

County of Loudoun  
Office of Transportation Services

MEMORANDUM

**DATE:** June 24, 2009

**TO:** Jane McCarter, Project Manager  
Department of Planning

**FROM:** Marc Lewis-DeGrace, Transportation Planner

**SUBJECT:** CMPT 2009-0003, SPEX 2009-0004 & SPEX 2009-0015 –  
Scott Jenkins Memorial Park  
First Referral

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**Background**

These Commission Permit (CMPT) and Special Exception (SPEX) applications propose an active recreational park with lighted fields and a 250-space commuter parking lot on an approximately 35-acre site in the Agricultural Rural (AR-1) zoning district. The site is located on the north side of East Colonial Highway (Business Route 7), approximately one (1) mile east of the Town of Hamilton. Access to the proposed uses would be via two new entrances from Business Route 7, one for passenger vehicles (for both the park facilities and commuter parking lot) and the other for the exclusive use of commuter buses. A vicinity map is provided as *Attachment 1*, and a reduced version of the special exception plat depicting the site layout is provided as *Attachment 2*.

In its consideration of these applications, the Office of Transportation Services (OTS) reviewed materials received from the Department of Planning on April 6, 2009, including (1) a statement of justification, dated February 2009, (2) a traffic impact study, dated February 18, 2009, along with supplemental traffic information dated March 20, 2009, and (3) a Commission Permit/Special Exception plat (plan set), dated February 2009, all prepared by Patton Harris Rust Associates, P.C.

**Existing, Planned and Programmed Transportation Facilities**

According to the *Revised General Plan*, the site is located within the Rural Policy Area. Major roadways serving the site are described below. OTS' review of existing and planned transportation facilities is based on the *2001 Revised Countywide Transportation Plan (2001 Revised CTP)* and the *2003 Bicycle & Pedestrian Mobility Master Plan (2003 Bike & Ped Plan)*.

**East Colonial Highway (Business Route 7)** (segment from Hamilton Station Road (Route 704) east to Charlestown Pike (Route 9)/Dry Mill Road (Route 699) is classified by the *2001*

Revised CTP as a major collector, and is a designated Virginia Scenic Byway. It is built to its ultimate planned two-lane rural undivided (R2) section within a variable right-of-way (ROW).

The 2003 Bike & Ped Plan categorizes this segment of roadway as a “baseline connecting roadway” along which bicycle and pedestrian facilities are envisioned. Currently, there are two existing four-foot sidewalks along East Colonial Highway to the west of the site; on the north side of the road, a sidewalk is in place from the end of the Old South Restaurant property and Twinoaks Place (approximately 600 feet); on the south side of the road, a sidewalk is in place from the Hamilton Town Limits to the eastern end of the Hamilton Rescue Squad property (approximately 1,500 feet).

**Harry Byrd Highway (Route 7)** (segment from the Route 7 Business interchange at Round Hill east to the Route 9 interchange) is classified by the 2001 Revised CTP as a principal arterial. It is currently built as a four-lane median divided (R4M) limited access facility with grade-separated interchanges at (1) Route 7 Business at Round Hill, (2) Route 287 (Berlin Turnpike); (3) Route 704 (Hamilton Station Road), and (4) Route 9 (Charlestown Pike). The 2001 Revised CTP calls for future widening to six-lanes (within the existing 200-foot ROW), along with construction of an additional grade-separated interchange at Route 690 (Hillsboro Road).

**Hamilton Station Road (Route 704)** (segment from Business Route 7 north to Route 9) is classified by the 2001 Revised CTP as a major collector. It is currently built as a two-lane local access rural (R2) section within a variable ROW. A grade-separated interchange is in place at Route 7, and a traffic signal is in place at Route 9. The adopted 2001 Revised CTP, calls for Hamilton Station Road to remain a two-lane (R2) facility within a 50-foot ROW.

The 2003 Bike & Ped Plan categorizes Hamilton Station Road as a “baseline connecting roadway” along which bicycle and pedestrian facilities are envisioned.

**Harmony Church Road (Route 704)** (segment from Business Route 7 south to Hughesville Road (Route 725)) is classified by the 2001 Revised CTP as a major collector, and is a designated Virginia Scenic Byway. It is currently built as a two-lane local access rural (R2) section within a variable ROW. The adopted 2001 Revised CTP, calls for Harmony Church Road to remain a two-lane (R2) facility. The adopted 2001 Revised CTP calls for Harmony Church Road to remain a two-lane (R2) facility.

The 2003 Bike & Ped Plan categorizes Harmony Church Road as a “baseline connecting roadway” along which bicycle and pedestrian facilities are envisioned.

**Charlestown Pike (Route 9)** (segment from Business Route 7 northwest to Hamilton Station Road (Route 704)) is classified by the 2001 Revised CTP as a minor arterial, and is a designated Virginia Scenic Byway. It is currently built as two-lane local access rural (R2) section within a variable ROW. A grade-separated interchange is in place at Route 7, and traffic signals are in place at Clarkes Gap Road (Route 662) and at Hamilton Station Road (Route 704). The adopted 2001 Revised CTP calls for Charlestown Pike to remain a two-

lane rural (R2) facility but with minor widening and installation of turn lanes at major intersections.

The 2003 Bike & Ped Plan categorizes Charlestown Pike as a “baseline connecting roadway” along which bicycle and pedestrian facilities are envisioned in the future. The W&OD Trail travels along the west side of Route 9 from Business Route 7 north for approximately 800 feet (on the bridge over Route 7) before turning northwest into Paeonian Springs.

**Canby Road (Route 662)** is a local secondary road which intersects Business Route 7 east of the proposed site. As a local road, Canby Road is not part of the CTP network and is not governed by the 2001 Revised CTP.

**Dry Mill Road (Route 699)** is a local secondary road which connects Business Route 7 (east of the site) and West Loudoun Street (in the Town of Leesburg); it is a designated Virginia Scenic Byway. As a local road, Dry Mill Road is not part of the CTP network and is not governed by the 2001 Revised CTP. The W&OD Trail roughly parallels Dry Mill Road between the Business Route 7/Route 9 intersection and the Town of Leesburg.

### **Review of Submitted Traffic Study**

The Applicant's submitted traffic study (dated February 18, 2009) analyzed current and future traffic conditions in the area, focusing on seven existing and three future intersections (the future intersections include the main site entrance from East Colonial Highway as well as two internal intersections on the site). Existing lane use and traffic control for the intersections analyzed is illustrated on *Attachment 3*. The project is proposed to be constructed in two phases: Phase 1 (to be completed by 2010) consists of a 250-space commuter parking lot with two bus bays (to be served by the County's commuter bus service in the AM and PM weekday peak periods), as well as the initial baseball field for the park; Phase 2 (to be completed by 2020) would add the remaining park uses, including three baseball fields, one large rectangular sports field and an additional 261 parking spaces. The study analyzed the commuter parking lot use in light of its peak hour weekday traffic impacts, while the park use was analyzed in light of both its weekly and Saturday peak hour traffic impacts. Relevant portions of the study are summarized below.

