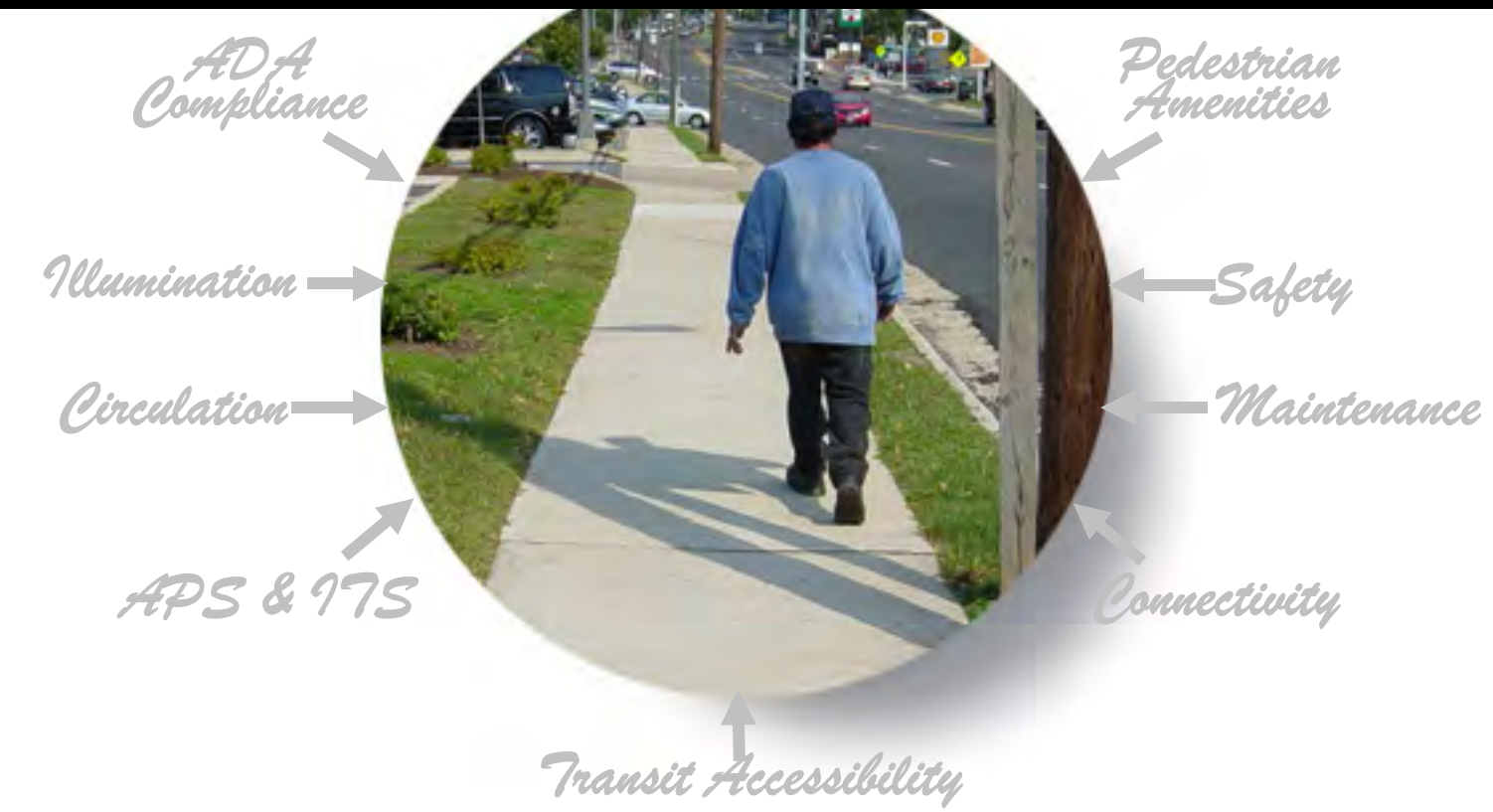
Annandale
Pedestrian Walkway Feasibility Study



Final Report

Submitted to

Fairfax County Public Works and Environmental Services

Submitted by

VOLKERT & ASSOCIATES, INC.

June 2007

VOLKERT & ASSOCIATES, INC.

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From: Cesar E. Vargas, PE
Project Manager

Subject: Project No. HCD53/Volkert No. 663802.60
Annandale Pedestrian Walkway Feasibility Study

Reference: Final Technical Memorandum

We have completed additional analysis of pedestrian access, safety, and circulation in the Annandale area to reflect previous comments from County staff and results of further research efforts. We have developed preliminary improvement recommendations for consideration by the County and the local community. The following sections discuss the key findings of the study, technical approach and study methodology, results of field surveys, and the recommendations of the study.

I. Key Findings of the Study

- There are a variety of opportunities for improved connectivity from the residential areas of Annandale to the Community Business Center (CBC). As discussed later in this report, the opportunities range from improving the existing pedestrian facilities within walking distance of the commercial core to providing internal and external pedestrian linkages as part of new land development activities.

- Based on discussions other area jurisdictions, pedestrian connectivity, safety, and circulation issues are addressed either by application of traffic engineering principles for operational aspects or through site plan review process from a transportation planning perspective.

- Surveys of the key roadway facilities in the Annandale study area indicate that of the approximately four (4) miles of roadways (8 miles of curbline) about 85% have existing sidewalks. In general, most sidewalks (about 90%) are in good condition.

- There are 258 handicap ramps on streets included in the study area. About half (51%) of these ramps are in compliance with either the most recent or the older versions of ADA design requirements. Twenty-four percent (24%) have truncated domes (which is the latest ADA requirement) and twenty-seven percent (27%) do not.

- There are several locations where additional traffic control devices are necessary to accommodate pedestrians.

- There are four (4) locations that require improvements to enhance pedestrian accessibility and safety. These locations and the proposed improvements are discussed in greater detail under "Specific Focus Areas" below.

- A review of the historic pedestrian accident records for a 3-year period provided data on the relative accident frequency at various locations. Based on this review, the intersection of Columbia Pike at Backlick Road/Maple Place has a higher pedestrian accident rate compared to other study locations. In an effort to improve safety conditions at this intersection, two (2) alternative improvement options (one short- and one long-term) were developed and are discussed in more detail in this technical memorandum.

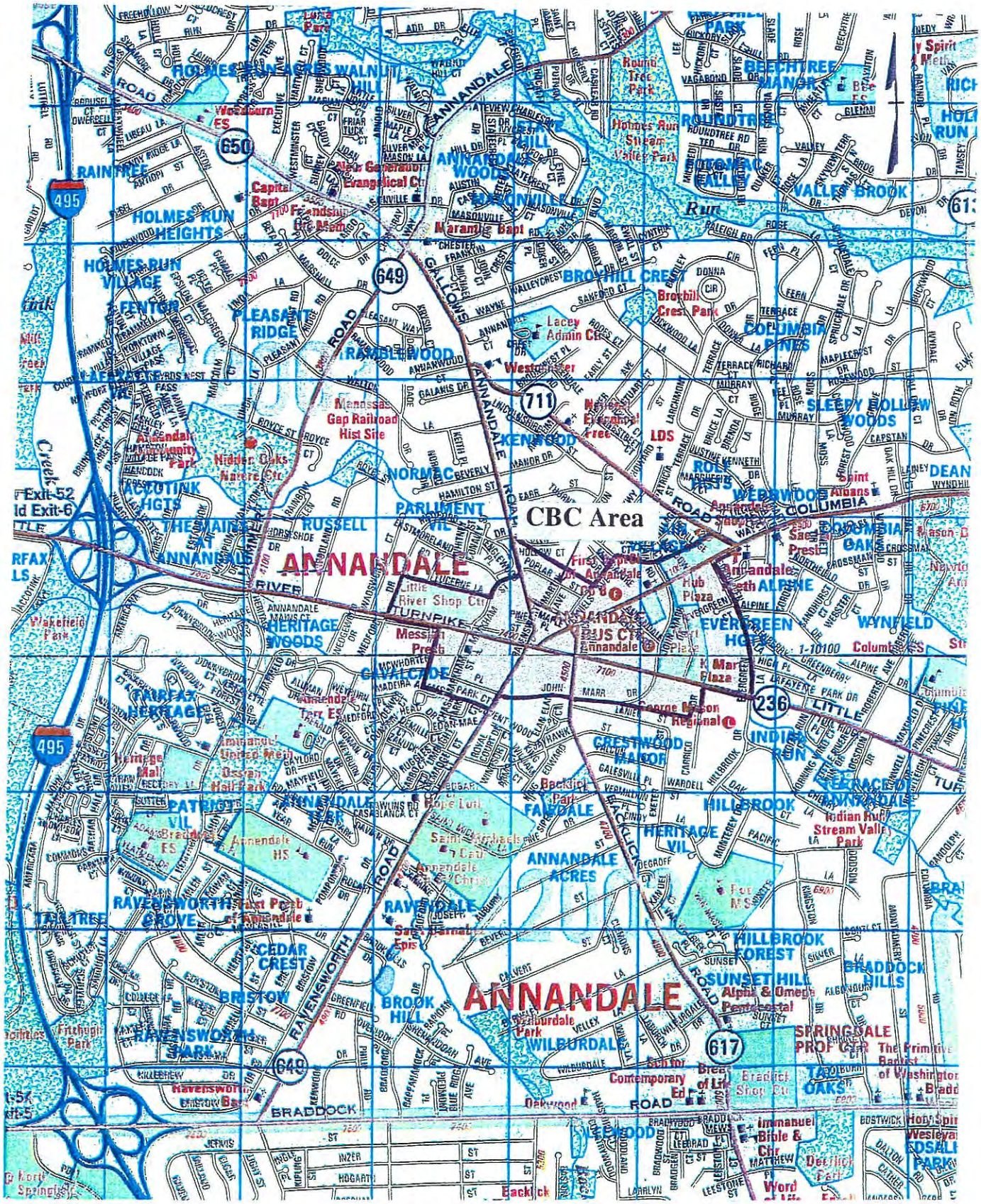
II. Study Area

Consistent with the objectives of this study, the areas included in the review of pedestrian connectivity consisted of not only the Annandale CBC but also the surrounding residential communities that are located within walking distance of the CBC. In additional, consideration was given to a broader geographical area to identify interconnectivity issues and opportunities. From a transportation planning perspective, while there are individual retail facilities within close proximity of the CBC, the large retail centers include Fair City Mall approximately five (5) miles to the West and Land Mark Mall area which is about two (2) to three (3) miles to the East in the cities of Fairfax and Alexandria, respectively, both of which are beyond walking distance. The boundaries of the Annandale Community Business Center on Figure 1.

III. Study methodology

A. Field Reconnaissance

Volkert staff conducted a field reconnaissance of the CBC area to evaluate patterns associated with pedestrian and bicycle activities; to evaluate the condition of existing facilities; and to identify obstacles and opportunities for improving pedestrian access, circulation, and safety while linking the residential and commercial land uses. As directed by the County, the study focused on the following key roadway facilities:



Source: ADC Street Map Book

Scale: 1"=2,000'

FIGURE 1 – BOUNDARIES OF ANNANDALE COMMUNITY BUSINESS CENTER

- Annandale Road
- Backlick Road
- Columbia Pike
- Daniels Avenue
- Evergreen Lane
- Gallows Road
- Little River Turnpike
- Markham Street
- Medford Drive
- John Marr Drive
- Jay Hawk Street
- Ravensworth Road

During the conduct of this study, in discussions with the County staff, it was determined that Annandale Center Drive should be added to the above list of streets.

B. Review of Prior Studies and Documents

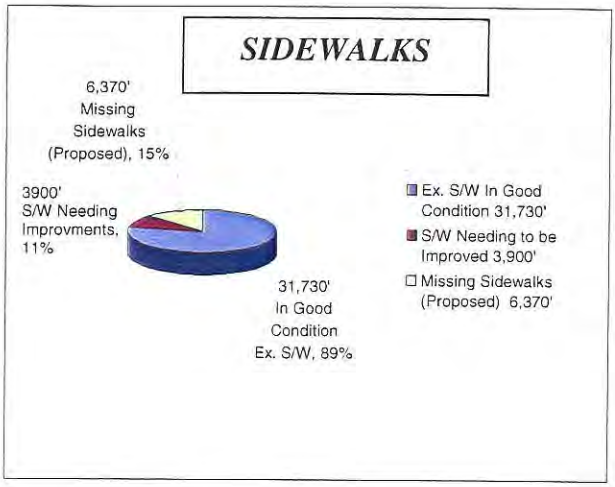
As part of this study, several publications were reviewed including: (1) Annandale Community Business Center Revitalization Report, October 8, 1997; (2) Columbia Pike Streetscape Plan, Annandale, VA, October 1993; (3) Fairfax County Pedestrian Task Force, Final Report, January 23, 2006; and (4) Annandale Community Business Center Circulation Study, May 2005. In addition, information was provided by the County staff regarding major planned developments in the area such as the Park Hotel and the K-Mart Property projects.

IV. Assessment of Existing Conditions

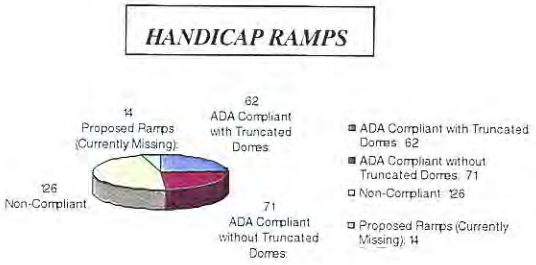
A comprehensive field inventory and inspection of the study area revealed a number of deficiencies, obstacles, and opportunities leading to recommendations that can help facilitate the overall pedestrian access, circulation and safety while bringing pedestrian facilities into compliance with the latest ADA requirements. The field reviews were performed for each major element of pedestrian facilities, results of which were summarized on various plan layers and are depicted in attached figures. All elements were then combined on a final figure representing a composite study findings and preliminary recommendations. It should be noted that due to the large geographic area for this study, appropriate drawings were prepared at a larger scale to provide clarity in preparation of the upcoming community meeting. Specific elements of the survey are discussed below.

Inventory of Sidewalks, Handicap Ramps, and Bus Stop Locations (Figure 2)

Sidewalks - A physical inventory of the key roadway facilities was performed to document the location, type, dimensions, condition, and availability of sidewalks. The results of this survey, shown on Figure 1, indicate that approximately 85% of streets (evaluated based on length of existing curbline) have sidewalks. Of the existing sidewalks (i.e., total of 35,630 feet or 6.75 miles in length), approximately 11% (3,900 feet or 0.75 miles) are in need of improvements or maintenance activities. The study has identified about 6,370 linear feet of sidewalks (1.2 miles) to complete the network of sidewalk system within the Annandale study area.



Handicap Ramps – There are currently 258 handicap ramps in the area. An assessment of these ramps indicate that more than 50% of these ramps are in compliance with either the latest or prior ADA standards. However, ramps should be replaced at several locations to meet current standards for accommodating individuals with disabilities.

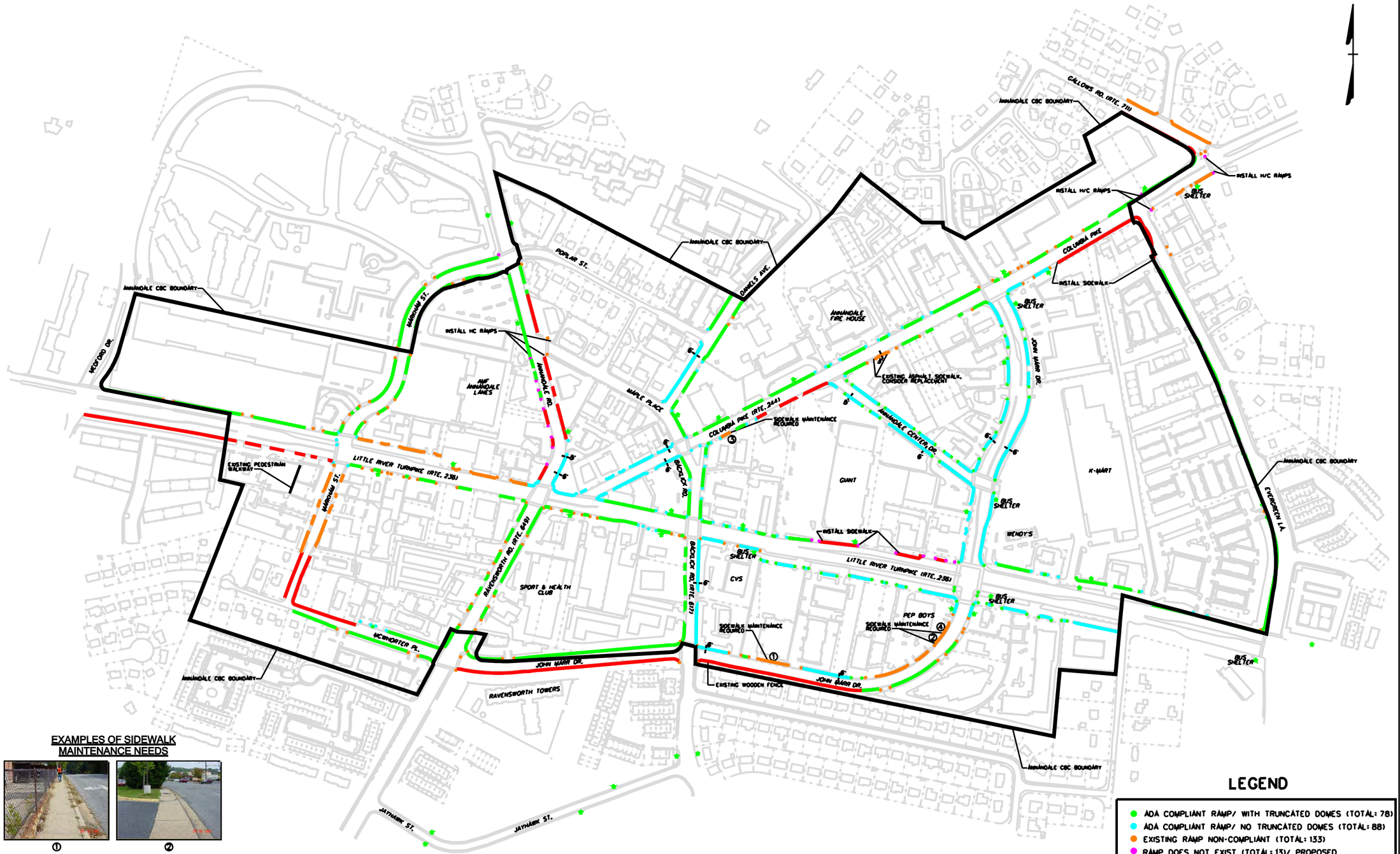


In addition, this study includes recommendations for construction of new ramps at thirteen (13) locations where handicap ramps do not currently exist.

