Sidewalks to Buses." Last modified 2013. Accessed December 11, 2013. http://www.nyc.gov/html/dot/html/pedestrians/safertstransit.shtml.
[17] Litman, Todd. Victoria Transport Policy Institute, "Evaluating Public Transit Benefits and Costs." Last modified November 05, 2013. Accessed December 3, 2013. http://www.vtpi.org/tranben.pdf
[18] Litman, Todd. Victoria Transport Policy Institute, "Evaluating Public Transit Benefits and Costs." Last modified November 05, 2013. Accessed December 3, 2013. http://www.vtpi.org/tranben.pdf

can be put towards even more shelters.[19] *See Figure 5.* Another option that can help mitigate cost is to analyze passenger volume, number of routes, and existing amenities such as benches and overhangs, and then designate the shelter size based on need.[20]

*Stop area seating:* Benches offer seating for passengers who are unable to stand for long periods of time, or they can offer relief for those passengers who have walked long distances or are hauling luggage. According to the SEPTA Bus Stop Design Guidelines, "…benches are recommended at bus stop locations that are near sites that attract riders who may have difficulty walking and standing, particularly at stops with wait times longer than 15 minutes."[21] When present, benches should be constructed of durable materials and should be of a standard ADA compliant length of 6.5 feet. Anti-sleeping bars are recommended to prevent unintended use, and location of the bench on the bus stop landing pad should be carefully considered before installation.

**Figure 6: Benches**

An interesting initiative that NYC DOT has implemented is the CityBench program. In an effort to increase the amount of public seating, they are installing benches and seating arrangements throughout the city, particularly at bus stops and near areas with high

[19] Nelson, Gary. AZ Central, "Mesa takes new look at advertising to pay for new bus shelters." Last modified September 24, 2013. Accessed December 5, 2013. http://www.azcentral.com/community/mesa/articles/20130919mesa-takes-new-look-advertising-pay-new-bus-shelters.html

[20] New York City Department of Transportation, "Bus Shelters." Last modified 2013. Accessed December 11, 2013. http://www.nyc.gov/html/dot/html/infrastructure/streetfurniture.shtml

[21] SEPTA, "SEPTA Bus Stop Design Guideline." Last modified October 2012. Accessed December 8, 2013. http://www.septa.org/reports/pdf/SEPTA-Bus-Stop-Design-Guidelines-2012.pdf

concentrations of senior citizens. Anyone can request a bench from the city and they have set a goal of 1000 new benches by the year 2015. Priority locations are set up, including bus stops without existing shelters, sidewalks near transit facilities, and senior centers.[22] *See Figure 6.*

*Bike racks:* Bike racks are increasingly used to accommodate commuters who use a bicycle to access transit but prefer to not use on-board bicycle racks. Bike racks are the most cost effective bike parking option, with the most basic racks costing about $75 each.

*Bike lockers:* another option for bicycle accommodations, bike lockers provide more security for long-term bike parking. Although more costly to erect than a bike rack, coming in at about $500 each, they are usually set up in a metered format so that over time, they will pay for themselves.[23] For example, in Seattle they have instigated "on-demand" bike lockers that charge 5 cents per hour on a pre-paid $20 card.[24] *See Figure 7.*

**Figure 7: Bike Locker**

# Evaluaton of the City of Eugene Curbside Design

## Framework for Observations

To create a framework for observations, I used a pared down version of the Oregon Department of Transportation's (ODOT) bus-stop checklist taken from the "Toolkit for the

[22] [22] New York City Department of Transportation, "CityBench." Last modified 2013. Accessed December 11, 2013. http://www.nyc.gov/html/dot/html/pedestrians/citybench.shtml

[23] Handi-Hut, "Bike Shelters or Racks." Last modified 2013. Accessed December 8, 2013. http://www.handi-hut.com/catalog.php?item=681

[24] King County, "Bike Parking at Transit Facilities." Last modified 2013. Accessed December 11, 2013. http://metro.kingcounty.gov/tops/bike/parking/index.html

Assessment of Bus Stop Accessibility and Safety."[25] I created a five-part list, as follows: Part A) Location and Shelter; Part B) Accessibility Features; Part C) Seating Assessment; Part D) Safety and Security; and finally, Part E) Information Features.