### **Existing (2008) Traffic Volumes and Levels of Service (LOS)**

*Attachment 4* illustrates existing average daily traffic volumes in the vicinity of the subject site. Traffic counts were taken in December 2008 at the seven existing intersections in the study area both during weekday AM and PM peak hours as well as during midday hours on Saturday; counts are depicted on *Attachment 5*. The study indicates that in December 2008, East Colonial Highway carried between 4,500 and 4,725 vehicles per day (VPD) near the site.

*Attachments 6 & 7* summarize existing intersection LOS in the vicinity of the site. Under existing traffic controls, the westbound Route 7 exit ramp at Route 9 (Intersection 8) operates at failing LOS during the weekday PM peak hour, while the eastbound Route 7 exit ramp at Route 9 (Intersection 9) operates at failing LOS during both AM and PM weekday peak hours

as well as during the Saturday midday peak. The overall southbound movement at Route 9 and East Colonial Highway/Dry Mill Road (Intersection 10) operates at failing LOS during the weekday AM peak hour.

**Background Traffic Growth**

The traffic study assumes a 4.0% annual growth rate for traffic volumes along Business Route 7 in the vicinity of this site. This figure is consistent with housing growth trends for the Route 7 West Planning Subarea contained in the 2007 Loudoun County Growth Summary.

**Trip Generation from Proposed Development**

As noted above, the site is proposed to be developed in two phases: Phase 1 (2010) is proposed to consist of a 250-space commuter parking lot and the initial baseball field for the park. Phase 2 (2020) would add the remaining park uses, including three baseball fields, one large rectangular sports field and an additional 261 parking spaces. It is noted that the traffic study used a combination of ITE trip generation codes (412 – County Park; 417 – Regional Park, and 488 – Soccer Complex) and assumed the highest possible trip generation for the proposed park uses. Trip generation figures for Phase 1 are listed in *Attachment 8* and summarized in the table below:

**Phase 1 (Interim) Trip Generation – 2010**

| Land Use                         | Amount     | AM Peak Hour |     |       | PM Peak Hour |     |       | Daily Total | Sat Peak Hour |     |       | Sat Total |
|----------------------------------|------------|--------------|-----|-------|--------------|-----|-------|-------------|---------------|-----|-------|-----------|
|                                  |            | In           | Out | Total | In           | Out | Total |             | In            | Out | Total |           |
| Maximum Park Uses (ITE Code 488) | 1 field    | 2            | 2   | 4     | 19           | 18  | 28    | 96          | 16            | 18  | 34    | 243       |
| Park & Ride Lot (ITE Code 90)    | 250 Spaces | 146          | 34  | 180   | 36           | 119 | 155   | 1,125       | 0             | 0   | 0     | 0         |
| Total Trips (Interim)            |            | 148          | 36  | 184   | 55           | 128 | 183   | 1,221       | 16            | 18  | 34    | 243       |

Trip generation figures for Phase 2 are listed in *Attachment 9* and are summarized in the table below:

**Phase 2 (Buildout) Trip Generation – 2020**

| Land Use                                 | Amount             | AM Peak Hour |     |       | PM Peak Hour |     |       | Daily Total | Sat Peak Hour |     |       | Sat Total |
|--|--------------------|--------------|-----|-------|--------------|-----|-------|-------------|---------------|-----|-------|-----------|
|  |                    | In           | Out | Total | In           | Out | Total |             | In            | Out | Total |           |
| Max. Park Uses (ITE Codes 488, 412, 417) | 5 fields/ 30 acres | 10           | 9   | 19    | 97           | 43  | 140   | 1,608       | 81            | 87  | 168   | 1,200     |
| Park & Ride Lot (ITE Code 90)            | 250 Spaces         | 146          | 34  | 180   | 36           | 119 | 155   | 1,125       | 0             | 0   | 0     | 0         |
| Total Trips (Buildout)                   |                    | 156          | 43  | 199   | 133          | 162 | 295   | 1,606       | 81            | 87  | 168   | 1,200     |

### **Trip Distribution & Assignment**

The traffic study (*Attachment 10*) distributed peak hour site-generated trips on the road network based on previous traffic studies, existing traffic patterns and input from Loudoun County OTS staff. For Phases 1 (2010) and 2 (2020), the TIA provides estimates for both the commuter parking lot generated traffic and the sports-related uses. A component of these site-generated trips is the commuter buses traveling to and from the commuter lot during the weekday AM and PM peak periods.

For commuter lot trips, the study estimates that 80% of the site-generated trips would arrive from the west via East Colonial Highway; the remaining 20% of site-generated trips are estimated to arrive from the east via East Colonial Highway from Charlestown Pike.

For park-related trips, the study estimates that 55% of the site-generated trips would arrive at the site from the west via East Colonial Highway; the remaining 45% of site-generated trips are estimated to arrive from the east via East Colonial Highway.

### **Commuter Bus Routing**

It is envisioned that all of the commuter buses (in the AM and PM) will access the site from the east via the Route 9 interchange and East Colonial Highway. Buses exiting in the AM will make a left-turn from the site and continue eastbound to the Route 9 interchange to locations at points east. The traffic study anticipates 12 bus trips to/from this site in the AM.

Buses exiting in the PM will make a right-turn from the site and continue west on East Colonial Highway to Hamilton Station Road (Route 704) to Route 7 west to points further west in Loudoun County. The traffic study anticipates 18 bus trips to/from this site in the PM.

### **Forecasted (2010) Traffic Volumes, Levels of Service, and Mitigation Measures**

Under background conditions (without the proposed development) in 2010, the traffic study (*Attachment 11*) indicates that the same intersections/movements that currently experience unacceptable LOS under existing (2008) conditions (Intersections 8, 9 and 10) will continue to operate as such with increased delays. It is noted that the southbound left-turn movement from Charlestown Pike to eastbound Route 7 (Intersection 9) moves from an acceptable LOS (LOS D) under existing conditions to an unacceptable LOS (LOS F) in the weekday AM peak hour.

With the proposed development (total future conditions) in 2010, the traffic study (*Attachment 12*) indicates that Intersections 8, 9 and 10 continue to experience unacceptable LOS with additional increases in delays.

Regarding mitigation measures to be completed before the site opening in 2010 (Phase 1), the traffic study (*Attachment 13*) indicates that the installation of all-way stop signs at Charlestown Pike/East Colonial Highway/Dry Mill Road (Intersection 10), while increasing overall delays at this location, would result in overall acceptable LOS at this intersection during the weekday AM and PM hours (LOS D and LOS C, respectively).

The traffic study also examined the need for left- and right-turn lanes into the site, also prior to the site opening in 2010. Based on VDOT turn lane warrants, a left-turn lane is required at the main site entrance (*Attachment 14*). A right-turn lane is not required based on VDOT warrants (*Attachment 15*), but the study recommends that a right-turn lane be installed due to the operational improvements that would result as well as driver expectations in the area. The study proposes that the length of the turn lanes be based on a reduced speed limit of 45 MPH (50 MPH design speed) (*Attachment 16*).

Future lane use and traffic control at the main site entrance (Intersection 4) and on-site intersections (Intersections 5 and 6) are depicted on *Attachment 17*.