Bus Stops – The area is well served with regular bus transit service with a total of 34 bus stop locations. As shown on Figure 1, standard WMATA bus shelters are provided at 6 bus stop locations. As discussed later in this memorandum, the study recommends adding one more bus shelter to supplement an existing bus stop along Columbia Pike.

FIGURE 2 - SIDEWALK INVENTORY, HANDICAP RAMPS & BUS STOPS

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



EXAMPLES OF SIDEWALK MAINTENANCE NEEDS

NOTE: ALL CONCRETE SIDEWALKS 4' WIDE EXCEPT AS NOTED

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SCHEMATIC: NOT TO SCALE

LEGEND

- ADA COMPLIANT RAMP/ WITH TRUNCATED DOMES (TOTAL: 78)
- ADA COMPLIANT RAMP/ NO TRUNCATED DOMES (TOTAL: 88)
- EXISTING RAMP NON-COMPLIANT (TOTAL: 133)
- RAMP DOES NOT EXIST (TOTAL: 13)/ PROPOSED
- BUS STOPS (34, 6 OF WHICH INCULDE SHELTERS)
- CONCRETE SIDEWALK IN GOOD CONDITION
- BRICK SIDEWALK IN GOOD CONDITION
- SIDEWALK REQUIRING MAINTENANCE
- MISSING SIDEWALK

P:\ 663802 Annandale Pedestrian Walkway\ Dgn\ Figure 2 Sidewalk HC Ramps.dgn

- **Pedestrian signals, signs and pavement markings (Figure 3)**

Pedestrian Signals – With the exception of two (2) intersections (i.e., Columbia Pike @ John Marr Drive and @ Gallows Road), all signalized intersections include either full or partial traffic signal head indications for pedestrians. There are eighteen (18) pairs of standard pedestrian signal heads with typical walk and don't walk symbols to accommodate 18 crosswalks at signalized intersections. In addition, there are four (4) pairs of the newer "countdown" pedestrian signal heads at the intersection of Little River Turnpike and John Marr Drive. As shown on Figure 2 on the following page, in an effort to enhance pedestrian safety, this study identified twenty (20) additional locations where provisions for installation of pedestrian signal heads should be considered for existing crosswalks at signalized intersections. This would nearly double the total number of signalized crosswalks.

Pedestrian Signs – Currently, there are no existing pedestrian warning signs in the study area. As discussed in the following section under "Specific Focus Areas," there is one location (Columbia Pike west of Annandale Center Drive) where it may be appropriate to install warning signs along with other features to accommodate pedestrians.

Pedestrian Pavement Markings - Location of all existing pedestrian crosswalks is depicted on Figure 2. Also shown on Figure 2, there are intersections where crosswalks should either be extended, relocated, or installed to better define pedestrian paths across intersections.

Preliminary Assessment of Pedestrian-Scale Lighting (Figure 4)

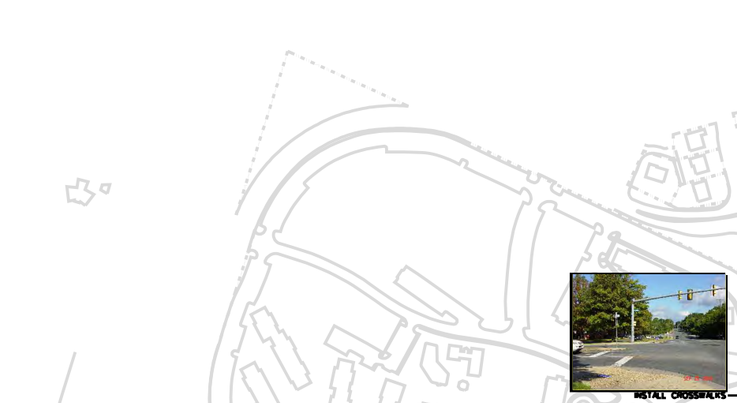
Pedestrian visibility during night hours is an important safety factor. Studies have shown that about two-thirds of pedestrian fatalities occur during low-light conditions (Guide for the Planning, Design, and Operation of Pedestrian Facilities, ASHTO, July 2004). Volkert staff conducted a night-time survey to determine the adequacy of illumination in the area. As shown on Figure 3 with different color codes, the visual observations were divided into three (3) categories: 1) good (properly lit), 2) Medium (needs additional lighting), and 3) no pedestrian lighting. While nearly one-third (approximately 28%) of the sidewalks were found to have adequate lighting, more than half of the sidewalks (about 60%) lack pedestrian-scale lighting. The remaining sidewalk areas either require maintenance or upgrade to existing lights.

Interaction between Residential and Commercial Zones (Figure 5)

One of the key objectives of this study was to identify opportunities for connectivity between the residential areas and the commercial core of the Annandale area. For this reason, the study area was divided into eight (8) residential & commercial interaction zones to facilitate field review and surveys of existing connectivity. As shown on Figure 4, there are existing pedestrian links that provide some connectivity. For instance, there are three pedestrian access points between the K-Mart property and areas to the east (see zone A). Inasmuch as the existing topography requires steps to gain access, it would be desirable to improve at least one of the three access points to serve individuals with disabilities. Similarly, within zones G and H there is existing pedestrian connectivity between the residential areas and adjacent commercial uses.

FIGURE 3 - PEDESTRIAN SIGNALS, SIGNS AND CROSSWALKS

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



LEGEND

- EXISTING PEDESTRIAN SIGNAL LOCATION (18 PAIRS)
- EXISTING COUNT-DOWN PEDESTRIAN SIGNAL LOCATION (4 PAIRS)
- EXISTING TRAFFIC SIGNAL LOCATION WITHOUT ANY PEDESTRIAN SIGNAL HEADS (3)
- PROPOSED PEDESTRIAN HEADS (23 PAIRS)

NOTE : NO EXISTING PEDESTRIAN WARNING SIGNS

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SCHEMATIC: NOT TO SCALE

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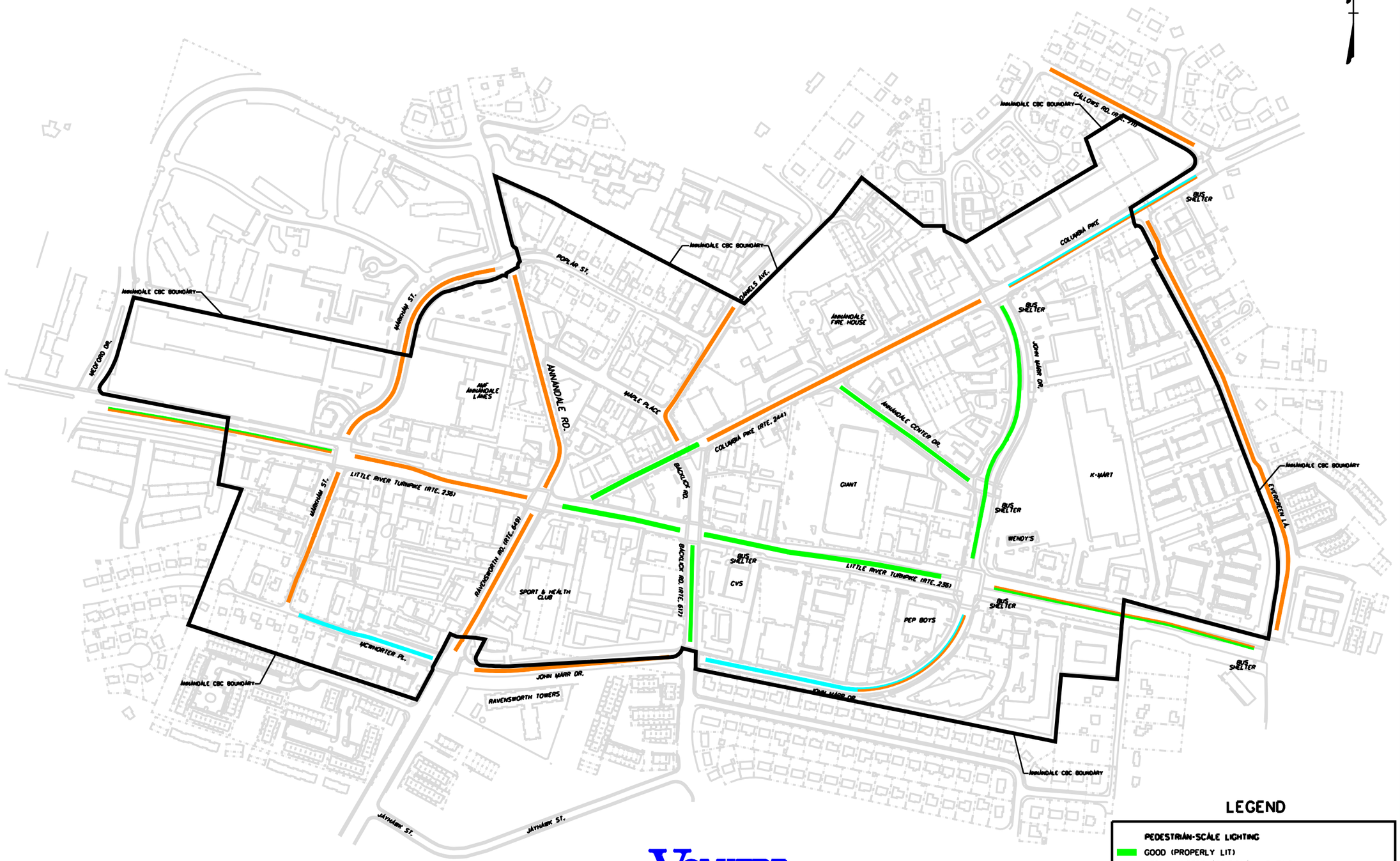
FIGURE 4 - PEDESTRIAN-SCALE LIGHTING

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



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LEGEND

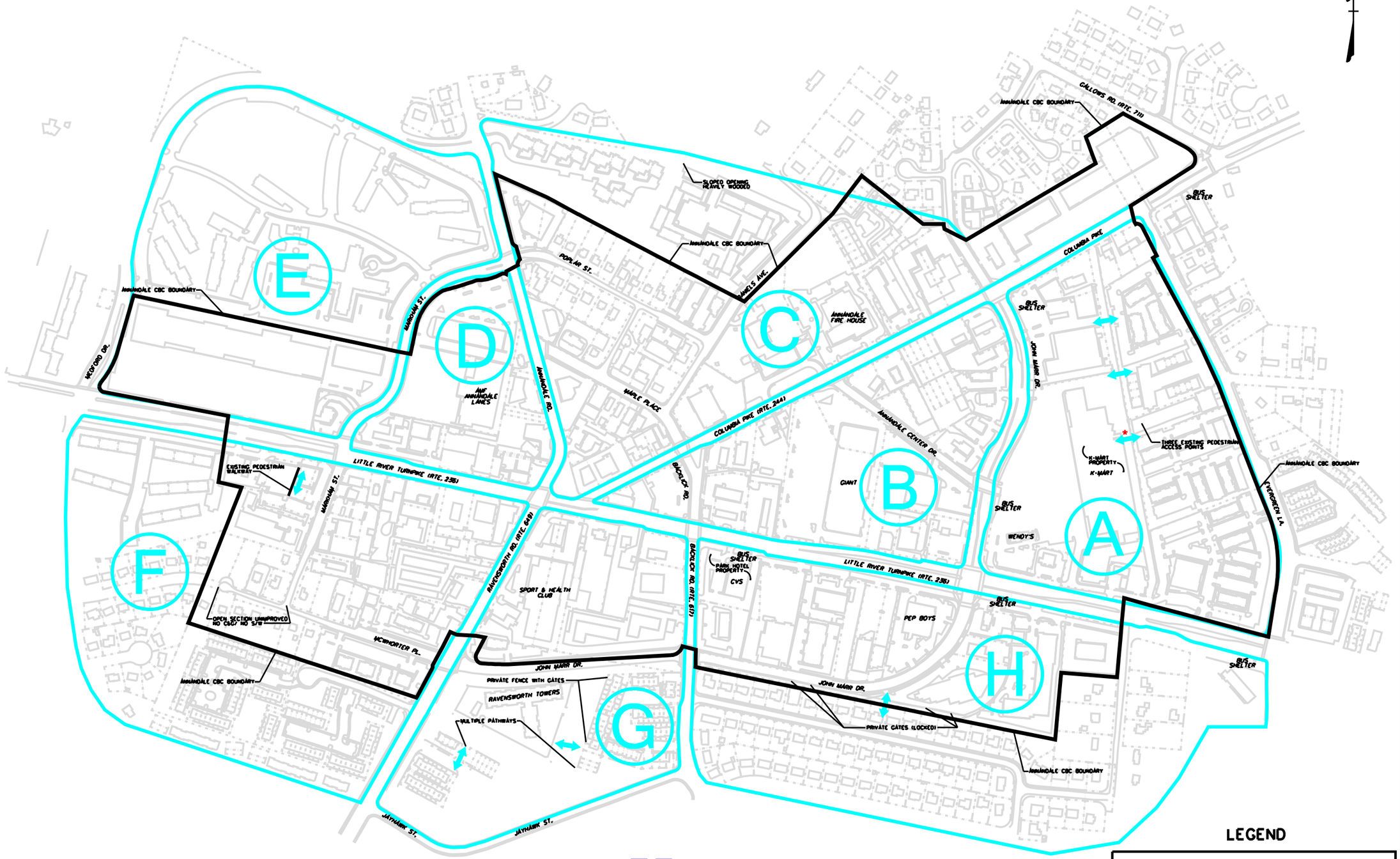
PEDESTRIAN-SCALE LIGHTING
- GOOD (PROPERLY LIT)
- MEDIUM (NEEDS ADDITIONAL LIGHTING)
- NO PEDESTRIAN LIGHTING

SCHEMATIC: NOT TO SCALE

T:\ 658902 Annandale Pedestrian Walkway\ Dgn\ Figure 4 Street Lighting fnl.dgn

FIGURE 5 - RESIDENTIAL & COMMERCIAL ZONES

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



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SCHEMATIC: NOT TO SCALE

LEGEND

- EXISTING PEDESTRIAN LINK/ ACCESS POINT
- * SHOULD BE IMPROVED

T:\ 663802 Annandale Pedestrian Walkway\ Dgn\ Figure 5 Residential Commercial Zones ht.dgn

The residential units in those zones have private gates that provide private access to the commercial core. Based on discussions with other jurisdictions such as Arlington County, it is typically desirable to provide pedestrian connectivity either using roadway facilities within public rights of way or identify linkages during site plan review process for proposed developments.

Pedestrian Catchment Areas (Figure 6)

Distance is the primary factor in the initial decision to walk. People walking want to be able to reach the same destinations as people on bikes, in cars or using public transportation. Walkers want the safest and most convenient route possible, with a minimum of delays and detours. A number of different components combine to create a network for pedestrian travel in a community such as sidewalks, crosswalks, signals, lighting, and other features.

Studies have shown that individuals may choose to walk to an activity center if they are within approximately ¼ mile, or five (5) to ten (10) minutes at a comfortable pace, to each their destinations (" Guide for the Planning, Design, and Operation of Pedestrian Facilities, AASHTO, July 2004). Figure 5 shows the major activity centers within Annandale CBC and the associated pedestrian catchment areas based on that criteria. As can be seen on the figure, due to the proximity of various destination points, there are many catchment areas that overlap. The overlapping areas indicate a greater potential for pedestrian activities and potentially higher priority for pedestrian facility improvements.

