TECHNICAL ASSISTANCE REPORT

GUIDELINES FOR THE RETROFIT INSTALLATION OF ACCESSIBLE PEDESTRIAN SIGNALS BY THE VIRGINIA DEPARTMENT OF TRANSPORTATION: PHASE I REPORT

E. D. Arnold, Jr., P.E.
Senior Research Scientist

L. E. Dougald
Transportation Engineer

Virginia Transportation Research Council
(A Cooperative Organization Sponsored by the
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ABSTRACT

In late 2000, the Northern Virginia District of the Virginia Department of Transportation (VDOT) received a request from a visually impaired citizen to install accessible pedestrian signals (APS) at an intersection in Falls Church. Since there were no national or state guidelines for this type of installation, the district was requested to install APS at an intersection as a pilot and develop appropriate guidelines that could be used statewide by VDOT for future installations. The Virginia Transportation Research Council was asked to assist in developing the guidelines. Further, a committee composed of representatives from VDOT, the Federal Highway Administration, the Virginia Department for the Blind and Visually Impaired, and the blind/visually impaired community (both formal organizations and individual citizen activists) was established to provide overall guidance and advice.

The guidelines will be applicable to retrofit installations and will ultimately include the following sections: (1) a procedure for requesting APS, (2) the basic requirements for retrofit, (3) an intersection evaluation methodology, (4) a funding process, (5) the basic specifications for APS equipment to be used statewide, and (6) installation guidance. As of April 2003, the first four of these sections were finalized. The aforementioned committee recommended that VDOT undertake a 2-year pilot to field test the application of these four sections while the evaluation of the piloted equipment was being completed and the final two sections were being developed.

This Phase I report describes the background for the pilot project, its purpose and scope, the methods undertaken, and the results to date that led to the recommendation for the 2-year pilot.

Specifically, the report includes details on the following:

1. *Results of a survey of VDOT's district traffic engineers.* No APS have been installed at VDOT-maintained intersections and only a handful of cities have installed them.

2. *Results of a review of the literature.* The APS guidelines from the Committee for the Removal of Architectural Barriers; the Los Angeles Department of Transportation; Fountain Valley, California; and Portland, Oregon, are described.

3. *Timeline of key events in the development of the guidelines.* The timeline focuses on the committee's review and role and traces the drafting of the 10 iterations before the final guidelines were accepted and approved.

4. *Outline of the guidelines.* A final outline of the guidelines is provided, and Sections I through IV are presented in an appendix. Forms for requesting an APS retrofit and for evaluating intersections are also included in appendices.

The report concludes with a discussion of the next steps, or tasks, that are required to complete the guidelines.

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INTRODUCTION

In late 2000, the Northern Virginia District of the Virginia Department of Transportation (VDOT) received a request from a visually impaired citizen to install accessible pedestrian signals (APS) at the intersection of Route 7 and Jefferson Avenue in Falls Church. At that time, there were no federal guidelines concerning APS, VDOT had no guidelines, and VDOT had never installed an APS at an intersection under its jurisdiction. Accordingly, VDOT's state traffic engineer requested that the district's traffic engineering section install APS at an intersection as a pilot and develop appropriate guidelines for future installations. The Virginia Transportation Research Council (VTRC) was asked to assist the district in the evaluation of the pilot and the development of the guidelines for future APS installations.

As a first step, a committee was appointed to provide overall guidance and advice on the pilot. The committee held its first meeting on December 14, 2000. Over the next 18 months, the committee met sporadically to discuss general issues regarding APS while awaiting the actual installation of a pilot APS. A couple of meetings were devoted to presentations from suppliers of APS equipment.

On June 15, 2002, a pilot APS system was installed at another intersection for which APS had been requested: Vaden Drive and Virginia Center Boulevard/County Creek Road in Fairfax County. A Navigator APS manufactured by Polara Engineering, Inc., was installed on three of the four legs. At that point, the committee began to address more seriously the development of guidelines for retrofitting intersections with APS.

After a number of additional meetings, the committee approved Sections I through IV of the guidelines on April 24, 2003. These sections describe a procedure for requesting an APS, the basic requirements that must be met, a methodology for evaluating intersections, and the funding process. Since the overall process is taking so long to complete and the effort has reached a milestone in the development of the guidelines, it was decided that a Phase I report was needed to document the effort to date. Accordingly, this report provides a summary of the effort through April 2003.

PURPOSE AND SCOPE

The primary purpose of this research was to assist the Northern Virginia District's Traffic Engineering Section in the evaluation of a piloted APS installation and the development of guidelines for future APS installations.

The guidelines developed to date identify a process to assess and evaluate the need to install (retrofit) APS at an existing intersection. The goal was that each request for APS receives a fair and equal assessment, that funds are expended in the most effective manner, and that all installations are undertaken as quickly as possible. The completed guidelines will also provide information on the type of APS equipment to deploy and procedures for installing it. The goal is to install the most suitable equipment uniformly throughout the state and to ensure that the required and best installation procedures are followed.

The scope of the pilot, and thus the guidelines, was limited to retrofit installations at existing intersections. Other guidelines may be applicable at new intersections or intersections that are undergoing major improvements.

A committee was formed to provide overall guidance and advice on the pilot and development of the guidelines. Members included representatives from VDOT's district and central offices, the VTRC, the Federal Highway Administration; the Virginia Department for the Blind and Visually Impaired, and the blind/visually impaired community (both formal organizations and individual citizen activists). A list of members and their affiliations is provided in Appendix A.

METHODS

The following tasks were undertaken or will be performed as the project is carried forward from this Phase I reporting period. Tasks 1 and 2 were completed, Task 3 is underway, and Sections I through IV of the guidelines to be developed in Task 4 have been finalized.

1. *Inventory Use of APS in Virginia.* The district traffic engineers in VDOT's nine districts were surveyed to determine the use of APS in Virginia by both VDOT and local jurisdictions. Further information was collected in those cases where APS were deployed.

2. *Review Literature for APS Guidelines.* A literature review was undertaken to identify guidelines and warrants for when to install APS, administrative processes or procedures for handling a request for APS installation, evaluation methodologies, and appropriate equipment.

3. *Evaluate Pilot Installation.* The equipment at the lone pilot intersection is being fine-tuned; however, anecdotal information on the installation process was obtained. Once the installation is finalized, information on how well the equipment is working, how visually impaired users are faring, and how visually impaired users feel about the

equipment at the intersection will be obtained. This information will be obtained from field observations and discussions with VDOT personnel and visually impaired users.

4. *Develop Guidelines for VDOT.* Based on findings from the literature review and extensive input from the committee, guidelines were developed that describe a procedure for requesting APS, the basic requirements that must be met, a methodology for evaluating intersections, and the funding process. Sections to be developed will address appropriate equipment and installation procedures.

THE APS INVENTORY

Each of VDOT's nine district traffic engineers responded to an email survey dated July 18, 2002, that requested information on APS in their area. It was reported that no accessible pedestrian signals were installed or were being maintained by VDOT. There are intersections with APS in Arlington County and the cities of Fairfax, Alexandria, and Norfolk. Richmond is planning to install APS at the intersection of Broad and Belvidere Streets.