### **Forecasted (2020) Traffic Volumes, Levels of Service, and Mitigation Measures**

Without the proposed development (background conditions) in 2020, the traffic study indicates that the intersections/movements that operate at failing LOS under existing (2008) conditions (Intersections 8, 9 and 10) will continue to operate at failing LOS (*Attachment 18*), with further delays. It should be noted that the south-bound left movement of Intersection 9 is degraded from an acceptable LOS (LOS D) in 2008 to an unacceptable LOS (LOS F) in 2020.

Under total future conditions (with the proposed development) in 2020, the traffic study (*Attachment 19*) indicates that Intersections 8, 9 and 10 will continue to operate at unacceptable LOS. In addition, Intersection 3 (East Colonial Highway and Hamilton Station Road) and Intersection 4 (East Colonial Highway and the proposed main site entrance) have movements that are forecast to operate at failing LOS. The southbound movement on Hamilton Station Road (Route 704) at East Colonial Highway is forecast to experience unacceptable LOS (LOS F) in the weekday AM and PM hours. The southbound left-turn movement exiting the site to East Colonial Highway is also forecast to experience unacceptable LOS (LOS E) in the AM peak hour with the proposed development.

Regarding mitigation measures, the traffic study (*Attachment 13*) indicates that, in addition to the all-way stop control identified for the 2010 opening of the site, a separate left-turn lane on East Colonial Highway and a separate right-turn lane on Dry Mill Road at Charlestown Pike (Intersection 10) would be required as a result of additional growth. At the intersection of East Colonial Highway and Hamilton Station Road (Intersection 3), the study indicates that the installation a mini-roundabout would result in an overall acceptable LOS at this location during both weekday peak hours and on Saturday.

### **Transportation Comments**

1. The traffic study recommends that the speed limit be lowered to 45 MPH for the entire segment of East Colonial Highway (Business Route 7) between Hamilton Station Road (Route 704) and Charlestown Pike (Route 9) due to existing roadway conditions. OTS staff notes that the Board of Supervisors would need to request such a speed limit reduction from VDOT, and that a speed study would need to be completed. OTS defers to VDOT's traffic engineering section for additional comments on this matter.

2. OTS staff requests further explanation of the "alternative length" measurement used in the traffic study (*Attachment 16*). In addition, OTS would like to know why the westbound left-turn lane length provided at the main site entrance (510 feet) is shorter than the maximum length (550 feet) noted in the study (*Attachment 16*).
3. Consistent with the traffic study's 2010 recommendation, the eastbound left-turn lane into the main site entrance and the westbound right-turn lane into the bus access lane and main site entrance should be installed prior to the opening of Phase 1 of this project. In addition, the plat should be clarified to clearly indicate the length of each turn lane proposed.
4. It does not appear that the right-turn lane is long enough to allow for sufficient deceleration of buses accessing the site. The right-turn lane should begin at an appropriate point prior to the bus entrance.
5. Appropriate signage should be installed to (1) prohibit all eastbound left turns into the bus entrance, and (2) prohibit non-authorized vehicles from accessing the site via the bus entrance.
6. All-way stop control (stop signs) should be installed, pending VDOT approval, at the intersection of East Colonial Highway/Dry Mill Road and Charlestown Pike (Intersection 10) prior to the opening of Phase 1 of this project.
7. The traffic study indicates that, under 2020 conditions, a dedicated eastbound left-turn lane on East Colonial Highway and a dedicated westbound right-turn lane on Dry Mill Road at Charlestown Pike (Intersection 10) would improve overall intersection LOS at this location to acceptable levels during both weekday AM and PM peak hours as well as on Saturday. A contribution commensurate with the site impacts should be provided.
8. The traffic study indicates that, under 2020 conditions, the installation of a mini-roundabout at the intersection of East Colonial Highway and Hamilton Station Road (Intersection 3) would result in acceptable LOS at this location during both the weekday AM and PM peak hours as well as on Saturday. Further discussion on potential improvements at this location is necessary and need to include the Town of Hamilton as the intersection is in close proximity to the town limits. OTS staff requests further information as to whether a traffic signal was considered for this location. In any case, a contribution commensurate with the site impacts should be provided.
9. OTS staff recommends that the multi-use path along the length of site should be increased to 10 feet in width per AASHTO guidelines.

### **Conclusion**

**Subject to resolution of the issues identified in this referral, OTS would not object to the approval of these applications. OTS staff is available to meet with project representatives to further discuss these comments.**