Specific Focus Areas (Figure 7)

During the field review, discussions with County staff, and analysis of accident patterns, three (3) locations along Columbia Pike and one (1) intersection on Annandale Road were identified as areas requiring more detailed study to address pedestrian access and safety concerns. The four (4) areas are:

1) Annandale Road at Maple Place

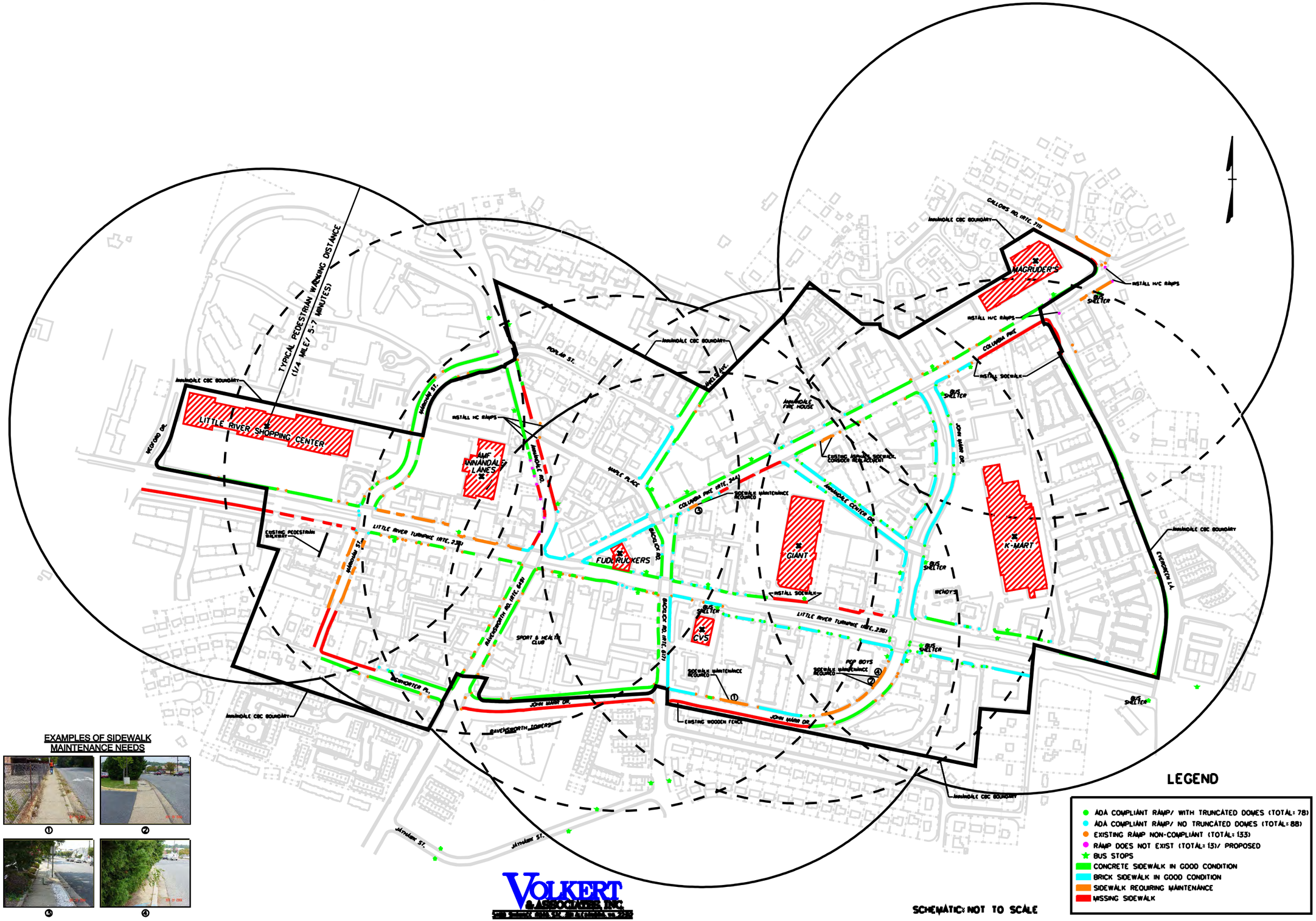
At this intersection, the existing crosswalk across Maple Place leads to a driveway and is in conflict with a drainage inlet. This crosswalk should be relocated and a new crosswalk should be placed across Annandale Road on the south side of the intersection. In addition, there is a need to install ADA-compliant handicap ramps on three corners of the intersection along with pedestrian signal heads as indicated on Figure 6. Furthermore, as shown on the figure there are areas along the east side of Annandale Road that have missing sidewalks.

2) Columbia Pike at Backlick Road/Maple Place (Figures 8 & 9)

As discussed earlier, the intersection of Columbia Pike at Backlick Road/Maple Place has a higher pedestrian accident rate than other locations within the study area.

FIGURE 6 - PEDESTRIAN CATCHMENT AREAS

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



EXAMPLES OF SIDEWALK MAINTENANCE NEEDS

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SCHEMATIC: NOT TO SCALE

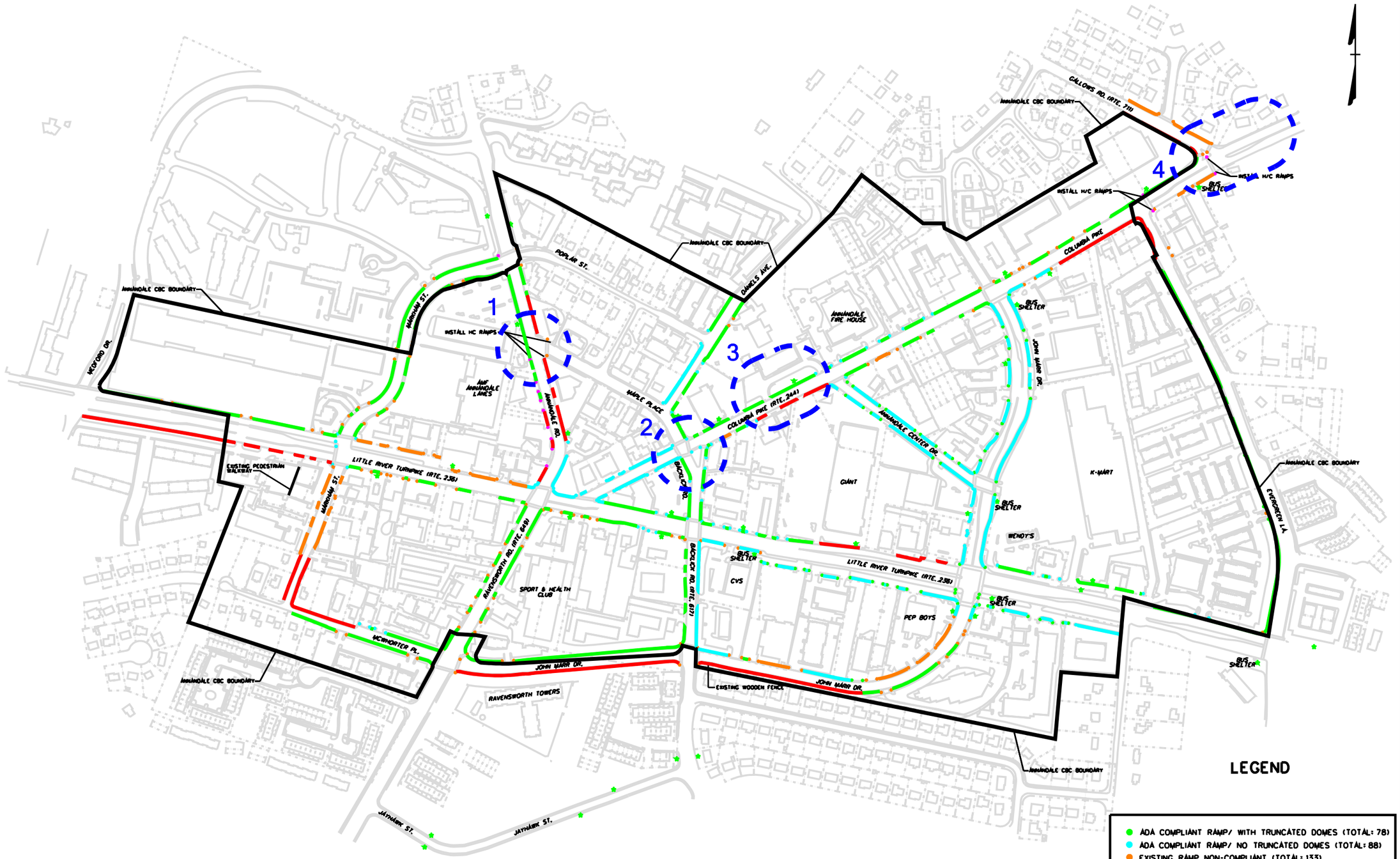
LEGEND

- ADA COMPLIANT RAMP/ WITH TRUNCATED DOMES (TOTAL= 78)
- ADA COMPLIANT RAMP/ NO TRUNCATED DOMES (TOTAL= 88)
- EXISTING RAMP NON-COMPLIANT (TOTAL= 133)
- RAMP DOES NOT EXIST (TOTAL= 131)/ PROPOSED
- BUS STOPS
- CONCRETE SIDEWALK IN GOOD CONDITION
- BRICK SIDEWALK IN GOOD CONDITION
- SIDEWALK REQUIRING MAINTENANCE
- MISSING SIDEWALK

TXT: 663802 Annandale Pedestrian Walkway, Dgn: Figure 6 Pedestrian Catchment Areas Mr.dgn

FIGURE 7 - SPECIFIC FOCUS AREAS

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



LEGEND

- ADA COMPLIANT RAMP/ WITH TRUNCATED DOMES (TOTAL: 78)
- ADA COMPLIANT RAMP/ NO TRUNCATED DOMES (TOTAL: 88)
- EXISTING RAMP NON-COMPLIANT (TOTAL: 133)
- RAMP DOES NOT EXIST (TOTAL: 13)/ PROPOSED
- BUS STOPS
- CONCRETE SIDEWALK IN GOOD CONDITION
- BRICK SIDEWALK IN GOOD CONDITION
- SIDEWALK REQUIRING MAINTENANCE
- MISSING SIDEWALK

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SCHEMATIC: NOT TO SCALE

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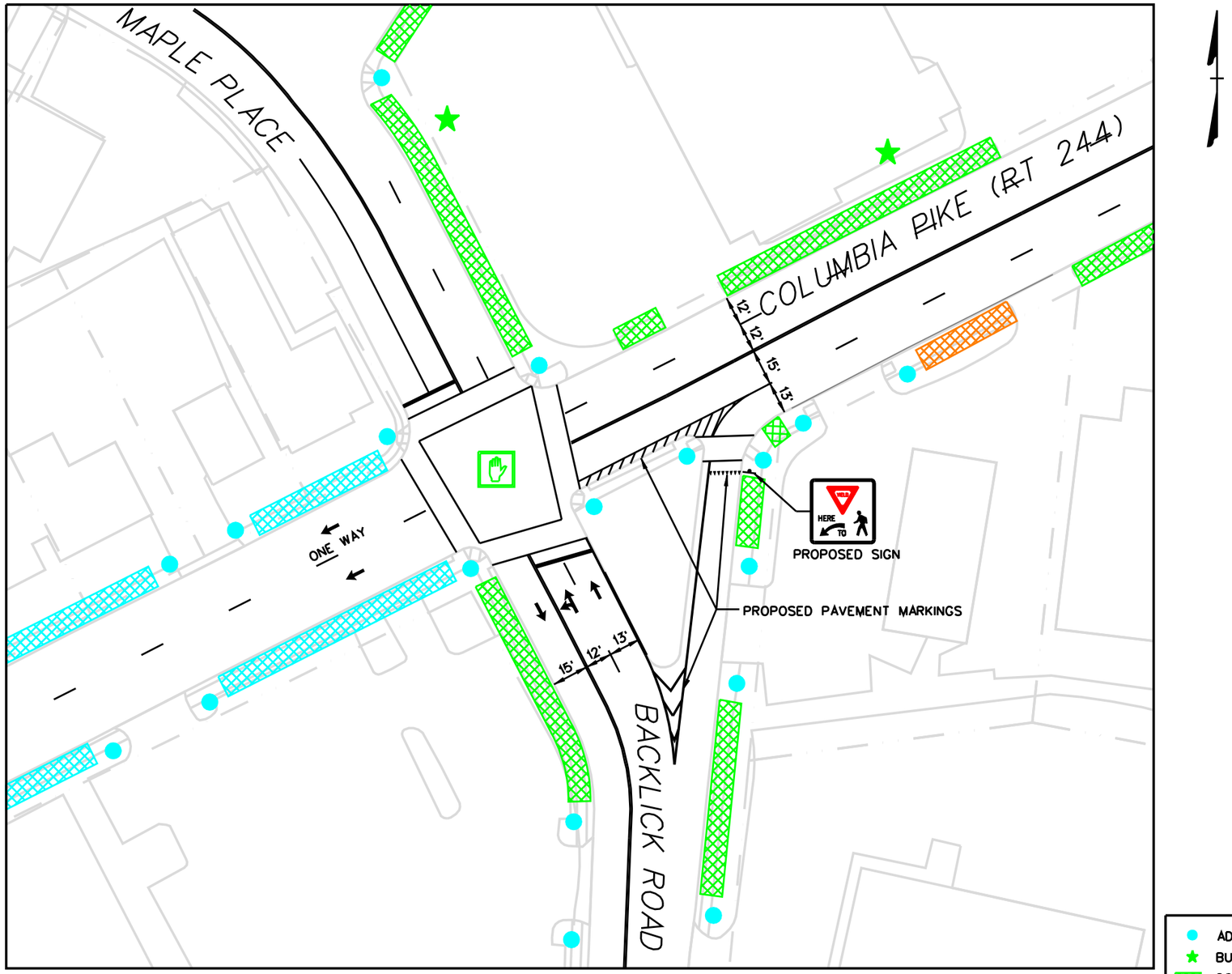
FIGURE 8 - COLUMBIA PIKE AND BACKLICK ROAD

(IMPROVEMENTS - ALTERNATE 1)

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



SCALE: 1" = 50'

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LEGEND

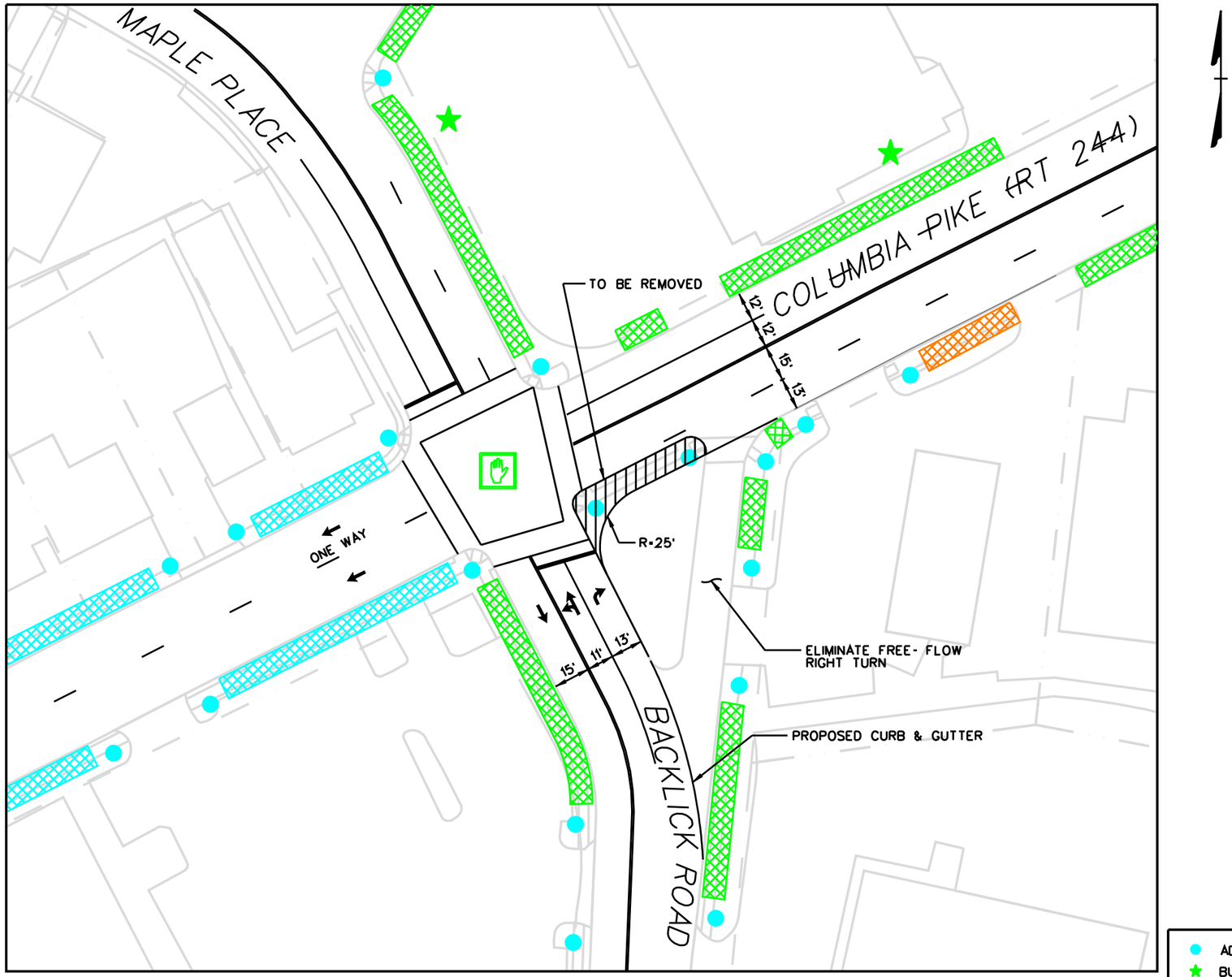
- ADA COMPLIANT RAMP/ NO TRUNCATED DOMES (18)
- BUS STOPS (2)
- CONCRETE SIDEWALK IN GOOD CONDITION
- BRICK SIDEWALK IN GOOD CONDITION
- SIDEWALK REQUIRING MAINTENANCE
- EXISTING PEDESTRIAN SIGNAL LOCATION (4 PAIRS)

T:\ 663802 Annandale Pedestrian Walkway\ Dgn\ Figure 8 Focus Area 2 - Alt 1 hlf.dgn

FIGURE 9 - COLUMBIA PIKE AND BACKLICK ROAD

(IMPROVEMENTS - ALTERNATE 2)

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



SCALE: 1" = 50'

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LEGEND

- ADA COMPLIANT RAMP/ NO TRUNCATED DOMES (18)
- BUS STOPS (2)
- CONCRETE SIDEWALK IN GOOD CONDITION
- BRICK SIDEWALK IN GOOD CONDITION
- SIDEWALK REQUIRING MAINTENANCE
- EXISTING PEDESTRIAN SIGNAL LOCATION (4 PAIRS)

T:\ 663802 Annandale Pedestrian Walkway\ Dgn\ Figure 9 Focus Area 2 - Alt 2 hlf.dgn

During field observations, it was noted that the northbound right-turn vehicles using the free-flow turn lane travel at a relatively high speed. In an effort to improve pedestrian safety conditions, two (2) alternative improvement options (one short- and one long-term) were developed as shown on Figures 7 and 8, respectively.