I used Part A to examine where stops are located, what types of properties are located around it, and what shelter options are available in the vicinity. In Part B, I examined the ADA accessibility features, sidewalk conditions, whether or not there are crosswalks in the area and whether or not there are other bus line connections in the vicinity. Part C addresses the bus stop seating and its distance from the curb. Part D looks at the relation of the stop to the road (is it in the travel lane or, on a paved shoulder?), the posted speed limit for the road, whether or not there is lighting, and lastly, whether or not there are problems with the landscaping around the sign and stop. Finally, in Part E, I examine the bus stop signage for problems and adequacy of information such as arrival times and route maps. The five-part evaluation instrument is attached as Appendix A.

*Sample Selection Area:* For my bus stop observations I decided to examine all of the stops within one mile of the center of campus; that would leave me with a total of 33 stops for my pool of results. *See Figure 8.*

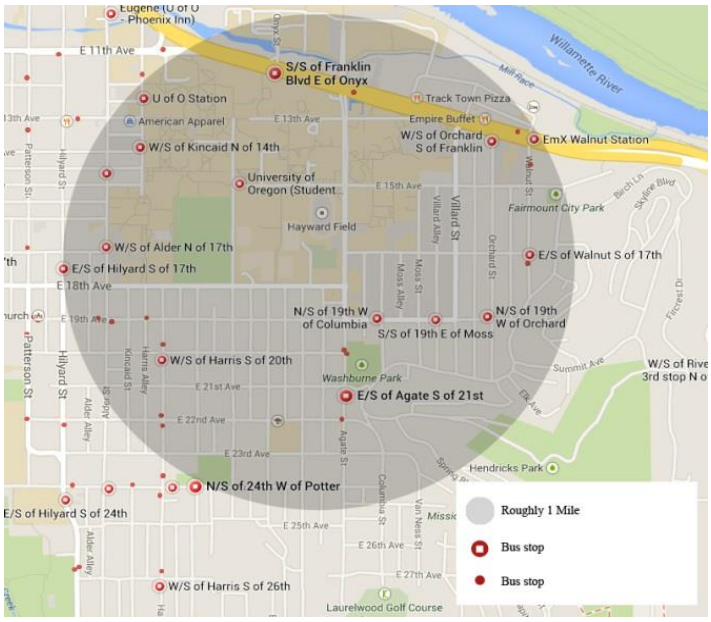


**Figure 8: Sample Area Map**

[25] Oregon Department of Transportation, "Toolkit for the Assessment of Bus Stop Accessibility and Safety." Last modified 2011. Accessed December 7, 2013. http://www.oregon.gov/ODOT/PT/docs/ada/ada-bus-stop-toolkit-aug2011.pdf

**Findings**

The results of my observations provided evidence of several facts and deficiencies in the bus system for the Eugene area. All of the stops surveyed are either in a bus bay or shoulder stop format; there were no "bus-bulb" stop formats. Additionally, all of the stops had designated yellow "no-parking" zones where the buses were pulling out of the main lane for the stop.

*Sidewalk access:* Of the thirty stops, only 5 had no sidewalk access. However, the sidewalks were sometimes poorly maintained or almost nonexistent, and they were often overgrown with neighboring landscaping.

*Wheelchair landing pads:* Of the thirty stops, 20 of them boasted landing pads. Of these landing pads, only 12 were what I considered functional; the other 8 I disregarded due to size issues, landscape overgrowth, or obstacles that impeded the designated 5' by 8' pad. I also would note that although there may have been a landing pad, often the sidewalks leading up to the pads (for instance, at the nearest intersection) were often too narrow or too steep to be considered usable for wheelchair access. *See Figure 9.*

**Figure 8: Landing Pad**

*Seating:* Only 1 out of 3 stops that I surveyed had designated stop seating; two had seating that was located a short distance away. As a side note, the seating mentioned is most often backless; some are not even a "bench," just small stools attached to the bus stop sign. *See figure 10.*

*Shelters:* Of the ten stops that had seating, seven of those stops also of fered shelter in the form of a roof. However, these shelters do not offer wind protection since they are without sides.