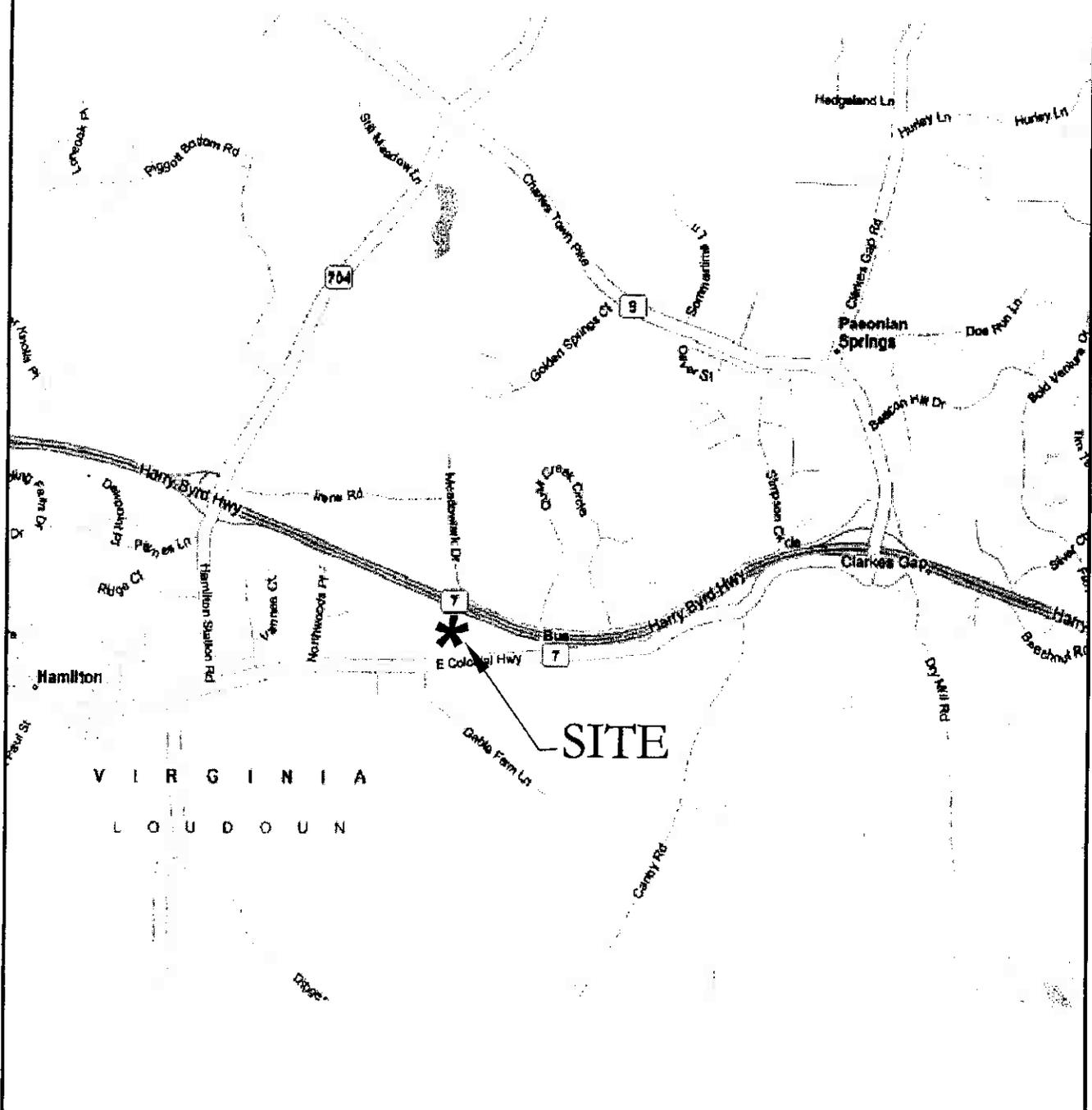
## ATTACHMENTS

1. Site Vicinity Map [Traffic Study Figure 1]
2. Site Concept Plan [Traffic Study Figure 4]
3. Existing (2008) Roadway Lane Geometry [Traffic Study Figure 6]
4. Existing (2008) Traffic Conditions [Traffic Study Figure 7A]
5. Existing (2008) Traffic Volumes [Traffic Study Figure 7B]
6. Existing (2008) Level of Service [Traffic Study Figure 7C]
7. Existing (2008) Intersection Level of Service [Traffic Study Table 2]
8. Phase 1 (2010) Trip Generation [Traffic Study Table 7]
9. Trip Generation Variables/Total Trip Generation [Traffic Study Table 5]
10. Site Trip Distributions [Traffic Study Figure 11]
11. Background (2010) Intersection Level of Service [Traffic Study Table 4A]
12. Total (2010) Intersection Level of Service [Traffic Study Table 8A]
13. Mitigation Measures [Traffic Study Figure 18]
14. Total (2010) Left Turn Warrant @ E Colonial Hwy/Site Driveway [Traffic Study Figure 17B]
15. Total (2010) Right Turn Warrant @ E Colonial Hwy/Site Driveway [Traffic Study Figure 17A]
16. Turn Lane Calculations [Traffic Study Table 10]
17. Future Roadway Lane Geometry [Traffic Study Figure 14]
18. Background (2020) Intersection Level of Service [Traffic Study Table 4B]
19. Total (2020) Intersection Level of Service [Traffic Study Table 8B]

cc: Andrew Beacher, Assistant Director, OTS  
Lou Mosurak, Senior Transportation Planner, OTS  
Nancy Gourley, Transit Division Manager, OTS