Alternative 1 consists of additional pavement markings and warning signs adjacent to the traffic island in the southeast quadrant of the intersection. This short-term improvement is intended to enhance pedestrian safety at the crosswalk that crosses the free-flow right turn lane.

Alternative 2 involves reconfiguring the intersection to eliminate the free-flow right-turn lane. This will result in a larger traffic island which can provide an opportunity for streetscape improvements.

3) Columbia Pike between Annandale Center Drive and Backlick Road

In this area, pedestrians crossing Columbia Pike do not have convenient access to a signalized intersection. Major destination areas include an adult day care center and the ACCA Child Development facility mid-block on the north side of Columbia Pike and Giant supermarket on the south, including several other adjacent uses in the area. There are missing sidewalk sections on the south side of the street. On the north side of Columbia Pike in this block, there are two bus stop locations. Proposed improvements for this area include:

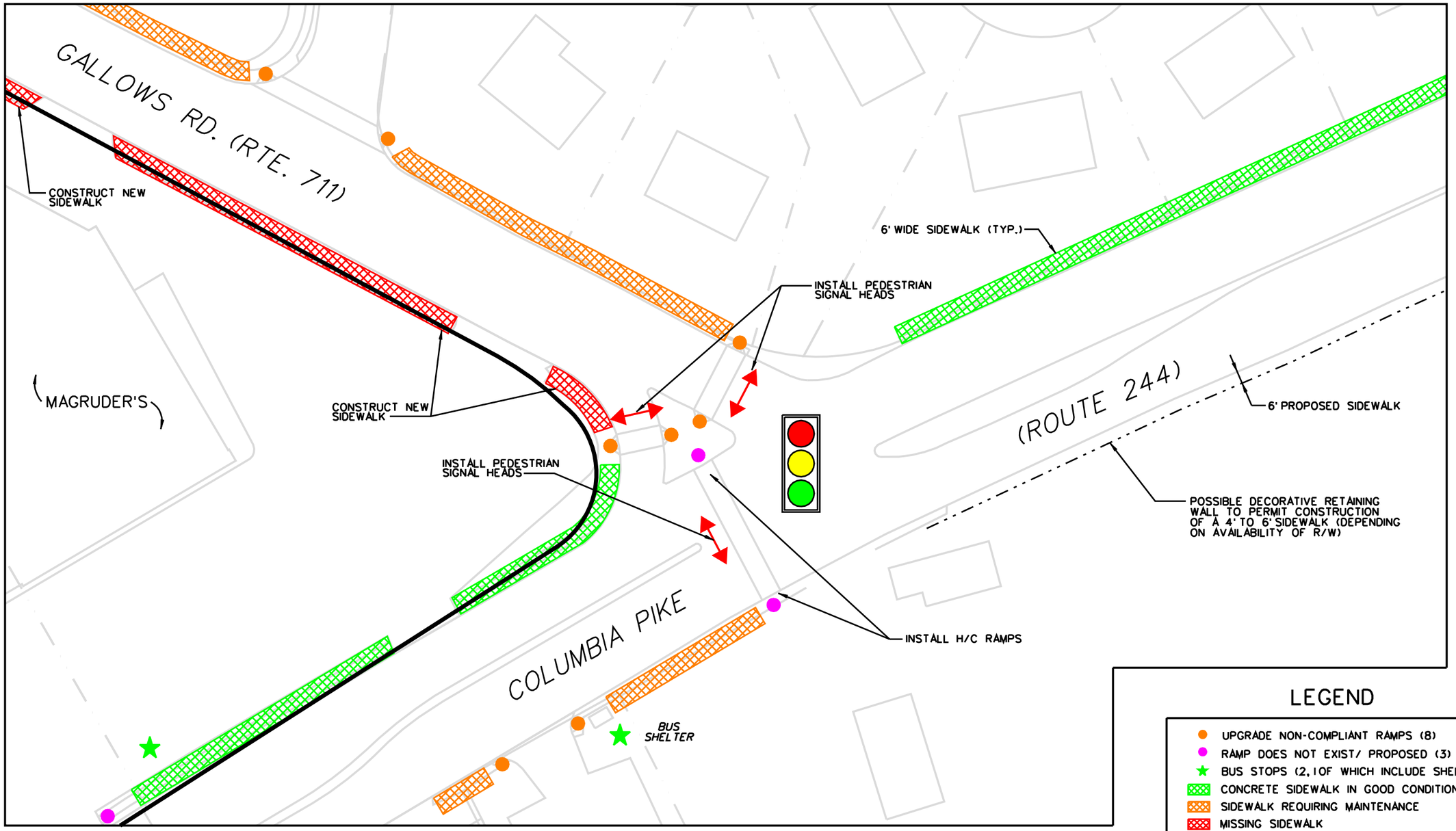
- Construction of sidewalks along the south side of Columbia Pike
- Installation of lighted pedestrian crosswalks across Columbia Pike west of Annandale Center Drive (similar to other such devices installed in other parts of Fairfax County)
- Pedestrian warning signs in advance and at the point of crossing in both directions
- Ballards with high-intensity yield to pedestrians sign within the crosswalk
- Installation of a bus shelter to accommodate transit passenger in inclement weather

A traffic signal warrant study is also recommended to determine whether a signal is justified at the intersection of Columbia Pike and Annandale Center Drive

4) Columbia Pike at Gallows Road (Figure 10)

The conditions in this area constitute a barrier to safe pedestrian access and safety. While this intersection is located outside the study boundary, County staff expressed concerns

FIGURE 10- COLUMBIA PIKE AND GALLOWS ROAD
(PEDESTRIAN ACCESSIBILITY IMPROVEMENTS)
ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



LEGEND

- UPGRADE NON-COMPLIANT RAMPS (8)
- RAMP DOES NOT EXIST/ PROPOSED (3)
- BUS STOPS (2, 1 OF WHICH INCLUDE SHELTER)
- CONCRETE SIDEWALK IN GOOD CONDITION
- SIDEWALK REQUIRING MAINTENANCE
- MISSING SIDEWALK
- EXISTING TRAFFIC SIGNAL LOCATION WITHOUT ANY PEDESTRIAN SIGNAL HEADS (1)
- PROPOSED PEDESTRIAN HEADS (3 PAIRS)

SCALE: 1" = 50'

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T:\ 663802 Annandale Pedestrian Walkway\ Dgn\ Figure 10 Focus Area hlf.dgn

about the many challenges that pedestrians face at this location. The intersection is signalized, however, there are no pedestrian signal heads and crosswalks are not properly located and lack handicap ramps.

The southeast quadrant of the intersection includes the Annandale United Methodist Church, a preschool, a daycare center and residential units. Annandale Shopping Center which includes Magruder's supermarket along with other shops is located in the northwest quadrant of the intersection. While there is a concrete sidewalk along the north side of Columbia Pike, there are no pedestrian facilities on the south side, east of the intersection. Therefore, individuals desiring to access the shopping center from the residential units on the south side of this roadway facility often walk though the Church parking lot to reach the intersection and then cross Columbia Pike in an unsafe manner. There are a number of improvements that are needed to safely accommodate pedestrian access and circulation. They include:

- Installation of three (3) pairs of pedestrian signal heads for the three (3) crosswalks as well as handicap ramps

- Construction of sidewalks on the west side of Gallows Road adjacent to the shopping center and maintenance activities on the existing sidewalks in the immediate area of the intersection

- Construction of a new sidewalk on the south side of Columbia Pike from Gallows Rd. to Martin Taylor Court. It should be noted that, due to the steep slope associated with the area on the south side of Columbia pike, it may be necessary to construct a retaining wall (preferably a decorative wall) to provide a level surface for such sidewalk.

V. Research Findings

As part of this study, a review was conducted of pedestrian plans that have been developed around the country. Appendix A contains a summary of exemplary pedestrian plans at the national, state, and local levels. In addition, research indicates that a number of jurisdictions in the U.S. have been implementing APS (Accessible Pedestrian Signals) to improve pedestrian safety and accessibility at signalized intersections. The devices, which vary from one jurisdiction to another, are based on ITS (Intelligent Transportation Systems) technologies. For example, Montgomery County, Maryland application of APS consists of the following features:

- Speech Walk Message
- Vibrotactile Walk Indication
- Pushbutton Locator Tone
- Automatic Volume Adjustments in Response to Ambient Sound
- Raised Arrow Oriented in the Direction of Travel on Crosswalk
- Speech Pushbutton Information Message

Appendix B contains information regarding APS types and features, installation, and maintenance requirements associated with applications by various jurisdiction across the country. Together, the appendices are intended to serve as an additional resource guide for future pedestrian facility improvement initiatives in Fairfax County.

VI. Pedestrian Connectivity from Surrounding Residential Areas to the Commercial Revitalization District

The key objective of this study was to identify opportunities for linking the residential areas with the commercial core of the Annandale CBD. For the purposes of this study, three (3) categories of connectivity were identified as follows:

1. Connectivity within the Commercial Revitalization District

   Residents within this area have the option of either using their private gates or the internal roadway network, which is recommended to be improved by this study, to gain access. Internal trips can involve walking, bicycling, or driving as available modes of transportation.

2. Connectivity from Neighborhoods within Pedestrian Catchment Areas

   Neighborhoods within the pedestrian catchment areas (i.e., 1/4 mile walking distance) can gain access to the commercial areas using the public roadway system. However, since the catchment areas encompass a larger geographical area than that included in this study, the street network within those areas should also be evaluated to identify any needed improvements. Bicycling and driving remain as optional modes of travel.

3. Connectivity from Neighborhoods Outside the Pedestrian Catchment Areas

   Those residing farther away are likely to drive to the commercial areas. Inasmuch as public right-of-way for internal pedestrian pathways or trails does not appear to be available between those areas and the commercial core to provide direct pedestrian links such as trails, consideration should be given to evaluating the existing transit service which is intended primarily to accommodate commuter travel (i.e., Metro buses have no weekend service to accommodate retail trips).

Finally, there are connectivity opportunities when new land developments occur. The following are preliminary connectivity design guidelines that can be followed to ensure appropriate connectivity from the surrounding residential areas to the commercial area of the Annandale CBD during site plan review process for new developments:

1. Create internal street grids and pedestrian pathways in mixed-use developments for inter-parcel connectivity between residential and commercial land uses, ease of circulation, and to reduce travel distance and time for waking/ biking trips.

2. Ensure that the public street networks are safe accessible with appropriate provisions for pedestrians (i.e., sidewalks, handicap ramps, crosswalks, pedestrian signals, etc.).

3. For commercial zones and major activity centers, determine the pedestrian catchment areas (i.e., area surrounding sites within ¼ mile distance or 5 to 7 minutes of walking distance) to address key connectivity issues and to ensure adequate accessibility for pedestrians.

4. Create open spaces and provide pedestrian amenities based on Annandale streetscape guidelines to produce ecstatically- pleasing environments.

5. Consider inclusion of pedestrian plaza's as part of new development activities.

Figure 11 shows the overall composite existing conditions. Further review of pedestrian catchment areas (i.e., within ¼ mile walking distance) associated with various commercial uses indicates that virtually all streets in the CBC are within more that two (2) catchment areas (see Figure 12). This finding, which can be attributed to the multiple attraction points that are closely spaced within the commercial zone, provides further evidence for the need to implement pedestrian facility improvements as previously identified by this study, especially 6-foot-wide sidewalks similar to those on John Marr Drive. Priority may be given to those streets which have bus stops including:

		From	To
1.	Little River Turnpike (Route 236)	Markham St.	Just East of John Marr Dr.
2.	Columbia Pike (Route 244)	Route 236	Just East of John Marr Dr.
3.	John Marr Drive	Route 236	Ravensworth Rd. (Rte. 649)
4.	Annandale Road	West of Markham St.	Route 236

The commercial area of Annandale includes a number of destination points and activity centers that have the potential for, but lack, safe and efficient pedestrian connections. One example is the area behind the K-Mart building which currently has three (3) pedestrian connections to the offices that are located to the east. While these connections provide convenient pedestrian access, they have insufficient lighting, two of which do not meet ADA standards. One option for this area would consist of consolidating the three (3) connections into one (1) ADA-compliant linkage with appropriate pedestrian lighting. As shown on Figure 13, the location of existing and missing pedestrian linkages were also identified as part of this study. A number of factors were taken into account in identifying these links including:

- Proximity of residential areas to the following activity centers:

  1. K-Mart property (an area next to Wendy's)
  2. Giant Supermarket Site
  3. Park Hotel Property (currently CVS)
  4. AMF Annandale Lanes (Bowling Alley)"

- Possible paths that a pedestrian would take to reach a destination
- Additional field surveys to locate specific paths that can physically be provided as new pedestrian linkages
- Catchment areas and where overlaps occur, and
- Location of street segments where sidewalks area missing, but pedestrian access is desired

Additionally, to enhance the pedestrian environment, consideration should be given to creating public gathering places with pedestrian amenities such as benches, tables, and/or electrical connections. These furnishings could be stored at the site in an enclosure or at a large community/commercial shop close to the gathering locations to preclude miss-use. Examples of possible locations that might be suitable as good candidates for such a feature are shown on Figure 13 and include:

1. K-Mart property (an area next to Wendy's)
2. Giant Supermarket Site
3. Park Hotel Property (currently CVS)
4. AMF Annandale Lanes (Bowling Alley)"

VII. Summary of the Overall Existing Conditions and Study Recommendations (Figures 11 and 13)

The above sections discussed various elements of pedestrian facilities, their conditions, and recommended improvements. The recommendations focus on four (4) categories of improvements:

1) **Overall** - Street lighting needs, sidewalk maintenance, construction of new sidewalks and handicap ramps, etc. (Figure 11)

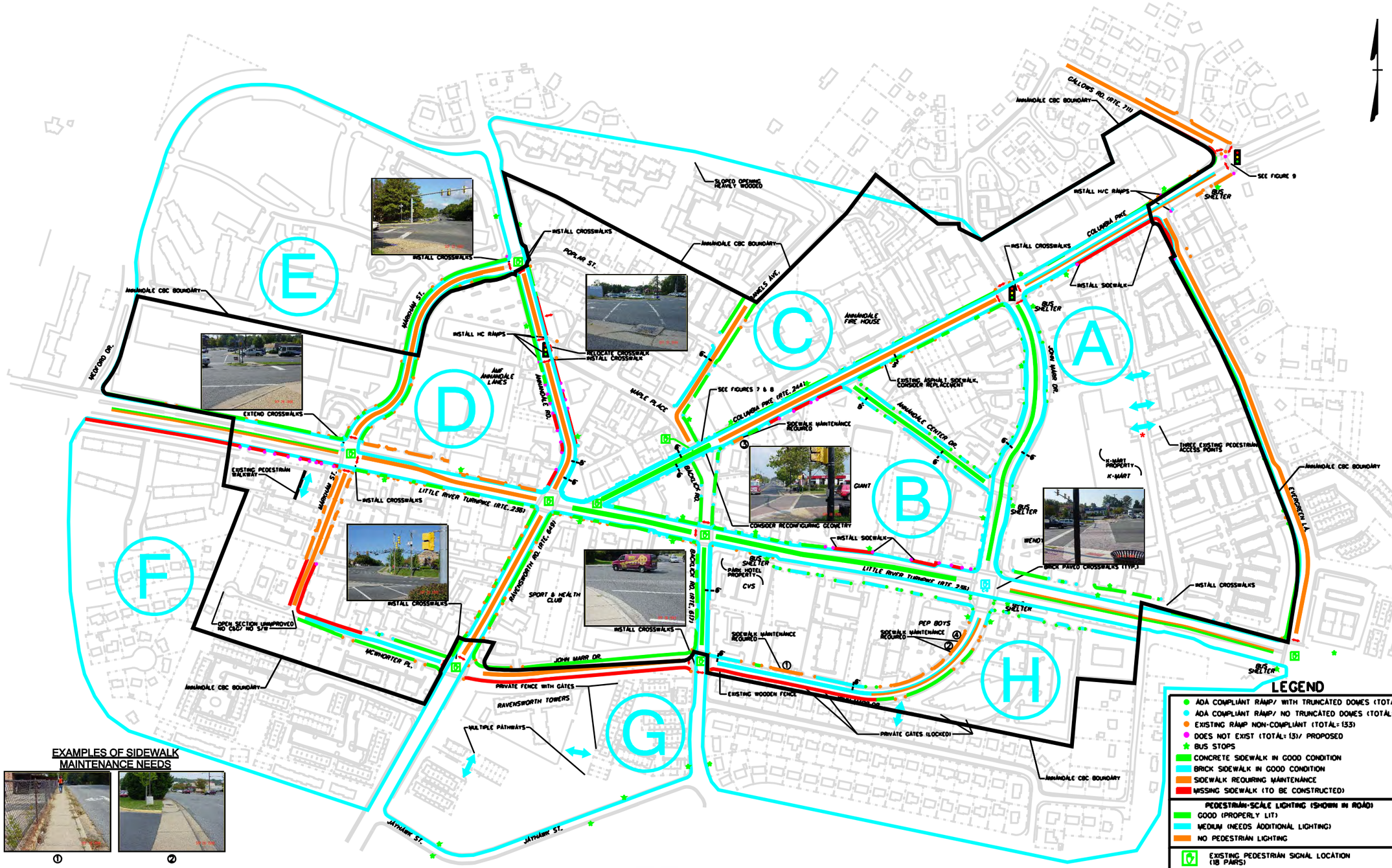
2) **Specific Focus Areas** - Corridors and intersections functioning as barriers to pedestrians which require multiple improvements

3) **Spot Intersection Safety Improvements** – Locations requiring crosswalks, pedestrian signal heads, etc.