**Figure 9: Benches**

*Lighting:* Of the thirty stops surveyed, 14 had some sort of lighting nearby. Only 4 of these 14 had actual designated bus stop lighting, while 10 had lighting somewhere nearby, such as on the next street corner.

*Maps and lists:* Only 5 of the thirty surveyed stops boasted an actual route map and information section. Five more stops (10 total) boasted lists of estimated times of arrival for the various routes that service the stop.

# Recommendations

Further surveys are needed in this area of study. The City of Eugene should consider conducting an entire bus system survey and user survey that assesses their transit needs and desires. Based upon my observations from this small sample of Eugene area bus stops, I found deficiencies in the following areas:

**ADA Accessibility**

Adding ADA accessibility isn't always monetarily feasible and is sometime difficult due to landscape constraints; however, by leaving stops non-accessible the city may be vulnerable potential costly lawsuits. Therefore, to make bus stops more ADA accessible, the City should consider some or all of the following recommendations:

1) *Sidewalk leveling:* sidewalk leveling;
2) *Landing pad additions:* adding 5' by 8' landing pads at all stops;
3) *Sidewalk widening:* to provide wheelchair access;

4) *General maintenance:* one of the myths associated with accessibility features, is that once these features have been implemented, the stop will always be accessible. This is not the case—many factors may decrease accessibility over time, including construction, poor sidewalk maintenance, tree root upheaval and unauthorized placement of objects, like trash receptacles or newspaper vending machines. This is evidenced in some of the bus stops I observed demonstrating the need for regular maintenance.

**Seating and Shelter Additions**

Most passengers are expected to wait at the stop for a longer amount of time than the actual bus ride.[26] Adding seating and shelter into stops should be an immediate consideration; these are the basic amenities that make transit stops bearable. Through these types of improvements, transit use will become more appealing to those potential riders who have ignored the option because of facilities lacking in comfort.

**Sign Additions**

While the signage that the LTD has located at the stops clearly displays the route options available, it is not always visibly placed. There are often landscaping issues and they rarely offer more information beyond the basic routes that are available. As previously stated, only 10 stops offered lists with estimated arrival times; these should be part of standard signage. Route maps and information cases should also be more liberally spread out along the transit paths.

*ETA signs:* the most basic of stops should at minimum include an estimated time of arrival chart, mounted at a lower height to meet ADA visibility standards. The users of these stops may not know how to use or have access to smart technology to be able to check on arrival times.

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[26] Chen, Xumei, Yushi Zhang, and Jifu Guo. "Analyzing urban bus service reliability at the stop, route and network levels."*Elsevier*. no. 43 (2009): 722-734.

*Information cases:* these are a more expensive option and they are to be used at more highly frequented bus stop locations. Potentially, in addition to ETAs, information cases should include a general map of the route with major stop locations listed, as well as system information for connections.

**Website**

Lane Transit District's current website regarding bus routes and times is very confusing and unclear. There is a basic route map, but no city map beneath it to clarify location, e.g. if you don't mentally know where "Hilyard and 14th" are located, you can't use these maps.

*Interactive map:* an interactive online or mobile map of a better quality than the existing online maps would be helpful for riders in planning their routes. A map designating which stops are ADA accessible or which stops have shelter options could be another helpful consideration.

**Bike Options**

Bike parking and lockers are my final recommendation. Although perhaps consider less pressing, they have the potential to bring in revenue and increase ridership and are essential if Eugene is to accomplish a well-planned multimodal system. During my observations, I noted only 1 stop (UO campus) that had available bike parking attached to the bus stop structure. Although convenient, they were extremely under-utilized because UO is not normally a rider's first stop—it is usually a destination.