Not to Scale



Source: <http://maps.live.com>

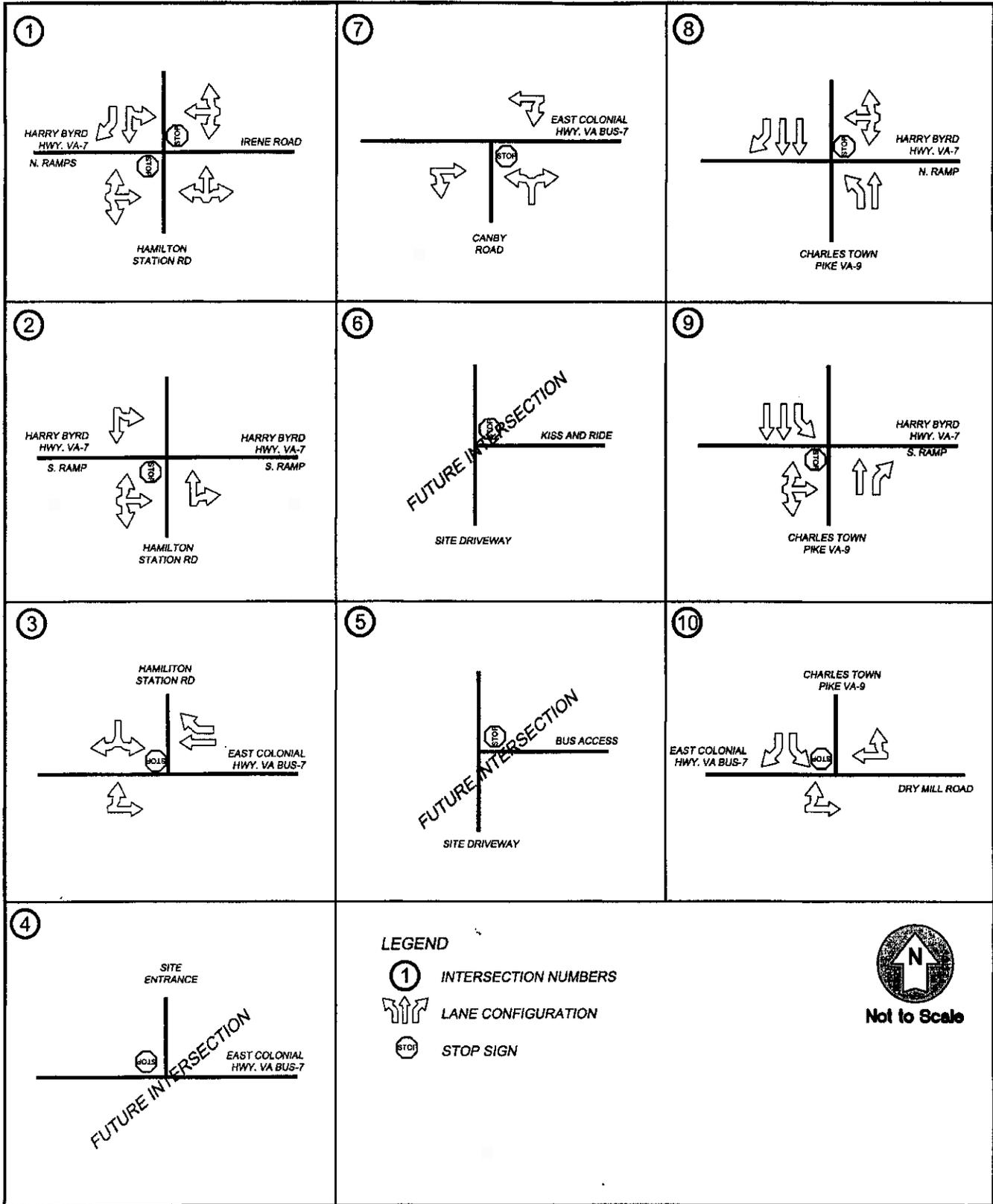


Site Location  
 Scott Jenkins Memorial Park

**FIGURE 1**  
 February 2009  
 13608-2.0

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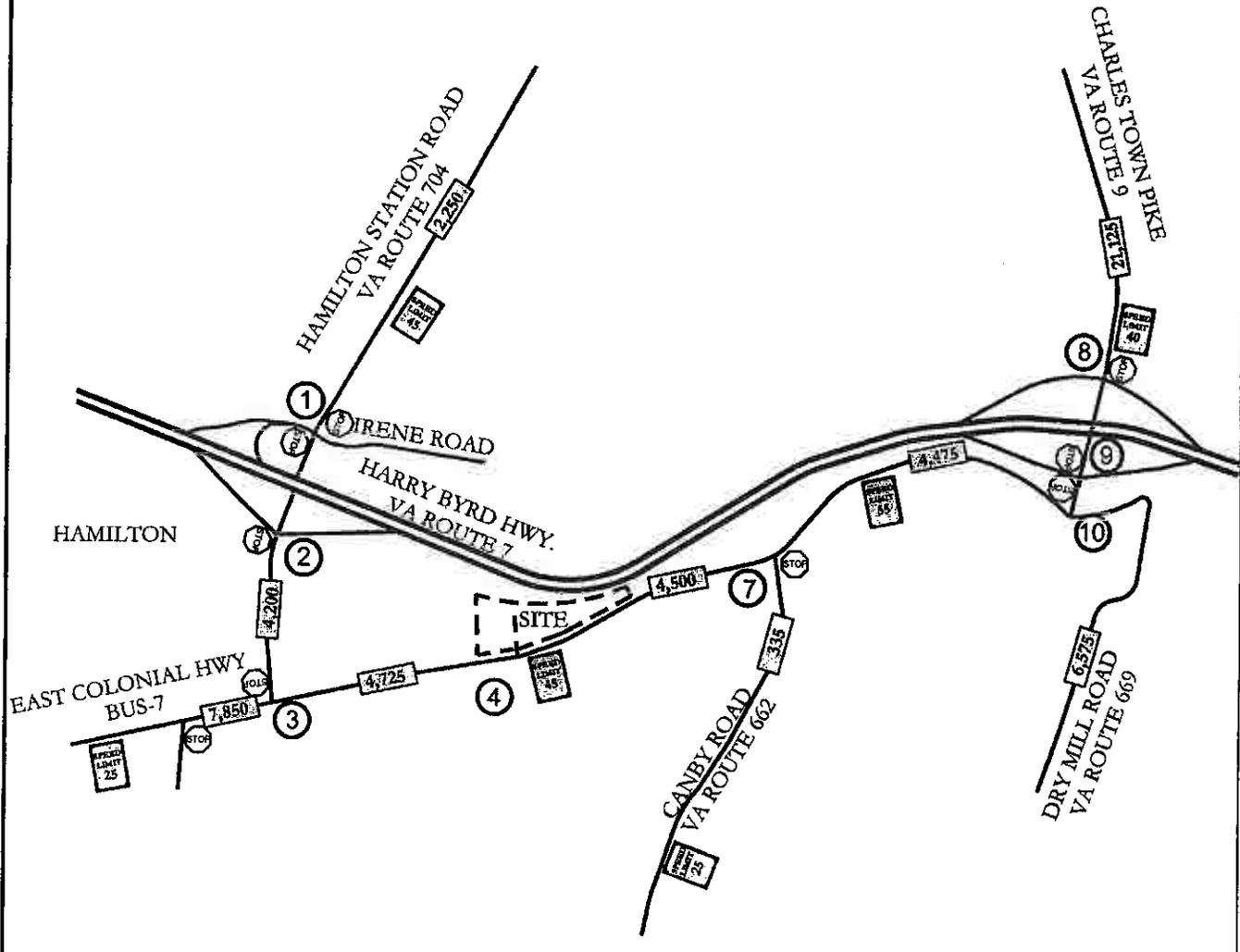