4) **Application of ITS Technologies** – A pilot project for evaluation of effectiveness of Accessible Pedestrian Signals (APS) technology in enhancing pedestrian safety.

FIGURE 11 - OVERALL COMPOSITE EXISTING CONDITIONS

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



EXAMPLES OF SIDEWALK MAINTENANCE NEEDS

NOTE: ALL CONCRETE SIDEWALKS 4' WIDE EXCEPT AS NOTED

VOLKERT & ASSOCIATES, INC.

SCHEMATIC: NOT TO SCALE

LEGEND

- ADA COMPLIANT RAMP/ WITH TRUNCATED DOMES (TOTAL: 78)
- ADA COMPLIANT RAMP/ NO TRUNCATED DOMES (TOTAL: 88)
- EXISTING RAMP NON-COMPLIANT (TOTAL: 33)
- DOES NOT EXIST (TOTAL: 13)/ PROPOSED
- BUS STOPS
- CONCRETE SIDEWALK IN GOOD CONDITION
- BRICK SIDEWALK IN GOOD CONDITION
- SIDEWALK REQUIRING MAINTENANCE
- MISSING SIDEWALK (TO BE CONSTRUCTED)

PEDESTRIAN-SCALE LIGHTING (SHOWN IN ROAD)

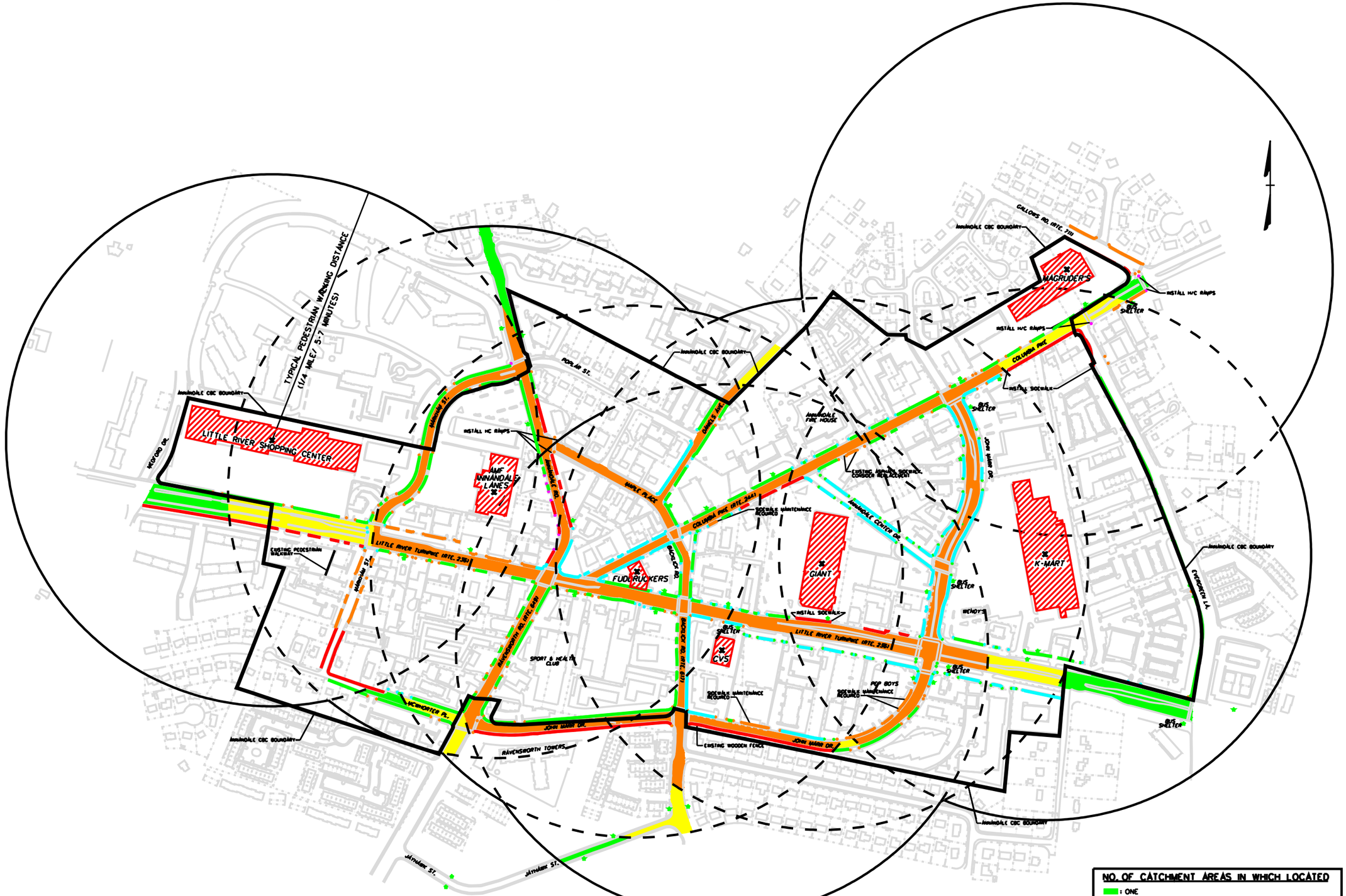
- GOOD (PROPERLY LIT)
- MEDIUM (NEEDS ADDITIONAL LIGHTING)
- NO PEDESTRIAN LIGHTING

- EXISTING PEDESTRIAN SIGNAL LOCATION (18 PAIRS)
- EXISTING COUNT-DOWN PEDESTRIAN SIGNAL LOCATION (4 PAIRS)
- EXISTING TRAFFIC SIGNAL LOCATION WITHOUT ANY PEDESTRIAN SIGNAL HEADS (3)
- PROPOSED PEDESTRIAN HEADS (23 PAIRS)
- EXISTING PEDESTRIAN LINK/ ACCESS POINT SHOULD BE IMPROVED

I:\ 663502 Annandale Pedestrian Walkway\ Dgn\ Figure 11 Overall Improvements.dgn

FIGURE 12 - OVERLAPPING PEDESTRIAN CATCHMENT AREAS

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY

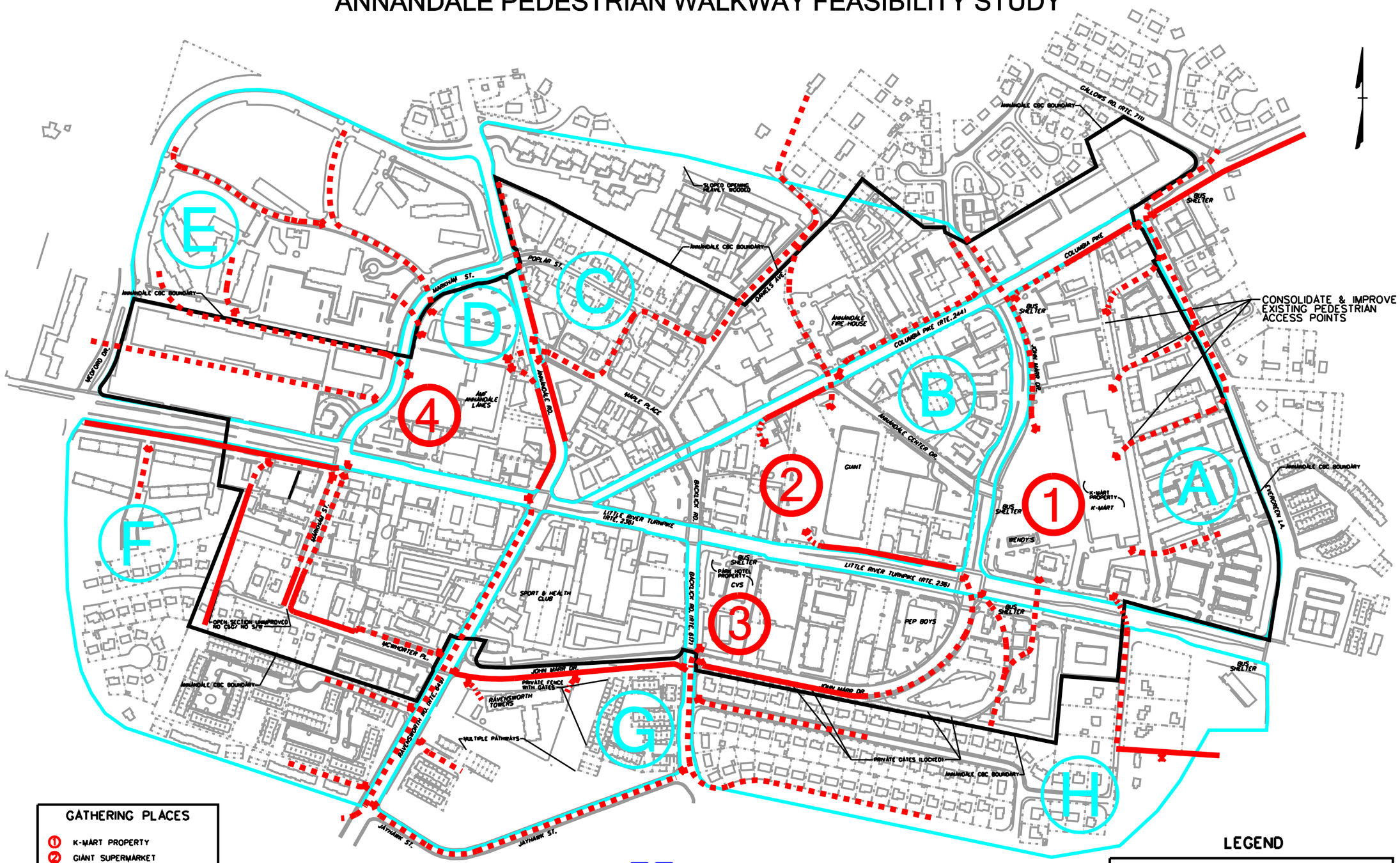


VOLKERT & ASSOCIATES, INC.

T:\ 663902 Annandale Pedestrian Walkway\ Dgn\ Figure 6 Pedestrian Catchment Areas NI.dgn

FIGURE 13 - EXISTING AND MISSING PEDESTRIAN CONNECTIVITY LINKAGES

ANNANDALE PEDESTRIAN WALKWAY FEASIBILITY STUDY



GATHERING PLACES

1. K-MART PROPERTY
2. GIANT SUPERMARKET
3. PARK HOTEL PROPERTY
4. AMF ANNANDALE LANES

VOLKERT & ASSOCIATES, INC.

SCHEMATIC: NOT TO SCALE

LEGEND

- EXISTING LINKAGE (REFER TO FIGURE 11 FOR EXISTING CONDITIONS)
- PROPOSED LINKAGE
- (A) INTERACTION ZONE
- (1) ACTIVITY CENTERS (POTENTIAL PUBLIC GATHERING AREA)
- POTENTIAL PATHWAY TO THE LIBRARY (IF SUPPORTED BY ADJACENT RESIDENTS)

T:\\ 663802 Annandale Pedestrian Walkways\ Dgn\ Figure 5 Residential Commercial Zones Int.dgn

5) **Site Plan Review** – Through this review process, opportunities may be available for internal and external pedestrian connectivity.

6) **Pedestrian Linkages** – Consideration of new pedestrian pathways (linkages) to reduce waking distance, improve accessibility, and encourage walking as a mode of travel.

As part of this study, a preliminary estimate of quantities and associated preliminary costs were developed for the recommended improvements (see Table 1 on the following page).

TABLE 1 - Summary of Proposed Improvements

	Proposed Improvements						
	*Sidewalks	**Handicap Ramps	Crosswalks	12" Pedestrian Head Section	***Pedestrian-Scale Lighting	Sidewalk Maintenance	Upgrade Existing Pedestrian-Scale Lighting
	S.Y.	EA.	L.F.	EA.	L.F. of Sidewalk	S.Y.	L.F. of Sidewalk
Columbia Pike Corridor	606	30			3,640	58	1,040
John Marr Drive		2	130	16			
Evergreen Lane		2					
Gallows Road		6		12			
Little River Turnpike Corridor	1,127	58			3,770	347	
Markham Street			260	12			
Ravensworth Road		2					
Backlick Road		2		8			
John Marr Drive Corridor	1,215	24			2,600	289	2,210
Ravensworth Road		5	195	8			
Backlick Road		4	130	8			
Markham Street Corridor	347	34			3,640	347	
Annandale Road		3	130	12			
Annandale Road Corridor	694	15			2,080		
Maple Place			195	12			
Gallows Road Corridor	260	6			780	173	
McWhorter Place Corridor	175	4					1,300
Ravensworth Road Corridor		20			1,430		
Total	4,424	217	1,040	88	17,940	1,213	4,550
Unit Cost	$32.00	$1,200.00	$3.50	$160.00	$125.00	N/A	$75.00
Estimated Cost	$141,568.00	$260,400.00	$3,640.00	$14,080.00	$2,250,000.00	--	$345,000.00

Total Cost: $3,014,688.00
Contingency (15%): $452,203.20
Grand Total: **$3,466,891.20**

* : Assuming 6ft wide sidewalk
** : ADA-compliant handicap ramps without the new truncated dome requirements not included.
Those ramps may be upgraded at the discretion of the county or as part of future construction/development activities.
***: Further engineering design required to determine number, location and type of luminaires.

APPENDIX A

Exemplary Pedestrian Plans

National Plans
State Plans
Local Plans

Exemplary Pedestrian Plans

Updated Sept. 2005

This list of exemplary pedestrian plans was compiled to provide easy access to a number of good examples of pedestrian planning. It isn't a comprehensive list of such plans, and it makes no attempt to rank or rate the plans. If you are embarking on the development of a bicycle and/or pedestrian plan, these examples will provide you with inspiration and information that we hope you'll find useful.

NATIONAL PLANS

Guide for the Planning, Design and Operation of Pedestrian Facilities (2004)
The American Association of State and Highway Transportation Officials (AASHTO) Guide for the Planning, Design and Operation of Pedestrian Facilities presents effective measures for accommodating pedestrians on public rights-of-way. The guide recognizes the profound effect that land use planning and site design have on pedestrian mobility and addresses these topics as well. The guide can be purchased through the AASHTO web site at:
www.aashto.org

Designing Sidewalks and Trails for Access, Parts 1 (1999) and 2 (2001)
The guides Designing Sidewalks and Trails for Access Parts 1 and 2 provide the state of the practice for applying the American with Disabilities Act (ADA) and similar requirements to pedestrian facilities. Find Part one at:
http://www.fhwa.dot.gov/environment/bikeped/access-1.htm and Part 2 at:
http://www.fhwa.dot.gov/environment/sidewalk2/.

Exemplary Pedestrian Plans (Cont'd)

Manual on Uniform Traffic Control Devices (2003)
The Manual on Uniform Traffic Control Devices (MUTCD) defines the standards used by road managers nationwide to install and maintain traffic control devices on all streets and highways. The MUTCD is published by the Federal Highway Administration (FHWA). The MUTCD audience includes the insurance industry, law enforcement agencies, academic institutions, private industry, and construction and engineering professionals. Find the document at http://mutcd.fhwa.dot.gov/pdfs/2003r1/pdf-index.htm.

Traffic Control Devices Handbook (2004)
The Traffic Control Devices Handbook (TCDH) was created to augment the MUTCD as adopted nationally by the Federal Highway Administration. While the MUTCD outlines the design and application of traffic control devices on public roadways in the United States, criteria and data to make decisions on the use of a device and its application are not always fully covered in the MUTCD. This Handbook bridges the gap between the MUTCD provisions and those decisions to be made in the field on device usage and application. The Handbook can be ordered through the Institute of Transportation Engineers (ITE) online bookstore at:
www.ite.org.

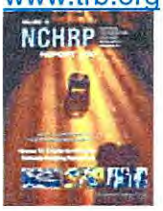
Design and Safety of Pedestrian Facilities, A Recommended Practice of the Institute of Transportation Engineers (1998)
Design and Safety of Pedestrian Facilities, A Recommended Practice of the Institute of Transportation Engineers is intended to provide guidance on how to implement a comprehensive program of engineering, education and enforcement to improve safety for pedestrians. Find the document at:
http://safety.fhwa.dot.gov/ped_bike/docs/designsafety.pdf.

Pedsafe: The Pedestrian Safety Guide and Countermeasure Selection System (2004)
Pedsafe: The Pedestrian Safety Guide and Countermeasure Selection System is

Exemplary Pedestrian Plans (Cont'd)

intended to provide practitioners with the latest information available for improving the safety and mobility of those who walk. The online tools provide the user with a list of possible engineering, education, or enforcement treatments to improve pedestrian safety and/or mobility based on user input about a specific location. It can be found at: http://www.walkinginfo.org/pedsafe/.