Alexandria has installed a number of different brands of equipment and has criteria for APS installation. These criteria are very similar to those developed by the Committee for the Removal of Architectural Barriers (CRAB) described in the next section. Arlington County tries to accommodate any requests for APS and installation is essentially based on a site visit to meet with the requesting party to determine his or her exact needs. Norfolk's policy is to try to accommodate any requests received. Only two or three intersections in the city have APS on one approach or crossing only. There is none with APS on multiple crossings.

THE LITERATURE REVIEW

Based on early input from the committee, it became evident that there were major concerns about potential basic criteria for the installation of APS and about the factors and scoring scheme to be used for evaluating the need for APS. Accordingly, the literature review focused on these two issues and had the goal of formulating a framework of a procedure to be used as a starting point for discussion by the committee. Several documents and procedures were reviewed; however, it was found that many were similar and based on previously developed procedures. Four key procedures or methods were chosen as being representative of the others, and these are identified as being developed by CRAB; the Los Angeles Department of Transportation (LADOT); Fountain Valley, California; and Portland, Oregon.

CRAB's guidelines were the first to attempt to evaluate intersections for APS installation using a scoring system. Much of the literature and evaluation methods that followed were modeled after CRAB's guidelines. The LADOT guidelines were the first to be developed with a different philosophy and scoring system. Following this effort, localities that developed an

evaluation method used either CRAB's or LADOT's as a model. Fountain Valley modeled their guidelines on CRAB's evaluation method, and Portland modeled their guidelines, with some alteration, on the LADOT effort. Following is a detailed description of these four evaluation methods.

Committee for the Removal of Architectural Barriers[1]

Criteria for Installation

The CRAB system identifies the following as basic considerations for installing an audible pedestrian signal at a given intersection:

1. The intersection must be signalized for vehicle traffic.

2. The signalization hardware must be capable of retrofitting to the existing signal device with little or no rewiring.

3. Audible signals should be equipped with pedestrian signal actuators (push buttons).

4. The intersection's location must be suitable in terms of land use, noise level, and neighborhood acceptance. Signals should be installed only where the visually impaired want them and where they will not draw noise complaints from residents and businesses.

5. There must be a demonstrated need for the audible signal device. Visually impaired pedestrians must make their need for an audible signal at a given site known to the city's traffic engineers or public works department.

Factors for Evaluation

To evaluate specific intersections, CRAB devised 12 factors within the four categories of intersection safety, pedestrian usage, traffic conditions, and mobility. Each factor can receive a score from 0 (lowest priority) to 5 (highest priority). For 7 of these 12 factors, it is possible to score 0 points. Scores for each factor are assigned for the selected sites by a three-person team composed of a visually impaired person, a mobility instructor, and a traffic engineer. The 12 factors CRAB devised follow.

1. **Pedestrian Accident Record**. Four-year pedestrian accident records for the intersection in question should be obtained from the police department.

Pedestrian Accidents in 4 years	Points
[0]	[0]
1	1
2	2
3	3
4	4
5 or more	5

2. **Intersection Configuration.** The geometry of an intersection, including the number of approaches, has much to do with the crossing difficulty experienced by the visually impaired. According to the CRAB study, three-leg intersections are difficult to cross because they do not provide adequate audible cues concerning the traffic phases. Also, traffic circles and intersections involving more than two streets are among the worst conditions for the visually impaired pedestrian.

Configuration	Points
4-leg right angle	1
3-leg tee	2
3- or 4-leg skewed	3
4-leg with uneven corners	4
Other complex or multi-leg (e.g., traffic circles, multi-street intersection)	5

3. **Width of Crossing.** Wider streets are more difficult and dangerous to cross since the pedestrian is in the roadway for a longer time. Pedestrian phasing should permit the visually impaired to cross in one continuous movement regardless of whether there are medians or pedestrian islands. Intersection width is measured along the widest pedestrian crossing and includes medians.

Width	Points
40 ft or less	1
41 to 52 ft	2
53 to 68 ft	3
69 to 78 ft	4
79 ft or more	5

4. **Vehicle Speed.** High vehicle speeds result in more danger to the visually impaired for two reasons. First, high speeds mean short vehicle closing times and less time for the visually impaired to get out of the way of an approaching vehicle. Second, the higher the speed, the greater the severity of an accident should one occur. Intersection speeds for this purpose are the 85th percentile speed measured along the fastest approach leg.

Speed Range	Points
0 to 25 mph	1
26 to 30 mph	2
31 to 35 mph	3
36 to 40 mph	4
41 mph or over	5

5. **Proximity to Facilities for the Blind or Visually Impaired.** These facilities include departments of rehabilitation, social security offices, organizations of and for the visually impaired, public housing facilities, and senior citizen complexes with one or more visually impaired persons. Points are assigned based on the intersection's proximity to such a facility. The closer a facility is to an intersection, the more points assigned.

Proximity	Points
4 to 6 blocks	1
3 blocks	2
2 blocks	3
1 block	4
At subject facility	5

6. **Proximity to Key Facilities Used by All Pedestrians, Both Visually Impaired and Sighted.** Medical, educational, recreational, commercial, and governmental facilities come under this heading. Points are assigned using the distance between the intersection and facility as in Factor 5. Points are awarded based on the proximity of the closest facility.

Proximity	Points
4 to 6 blocks	1
3 blocks	2
2 blocks	3
1 block	4
At subject facility	5

7. **Number of Transit Stops and/or Routes Within One Block of Proposed Audible Signal Site.** Since the visually impaired generally do not drive, they depend heavily on public transportation such as buses and subways. Special consideration should be given to crossings that have heavy general use, are located near any of the facilities listed in evaluation Factors 5 and 6, serve as a transfer point between modes of travel, or serve two or more transit routes within a one-block walk.

Number of Routes and Stops	Points
[0 routes and 0 stops]	[0]
1 to 2 routes and 1 stop	1
3 or more routes and 1 stop	2
1 to 2 routes and 2 stops	3
3 or more routes and 2 stops	4
3 or more routes and more than 2 stops	5

8. **Passenger Usage.** The passenger usage factor is assigned points based on the total number of both sighted and visually impaired passengers each day who get on or off a transit stop or transfer point within a one-block walking distance.

Passengers Boarding/Debarking Each Day	Points
[0]	[0]
1 to 249	1
250 to 499	2
500 to 999	3
1,000 to 1,499	4
1,500 and over	5

9. **Heavy Traffic Flow.** The visually impaired listen for vehicle sounds to determine when traffic is moving and from which direction. Under heavy traffic flow conditions, when the sum of the approaching traffic on all legs is greater than 2,000 vehicles per hour during any peak hour, there are regular gaps to indicate when traffic from one direction has stopped and from another has started.

Vehicles per Hour	Points
[0 to 1,999]	[0]
2,000 to 2,999	1
3,000 to 3,999	2
4,000 to 4,999	3
5,000 to 5,999	4
6,000 and over	5

10. **Light Traffic Flow.** It is more difficult to determine when crossing is safe in light traffic flow because passing traffic gives few audible cues. *Light flow* exists when the sum of the approaching traffic on all legs is less than 900 vehicles per hour during any 1-hour period between 6 a.m. and 6 p.m.

Vehicles per Hour	Points
[900 and over]	[0]
800 to 899	1
700 to 799	2
600 to 699	3
500 to 599	4
Under 500	5

11. **Uneven Traffic Flow.** Since it is much easier for the visually impaired to determine gaps in traffic when there are platooning vehicles rather than when the traffic is erratic, uneven traffic flow presents additional problems.