## Measurement of Improvements

As this is a preliminary design, effectiveness will be measured by the ability to secure funding and implement the preferred solutions. After improvements are constructed, effectiveness will be measured in increased transit ridership, increased walk/bike trips created through linkages, reduced vehicle/pedestrian/bike conflicts or accidents, and user satisfaction

through surveys. This proposal also includes a suggested instrument for measuring efficiency of transit systems. *See Appendix A.*

## Conclusion

Public transit creates space efficiency on our roads, while also reducing air emissions. A road can carry 20 to 50 times more transit users than it can single occupancy vehicle users, which reduces congestion. Increasing ridership also makes public transit more cost efficient for the city. For these three reasons alone, the city will benefit by making public transit as comfortable and convenient as possible. The recommendations in this proposal are intended to be implemented over time in incremental steps beginning with ADA accessibility standards (which will improve ridership for all) and then moving toward other improvements such as better seating, lighting, and shelters, and better communication of routes and schedules.

Establishing a safe and viable public transportation system for the City of Eugene will contribute to the city's long-range goal to develop a multimodal system that integrates mass public transportation with other resources including sidewalks, bike trails, and pedestrian pathways. A multimodal system will ensure that land development practices and transportation projects promote better community linkages and provide alternatives to meet the varied needs of its community users.

| | | | |
|---|---|---|---|
| | **Part A: Identification/Location** | | |
| | | | |
| **A1** | Is there a bus shelter? | Y | N |
| | *If NO, are there any exterior alternative shelters nearby? (awning, overhang, underpass)* | Y | N |
| | *If so what:* _____ | | |
| **A2** | Intersection cross streets: _____ | | |
| **A3** | Adjacent Property Description: | | |
| | *Apartment, industrial, park, library, school, market, etc.* | | |
| | **Part B: Pedestrian Access Features** | | |
| | | | |
| **B1** | Is there a landing area at least 5' wide and 8' deep adjacent to the curb/street? | Y | N |
| **B2** | What is the material of the landing area? *(Consider asphalt, concrete, dirt, grass, gravel, pavers)* | | |
| | *Notes:* | | |
| | *Are there problems with the landing area surface?* | Y | N |
| | *Does the landing pad connect to the sidewalk?* | Y | N |
| **B3** | Are there any obstacles that would limit wheelchair mobility? | Y | N |
| | *If so, what?* | | |
| **B4** | How wide is the sidewalk? | | |
| | *_no sidewalk _less than 3' _3'-5' _5' or greater* | | |
| **B5** | Rank the sidewalk condition: | | |
| | _1 _2 _3 _4 _5 | | |
| | *1 = hazardous--large breaks, cracks, root uplifting, etc* | | |
| | *2=in poor shape though not hazardous--very rough, some root uplift, cracks and breaks* | | |
| | *3=fair--minor root uplift, minor cracks or breaks* | | |
| | *4=good--not perfect but no immediate repair* | | |
| | *5=new* | | |
| **B6** | Crosswalks in the area? | Y | N |
| **B7** | Are there connections to other transportation services at this stop? | Y | N |
| | **Part C: Seating Assessment** | | |
| | | | |
| **C1** | Is there seating available? | Y | N |
| **C2** | What type? *(bench in shelter, freestanding bench, fold down bench, other)* | | |
| | *Notes:* | | |
| **C3** | Distance from curb? | | |
| | _0-2' _2'-4' _4' or greater | | |

| | Part D: Safety and Security | | |
|---|---|---|---|
| | | | |
| **D1** | Where is the bus stop area located? *(in travel lane, bus lan/pull off area, paved shoulder, right turn lane, unpaved shoulder, off street, other)* | | |
| | Notes: | | |
| **D2** | Is the bus stop zone designated no parking? | Y | N |
| **D3** | What is the posted speed limit? _____ | | |
| **D4** | How many total lanes? _____ | | |
| **D5** | What type of lighting is available? *(street light, shelter lighting, outside light on adjacent building, other)* | | |
| | Notes: | | |
| **D6** | Are there problems with landscaping around the stop? *(blocking accessibility, blocking sign, etc)* | Y | N |
| | Notes: | | |

| | Part E: Information Features | | |
|---|---|---|---|
| | | | |
| **E1** | Is there a bus stop sign? | Y | N |
| | *Are bus routes indicated? If so, which ones:* _____ | Y | N |
| | *Are there any problems with the signage? If so what:* _____ | Y | N |
| **E2** | Is there a route/schedule/map (circle as appropriate) information posted? | | |
| | *Is information provided in Braille or talking Signs?* | Y | N |