A Guide for Reducing Collisions Involving Pedestrians (2004)
The National Cooperative Highway Research Program (NCHRP) Report 500, Volume 10: A Guide for Reducing Collisions Involving Pedestrians provides strategies that can be employed to reduce the number of collisions involving pedestrians. The NCHRP Report 500, Volume 10 can be purchased through the Transportation Research Board web site at:
www.trb.org



A Review of Pedestrian Safety Research in the United States and Abroad (2004)
The purpose of this report is to provide an overview of research studies on pedestrian safety in the United States and abroad. Readers will find details of pedestrian crash characteristics, measures of pedestrian exposure and hazard, and specific roadway features and their effects on pedestrian safety. Such features include crosswalks and alternative crossing treatments, signalization, signing, pedestrian refuge islands, provisions for pedestrians with disabilities, bus stop locations, school crossing measures, reflectorization and conspicuity, grade-separated crossings, traffic-calming measures, and sidewalks and paths. Pedestrian educational and enforcement programs are also discussed. Review this document online at:
http://www.walkinginfo.org/pdf/PedSynth/Ped_Synthesis_Report.pdf.

National Bicycling and Walking Study (1994)
The National Bicycling and Walking Study includes a series of twenty four case studies highlighting model activities conducted with respect to bicycle and pedestrian planning. The National Bicycle and Walking Study presents a plan of action for activities at the Federal, State, and local levels for increasing the amount of walking and bicycling in the United States. A five-year status report on the National Bicycling and Walking Study was published in 1999. A ten-year status report on the study was published in 2004. Selected case studies included in the 1994 National Bicycling and Walking Study can be obtained through the National Transportation Library at http://ntl.bts.gov/DOCS/nbws.html. The

Exemplary Pedestrian Plans (Cont'd)

1999 five-year status report is available through the FHWA web site at:
http://www.fhwa.dot.gov/environment/bikeped/study.htm
The 2004 ten-year status report is available at:
http://www.fhwa.dot.gov/environment/bikeped/study/

STATE PLANS

Arizona: Statewide Bicycle and Pedestrian Plan (2003)
This is a guide for making pedestrian-related transportation decisions at the State and local level. The plan provides a long-term agenda for implementing a system of pedestrian facilities on the ADOT State Highway System and seeks to coordinate the relationship between ADOT and smaller jurisdictions. The plan described state policies and codes that affect pedestrian planning and provides a matrix of creative ordinances from around the nation, encouraging localities to implement and follow them. It contains an informative table on potential funding opportunities and resources that consist of project type, required matching funds, deadlines, etc. The plan is well-organized and presents a great example of citizen participation and stakeholder involvement. Development of the plan involved a comprehensive steering committee of representatives from pedestrian activist organizations, municipalities, State engineering agencies, a review committee, and engineering input.

New Jersey: Statewide Bicycle and Pedestrian Master Plan, Phase 2 (2004)
This plan provides clear guidance for the most effective use of Federal, State, and local resources to implement pedestrian and bicycle facilities. The stated goals and objectives are supported with proposed performance measures to determine the effectiveness and critical success factors. The plan presents a good example of how to use GIS analysis to prioritize the improvement of pedestrian facilities around the State. It used demand forecasting (showing pedestrian trips by census tract and roadway crossability) and suitability forecasting (calculating the suitability of making capital investments) to identify and prioritize project locations. Summarized in a matrix form, the implementation section includes several strategies and assigns responsibility to various agencies and organizations. This document is available online at:
http://www.bikemap.com/RBA/

Exemplary Pedestrian Plans (Cont'd)

Virginia: VTrans 2025 Statewide Pedestrian Plan (2004)
This plan is a tool for establishing a consistent approach to integrate a consideration for walking into transportation planning in Virginia. The preliminary draft remains general, providing a basic framework of the vision, strategies, and action items. It discusses several influences on the need to offer and operate pedestrian facilities, including Federal legislation such as the Intermodal Surface Transportation Efficiency Act (ISTEA), ADA accessibility requirements, and Virginia Department of Transportation policies. The plan reveals a regional program for obtaining public input, holding twelve public stakeholder meetings across the state. It acknowledges that disagreements exist on how to accommodate pedestrians and that there is a need to arrive at a cooperative solution. For more information, see the web site:
http://www.transportation.virginia.gov/VTrans/home.htm

Florida: Pedestrian Planning and Design Handbook (1996)
The plan presents guidelines, standards, and criteria for pedestrian planning and facilities. It is intended as a reference for any locality, agency, organization, group, or citizen interested in improving the walking environment. It offers an overview of the pedestrian planning process and discusses the various steps of public involvement, data collection, development of goals and strategies, and implementation resources. The plan provides a comprehensive analysis of pedestrian-motor vehicle crashes in the State. It discusses the design details of roadway crossings, intersection treatments, and traffic calming strategies as well as presents other pedestrian considerations such as signage and signalization, school/work zone practices, street lighting. A chapter is devoted to each element and includes recommendations, maintenance, and further references. This document can be downloaded from the site:
http://www.dot.state.fl.us/safety/ped_bike/ped_bike_standards.htm

Georgia: Pedestrian Facilities Design Guide (2002)
The guide focuses on the design of pedestrian environments and streetscape facilities. It offers technical information on "best practices" that apply to situations encountered in project development. It provides a thorough examination of pedestrian characteristics and factors that influence pedestrian travel. The guide supplies an interesting spatial analysis, diagramming the space needs for different types of pedestrians—adults, children, elders, and those with disabilities. It discusses ways to prioritize projects using Geographic Information Systems (GIS), referencing the Latent Demand Model and Portland, OR's Pedestrian Potential Index. The bulk of the guide exists in several toolkits, each devoted to different subjects. The toolkits begin with general design guidelines and move into more specific topics such as accessibility, school zones, trails and paths, sidewalks, crossings, etc. Detailed facility diagrams provide useful technical

Exemplary Pedestrian Plans (Cont'd)

information for other agencies and localities. This report can be found at:

http://www.dot.state.ga.us/dot/plan-prog/planning/projects/bicycle/ped_facilities_guide/index.shtml

Vermont: Pedestrian and Bicycle Facility Planning and Design Manual (2002)
The manual assists agencies, organizations, and citizens with the planning, design, construction, and maintenance of pedestrian facilities in the variety of settings. It incorporates a separate analysis of characteristics of traffic-related pedestrian fatalities and common characteristics of pedestrian crashes. It primarily focuses on the sidewalk environment adjacent to the roadway, considering width, slope, surface, and access points. The supporting street cross-sections give a clear representation of desired space and scale. The manual also recognizes special treatment of pedestrian planning for rural areas. Visit the web site:
http://www.aot.state.vt.us/planning/bikeped.htm

Oregon: Bicycle and Pedestrian Plan (1995)
This is one of the first plans developed to promote walking. It is in-depth and informative, addressing various aspects of pedestrian planning. The plan is divided into two sections—policy/action planning and network planning—with the purpose of presenting ODOT with general principles and policies for providing walkways along State highways. It provides a framework for cooperation between ODOT and local jurisdictions and offers guidance to cities and counties wanting to develop local pedestrian plans. The plan presents an overview of existing legislation relating to pedestrians, describes the current conditions statewide, and suggests implementation actions to ensure achievement of stated goals and policies. It contains clear, measured diagrams and street cross-sections of most desirable design facilities. The Oregon plan can be read and ordered online at:
http://www.odot.state.or.us/techserv/bikewalk/obpplan.htm.

California: Pedestrian and Bicycle Facilities in California, Technical Reference Report (2004)

Exemplary Pedestrian Plans (Cont'd)

Caltrans Technical Reference Report is intended to help accommodate pedestrian transportation throughout the State of California. It is intended as a resource for professionals, agency staff, and citizens. Through the collection of demographic and pedestrian collision data, the report makes a strong case for the need to improve pedestrian facilities. It contains a grant source matrix that shows available funding by agency, amount, deadline, and requirements. The bulk of the report is related to pedestrian travel, organized from broad topics to design detail. Each page contains a description and discussion of a different element, drawing, diagram or photo that enables standard and innovative practices to be easily understood. This document is available at:
http://www.dot.ca.gov/hq/traffops/survey/pedestrian/TR_MAY0405.pdf

North Carolina: Bicycling and Walking in North Carolina, A Long Range Transportation Plan (1996)
Developed by the Office of Bicycle and Pedestrian Transportation of the NCDOT, this pedestrian plan builds upon the NC long-range transportation plan, elaborating on the goals, focus areas, and programming specific to walking. It also demonstrates a technique for performing a state-wide inventory: in the plan- making process, city managers or mayors of NC communities with populations of at least 1,000 were surveyed for information on the community s walking environment. The plan summed the individual data to obtain the total miles of a particular pedestrian facility in the state. The plan also discusses crash data and reviews relevant pedestrian content of different Metropolitan Planning Organization (MPO) plans. The plan formulates actions, supplies funding sources/levels, and calls for an evaluation of projects. This document is available at:
http://www.ncdot.org/transit/bicycle/about/longrangeplan2.pdf

North Carolina: Planning and Designing Local Pedestrian Facilities (1997)
The Local Pedestrian Facilities manual provides suggestions and guidelines for local planners and traffic engineers to increase pedestrian safety and friendliness. The manual demonstrates design details for pedestrian treatments and traffic calming. It contains a table of sidewalk placement and width recommendations according to street type and gives individual consideration to pedestrians with disabilities as well as pedestrians in school and work zones. The manual focuses on signage and signalization, treatments often overlooked in pedestrian design manuals. The manual finishes with a comprehensive matrix summarizing pedestrian problems and possible solutions.

top ↑

Exemplary Pedestrian Plans (Cont'd)

It can be ordered online at:

http://www.ncdot.org/transit/bicycle/projects/resources/projects_peddesign.html

Washington: Pedestrian Facilities Guidebook (1997)
The purpose of the Pedestrian Facilities Guidebook is to assist various agencies and organizations in pedestrian planning and encourage good design practices when developing these spaces. It discusses the importance of construction, maintenance, and operations. The guidebook presents the needs and characteristics of pedestrians and then provides several toolkits, highlighting important information in boxes, tables, diagrams, and graphs. The guidebook gives attention to the spatial needs of all types of pedestrians. The toolkits address the design of important walking facilities like trails, sidewalks, intersections, and crossings, and they also discuss important accessibility issues and school zone safety. The guidebook provides an opportunity for citizen comments through a request form and a detailed resource guide. For further information, visit the web site:
http://www.wsdot.wa.gov/walk/designinfo.htm

Pennsylvania: Pedestrian Planning and Design Guidelines (1996)
The Pedestrian Planning and Design Guidelines is one part of Statewide Bicycle and Pedestrian Master Plan for Pennsylvania. The plan-making process involved a comprehensive public outreach program that held workshops across the state, established a toll-free number and questionnaire, and included representatives from several stakeholder groups. The Pedestrian Planning and Design Guidelines act as a guide for PENNDOT and localities to make the current transportation system more accessible to pedestrians. The guide recognizes the importance of incorporating pedestrians into land use and planning policies and discusses ways to retro-fit existing developments to better serve pedestrians. The design guidelines focus on best practices for sidewalks, intersections, and other crossings. This document can be found by visiting http://www.dot.state.pa.us

Exemplary Pedestrian Plans (Cont'd)

District of Columbia: Traffic Calming Policies and Guidelines (2002)
To reduce the negative impact of motor vehicle use and ensure overall safety, the District of Columbia Traffic Calming Policies and Guidelines provide a process for involving the public in implementing traffic calming measures. It supplies a formal request form for citizens and describes the process from request to implementation. The document presents criteria for rating and selecting traffic calming projects when competing for specific funding. Also, it describes and diagrams traffic calming measures approved for the District of Columbia. The document is available at
http://www.ddot.dc.gov/ddot/lib/ddot/services/pdf/traffic_calming.pdf

Idaho: Bicycle and Pedestrian Transportation Plan (1995)
This document serves as a first step in establishing a statewide vision and comprehensive approach to pedestrian transportation planning. It provides a clear, simple statement of goals and objectives as well as action strategies, policies, statutes, and design standards that can be used to meet those goals. It provides guidelines pertaining to pedestrian facilities combined with helpful planning and design information for local agencies. It can be found at
http://itd.idaho.gov/planning/reports/bikepedplan/idt.pdf

Wisconsin: Pedestrian Policy Plan 2020 (2001)
This Statewide pedestrian plan focuses on the policies and programs that will help improve conditions for walking. The plan was conceived with assistance from the Pedestrian Plan Citizen's Advisory Committee and citizens around the state provided additional insights, suggestions, and reactions through public sessions and hearings as well as focus group meetings; this enables the plan to better reflect citizen concerns. The plan is meant to be used by local traffic officials seeking guidance to meet pedestrian needs on local road systems. It can be found at

http://www.dot.wisconsin.gov/projects/state/ped2020.htm

Exemplary Pedestrian Plans (Cont'd)

LOCAL PLANS

Denver, CO: Pedestrian Master Plan (2004)
The plan establishes a city-wide pedestrian network. It uses a detailed development process that incorporates existing conditions assessment, existing plans, GIS studies, public involvement, and policy review. Development of the plan included two rounds of public workshops and input from an inter-agency advisory team. The plan uses GIS analysis to measure potential pedestrian activity by locating concentrations of pedestrian destinations; GIS allows for a systematic strategy for building, improving, and maintaining the pedestrian infrastructure. The plan prioritizes projects with a scoring system and provides several funding sources. It can be found at http://www.denvergov.org/transportation_planning/

Marina, CA: Pedestrian and Bicycle Master Plan (2003)
This plan contains a clear outline and discussion of goals and action strategies. It offers a comprehensive street inventory and assessment of deficiencies. The plan suggests changes to the pedestrian environment and sets guidelines for different size roadways. It uses several graphic examples, describes design details, and mentions proper placement to enhance the walking environment. The plan can be downloaded from the web site http://www.lgc.org/marina/

Bellevue, WA: Pedestrian and Bicycle Transportation Plan Update (1999)
This is a policy-oriented document that aims to revise the 30-year plan. It presents key issues that have appeared during the implementation of pedestrian facilities, proving to be a helpful resource for localities considering such improvements. The document emphasizes the importance of maintenance policies. It supplies an organized, informative table that contains description, justification, cost, priority, and jurisdiction of projects. Find this document online at http://www.ci.bellevue.wa.us/departments/Transportation/pdf/PedBikePlan99.pdf

Exemplary Pedestrian Plans (Cont'd)

San Diego, CA: Planning and Designing for Pedestrians, Model Guidelines for the San Diego Region (2002)

These guidelines provide an extremely thorough look at how to plan and design for the pedestrian. The plan discusses the land use and community structure elements that affect the pedestrian environment. It contains a comprehensive list of site and design details that includes information on considerations, guidelines, example images, and technical diagrams. The pedestrian measures index is a good tool for identifying appropriate countermeasure to use depending on roadway volume and speed. To download this plan, go to the site http://www.sandag.org/uploads/publicationid/publicationid_713_3269.pdf

Sacramento, CA: Pedestrian Safety Guidelines (2003)

These guidelines focus on street crossing treatments at controlled and uncontrolled intersections, discussing tools such as pavement marking and signal options and giving attention to roadway design. The guidelines create a four level system to address crosswalk placement for uncontrolled locations as well as a matrix of appropriate treatments for streets with different numbers of lanes, average daily traffic volume (ADT), and posted speed. The Sacramento plan is available online at http://www.cityofsacramento.org/dsd/dev_eng_finance/entitlements/pdfs/ped_safety.pdf

Portland, OR: Pedestrian Master Plan (1998)

The Master Plan outlines an action plan to achieve the city's pedestrian-oriented goals. To identify needed improvements, the plan used a rigorous identification process, including several opportunities for public input. Data collection included citizen requests, street inventories, and an examination of crash data. Using GIS mapping capabilities, it developed a Pedestrian Potential Index, which measures the strength of environmental factors (policy, proximity, and quantitative) that favor walking, and a Deficiency Index, which measures how critically pedestrian improvements are needed based on traffic volumes, crash data, and a lack of sidewalks. The plan contains a section on sources and strategies for obtaining funding. It also presents a graph of the past pedestrian funding and gives five different scenarios for the implementation of future pedestrian improvements. For more on this plan, visit the web site: http://www.trans.ci.portland.or.us/plans/pedestrianmasterplan/default.htm

Exemplary Pedestrian Plans (Cont'd)

Madison, WI: Pedestrian Transportation Plan (1997)
This plan dedicates a significant section to the history and importance of pedestrian planning, as well as "thinking like a pedestrian." It includes a hypothetical walking tour of photographs that reveal possible locations for pedestrian improvements. It incorporates planning, design, and maintenance into long-term goals and objectives. The plan emphasizes the importance of education and encouragement of pedestrian travel as integral to the success of pedestrian transportation.