Traffic Flow Condition	Points
Platooning vehicles	0
Erratic traffic flow	5

12. **Mobility Evaluation.** Based on the judgment of the evaluation team, additional points may be assigned based on observed or special conditions not covered by the previous factors. Among these are the right-on-red volume and complexity of the signal phasing sequence.

Mobility	Points
No special circumstances	0
Many special circumstances	5

Los Angeles Department of Transportation[2]

In 1996, the City of Los Angeles adopted a similar version of the CRAB prioritization method but with changes. A study of the CRAB method at seven locations in Los Angeles revealed that there was little difference in the scores for locations with severe problems and those that were easily accessible. This was primarily due to the fact that the minor factors had as much weight as the major ones (i.e., transit passenger usage versus traffic volume), which prevented an intersection with a single serious problem from receiving a high score. The LADOT guidelines were developed through the collaborative effort of traffic engineers at LADOT and orientation and mobility instructors from the Braille Institute. The California Department of Transportation (Caltrans) had already established standards for the use of audible pedestrian signals.

The guidelines covered two major categories: pedestrian usage and safety and traffic conditions at intersections.

Standards

1. The signalized intersection should be equipped with pedestrian push buttons.

2. The selected crosswalk must be suitable in terms of land use, traffic patterns, noise levels and neighborhood acceptance.

3. The audible devices should emit a "cuckoo" sound for the north-south WALK indicator and a "peep-peep" sound for the east-west WALK indicator.

Pedestrian Usage

1. **Proximity to Facility for Blind People.** In considering pedestrian usage, evaluators give points when a crosswalk is close to a facility, such as a rehabilitation agency, a special school, a service club, an occupational center, or a college or university, that serves the visually impaired. The closer the crosswalk is to the facility, the higher the score.

Proximity	Points
>6 blocks	0
4-6 blocks	2
3 blocks	4
2 blocks	6
1 block	8
Adjacent to facility	10

2. **Proximity to Alternative Crossings.** If the crosswalk is not close to a facility but a visually impaired person needs to cross it regularly and there are no good alternate crossings, the crosswalk can still qualify for an adaptive device. It is just as important for 1 person to be able to cross an intersection as it is for 100 people.

Proximity	Points
Adaptive device within 1,000 ft	0
Good crossing location within 299 ft	0
Good crossing location within 300-599 ft	3
Good crossing location within 600-999 ft	4
Good crossing location within 1,000 ft	5

3. **Need to Cross.**

Need	Points
Occasionally	0
Regularly to run errands	2
Daily for work or school	3
High volume of blind pedestrians	4

4. 4. **Proximity to Transit Stops and Routes Within a Block.** The more routes and bus stops at an intersection, the more attractive the intersection is to those who use public transportation. This is an important factor, since most visually impaired pedestrians rely heavily on public transportation.

Proximity	Points
No stops	0
1-2 routes and 1 stop	1
3+ routes and 1 stop	2
1-2 routes and 2 stops	3
3+ routes and 2 stops/2 routes and 3+ stops	4
3+ routes and 3+ stops	5

Intersection Safety and Traffic Conditions

Just as the times for the green and yellow signals for vehicles and the signal-crossing times for pedestrians are individually determined for each approach, the analysis of safety and traffic conditions should be done separately for each crosswalk. The separate consideration of each crosswalk makes it easier to justify an adaptive device at a single, complex crossing when it is needed, rather than at the entire intersection, where some crossings may not need adaptive devices.

5. **Number of Pedestrian Accidents in Past 3 Years.** Past pedestrian accidents are an indication of the potential danger of a crosswalk. If many sighted pedestrians have had accidents, the risk for the visually impaired pedestrians should also be considered high.

Pedestrian Accidents in Past 3 Years	Points
No. of accidents correspond to . . .	No. of points

6. **Configuration of the Intersection.** Intersections with certain types of geometry tend to create unexpected pedestrian-vehicle conflicts or inadequate audible cues of the flow of traffic. As the complexity of the intersection increases, so does the number of points awarded.

Configuration	Points
4-leg right angle	0
3- or 4-leg skewed	2
4-leg offset (crossing stem)	3
3-leg T/4-leg offset (crossing major street)	4
More than 4 legs/midblock/unusual geometry	5

7. **Width of Street to Be Crossed.** Wide streets increase the risk of veering or disorientation. Installing an adaptive device enables the pedestrian who is visually impaired to use the maximum amount of signal time to cross the street, so he or she has more time to correct from veering. Also, when a visually impaired pedestrian crosses in certain directions, the near-side traffic may be waiting across an eight-lane-wide intersection, which makes it difficult for the pedestrian to identify clearly the traffic surge while there is still time to cross the street.

Width	Points
40 ft or less	0
41-59 ft	1
60-70 ft	2
80-99 ft	3
100-119 ft	4
120+ ft	5

8. **Speed of Vehicles.** High vehicle speeds on the street to be crossed mean greater risk to the pedestrian. As the speed increases, the arrival times of vehicles decrease and stopping distances increase. Thus, the visually impaired pedestrian may misjudge the traffic flow and cross at the wrong time. Adaptive devices would eliminate guessing at locations where there is no room for error.

Speed	Points
0-25 mph	0
26-30 mph	1
31-35 mph	2
36-50 mph	3
41-45 mph	4
45+	5

9. **Traffic Volume Surge.** Traditionally, traffic counts were obtained and an intersection was given points for the flow of heavy and light traffic, with the heavy and light traffic sometimes canceling each other out. The new criteria require the use of traffic surge volume per green light rather than volume per hour, since the surge is what pedestrians who are visually impaired use to determine when the WALK signal is on. If the surge at the beginning of the green light is usually heavy, the pedestrian can rely on the sound of traffic to indicate when the opportunity to cross is good. For traffic-actuated intersections with light, randomly arriving traffic, the traffic surge is an unreliable factor, and the crosswalk is scored high. The surge is measured by counting the number of cars on the nearside parallel street when the light changes from red to green (and WALK). Vehicles turning right are not included with the surge because they may mislead pedestrians if right turns are permitted on the red signal or on a green right-turn arrow.

Traffic Volumes (Total surge volume per cycle (6am-6pm))	Points (Heavy hour)	Points (Light hour)
<1 car	10	10
<2 cars	8	8
<3 cars	6	6
<4 cars	4	4
<5 cars	2	2
≥5 cars	0	0

Special Conditions

10. **Special Conditions.** These include right-turn islands, heavy right-turn volumes, right-turn signals, opposed phasing/three-way signal operations, intersections with prohibited pedestrian crossings, and complex signal phasing. Based on the judgment of the evaluation team, additional points are assigned to special conditions.

Special Condition	Points
Heavy right-turn volume	2
Right-turn island	3
Right-turn signals	3
Complex phases	3
Only one crosswalk opposed phasing	5
Other (circle and explain)	0 1 2 3 4 5

Final Recommendation

For an intersection to qualify for an adaptive device, *pedestrian usage* must total at least 10 points and *intersection safety and traffic conditions* must total at least 20 points. Comments by the orientation and mobility instructor are included with the final recommendation.

Fountain Valley, California[3]

Fountain Valley's basic intersection requirements are similar to most of the reviewed literature and its evaluation methods resemble those of CRAB.