**PHRA** Existing (2008) Roadway Lane Geometry  
 Scott Jenkins Memorial Park

**FIGURE 6**  
 February 2009  
 13608-2-0



Not to Scale



LEGEND

① INTERSECTION NUMBER

--- FUTURE SITE DRIVEWAY

STOP SIGN

POSTED SPEED LIMIT

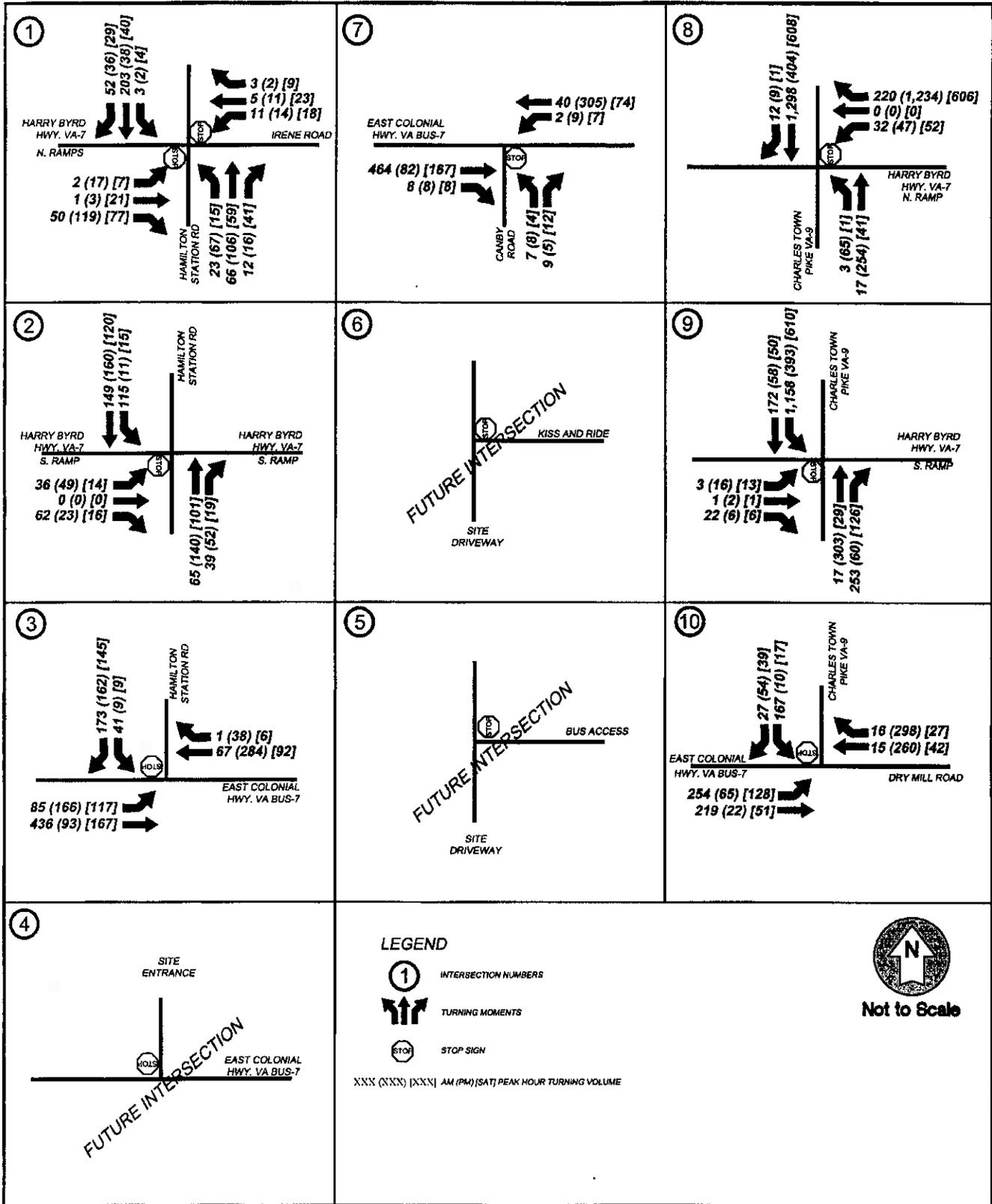
ADT 4000 AVERAGE DAILY TRAFFIC VOLUME



Existing (2008) Traffic Conditions  
Scott Jenkins Memorial Park

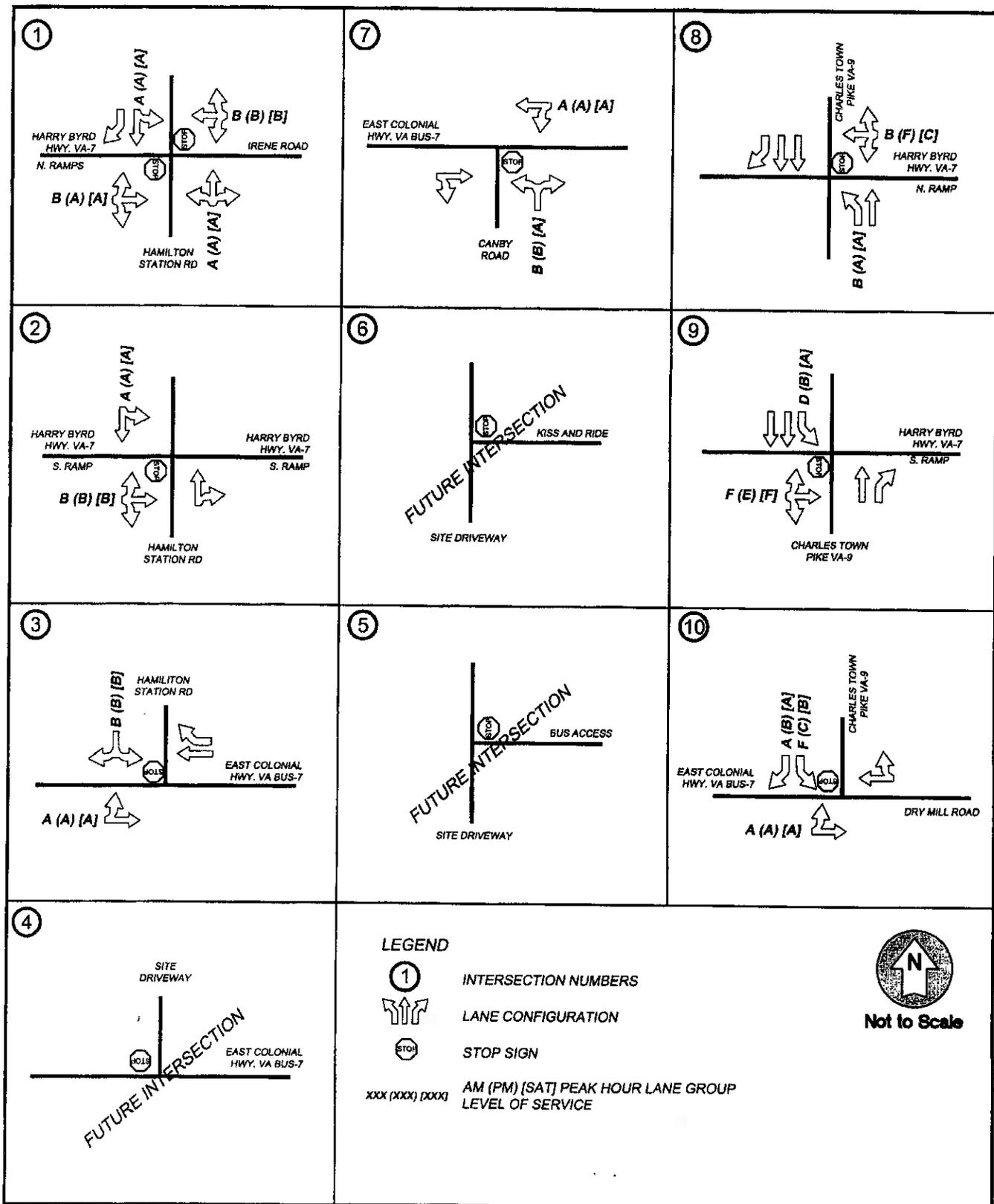
FIGURE 7A  
February 2009  
130/18-2-0

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Existing Traffic Volumes (2008)  
Scott Jenkins Memorial Park

FIGURE 7B  
February 2009  
13008-20



Existing (2008) Level of Service  
 Scott Jenkins Memorial Park

FIGURE 7C  
 February 2009  
 13008-2-9

Existing 2008 Intersection Level of Service

| Scenario   |            | 2008             |       | 2008             |       | 2008              |       |
|--|------------|------------------|-------|------------------|-------|-------------------|-------|
| Intersection   | Lane Group | AM Peak Existing |       | PM Peak Existing |       | Sat Peak Existing |       |
|  |            | LOS              | Delay | LOS              | Delay | LOS               | Delay |
| 1 VA RT 7 N<br>Ramps/Irene<br>Rd/Hamilton<br>Station Rd<br><br><i>Unsignalized</i> | EBLTR      | B                | 10.1  | A                | 9.8   | A                 | 9.6   |
|  | EB         | B                | 10.1  | A                | 9.8   | A                 | 9.6   |
|  | WBLTR      | B                | 12.2  | B                | 13.1  | B                 | 10.8  |
|  | WB         | B                | 12.2  | B                | 13.1  | B                 | 10.8  |
|  | NBLTR      | A                | 1.9   | A                | 2.9   | A                 | 1     |
|  | NB         | A                | 1.9   | A                | 2.9   | A                 | 1     |
| SBLT   | A          | 0.1              | A     | 0.4              | A     | 0.7               |       |
| 2 VA RT 7 S<br>Ramps/Hamilton<br>Station Rd<br><br><i>Unsignalized</i>             | EBLTR      | B                | 12.1  | B                | 11.7  | B                 | 10.1  |
|  | EB         | B                | 12.1  | B                | 11.7  | B                 | 10.1  |
|  | SBLT       | A                | 3.7   | A                | 0.6   | A                 | 0.9   |
|  | SB         | A                | 3.7   | A                | 0.6   | A                 | 0.9   |
| 3 E Colonial<br>Hwy/Hamilton<br>Station Rd<br><br><i>Unsignalized</i>              | EBLT       | A                | 1.8   | A                | 6     | A                 | 3.7   |
|  | EB         | A                | 1.8   | A                | 6     | A                 | 3.7   |
|  | SBLR       | B                | 12.3  | B                | 12.6  | B                 | 10    |
|  | SB         | B                | 12.3  | B                | 12.6  | B                 | 10    |
| 7 E Colonial<br>Hwy/Canby<br>Road<br><br><i>Unsignalized</i>                       | WBLT       | A                | 0.4   | A                | 0.3   | A                 | 0.7   |
|  | WB         | A                | 0.4   | A                | 0.3   | A                 | 0.7   |
|  | NBLR       | B                | 13.8  | B                | 10.7  | A                 | 9.8   |
|  | NB         | B                | 13.8  | B                | 10.7  | A                 | 9.8   |
| 8 VA RT 7 N<br>Ramps/VA RT 9<br><br><i>Unsignalized</i>                            | WBLTR      | B                | 12.2  | F                | 556.7 | C                 | 18.7  |
|  | WB         | B                | 12.2  | F                | 556.7 | C                 | 18.7  |
|  | NBL        | B                | 12.2  | A                | 8.6   | A                 | 9     |
| 9 VA RT 7 S<br>Ramps/VA RT 9<br><br><i>Unsignalized</i>                            | EBLTR      | F                | N/A   | E                | 48.1  | F                 | 61.3  |
|  | EB         | F                | N/A   | E                | 48.1  | F                 | 61.3  |
|  | SBL        | D                | 34.9  | B                | 10.3  | A                 | 9.8   |
| 10 E Colonial<br>Hwy/Dry Mill<br>Rd/VA RT 9<br><br><i>Unsignalized</i>             | EBLT       | A                | 5.1   | A                | 7.3   | A                 | 5.7   |
|  | SBL        | F                | 66.2  | C                | 15.3  | B                 | 12    |
|  | SBR        | A                | 8.5   | B                | 12.5  | A                 | 8.8   |
|  | SB         | F                | 58.2  | B                | 13    | A                 | 9.8   |