Chapel Hill, NC: Bicycle and Pedestrian Action Plan (2004)
This is a concise, general plan that provides a foundation for future pedestrian planning. The plan contains information on policies and guidelines that should be used in planning for future pedestrian needs. It discusses how to encourage pedestrian movement, highlighting characteristics and influences on pedestrian travel. The plan reinforces design guidelines from previous studies and establishes local standards for streets. Finally, it addresses the role of the state, MPO, university and private developers in the identification of projects and funding process. This plan is available at:
http://townhall.townofchapelhill.org/planning/bikeped/bikepedplan.htm

Oakland, CA: Pedestrian Master Plan (2002)
The plan is a fine example of how to examine census information and pedestrian collision data, showing graphs on speed, location, time of day, age, etc. The development of the plan involved an extensive community outreach process with technical and citizen advisory team, as well as neighborhood meetings. The plan identifies a pedestrian route system through the city from the specified criteria and then focuses improvements in those areas first. It contains comprehensive descriptions and graphics of design details and provides a detailed implementation plan with prioritization and cost of individual projects. To find this plan online, go to:
http://www.oaklandnet.com/government/pedestrian/index.html

Exemplary Pedestrian Plans (Cont'd)

Cambridge, MA: Pedestrian Plan (2000)
This is a beautiful and creative plan that addresses safety and walkability. It begins with general pedestrian issues and then moves on to specific action in Cambridge. The analysis tools include census data and an examination of the pedestrian environment. The plan separates pedestrian design guidelines from roadway issues and vehicular movements, allowing for the safety issues to be addressed from different, independent viewpoints. For the pedestrian improvements specific to Cambridge, the plan classifies the city into nodes, spines, and other areas pedestrians are most likely use. It then presents needed actions to improve the space. This plan is available at http://www.cambridgema.gov/~CDD/et/ped/plan/ped_plan.html

Phoenix, AZ: Pedestrian Plan 2000 (1999)
The Maricopa Association of Governments plan promotes the accommodation of pedestrian travel throughout the low-density, automobile-oriented Phoenix metropolitan area. It uses a two-step process in creating roadway design guidelines: (1) the Latent Demand Model estimates potential pedestrian activity based upon the frequency and proximity of adjacent trip generators, and (2) the Roadside Pedestrian Condition Model analysis statistically separates results based on roadway and traffic variables. The focus of the plan is on providing sidewalks and lateral separation (buffer). The online version of this document is available at:
http://www.mag.maricopa.gov/pdf/cms.resource/ped-plan2000sum-web_427.pdf

Seattle, WA: Regional Bicycle and Pedestrian Implementation Strategy for the Central Puget Sound Region (2002)
This regional plan identifies more than 2,000 miles of needed bike lanes and oaths and pedestrian improvements around activity centers. It can be found online at http://www.psrc.org/projects/nonmotorized/strategy.pdf

Boulder, CO: Transportation Master Plan (2003)
Pedestrian planning is fully integrated into the Boulder, CO Transportation Master Plan. The plan outlines modal split targets of 15 percent by bike and 24 percent by foot by 2020 and offers a variety of resources to transportation officials seeking to increase pedestrian travel. More about the plan and its elements can be found at:
http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=331&Itemid=1201

APPENDIX B

U.S. Case Studies of APS Applications

Montgomery County, Maryland
Portland, Oregon
Newton, Massachusetts
Washington, New Jersey
Morgantown, West Virginia
Dunedin, Florida
Maryland Department of Transportation
Charlotte, North Carolina
Atlanta, Georgia

Montgomery County, Maryland

History and background
The intersection of Fenton Street and Wayne Avenue is the first of eleven locations in the Silver Spring Central Business District (CBD) to be equipped with Accessible Pedestrian Signals (APS) under a pilot program initiated by the County Executive.

Process and procedure
There is no formal procedure to request APS. A committee was formed, in coordination with the Montgomery County Commission on Persons with Disabilities, to make decisions about type and features of APS to be installed.

Most signalized intersections in the county are on state roads, so final decisions of the State Highway Administration on APS policy will affect installation at those locations.

Funding
Costs for the pilot project are absorbed as part of the traffic engineering department budget. Additional line item for APS installation was requested in budget but was not funded.

Description of intersection
These traffic signals are being rebuilt as part of the redevelopment of the CBD. Fenton Street and Wayne Avenue was the first one to be rebuilt, and hence the first to receive APS. All intersection legs are 4 lanes wide. Fenton Street runs approximately north/south and Wayne Avenue runs east/west. There is a leading left turn phase from westbound Wayne to Southbound Fenton.

Date installed
September 2001

APS type and features
Pushbutton-integrated devices from Polara Engineering.

Intersection is pre-timed, with walk intervals associated with each crossing being provided each cycle, but the APS are actuated (audible
and vibrotactile WALK indications are not provided unless the pushbutton is pushed).

APS features:

- Speech WALK message
- Vibrotactile WALK indication
- Pushbutton locator tone
- Automatic volume adjustment in response to ambient sound
- Raised arrow oriented in the direction of travel on the crosswalk
- Speech pushbutton information message.

The locator tone is constant except when the speech WALK message or pushbutton information message is activated.

• Speech WALK message: 'WALK sign is on to cross Fenton Street'-
(or Wayne Avenue)

Montgomery County, Maryland (Cont'd)

• Pushbutton information message, provided after three second depression of pushbutton:
  - Includes both street names
  - Clarifies to which crossing the button applies
  - Example: "Crossing Wayne Ave at Fenton St"

APS installation

Devices are installed on all four corners, using stub poles for all in order to place the pushbuttons and APS at the top of the ramp for each direction, separated by at least 10 feet.

Pushbutton-integrated APS located on a stub pole beside the level landing of the curb ramp.

Pedestrian with dog guide at an APS located in line with crosswalk.

Each pole is approximately five feet tall with a substantial base; locations vary somewhat but are generally located:

• Within 5 feet of the crosswalk lines extended
• 6-10 feet from the curb, (except on NW corner where further construction is planned and those poles were located farther from the curb)

'The Polara control unit and the microphone, which monitors sound for the automatic volume adjustment, are typically installed inside 18-inch pedestrian traffic signal heads. At this location with 12-inch pedestrian signal heads, the control units were installed in an exterior box attached to the top of the pedestrian traffic signal heads. The microphone was attached to the box, which located it much higher than usual; however, that placement seems acceptable.

Installation issues

There were no real problems with the installation, however, locating the poles and APS properly in relation to the curb ramp and as recommended in the MUTCD is difficult. While it may be less of a problem in new construction, it requires thought and planning, and extra poles, conduit, wiring and construction in retrofit situations.

Maintenance

Except for some minor adjustments after installation, there have been no maintenance issues or failures.

Montgomery County, Maryland (Cont'd)

Evaluation
No formal evaluation has been conducted. Committee members visited the installation and were generally pleased with the functioning.

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Portland, Oregon

History and background
The City of Portland has had some form of audible pedestrian signal for over 20 years. In installing these devices, staff worked closely with the requester to identify specific needs.

- In the late 1970's City staff installed buzzer-like devices at three intersections on request basis. These buzzers were inexpensive devices purchased from a local electronics store. The buzzer was only activated with a normal pedestrian push button call.
- During the late 1980's the City began using an inexpensive Mallory chime as an audible device. It was installed in some fixed timed intersections as well as actuated intersections.
- By 1995 the City had ten signalized intersections with audible devices.
- In 1996 the City decided that a more formal policy was necessary and a process was implemented, which was revised in 1999 by a Citizens Advisory Committee.

During the past five years the City has greatly expanded its program.
By mid-2003, the City had 53 signalized intersections with some form of audible signal.

The City of Portland was awarded a Pedestrian Project Award for 2003 from ITE and the Partnership for a Walkable America. The award was for the Elderly and Mobility category for Portland's project to retrofit existing signals with APS.

APS mounted over 12 feet high on the pole broadcast speech messages at this location in Portland. City engineers expressed concerns about intelligibility of the message.

Process and procedure
A formal policy was established in 1996.

- City staff assembled a stakeholders group, which included representation from the Oregon Council of the Blind, the National Federation of the Blind, the Oregon Commission for the Blind, Independent Living Resources, and other groups representing both the visually impaired community and mobility instructors.

Portland, Oregon (Cont'd)

- The policy was developed over a series of three meetings (see City of Portland procedures and evaluation form in Appendix D).

Key points of policy:

- Audible signals are installed only on a request basis.
- The intersection has to have some unique or unusual characteristics that warrant the addition of an audible signal.
- Referral to a mobility specialist is required; this service is provided through an agreement with Oregon Commission for the Blind. In some instances the crossing problems may be related to a lack of user skills that might be better addressed by further training.

In mid-1999 the requests for audible signals outstripped City resources for the program. A citizens advisory committee (CAC) was activated to review and rank the requests.

- The CAC and City staff started with a ranking process similar to that used in the City of Los Angeles.
- Staff applied the criteria to ten intersections on the request list. CAC made some revisions to the scoring criteria (See Appendix D).
- Scoring materials were developed. The electrician responsible for the installations and a mobility instructor from the Oregon Commission for the Blind meet the requester at the candidate intersection to better understand the user's needs and concerns. After agreeing that some sort of audible signal is a viable solution, the City staff person and mobility instructor complete field aspects of the scoring form. Information such as volumes and accidents is gathered by office staff from existing City records and added to the scoring form.
- CAC meets semi-annually to rank the requests.

Funding

From 1996 through 2000, the City used approximately $150,000 in general transportation funds to install APS. That funding source for APS has been lost. To continue with new installations, the City received over $200,000 in transit mobility funds from the local transit agency. However, that grant expires in July 2004 and no replacement funding source has been identified yet.

APS types and features

Pedhead-mounted at numerous intersections. Pushbutton-integrated at two intersections.

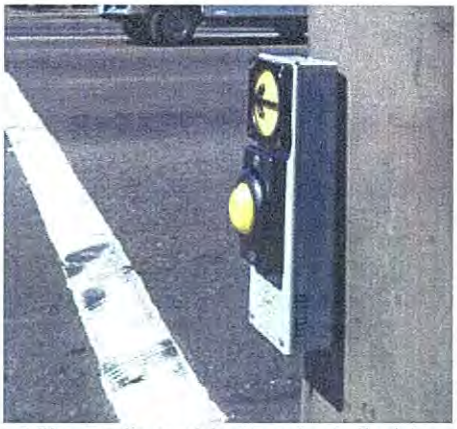
Pedhead-mounted device manufactured by Novax and Mallory.

Pedhead-mounted APS features

- Walk indication – cuckoo/chirp, beep, chime

Extended button press to call accessible features on some devices (no locator tone is used.)

Pushbutton-integrated devices, manufactured by Polara Engineering and Campbell Company, have been installed recently with locator tones and additional features.



Vibrawalk pushbutton installed in Portland includes a locator tone. The arrow vibrates during the WALK interval and walk indication is provided from pushbutton or speaker mounted on the pedhead.

Portland, Oregon (Cont'd)

The City of Portland has also evaluated the Vibrawalk pushbutton manufactured by Novax Industries.

Special features Portland staff has worked with manufacturers on developing features:

- After 1996, in deference to requests of members of the National Federation of the Blind, a technology was used that requires the user to hold the button for at least one second to place a call for an audible signal to make the technology 'refuseable'. Button Activated Timer (BAT), from Novax Industries of British Columbia, requires that the button be depressed for at least one second to call the audible indication.
- Staff worked with Novax and McCain to take the speaker and electronics out of the exterior Novax housing and mount them directly in the pedhead to afford more protection from vandalism and place the speaker closer to the users' ears.

In 1999, the CAC and City staff expressed a desire to find lower cost options so that more intersections could be treated. City staff received approval from the CAC to install lower cost Mallory devices. Since the Mallory device has neither automatic volume adjustment nor Button Activated Timer, city staff is careful to use the device only in locations
that are that are not close to residences.

Date installed

Between 1970's and present

Installation
Installation varies greatly from intersection to intersection. Portland transportation engineering staff reports that the largest problem faced is with existing infrastructure. The aging transportation system makes installing new wires in old, undersized conduits a challenge. Location of existing poles also poses a problem. As intersections evolve throughout their life span, poles for pushbutton locations are often located in areas that are less than desirable for accessible pedestrian installations.

Obstructions, such as utility and sign poles, also are a significant challenge. These obstacles often make placement of pushbutton locations difficult, translating into higher installation costs.

Proximity of poles, in relation to one another, also has to be taken to account. Volume level of the "WALK" cue and locator tone must be loud enough to tell pedestrians to go, but quiet enough to not give a false "WALK" cue to someone at a conflicting ped lane. This can be difficult at intersections with odd configurations, such as islands with separately actuated ped lanes.

Maintenance
Maintenance of equipment has been almost a non-issue. There have been few maintenance problems although it should be noted that most of the equipment with electronics mounted in the pedhead or pushbutton, is relatively new. These installations are only one to six years old so there
is not a long maintenance history on those devices.

Evaluation
Portland tested a variety of WALK indications

- Earliest sounds for the WALK were a buzzer and Mallory chime.
- A trial installation used voice messages. The voice message typically said "The WALK light is now on to cross 41st Street". Although equipped with ambient sound adjustment to increase the output as background noise increased, the voice message was often difficult to hear.
- Tones seem to be better for cutting through background noise in an urban street environment. After the initial test with voice and tones, the City decided to use the cuckoo and chirp sounds.

Portland, Oregon (Cont'd)

Community Response/reactions:

- Buzzer - Staff received some calls regarding the annoying sound and usually responded by placing some sort of baffling material around the buzzer.
- Mallory chime - The chime was a more pleasing sound and the City seldom received any noise complaints, even though the chime was installed in some fixed time intersections.

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Newton, Massachusetts

History and background
APS were installed at the major intersection in Newton, Massachusetts in 2001, as part of a major signalization up-grade project, and at the recommendation of the Mayor's Committee for People with Disabilities (Mayor's Committee). This is Newton's first experience with this signal type.

Process and procedure
New construction and signal up-grades
When new signals are installed in Newton, the Mayor's Committee considers whether they should have accessible pedestrian signals. Their recommendation is then referred to the departments of Public Works and Planning. For example, when signalization at an intersection is being upgraded from a flashing beacon to full signalization, input is obtained from the Mayor's Committee.

Handling individual requests
Individual requests are referred simultaneously to the Mayor's Committee and to the Traffic Council. The Traffic Council is required to respond to requests by making a decision within 12 weeks.

Consultation with local agency for the blind
The City Traffic Engineer also consults with an orientation and mobility specialist at the Carroll Center for the Blind regarding the need for APS and for suggestions regarding the most appropriate type of APS for a particular intersection.

Funding
APS in Newton were funded jointly by Public Works and Planning, with a portion of the cost being covered through the Community Development Block Grant program.

The City of Newton currently has $10,000/yr earmarked for APS.

Description of intersection
The APS were installed at a complex intersection with high pedestrian as well as vehicular traffic counts. At this intersection, three crosswalks share the same exclusive pedestrian phase timing:

- One is a mid-block arterial crossing;
- One is a minor street intersecting the arterial in a "T", near the mid-block crossing;
- The other is across a third street that enters the arterial diagonally, close to the "T" intersection of the minor street.

Because of abundant turning traffic during all vehicular phases, there
is no safe crossing time for pedestrians except during the exclusive pedestrian phase.

APS type and features
Pushbutton-integrated APS manufactured by Bob Panich Consultancy.
APS Features:

- WALK indication – audible rapidly repeating tones
- Vibrotactile WALK indication
- Pushbutton locator tone
- Tactile arrow
- Alert tone
- Automatic volume adjustment in response to ambient sound.

Newton, Massachusetts (Cont'd)

Panich APS at mid-block crossing, Newton, Mass. APS should have been mounted on side of pole closest to crosswalk, with arrow parallel to crosswalk rather than pointing up.

Panich APS for crossing the stem of a "T" intersection.

APS Installation

At another intersection at which APS were installed, a stub pole was installed in order to locate the pushbutton properly for one crosswalk.

Panich APS on stub pole in Newton, Mass. arrow oriented parallel to crosswalk.

Installation issues

Installation presented no technical difficulties.

Newton, Massachusetts (Cont'd)

Initially the signal volume was set so loud at one location that the WALK signal was audible from a nearby intersection, possibly leading pedestrians at that

intersection to believe they had the walk interval when they did not. The volume was turned down several months after the APS were installed.

Although the basic requirement in Newton for conduit in public rights-of-way is a 36" trench, actual construction may be less than 36" depending on site conditions. It is important that such an installation be based on direct field knowledge, rather than be designed in the shop.

Maintenance
No maintenance, except for volume adjustment, has been necessary since the audio-tactile pushbuttons were installed. Weather does not seem to affect their performance, and there has been no vandalism.

Evaluation
The APS have been well-received by blind users, and there have been no objections from neighbors.

The APS are in a small business area, not close to any residences.

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New Jersey DOT - Washington, New Jersey

History and background
The New Jersey Department of Transportation has been sensitive to the needs of the visually impaired. The first vibratory (with raised directional arrow) pushbuttons in New Jersey were installed in 1992 at the Rowan College signalized pedestrian crossing across Route 322. As of August 2000, NJDOT had installed APS devices at four intersections. The devices at the location described and pictured here, Route 31 and Route 57, were installed in the fall of 2000. NJDOT has recently installed APS devices at other intersections and expects to install more devices.

Study underway

A project is underway for the installation and evaluation of four types of APS devices at intersections in Morristown, NJ. The study is funded by NJ Highway Traffic Safety and is being conducted by Edwards and Kelcey in cooperation with The Seeing Eye. More information is provided here.

Process and procedure
There is no formal process for deciding to install an APS.

These APS devices were installed at the request of a blind person in conjunction with reconstruction of the intersection. An orientation and mobility specialist provided information used in making a decision about type of APS selected.

Funding
The APS signals are funded under the general state fund with no special funding sources.

The cost of the devices was $400.00 per device to NJDOT, plus installation by NJDOT forces. NJDOT went out to bid for the devices.

Date installed
Fall 2000

Description of intersection
Route 31 and Route 57, major intersection of four-lane undivided road
and two and three lane road with parking lane at the edge of small downtown CBD. There are four traffic islands with signalized crossings to the islands. Pushbuttons were installed at all crossings for a total of twelve devices at the intersection.