Basic Considerations

1. The intersection must be signalized.

2. The signals must be reasonably capable of retrofitting with existing equipment.

3. Signals should be already equipped with pedestrian signal actuations.

4. The location must be suitable to installation of audible signals in terms of surrounding land use, noise level and neighborhood acceptance.

Intersection Safety

1. Accident Records for Past 4 Years

Pedestrian Accidents	Points
1	1
2	2
3	3
4	4
5 or more	5

2. Intersection Configuration

Configuration	Points
4-leg right angle	1
3-leg tee	2
3 or 4-leg skewed	3
4-leg offset	4
Other complex or multiple leg	5

3. Width of Crossing

Width	Points
40 ft or less	1
41-52 ft	2
53-68 ft	3
69-78 ft	4
79 ft or more	5

4. Vehicle Speed

Speed Range	Points
0-30 mph	1
31-35 mph	2
36-40 mph	3
41-45 mph	4
46+ mph	5

Pedestrian Usage

5. Proximity to Facilities for the Blind or Visually Impaired

Proximity	Points
4 to 6 blocks	1
3 blocks	2
2 blocks	3
1 block	4
At subject facility	5

6. Proximity to Key Facilities Used by all Pedestrians (Both Blind and Sighted)

Proximity	Points
4 to 6 blocks	1
3 blocks	2
2 blocks	3
1 block	4
At subject facility	5

7. Access to Public Transit

Number of Routes and Stops	Points
1-2 routes and 1 stop	1
3 or more routes and 1 stop	2
1-2 routes and 1 stop	3
3 or more routes and 2 stops	4
3 or more routes and more than 2 stops	5

Passengers Boarding and Disembarking Each Day	Points
10-25	1
26-50	2
51-100	3
101-150	4
150 and over	5

Traffic Conditions

8. Heavy Traffic Flow

Vehicles per Hour	Points
2000-2999	1
3000-3999	2
4000-4999	3
5000-5999	4
6000 and over	5

9. Light Traffic Flow

Vehicles per Hour	Points
800-899	1
700-799	2
600-699	3
500-599	4
Under 500	5

10. Uneven Traffic Flow Points (0-5)

11. Mobility Evaluation Points (0-5)

Portland, Oregon[4]

The guidelines in Portland, Oregon, are similar to those used by LADOT. The ranking process for Portland includes a weighted scale for each factor, depending on the importance of the factor (determined by the visually impaired, mobility specialists, and engineers). For example, pedestrian accidents have a scale of 2-10 whereas the width of crossing has a scale of 1-5.

Basic Criteria

1. The intersection must already be signalized.

2. The location must be suitable to the installation of audible signals in terms of safety, noise level, and neighborhood acceptance.

3. There must be a demonstrated need for an audible signal device. The need is demonstrated through a user request.

4. The location should have unique characteristics (i.e., a unique intersection configuration).

Once the criteria have been met, the following procedures should be followed:

1. The audible signal should be activated by a pedestrian signal push button with at least a 1-second delay to activate the sound.

2. In the event the number of acceptable requests exceeds Bureau of Traffic Management funding, the bureau will appoint a committee representing the effected communities to assist the bureau in prioritization and recommending future audible signal installations.

3. The Portland Office of Transportation should coordinate with Driver and Motor Vehicle Services (DMV) on driver education, specifically on pedestrian issues and the white cane law.

4. When appropriate, the Bureau of Traffic Management will refer people who request audible signal information and installations to facilities and agencies that provide mobility training.

5. Once an audible pedestrian traffic signal is installed, city staff will take steps to publicize and educate the effected communities on the location and operation of the audible signal device. The city will notify neighborhood associations of new installations.

Pedestrian Usage

1. Proximity to Facilities for the Visually Impaired

Proximity	Points
4-6 blocks	2
3 blocks	4
2 blocks	6
1 block	8
Less than 1 block	10

2. Proximity to Key Destinations

Proximity	Points
4-6 blocks	2
3 blocks	4
2 blocks	6
1 block	8
Less than 1 block	10

3. Proximity to Transit Stops/Routes

Number of Routes and Stops	Points
1-2 routes and 1 stop	4
1-2 routes and 2 stops	6
3 or more routes and 3+ stops	8

4. Need to Cross

Need	Points
Occasionally (approximately 1x/week)	2
Regularly (approximately 3x/week)	4
Daily	6
High (justify)	8

5. Alternate Crossing Location

Proximity	Points
Good crossing within 400 ft	1
Good crossing within 401-600 ft	2
Good crossing within 601-800 ft	3
Good crossing within 1,000 ft	4

6. Pedestrian Accidents in Past 4 Years

Pedestrian Accidents	Points
1	2
2	4
3	6
4	8
5+	10

Intersection Conditions

7. Intersection Configuration

Configuration	Points
4-leg right angle intersection	1
3-leg tee intersection	2
3- or 4-leg skewed intersection	3
4-leg offset intersection	4
Other complex or unusual intersection	5

8. Width of Crossing

Width	Points
40 ft or less	1
41-52 ft	2
52-68 ft	3
69-78 ft	4
79+ ft	5

9. Traffic Volume (Heavy Traffic Flow)

Vehicles per Hour	Points
2000-2999	1
3000-3999	2
4000-4999	3
5000-5999	4
6000+	5

10. Traffic Volume (Light Traffic Flow)

Vehicles per Hour	Points
800-899	1
700-799	2
600-699	3
500-599	4
Under 500	5

Mobility Evaluation

Based upon evaluation by city staff and mobility instructor, 0-10 points may be assigned based on the following comments:

_____

_____

Additional points may be assigned for unique circumstances as described below:

_____

_____

STATUS OF GUIDELINE DEVELOPMENT

As noted earlier, the committee that is providing oversight and guidance in the development of the guidelines first met on December 14, 2000, and met sporadically over the next 18 months. Once the pilot equipment was installed in June 2002, however, the committee moved rapidly toward its objective of recommending guidelines for retrofitting APS equipment at VDOT-maintained intersections. A timeline of key events follows as well as information on the final outline of the guidelines and the results to date of the effort to complete them.

Timeline of Key Events in Developing the Guidelines

July 2002: The committee held its first meeting after the pilot installation and discussed issues concerning the installation and the scope of future activities.

August 2002: Draft 1 of the guidelines on APS was prepared by VDOT's central office representative and sent to the committee for review and comment. It was patterned closely after the Fountain Valley, California, guidelines described previously.

September 2002: An internal ad hoc group of VDOT staff met in September to review the comments received. After the meeting, Draft 2 was developed and subsequently reviewed by the ad hoc group. Comments received were incorporated into Draft 3.

October 2002: Draft 3 was sent to the full committee for review and was discussed in depth at an October 30 meeting. There was a considerable number of issues and problems with the third draft, and the committee decided to appoint a small working group to refine the guidelines. Draft 4 was developed based on discussion at the meeting. This draft included minor changes to several of the front pages in the guidelines but did not revise the evaluation factors or rating methodology.

November 2002: The small working group met to discuss Draft 4, especially the evaluation factors and rating methodology. Significant revisions were recommended; however, due to the length of the meeting, the group was unable to resolve problems with the volume factor or reach a consensus on the weighting methodology. Based on the meeting, Draft 5 was developed, leaving unanswered the problems associated with the volume factor and the weighting methodology. Draft 5 was sent to the small working group in late November for review and comment, accompanied with additional clarifying information on the weighting methodology.