**Table 7  
Phase 1 Trip Generation**

| <i>ITE Land Use (1)</i>            |             |                        |             | <i>AM PEAK HOUR</i>        |            |            | <i>PM PEAK HOUR</i> |           |            | <i>DAILY</i> |                |
|------------------------------------|-------------|------------------------|-------------|----------------------------|------------|------------|---------------------|-----------|------------|--------------|----------------|
| <i>CODE</i>                        | <i>CODE</i> | <i>DENSITY</i>         | <i>Var.</i> | <i>USE</i>                 | <i>IN</i>  | <i>OUT</i> | <i>TOTAL</i>        | <i>IN</i> | <i>OUT</i> | <i>TOTAL</i> | <i>(2-way)</i> |
| <b>Weekday</b>                     |             |                        |             |                            |            |            |                     |           |            |              |                |
| 488                                | 488.0       | 1 fields               |             | Soccer Complex             | 1          | 0          | 1                   | 14        | 7          | 21           | 71             |
| 488                                | 488.1       | 1 fields               |             | Soccer Complex (Factored)  | 1          | 1          | 2                   | 19        | 9          | 28           | 96             |
| 488                                | 488.2       | 1 fields               |             | Soccer Complex (Max rates) | 1          | 1          | 2                   | 17        | 8          | 25           | 91             |
| 488                                | 488.3       | 1 fields               |             | Soccer (Generator Max)     | 2          | 2          | 4                   | 9         | 18         | 27           | 96             |
|                                    |             |                        |             | Max Trips (Park)           | 2          | 2          | 4                   | 19        | 9          | 28           | 96             |
| <b>Average Trips (Soccer Park)</b> |             |                        |             |                            | <b>1</b>   | <b>1</b>   | <b>2</b>            | <b>15</b> | <b>10</b>  | <b>25</b>    | <b>87</b>      |
| 90                                 | 90.2        | 1 fields<br>250 spaces |             | Athletic Fields            | 2          | 2          | 4                   | 19        | 9          | 28           | 96             |
|                                    |             |                        |             | Park & Ride Lot            | 146        | 34         | 180                 | 36        | 119        | 155          | 1,125          |
| <b>Total Trips (Proposed SPEX)</b> |             |                        |             |                            | <b>148</b> | <b>36</b>  | <b>184</b>          | <b>55</b> | <b>128</b> | <b>183</b>   | <b>1,221</b>   |

**Park & Ride Lot Trips**

|  |                         |            |           |            |           |            |            |              |
|--|-------------------------|------------|-----------|------------|-----------|------------|------------|--------------|
| 250 spaces                             | BUS Trips**             | 6          | 6         | 12         | 8         | 8          | 16         | 60           |
| 250 spaces                             | Effective Vehicle Trips | 140        | 28        | 168        | 28        | 111        | 139        | 1,065        |
| <b>Total Park &amp; Ride Lot Trips</b> |                         | <b>146</b> | <b>34</b> | <b>180</b> | <b>36</b> | <b>119</b> | <b>155</b> | <b>1,125</b> |

**Saturday**

|                                    |         |                            |  | <i>SAT PEAK HOUR</i>       |            |              | <i>SAT DAILY</i> |     |
|------------------------------------|---------|----------------------------|--|----------------------------|------------|--------------|------------------|-----|
|                                    |         |                            |  | <i>IN</i>                  | <i>OUT</i> | <i>TOTAL</i> | <i>(2-way)</i>   |     |
| 488                                | 488.400 | 1 fields                   |  | Soccer Complex (Sat)       | 0          | 0            | 0                | 117 |
| 488                                | 488.800 | 1 fields                   |  | Soccer (Sat)               | 14         | 15           | 29               | 0   |
| 488                                | 488.900 | 1 fields                   |  | Soccer (Sat Generator Max) | 16         | 18           | 34               | 0   |
| 412                                | 412.300 | 10 acres                   |  | County Park (Sat)          | 13         | 9            | 22               | 121 |
| 412                                | 412.400 | 10 acres                   |  | County Park (Sat Max)      | 19         | 13           | 32               | 247 |
|                                    |         |                            |  | Max Trips (Park)           | 19         | 18           | 34               | 247 |
| <b>Average Trips (Park)</b>        |         |                            |  | <b>16</b>                  | <b>13</b>  | <b>29</b>    | <b>162</b>       |     |
| 1 fields                           | ^^      | Athletic Fields (Saturday) |  | 16                         | 18         | 34           | 243              |     |
| 250 spaces                         |         | Park and Ride (Saturday)   |  | 0                          | 0          | 0            | 0                |     |
| <b>Total Trips (Proposed SPEX)</b> |         |                            |  | <b>16</b>                  | <b>18</b>  | <b>34</b>    | <b>243</b>       |     |

| <i>Effective Trip Rates (3)</i> | <i>ITE Land Use Code</i>   | <i>Trip rate per</i> | <i>AM Peak Hour</i> |                  | <i>PM Peak Hour</i> |                  | <i>Daily</i>           |
|---------------------------------|----------------------------|----------------------|---------------------|------------------|---------------------|------------------|------------------------|
|                                 |                            |                      | <i>(2-way)</i>      | <i>Inbound %</i> | <i>(2-way)</i>      | <i>Inbound %</i> | <i>Weekday (2-way)</i> |
|                                 | Athletic Fields            | fields               | 4.00                | 50%              | 28.00               | 68%              | 96.00                  |
|                                 | 90 Park & Ride Lot         | spaces               | 0.72                | 81%              | 0.62                | 23%              | 4.50                   |
|                                 | Athletic Fields (Saturday) | fields               |                     |                  | 34.00               | 47%              | 243.00                 |
|                                 | 488 Soccer Complex         | fields               | 1.00                | 100%             | 21.00               | 67%              | 71.00                  |
|                                 | 488 Soccer Complex (Sat)   | fields               |                     |                  | 29.00               | 48%              | 117.00                 |

**TRIP RATE SOURCE:**

*Trip Generation Manual (8th Edition)*, Institute of Transportation Engineers: 2008.