APS type and features
Pushbutton-integrated APS manufactured by Polara

APS features:

- Vibrotactile WALK indication only
- Pushbutton locator tone
- Raised arrow
- Braille street name
- Actuation indicator - tone

New Jersey DOT - Washington, New Jersey (Cont'd)

APS Installation

APS were installed at all crosswalks to provide the signal information at all possible crossings used by the blind person. It is a state standard to put two push buttons on the same pole, with no stand-alone pole for the APS. This meant that some devices were located a distance from the beginning of the crosswalk. Because the indication was vibrotactile only, the walk interval was lengthened to provide time for a pedestrian who is visually impaired to reach the departure curb after the WALK began.

Installation of two pushbuttons on a single pole (only a single pushbutton is visible in the photo). while the pushbutton is in line with the crosswalk, the pedestrian must travel over 10 feet before reaching the street and the beginning of the crosswalk.

These devices were installed as a retrofit before various recommendations and guidelines were issued. Currently, recommendations of the Public Rights-of-Way Access Advisory Committee (PROWAAC) and draft Public Rights-of-Way Accessibility Guidelines state that devices should provide audible and vibrotactile information about the walk interval. These APS are vibrotactile only, so do not conform to these recommendations. MUTCD and PROWAAC recommendations also encourage installation of devices on two poles separated by at least 3 meters. If separation is not possible, PROWAAC recommends speech messages for the walk interval. Vibrotactile indication was used here.

Installation issues No major installation issues

Maintenance

There have been no reported maintenance problems except the vibrating arrows on a couple of devices have gotten stuck and stopped vibrating.

There has been no vandalism.

Evaluation

There are no reports of complaints or comments received from the general public or individuals in the community. In some other installations, there have been complaints due to the locator tone increasing due to the traffic noise and bothering the people that live close to the intersection.

There were complaints at first from the blind woman using the device regarding placement of the devices and ability to line up and cross while keeping her hand on the vibrating arrow. She was trained to use the APS by the mobility specialist and was able to use them adequately.

Placement is problematic for a device that is vibrotactile only. In order to keep her hand on the device, the user must stand back from the crosswalk, and turn toward it after the WALK indication begins.

There has been no research or evaluation regarding the APS either before or after the installations.

APS mounted on signal pole for crossing signalized right turn lane. A pedestrian who is blind is waiting with her hand on the pushbutton for the vibrotactile Walk indication. After the Walk indication begins, she must turn, and cross the sidewalk before beginning to cross the street.

New Jersey DOT - Washington, New Jersey (Cont'd)

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West Virginia Division of Highways - Morgantown, West Virginia

History and background
APS were installed in 2002, at the request of blind citizens. These are the first APS that have been installed in the state.

Process and procedure
Morgantown does not have a process or procedure for determining which intersections will be equipped with APS. Typically, all traffic signal installations in West Virginia are installed by contract under the purview of the West Virginia Division of Highways.

Funding
This demonstration project was fully funded by the West Virginia Division of Highways.

Description of intersection
APS were installed at two intersections in the downtown area of Morgantown that have pedestrian actuation, and exclusive pedestrian phasing with right turns on red permitted.

APS type and features
Pushbutton-integrated APS manufactured by Prisma Teknik (model TS-903).

APS features:

- WALK indication for crossing in both directions is fast repetition of the pushbutton locator tone
- Pushbutton locator tone
- Automatic volume adjustment in response to ambient sound
- Tactile map of crossing

Signals are being modified to include pushbutton information messages modeled after "Wait to cross Willey St. at High St. Wait for red light for all vehicles. Right turn on red permitted."

APS Installation
Two pushbuttons have been mounted on some corners so the standard single arrow can be correctly oriented in the same direction as each crosswalk. This was necessary where the two crosswalks at a corner were not at right angles to each other.

Since these locations used exclusive pedestrian phases, a right-angle, double ended arrow was installed so that a single pushbutton could be located on one corner or quadrant, controlling the WALK signal for two crossing directions. The right angle arrow will be installed where both crossings are 90 degrees from a particular quadrant.

Installation issues
Wiring of the APS was little different than typical (non-APS) pushbuttons.

APS are mounted to signal uprights using two quarter-inch stainless steel screws. In the future, stainless steel bands may be placed at the top and bottom sections of APS in high-vandalism areas.

West Virginia Division of Highways - Morgantown, West Virginia (Cont'd)

Mounting of two Prisma pushbutton units on a single pole. See arrows on insert detail for the orientation of the tactile arrow on the top of each unit. Both devices make the same sound during the Walk indication, which is acceptable in this installation since there is exclusive pedestrian phasing.

Diligence is needed in the initial design of a complete intersection, so as to correctly locate APS according to the MUTCD.

Maintenance
No weather-related maintenance issues.

Cabinets and signals are well guarded against transient voltage surges, including high-speed surges that are accompanied by lighting.

To date, APS have been installed at six intersections in West Virginia.
At one intersection in downtown Charleston, in a high vandalism area, three APS have been knocked off the signal upright.

Evaluation
APS have performed as expected according to manufacturer's literature.

Negative comments have been received from nearby businesses about the noise level of the locator tone. The entrance to one business is less than 10 feet from the pole on which two APS are mounted.

Blind users have objected to the location of some APS units (in some cases at a distance of about 20 feet from the crosswalk).

Positive comments have been received about proactive installation of APS.

West Virginia Division of Highways - Morgantown, West Virginia (Cont'd)

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Dunedin, Florida

History and background
There are two intersections in downtown and one at Patricia Avenue and Beltrees in Dunedin where APS have been installed at the request of citizens who are blind.

The City of Dunedin was awarded the Inspired Leadership Award for 2003 from the Florida Alliance for Assistive Services and Technology (FAAST) for the APS installations.

Process and procedure
Requests for APS are received by the City of Dunedin ADA Coordinator and reviewed and recommended by the City Manager appointed ADA Committee.

APS were requested by one person who is blind and who has limited hearing in one ear as well. She consulted with an orientation and mobility specialist and requested pushbutton-integrated devices and worked with the engineer on installation details.

Funding
The intersection modifications were part of a redevelopment project.

Description of intersection
One of the intersections downtown, Douglas & Main is a fairly small square intersection of two-lane streets with a pushbutton actuated exclusive pedestrian phase.

The other intersection downtown at Broadway & Main is a more complex intersection where a very busy state road intersects with the city's Main Street.

The third intersection at Patricia and Beltrees is a T intersection of a minor street with very busy street with a right turn lane.

APS type and features
Pushbutton-integrated devices from Polara Engineering

APS features:

- Speech WALK message:
  - At Douglas and Main (with exclusive pedestrian phasing): "WALK sign is on"
  - At Broadway & Main: "WALK sign is on to cross Main" and "WALK sign is on to cross Broadway"
- Vibrotactile WALK indication
- Pushbutton locator tone
- Actuation indicator – tone
- Tactile arrow
- Extended button press – increased the volume of the WALK indication and locator tone

APS Installation
Two APS were mounted on each pole.

At one crossing APS were about 15 feet back from the crosswalk location, and approximately 5 feet toward the intersection from the extension of the crosswalk lines. Volume of locator tone and WALK message was quite loud.

Dunedin, Florida (Cont'd)

At the Patricia and Beltrees location, APS were installed on only one crosswalk, to cross the through street, as needed and requested by the person who lived near the intersection.

Two pushbuttons are located on fluted pole at this location with exclusive pedestrian phasing. Tactile arrow of each device points in the direction of travel on the crosswalk.

Installation issues
Installers stated that they had difficulties with figuring out the new devices but seemed to work fine after they figured them out.

Fluted poles were used in the redesign which made it difficult to align the tactile arrow.

Maintenance
No maintenance issues have been reported except for need to adjust volume levels.

Evaluation
Installation caused complaints from patrons of a restaurant/bar on one corner with outdoor seating. Locator tone was loud enough to hear from over 30 feet away.

The woman who requested the installation was initially unhappy with some parts of the installation. Original plans included a stub pole close to the crosswalk but that was not installed at first. Even with the signal adjusted to the maximum volume, she was unable to hear the WALK indication when she was standing at the crosswalk location. A stub pole was later installed which allows a reduction in volume of the device and diminishes problems for neighbors as well.

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Maryland DOT

History and background
During the 1980's and 90's, Maryland installed some APS of the cuckoo/chirp type at locations throughout the state, including Montgomery County, Frostburg, Lutherville, and Towson.

Maryland DOT, in response to concerns about mobility for persons who are visually impaired through unique intersections, such as roundabouts, and the addition of the APS section to the MUTCD, convened a committee in November 2000 to develop criteria for installation and prioritization plans for installation of APS.

The committee consisted of representatives of the visually impaired community, traffic engineers, orientation and mobility specialists, local ADA coordinators and DOT staff.

The goals of the committee included:

- Identify factors affecting mobility of the visually impaired through intersections
- Identify and reconcile differences of approach to mobility issues within the visually impaired community
- Develop a rating and prioritizing process for APS.

Process and procedure
The committee developed a prioritization checklist (see Appendix D).
This checklist has been used on approximately 40 intersections to date, with scores ranging from 14 to 46 out of a possible total of 60. While each crossing receives a rating, the highest rating for any crossing is used for the intersection.

At this time, Maryland is considering any intersection with a rating greater than 36 to be a high priority. Eleven intersections are rated at this level and have either had APS installed or are under design for installation.

Funding
Maryland considers an APS to be a traffic control device and as such funding is from traffic control, highway construction and Federal funds.

APS type and features
Pushbutton-integrated APS manufactured by Polara Engineering

APS features:

- Speech WALK message, with option of cuckoo/chirp if desired for specific location
- Vibrotactile WALK indication
- Pushbutton locator tone
- Actuation indicator – speech WALK message
- Pushbutton information message
- Locator tone
- Automatic volume adjustment in response to ambient noise levels

Maryland is also testing and evaluating equipment from other manufacturers.

Description of intersection 1
Installation Example 1, Loch Raven and Taylor, is a large intersection with right turn islands, heavy traffic volumes and left turn lanes on all approaches.

Maryland DOT (Cont'd)

APS Installation 1

Two APS are mounted on the existing pole on this island.

APS as seen from right-turn lane crossing.

Existing poles were used at this location with channelizing islands and uncontrolled right turn lanes in three of the four quadrants.

WALK indication is a speech message. The volume levels of the APS were carefully adjusted to prevent the WALK indication from being audible to pedestrians before they crossed the right turn lane. The speaker is blocked on the side away from the intersection. However, wind, humidity and large trucks can affect the sound levels and the signals may be audible from the sidewalk under certain conditions. In this case, the person who requested the signals is familiar with the geometry.

Description of intersection 2

Installation Example 2, Loch Raven and Glen Keith, is an intersection with low side street volumes. The APS is to cross the major street (Loch Raven) only. There are no pedestrian indications to cross the minor (Glen Keith) so APS were not installed for those crossings. The major street is quite wide, with a median island and a stop sign controlled service road along the west side of Loch Raven. Again, the volumes needed to be carefully adjusted. Vehicular signal pole was used for one APS but others were located close to the crosswalk on pedestrian signal poles.

APS Installation 2

APS installed on pedestrian signal pole.

View across Loch Raven toward two media islands and stop sign controlled service road.

Maryland DOT (Cont'd)

APS installed on signal pole beside crosswalk waiting location.

Installation issues

Mr. Paulis of the Office of Traffic and Safety states that the location of pushbuttons and other APS equipment is of high importance in providing a properly operating system for pedestrians who are visually impaired. In many cases, it is not desirable to only use existing poles for the installation of APS. The installation of additional pedestal poles is often necessary to insure the proper location of APS relative to crosswalks and curb cuts.

Adjustment of initial volume levels for use has been an issue. Obtaining
the proper balance between the needs of the persons who are visually impaired and surrounding development while not presenting misleading information to pedestrians has proved to be difficult. Complicating the process are uncontrollable factors, that is, traffic noise and weather conditions such as wind and rain.

Maintenance

There have been some failures of the control boards, but these may not be excessive when considering that the equipment is a new and relatively recent design and the growing pains associated with new technology.

Evaluation

No formal evaluation has been conducted of installations. Most individuals who have requested the installations seem to be pleased.

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Charlotte, North Carolina

History and background

Charlotte began installing pushbutton-integrated APS in 1999 after discussion with the Charlotte/Mecklenburg Advocacy Council of People with Disabilities Committee. Approximately twelve intersections with forty-two pushbutton-integrated APS devices are now installed. Before that, pedhead-mounted APS had been installed upon request; current staff are not sure when those devices were installed or how the decision was made to install them. They state that they are replacing current "chirpers" with pushbutton-integrated devices.

Orientation and Mobility specialists helped evaluate APS products in advance and made recommendations to engineers.

An early Polara installation in Charlotte.

Process and procedure

APS are requested by citizens and installed after review by staff of Metrolina Association for the Blind. In general, devices are installed in the order of request, depending on how much construction is involved.

The Charlotte/Mecklenburg Advocacy Council for People with Disabilities Committee and the Metrolina Association for the Blind serve as liaisons between the person who is visually impaired and the city.

Funding

City council approved $95,000 in a restricted fund that is carried over year to year for purchase of equipment. The installation cost is covered in the normal budget. The public and individuals who are blind were involved in making the request for funding and getting it approved.

APS type and features

Pedhead-mounted devices before 1999

Pushbutton-integrated devices from Polara Engineering since July 1999

APS features (pushbutton-integrated device installations):

- Speech WALK indication
- Vibrotactile WALK indication
- Raised tactile arrow
- Pushbutton locator tone
- Actuation indicator
- Pushbutton information message
- Automatic volume adjustment in response to ambient sound

Charlotte, North Carolina (Cont'd)

Installation issues

The first generation Polara device did not accommodate pre-timed or "ped recall" locations. It was designed to look for a logic common signal from the controller. Using instructions provided by Polara, city technicians in the signal shop modified the printed circuit board, including adding a resistor and two jumpers. This being done, the devices were usable in these situations.

A simple jumper setting has addressed this problem with the newer Polara product. The first generation Polara (installed at four locations) was also more labor intensive to install. Installers drilled holes in the top of the device to accept conduit on wood pole locations.

The newer version Polara Navigator has addressed all installation concerns.

Recent Polara Navigator installation.

When it is necessary to install new poles to locate the device more appropriately, it takes longer and more funds, because traffic engineering has to coordinate with various departments to fix curb ramps and work around other utilities. Installation can be time-consuming when a new pole is needed.

Maintenance

No problems reported.

In early installation where two devices were on the same metal pole, it was possible to feel the vibration during walk on both devices at the same time (separate walk phases). This was solved by insulating between the device and pole. A speaker problem was resolved by improving the installation method through efforts between the City Electronics Tech and the manufacturer.

Evaluation

The Public Service Department has no complaints regarding the devices. However, staff of Metrolina Association for the Blind received some complaints about the noise level of the locator tones, especially in residential areas. The volume can easily be adjusted.

The City of Charlotte placed in the top ten U.S. cities in the Accessible America contest a year ago and in the top seven this past year. Metrolina Association for the Blind has provided very favorable input and review of this project. Communication between all agencies involved has made this project a success.

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Atlanta, Georgia

History and background
Atlanta has installed APS upon specific request since 1992. Until April 2003, all devices installed had been pedhead-mounted devices. The city is evaluating pushbutton-integrated devices as part of a research project. There have been requests by citizens who are blind for devices with pushbutton locator tones at pushbutton actuated locations, however the city has not installed them generally to date.

Process and procedure
Individuals who are blind or visually impaired make a request to the traffic engineering department. The engineer evaluates the intersection and current timing and signalization. He may meet the blind person and an orientation and mobility specialist (usually from the Center for the Visually Impaired) at the intersection to discuss the problems.

Requests are prioritized by date of request and volume of traffic.

If the request is for an APS at a signalized intersection and devices are in stock, they can usually be installed in less than a month.

Funding
City traffic engineering funds, however, some private developers have paid for street improvements as part of a development project.

APS type and features
Pedhead-mounted devices from IDC/U.S. Traffic are installed at approximately 15 intersections.

APS features:

- Walk indication -Cuckoo/chirp
- No pushbutton locator tone
- No automatic volume adjustment

Atlanta has recently installed pushbutton-integrated APS from Polara Engineering and a receiver-based system from Relume as part of a research project.


Pedhead-mounted speaker mounted on the pole as typically installed in Atlanta.

Date installed
1992 to present

Installation issues
Pedhead-mounted devices are simple to wire and install on the pole or on the pedhead.

Signal shop found the pushbutton-integrated device to be very difficult to install, requiring additional wiring and careful adjustment. After installation, the control unit of one APS was malfunctioning and the device was not sounding; manufacturer replaced the unit.

Maintenance
Many pedhead-mounted units have been installed for five to ten years or more without problems. Recently, two units failed two consecutive times until engineers found that water was getting into the devices, probably through the speaker holes. They recommend double checking the seals and mounting the speakers under the pedheads to protect them from the impact of heavy rain.

Atlanta, Georgia (Cont'd)

In general, Atlanta's department considers pedhead-mounted devices very reliable and serviceable. Vandalism has not been a problem.

Evaluation

The traffic engineering department has received some complaints about noise levels of pedhead-mounted speakers (ones currently installed do not have automatic volume adjustment), but complaints have usually stopped a couple weeks after installation. At times, they have adjusted the volume after installation.

The city looked at pushbutton-integrated devices with locator tones to address concerns of persons who are blind about finding the pushbuttons. However, the signal maintenance department prefers to install the pedhead-mounted devices, as long as there are no complaints.

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