February 2003: The small working group met to discuss Draft 5, including the development of an appropriate volume factor and the weighting scheme to be used. Based on that meeting, Draft 6 was prepared and sent to the small working group in mid-February for review.

March 2003: The small working group met to discuss Draft 6 and to finalize the weighting scheme to be used. Drafts 7 and 8 were subsequently developed. The small working group considered Draft 8 as being reasonably close to its final effort; therefore, it was sent to the full committee for review and comment in early April.

April 2003: Several members of the small working group met at two intersections at which APS had been requested to field test the evaluation methodology and form. The two intersections were Leesburg Pike and South Jefferson Street and Little River Turnpike and Medford Drive. Several problems were discovered with the evaluation factors and form, and subsequent revisions resulted in Draft 9. This draft was the one recommended by the small working group for consideration by the full committee at its meeting on April 24. A minor revision was suggested at the meeting and its incorporation resulted in the final Draft 10.

Outline of Guidelines

As the committee progressed through the various iterations, an outline of the final guidelines began to take shape. Accordingly, as of this point in the process, the guidelines will be configured as follows:

I. Introduction
II. Basic Requirements
III. Funding Process
IV. Intersection Evaluation
    A. Overview of the Procedure
    B. Background on the Evaluation Methodology
    C. Details on the Evaluation Factors and Rating Methodology
        1. Configuration of Intersection
        2. Width of Crossing
        3. Posted Speed Limit on Street to Be Crossed
        4. Special Traffic Conditions I
        5. Special Traffic Conditions II
        6. Special Pedestrian Signal Conditions
        7. Proximity of Intersection to Key Facilities
        8. Need to Cross by the Visually Impaired
        9. Time in Queue
        10. Other Special Traffic and Mobility Conditions
V. Equipment
VI. Installation Procedures
    A. Manual on Uniform Traffic Control Devices
        1. Section 4E.06 Accessible Pedestrian Signals
        2. Section 4E.08 Accessible Pedestrian Signal Detectors
    B. Miscellaneous Practices

Results to Date

The final Draft 10 approved by the committee on April 24, 2003, includes Sections I through IV, which are provided in Appendix B. Appendix C shows the Accessible Pedestrian Signal Evaluation Form that should be used by the evaluation team at the site review. Appendix D shows the Request for the Installation of Accessible Pedestrian Signals Form that should be used by a visually impaired individual to submit a request for APS.

As part of the intersection evaluation, committee members were asked to choose between two weighting methodologies that would account for the fact that particular evaluation factors were more important than others. Both methods yielded the same results; however, in one case the weighting is applied initially and in the other case at the end. Appendix E provides the discussion paper that was developed by the researchers to assist committee members in this decision. The committee opted for the method that applies the weighting initially, feeling it was the easiest to explain and would be the most likely understood by the evaluation team.

NEXT STEPS

The next steps will be to undertake Task 3, the evaluation of the pilot installation. The equipment at the pilot intersection is still being fine-tuned; however, anecdotal information on

the installation process has been obtained from VDOT installation personnel. Once the installation is finalized, information on how well the equipment is working, how visually impaired users are faring, and how visually impaired users feel about the equipment at the intersection will be obtained from field observations and discussions with VDOT personnel and visually impaired users. Based on the results of this evaluation and input from the committee, Sections V and VI of the guidelines will be developed and approved by the committee. Part V will include detailed information on the APS equipment that VDOT should be procuring. Part VI will contain detailed information on installation procedures and include the information in the latest version of the *Manual on Uniform Traffic Control Devices* that pertains to APS and "best practice" information obtained from the pilot installations.

Rather than wait for an extended period while Task 3 is completed and Sections V and VI of the guidelines are being developed, the committee recommended that VDOT undertake a 2-year pilot of these sections to "field test" them in actual practice, verify that the funding process and evaluation methodology are valid, and refine any problem areas that may surface. In other words, the processes and procedures established for the APS retrofit program can be implemented in a "pilot mode" while the equipment issues are being resolved. This is especially timely since the guidelines require that "an initial period of three months will be allowed to publicize and promote the APS program, assemble existing APS requests, collect an initial round of requests, and conduct intersection evaluations."

REFERENCES

1. Oliver, M.B. Guidelines for Audible Pedestrian Signals. *Public Roads,* Volume 53, Number 2, pp. 33-38, 1989.

2. Gallagher, B.R. and Montes de Oca, P. Guidelines for Assessing the Need for Adaptive Devices for Visually Impaired Pedestrians at Signalized Intersections. *Journal of Visual Impairment and Blindness*, pp. 633-646, 1998.

3. Willdan. *Accessible Pedestrian Traffic Signals*. Prepared for The City of Fountain Valley. Fountain Valley, Calif., December 11, 2000.

4. Kloos, W.C. *Audible Pedestrian Signal Case Study: City of Portland, Oregon*. City of Portland, 2000.

APPENDIX A

MEMBERSHIP OF THE ACCESSIBLE PEDESTRIAN SIGNAL COMMITTEE

Active Members of the APS Committee

Name	Organization
Bud Keith	Visually Impaired Citizen
Chris Wells	Fairfax County Department of Transportation
Melanie Hughes	Virginia Department for the Blind and Visually Impaired
Vijaya Dabir	Virginia Department for the Blind and Visually Impaired
Doug Hansen	Fairfax County Department of Transportation
Melanie Brunson	Visually Impaired Citizen
Mohamed Dumbuya	Federal Highway Administration
Becky Crowe	Federal Highway Administration
Dona Sauerburger	
Tarsem Lal	Federal Highway Administration
Thomas Lee	Virginia Department of Transportation
Leslie Martin	Virginia Department of Transportation
Robert Souza	Virginia Department of Transportation
Loren Epton	Virginia Department of Transportation
Lance Dougald	Virginia Transportation Research Council
Gene Arnold	Virginia Transportation Research Council
Mark Hagan	Virginia Department of Transportation

APPENDIX B

GUIDELINES FOR THE RETROFIT INSTALLATION OF ACCESSIBLE PEDESTRIAN SIGNALS

Sections I through IV

GUIDELINES FOR THE RETROFIT INSTALLATION OF ACCESSIBLE PEDESTRIAN SIGNALS
Virginia Department of Transportation
Mobility Management Division

I. INTRODUCTION

An Accessible Pedestrian Signal (APS), which is used in conjunction with standard pedestrian signals, makes signal information accessible to blind, visually impaired, and other disabled persons by providing that information in a non-visual format, typically audible tones, verbal messages, and/or vibrotactile surfaces.

These guidelines provide the Virginia Department of Transportation (VDOT) with a process to assess and evaluate the need to install (retrofit) an APS at an existing intersection. The goal is that all requests for APS installation receive a fair and equal assessment, that funds are expended in the most effective manner, and that all installations are undertaken as quickly as possible. The guidelines also provide information on the type of APS equipment to deploy and procedures for installing it. The goal is to install the most suitable equipment uniformly throughout the state and to ensure that the required and best installation procedures are followed.

The guidelines describe a process in which an intersection must first meet certain basic requirements in order to be considered for an APS. Then, if an APS is justified, an intersection must be evaluated to determine first hand the needs of the requesting blind/visually impaired individual, the estimated cost of installation, and the intersection's need for an APS relative to other intersections for which an APS has been requested. The scores received in the evaluation determine this relative need and, if needed because of limited funding, can be used to develop a prioritized list of intersections to be funded. Once the installation is scheduled, guidance is provided on the type of equipment to deploy and on procedures for installing it.

It should be noted that different guidelines apply at new intersections or at intersections undergoing major improvements.

II. BASIC REQUIREMENTS

1. There must be a request and a demonstrated need for an APS (as evidenced by #2).

2. The attached **Request for the Installation of Accessible Pedestrian Signals** form must be completed and submitted to VDOT's District Traffic Engineer. Anyone having difficulty

completing the form will be given the appropriate assistance needed to either complete the form or otherwise submit the required information. The requestor should be a blind/visually impaired individual or a person or agency filing on his/her behalf.

3. The intersection must be signalized and equipped with pedestrian signals on the crossing for which APS is being requested. The following procedure should be followed in implementing this basic requirement:

    a. If the intersection is signalized and the crossing for which APS is being requested is equipped with pedestrian signals, proceed with its evaluation.
    b. If there are plans for the installation of pedestrian signals on the crossing for which APS is being requested, revise them (unless shown to be an undue hardship) to include APS. In this case, the intersection need not be evaluated. If there is undue hardship, install the pedestrian signals without APS as planned and proceed with its evaluation.
    c. If there are no pedestrian signals on the crossing for which APS is being requested and no plans for them, conduct a traffic engineering study at the intersection to determine if pedestrian signals are warranted. If warranted, include the appropriate APS when the pedestrian signals are installed. The intersection need not be evaluated.

4. The attached **Accessible Pedestrian Signal Evaluation** form must be completed as instructed for those intersections requiring an evaluation. The form can be used by any office by writing in the appropriate contact information, or revised electronically with the contact information.

III. FUNDING PROCESS

Each fiscal year the district requests and is allocated an amount of funds for the APS retrofit program. Generally, intersections approved for APS retrofit are funded on a "first come, first served" basis unless the funds are depleted. If this occurs, the approved intersections are put on hold, or carried over to the next funding cycle (typically a fiscal year). The new funds are first distributed to the carried over intersections based on a priority established by an evaluation score, and then to any new intersections for which requests are received and approved. This basic process is repeated year after year. There is an exception and this is explained in the following comprehensive explanation of the process.

More specifically, when a request for an APS retrofit installation is received, it is checked against the basic requirements. If the intersection is approved and requires an evaluation, a team is assembled to visit the intersection to conduct the evaluation. (The evaluation process is described later.) Funds are then allocated to the intersection based on an estimated cost and the retrofit is scheduled for design and installation. This "first come, first served" process is repeated until the funding is depleted. At that point, further requests are evaluated and then put on hold, or carried over until funding becomes available from the next funding cycle (typically at the beginning of the next fiscal year). Once the new funds are received, they are allocated to the carried over intersections based on a prioritized list established by the evaluation scores. If funds still remain after being distributed to the prioritized list, further requests for APS retrofit installations are once again funded, designed, and scheduled for implementation on a "first come,

first served" basis until the funds are depleted. Again, further requests are evaluated and then put on hold, or carried over, until new funding becomes available.

The exception to this process is when intersections are carried over into a third funding cycle (typically the third fiscal year). Any intersections carried over into the third funding cycle will receive first priority for the money, using their existing evaluation scores if need be. They will not be combined with intersections that received approval during the second funding cycle (typically fiscal year); that is, have been carried over only one cycle.

(For the first year of the program only, an initial period of three months will be allowed to publicize and promote the APS program, assemble existing APS requests, collect an initial round of requests, and conduct intersection evaluations. After the three-month period, an initial prioritized list of intersections to receive APS retrofit installations should be developed and then the procedures described in these guidelines should be followed.

IV. INTERSECTION EVALUATION

A. Overview of the Procedure

Once a request is received for an APS and it is determined that the intersection meets the basic requirements and needs to be evaluated, an Evaluation Team should be assembled to visit the intersection and conduct the evaluation described later in order to derive a priority score. This evaluation should be conducted within one month of the date of receipt of the written request.

Team members should include the requesting blind/visually impaired individual, an orientation and mobility specialist (possibly from the Virginia Department of Blind and Visually Impaired [DBVI], and the VDOT District Traffic Engineer or designated representative. Both the local VDOT Resident Engineer and a representative from the local city, town, or county should be invited to be a member of the Evaluation Team and included if they accept. Finally, the requesting blind/visually impaired individual may, at his/her discretion, invite others to participate in the evaluation as a member of the Evaluation Team.

During the intersection visit, members of the Evaluation Team should thoroughly discuss all possible solutions to address the crossing needs of the requesting blind/visually impaired individual. These discussions should include but not be limited to minor intersection improvements, installation of new crosswalks, installation of pedestrian signals with APS on crossings for which APS are not being requested, consideration of the needs of other potential blind/visually impaired individuals, and consideration of intersections characteristics once improvements are made.

At any point deemed appropriate and at the discretion of the District Traffic Engineer, an intersection may be reevaluated to account for changes that would influence the evaluation score and hence ranking on the prioritized list. Similarly, if a significant amount of time elapses between the intersection's evaluation and the design or installation of the APS system, the District Traffic Engineer should ensure that there is a continued need for the APS. For example,

the requesting blind/visually impaired individual may have relocated since submitting the request.

B. Background on the Evaluation Methodology

If the basic requirements above are met, an APS should be installed at the requested intersection after an evaluation is undertaken. The evaluation will determine first hand the needs of the requesting blind/visually impaired individual, the estimated cost of installation, and the intersection's need for an APS relative to other intersections for which an APS has been requested. Should funding be limited, the evaluation process is used to prioritize multiple requests for installations to determine an appropriate order of the expenditure of funds and design/installation of the retrofit APS. When this happens, new funds will be distributed to and installation will be scheduled at intersections based on the scores received in the evaluation process.

A logical process to compare intersections should include an evaluation of factors that impact the ability of a blind or visually impaired pedestrian to cross an intersection and that specifically address the needs of the requesting party. Further, some factors are more important than others and the evaluation process should be capable of distinguishing and accounting for this distinction through the use of the point system. The following factors will be used to establish a prioritized list of intersections to receive funding and be scheduled for an APS installation in the case of limited funding. More details on the factors and the rating methodology to be used are provided in the next section.

Accessible Pedestrian Signal Evaluation Factors	
Evaluation Factor	**Brief Description**
1. Configuration of Intersection	Skewed, offset, lacking certain straight through movements
2. Width of Crossing	Width of approach used by requesting party
3. Maximum Posted Speed Limit on Street to be Crossed	Maximum posted speed limit on street to be used by requesting party
4. Special Traffic Conditions I	Heavy right-turn volumes and right-turn signals or arrows
5. Special Traffic Conditions II	Free flow right turn lane (with or without a right-turn island)
6. Special Pedestrian Signal Conditions	Lead or exclusive pedestrian phases, mid-block exclusive pedestrian signals
7. Proximity of Intersection to Key Facilities	Distance to pedestrian generators or attractors
8. Need to Cross by Visually Impaired	Work or school related trip purpose by requesting party
9. Time in Queue	Length of time intersection has been waiting for funding based on time since request
10. Other Special Traffic and Mobility Conditions	Catchall to account for other concerns, especially if low volumes are problematic

C. Details on the Evaluation Factors and Rating Methodology

The following factors and rating methodology should be used to evaluate those intersections for which an APS installation has been requested and that have met the basic requirements. The Evaluation Team should review this methodology, employ it when conducting an intersection evaluation, and complete the attached **Accessible Pedestrian Signal Evaluation** form. If needed due to limited funding, the total score tallied should be used to rank the intersection on a prioritized list of intersections that have been approved for APS installation.

It is very important to re-emphasize that the application of these factors and this rating methodology, and thus the scoring and point systems contained therein, are applied equally to all the intersections. The final score is only used to establish a relative ranking of intersections that have already been approved for an APS. That is, the absolute value of the score has no bearing on the earlier justification process.

1. Configuration of Intersection – the number of approaches to an intersection and the geometric design (offset, skewed, etc.) can affect the ability of the blind/visually impaired pedestrian to safely cross the roadway. The blind/visually impaired pedestrian listens for the traffic going straight through the intersection that is close and parallel to the crosswalk being traversed in order to guide his/her passage across the roadway. Accordingly, when an intersection's configuration is skewed, offset, or does not have certain straight through movements (as is the case in a 3-leg tee intersection), a safe crossing can become problematic to the blind/visually impaired pedestrian. Points are assigned if the intersection's configuration causes there to be an absence of straight through traffic that is parallel to the crossing to be used by the requesting party and close enough to be heard.

Configuration of Intersection	Points
There **is no** straight through traffic flow that is parallel to the crosswalk to be used by the requesting party or close enough to be heard.	15

2. Width of Crossing – wider streets are more difficult for the blind/visually impaired pedestrian to safely cross. Points are assigned on the basis of the width of the crossing to be used by the requesting party. Crossing width is measured from the curb at the embarkation point to the curb at the destination point. Islands and medians should be included in the total crossing distance even if they are equipped with separate pedestrian actuators. Efforts should be made to permit blind/visually impaired pedestrians to cross in one continuous movement. Traffic signal timings should be extended to accommodate a full crossing. Divided streets with or without a pedestrian actuator in the median should be handled as a single crossing, with the width measured across the entire street.

Width of Crossing to be Used by Requesting Party (feet)	Points
40 or less	2
41 to 52	4
53 to 68	6
69 to 78	8
79 or more	10

3. Posted Speed Limit on Street to be Crossed – the speed of approaching traffic reflects the capability of approaching vehicles to stop for pedestrians clearing the intersection as the traffic signals and pedestrian signals change. Points are assigned on the basis of the maximum posted speed limit on the street to be used by the requesting party. More points are assigned for higher speeds.

Maximum Posted Speed Limit on Street to be Used by Requesting Party (mph)	Points
0 to 25	1
26 to 30	2
31 to 35	3
36 to 40	4
41 or more	5

4. Special Traffic Conditions I – there are special conditions found at intersections that are related to traffic flow and signals and signal timings that may hinder the capability of a blind/visually impaired pedestrian to cross the street. These conditions include heavy right-turn volumes (≥ 40 vehicles in the peak hour or the existence of a right turn lane) from the street parallel to the crossing and right-turn signals or arrows. Accordingly, points are assigned if these conditions impact the crossing to be used by the requesting party.

Special Traffic Conditions I	Points
There **are** heavy right-turn volumes (≥ 40 vehicles in the peak hour) from the street parallel to or right-turn signals or arrows that impact the crossing to used by the requesting party.	15

5. Special Traffic Conditions II – there are special conditions found at intersections that are related to geometric features that may hinder the capability of a blind/visually impaired pedestrian to cross the street. One of the most critical is a free flow right turn lane (with or without a right-turn island). Special care must be taken when installing an APS to mitigate the problems associated with this condition. Accordingly, points are assigned if this condition impacts the crossing to be used by the requesting party.

Special Traffic Conditions II	Points
There **is** a free flow right turn lane (with or without a right-turn island) that impacts the crossing to used by the requesting party.	15

6. Special Pedestrian Signal Conditions – there are special conditions found at intersections that are related to pedestrian signals that may hinder the capability of a blind/visually impaired pedestrian to cross the street. These conditions include the presence of a lead pedestrian phase, an exclusive pedestrian phase, or a mid-block exclusive pedestrian signal. Accordingly, points are assigned if any of these conditions impact the crossing to be used by the requesting party.

Special Pedestrian Signal Conditions	Points
There **are** lead pedestrian phases, exclusive pedestrian phases, or mid-block exclusive pedestrian signals that impact the crossing to be used by the requesting party.	15

7. Proximity of Intersection to Key Facilities – an APS system should be considered at intersections that are close to facilities that attract or generate significant amounts of pedestrian traffic. It would improve the safety and mobility of the blind/visually impaired pedestrian as well as making these facilities more accessible. Examples include medical, educational, social, recreational, commercial, shopping, public, governmental facilities, and transit stops. Pedestrian demand is based in part on how close the intersection is to these facilities; i.e., the closer a facility, the more the demand. Likewise, points are assigned based on the closeness of these facilities to the intersection; i.e., the closer a facility, the more the points. In the case of multiple facilities, points should be assigned using the closest facility to the proposed APS deployment site. An estimate of 400 feet can be used an average block length.

Proximity of Intersection to Key Facilities	**Points**
4 to 6 blocks	2
3 blocks	4
2 blocks	6
1 block	8
At the Subject Facility	10

8. Need to Cross by Visually Impaired – there is obviously a trip purpose or reason to cross for every crossing needed by a blind/visually impaired individual. While all trips are important, those related to work/employment or school are considered much more important. Accordingly, points are assigned if the purpose of the requesting party's need to cross is related to work/employment or school.

Need to Cross by Visually Impaired	**Points**
The purpose of the requesting party's need to cross **is related to** work/employment or school.	15

9. Time in Queue – APS retrofit installations should be undertaken as soon as possible, and this factor enhances the score of intersections that have been waiting the longest to be funded. Points are assigned based on when during the fiscal year the request for an APS retrofit installation was received. More points are assigned as the wait time increases. As noted in earlier discussion, once an intersection is carried over the second year (into the third year), however, it is automatically placed on a priority list to receive funding regardless of how its score compares with the scores of intersections requested during the second fiscal year.

Time in Queue	Points
Month in fiscal year request received:	
July	24
August	22
September	20
October	18
November	16
December	14
January	12
February	10
March	8
April	6
May	4
June	2

10. Other Special Traffic and Mobility Conditions – this factor is intended to provide the orientation and mobility specialist on the Evaluation Team an opportunity to add 15 points based on special conditions not adequately covered by previous factors or based on special needs of the requesting party. In particular, the orientation and mobility specialist should consider adding the points if traffic volumes are so low as to result in problematic crossing conditions for the requesting party.

Other Special Traffic and Mobility Conditions	**Points**
Special traffic & mobility conditions **do exist**.	15
Comments:	

APPENDIX C

FORM
ACCESSIBLE PEDESTRIAN SIGNAL EVALUATION

ACCESSIBLE PEDESTRIAN SIGNAL EVALUATION

Location:		
Date:	Day:	Time of Day:
Weather Conditions:		
Evaluation Team Members:		
Specific Needs of Requesting Party:		

EVALUATION FACTOR	POINTS
1. Configuration of Intersection	

Points are assigned if the intersection's configuration causes there to be an absence of straight through traffic that is parallel to the crossing to be used by the requesting party or that is close enough to be heard. For example, the intersection may be skewed, offset, or does not have certain straight through movements (as is the case in a 3-leg tee intersection). Accordingly, if there **is no** straight through traffic flow that is parallel to the crosswalk to be used by the requesting party or close enough to be heard, assign 15 points.

Comments:

2. Width of Crossing to be Used by Requesting Party

Width (feet)	Points	Comments:
40 or less	2	
41 to 52	4	
53 to 68	6	
69 to 78	8	
79 or more	10	

3. Maximum Posted Speed Limit on Street to be Used by Requesting Party

Speed (mph)	Points	Comments:
0 to 25	1	
26 to 30	2	
31 to 35	3	
36 to 40	4	
41 or more	5	

4. Special Traffic Conditions I

If there **are** heavy right-turn volumes (≥ 40 vehicles in the peak hour or the existence of a right turn lane) from the street parallel to or right-turn signals or arrows that impact the crossing to used by the requesting party, assign 15 points.
Comments:

5. Special Traffic Conditions II

If there **is** a free flow right turn lane (with or without a right-turn island) that impacts the crossing to used by the requesting party, assign 15 points.
Comments:

6. Special Pedestrian Signal Conditions

If there **are** lead pedestrian phases, exclusive pedestrian phases, or mid-block exclusive pedestrian signals that impact the crossing to be used by the requesting party, assign 15 points.
Comments:

7. Proximity of Intersection to Key Facilities

Proximity to Facility	Points	Comments:
4 to 6 blocks	2	
3 blocks	4	
2 blocks	6	
1 block	8	
At the Facility	10	

(Use 400 feet as an estimate of an average block length.)

8. Need to Cross by Visually Impaired

If the purpose of the requesting party's need to cross **is related to** work/employment or school, assign 15 points.
Comments:

9. Time in Queue		
Month in fiscal year request received	Points	
July	24	
August	22	
September	20	
October	18	
November	16	
December	14	
January	12	
February	10	
March	8	
April	6	
May	4	
June	2	
10. Other Special Traffic & Mobility Conditions		
If special traffic & mobility conditions **do exist** as determined by Orientation and Mobility Specialist (including intersections at which traffic volumes are so low as to result in problematic crossing conditions for the requesting party), assign 15 points. Comments:		
TOTAL POINTS		
Additional Comments by Evaluation Team:		

APPENDIX D

FORM
REQUEST FOR THE INSTALLATION OF ACCESSIBLE PEDESTRIAN SIGNALS

REQUEST FOR THE INSTALLATION OF ACCESSIBLE PEDESTRIAN SIGNALS

Requesting Party's Name: _____
(blind or visually impaired pedestrian)

Address: _____

City: _____ State: _____Zip Code: _____

Telephone (Home): _____ Telephone (Work): _____

I request that the Virginia Department of Transportation install Accessible Pedestrian Signals (APS) to cross _____ (*route number/street name*) at the intersection of _____ and _____ in _____ *(city, town, or county).*

Please describe the difficulty you have in crossing:
_____
_____
_____

Signature: _____ Date: _____

Please call _____ at _____ with questions and/or mail form to:

For Office Use Only

Date Received: _____ Received By: _____

a. If intersection signalized and crossing APS requested for is equipped with ped signals, evaluate intersection.
b. If plans to install ped signals on crossing APS requested for exist, revise them (unless shown to be undue hardship) to include APS, and do not evaluate intersection. If undue hardship, install ped signals without APS as planned and evaluate intersection.
c. If no ped signals on crossing APS requested for and no plans, conduct study to determine if ped signals warranted. If warranted, include appropriate APS when ped signals installed, and do not evaluate intersection.

Evaluation Date: _____ Evaluation Team: _____
_____

Recommendations: _____
_____
_____

Signature (District Traffic Engineer): _____ Date: _____

Signature (District EO Manager): _____ Date: _____

Attach Evaluation Sheets and All Supporting Documentation.

APPENDIX E

THE WEIGHTING METHODOLOGY

The Weighting Methodology

In discussions to date with the APS committee, there is the general feeling that some factors used in evaluating an intersection that has been approved for APS retrofit are more important than others. That is, all factors are not created equal! Accordingly, the evaluation methodology that the committee develops should have a "weighting" scheme that takes into account that some factors are more important than others.

Let's start with a basic assumption that we can measure importance by simply saying that, relative to each other, factors are important, twice as important, or three times as important. (Maybe there are no factors that we should consider to be three times as important and we will decide to just stay with important and twice as important as weights; however, for discussion purposes at this point, let's stay with the 3-weight scheme.)

If this basic assumption is accepted, then, mathematically, there are two ways to apply the 3-weight scheme, and each gives the same answer in the end. These two ways are as follows:

1. Each factor is **initially** rated and scored on a 0-5 point scale and a weight of 1, 2, or 3 is **applied at the end** to each factor's initial score to reflect its weight of importance; that is, twice as important, or three times as important. The weight of 1, 2, or 3 is in the form of a multiplier. This is the weighting scheme that the current methodology has used for simplicity purposes. We feel that this scheme is more straightforward, is easier to explain, is easier to defend, and will be more inherently obvious to the members of the evaluation team who ultimately apply the evaluation methodology.

2. The weight of 1, 2, or 3, which reflects a factor's relative importance of important, twice as important, or three times as important, respectively, is **applied initially** to the 0-5 point scale as a multiplier as shown in the following table. We feel that this scheme, while yielding the same score as above, is more difficult to understand.

Factor Importance	Weight	Scoring Point Scale
Important	1	0-1-2-3-4-5
Twice as Important	2	0-2-4-6-8-10
Three Times as Important	3	0-3-6-9-12-15

A simplified hypothetical example using three factors and set up according to the two above schemes follows. It is noted that the resulting scores and thus final ranking on a priority list would be the same regardless of the scheme applied.

Example of Applying the Weighting Schemes

For a subject intersection that has a maximum speed on approaches of 35 mph, a width of 80 feet and a proximity to key facilities of 1 block, the following is an example of applying the aforementioned weighting schemes. It is assumed that the 3 factors are weighted as important, twice as important and three times as important respectively. *Note the identical final scores.*

Weighting applied at the end

Maximum speed on approaches		
speed	**points**	**weight**
0 to 25	1	
26 to 30	2	
31 to 35	**3**	**x 1**
36 to 40	4	
41 or more	5	

Width of crossing (feet)		
width	**points**	**weight**
40 or less	1	
41 to 52	2	
53 to 68	3	**x 2**
69 to 78	4	
79 or more	**5**	

Proximity of intersection to key facilities		
blocks	**points**	**weight**
4 to 6 blocks	1	
3 blocks	2	
2 blocks	3	**x 3**
1 block	**4**	
at subject facility	5	

Total score = (3+10+12) = 25 points

Weighting applied initially

Maximum speed on approaches	
speed	**points**
0 to 25	1
26 to 30	2
31 to 35	**3**
36 to 40	4
41 or more	5

Width of crossing (feet)	
width	**points**
40 or less	2
41 to 52	4
53 to 68	6
69 to 78	8
79 or more	**10**

Proximity of intersection to key facilities	
blocks	**points**
4 to 6 blocks	3
3 blocks	6
2 blocks	9
1 block	**12**
at subject facility	15

Total score = (3+10+12) = 25 points