Average trip rates used, unless noted with \* then equations used.

(1) ITE Land Code shown as the first 3 digits. Decimal shown for internal use by PHR+A for lookup table for trip rate variable.

^^ Saturday Average of max trips and average soccer park, derived based on K=0.14 to allow for peak use at 4.0 trips/space

Trip rate calculation = 2-way Trips (In + Out) / (Density) ; % inbound = trips in / (Total Peak Hour Trips)

(3) Effective trip rates calculated by land use:

For average rates =

Density \* ave. trip rate = 2-way Trips ; \* inbound percentage for Trips In

For ITE equations =

Density \* trip equation = 2-way Trips ; \* inbound percentage for Trips In

\*\* Trip Rate equations used to determine trips, effective rate Shown

**Table 5**  
**Trip Generation Variables**

| <i>ITE Land Use (1)</i>            |             |                |             | <i>AM PEAK HOUR</i>        |            |            | <i>PM PEAK HOUR</i> |            |            | <i>DAILY</i> |                |
|------------------------------------|-------------|----------------|-------------|----------------------------|------------|------------|---------------------|------------|------------|--------------|----------------|
| <i>CODE</i>                        | <i>CODE</i> | <i>DENSITY</i> | <i>Var.</i> | <i>USE</i>                 | <i>IN</i>  | <i>OUT</i> | <i>TOTAL</i>        | <i>IN</i>  | <i>OUT</i> | <i>TOTAL</i> | <i>(2-way)</i> |
| <b>Weekday</b>                     |             |                |             |                            |            |            |                     |            |            |              |                |
| 488                                | 488.0       | 5              | fields      | Soccer Complex             | 4          | 3          | 7                   | 71         | 32         | 103          | 357            |
| 488                                | 488.1       | 5              | fields      | Soccer Complex (Factored)  | 5          | 4          | 9                   | 97         | 43         | 140          | 481            |
| 488                                | 488.2       | 5              | fields      | Soccer Complex (Max rates) | 5          | 4          | 9                   | 86         | 38         | 124          | 454            |
| 488                                | 488.3       | 5              | fields      | Soccer (Generator Max)     | 10         | 9          | 19                  | 44         | 89         | 133          | 454            |
| 412                                | 412.000     | 30.1005        | acres       | County Park                | 0          | 0          | 0                   | 1          | 1          | 2            | 69             |
| 412                                | 412.100     | 30.1005        | acres       | County Park (Max)          | 1          | 0          | 1                   | 1          | 1          | 2            | 1,608          |
| 412                                | 412.200     | 30.1005        | acres       | County Park (Generator)    | 11         | 5          | 16                  | 6          | 12         | 18           | 281            |
| 417                                | 417.000     | 30.1005        | acres       | Regional Park              | 0          | 0          | 0                   | 3          | 3          | 6            | 138            |
| 417                                | 417.100     | 30.1005        | acres       | Regional Park (Max)        | 0          | 0          | 0                   | 14         | 19         | 33           | 1,176          |
| 417                                | 417.200     | 30.1005        | acres       | Regional Park (Generator)  | 3          | 2          | 5                   | 4          | 4          | 8            | 439            |
| <b>Max Trips (Park)</b>            |             |                |             |                            | <b>10</b>  | <b>9</b>   | <b>19</b>           | <b>97</b>  | <b>43</b>  | <b>140</b>   | <b>1,608</b>   |
| <b>Average Trips (Soccer Park)</b> |             |                |             |                            | <b>6</b>   | <b>5</b>   | <b>11</b>           | <b>75</b>  | <b>50</b>  | <b>125</b>   | <b>437</b>     |
| <b>Average Trips (County Park)</b> |             |                |             |                            | <b>4</b>   | <b>2</b>   | <b>6</b>            | <b>3</b>   | <b>5</b>   | <b>7</b>     | <b>653</b>     |
| 90                                 | 90.2        | 250            | spaces      | Athletic Fields            | 10         | 9          | 19                  | 97         | 43         | 140          | 481            |
| Park & Ride Lot                    |             |                |             |                            | 146        | 34         | 180                 | 36         | 119        | 155          | 1,125          |
| <b>Total Trips (Proposed SPEX)</b> |             |                |             |                            | <b>156</b> | <b>43</b>  | <b>199</b>          | <b>133</b> | <b>162</b> | <b>295</b>   | <b>1,606</b>   |

| <i>Saturday</i>                        |             |                |             | <i>SAT PEAK HOUR</i>       |           |            | <i>SAT DAILY</i> |                |
|--|-------------|----------------|-------------|----------------------------|-----------|------------|------------------|----------------|
| <i>CODE</i>                            | <i>CODE</i> | <i>DENSITY</i> | <i>Var.</i> | <i>USE</i>                 | <i>IN</i> | <i>OUT</i> | <i>TOTAL</i>     | <i>(2-way)</i> |
| 488                                    | 488.400     | 5              | fields      | Soccer Complex (Sat)       | 0         | 0          | 0                | 587            |
| 488                                    | 488.800     | 5              | fields      | Soccer (Sat)               | 69        | 75         | 144              | 0              |
| 488                                    | 488.900     | 5              | fields      | Soccer (Sat Generator Max) | 81        | 87         | 168              | 0              |
| 412                                    | 412.300     | 30.1005        | acres       | County Park (Sat)          | 40        | 27         | 67               | 365            |
| 412                                    | 412.400     | 30.1005        | acres       | County Park (Sat Max)      | 57        | 39         | 96               | 745            |
| <b>Max Trips (Park)</b>                |             |                |             |                            | <b>81</b> | <b>87</b>  | <b>168</b>       | <b>745</b>     |
| <b>Average Trips (Park)</b>            |             |                |             |                            | <b>62</b> | <b>57</b>  | <b>119</b>       | <b>566</b>     |
| 5 fields ^^ Athletic Fields (Saturday) |             |                |             |                            | 81        | 87         | 168              | 1,200          |
| 250 spaces Park and Ride (Saturday)    |             |                |             |                            | 0         | 0          | 0                | 0              |
| <b>Total Trips (Proposed SPEX)</b>     |             |                |             |                            | <b>81</b> | <b>87</b>  | <b>168</b>       | <b>1,200</b>   |

| <i>Effective Trip Rates (3)</i> | <i>ITE Land Use Code</i>      | <i>Trip rate per</i> | <i>AM Peak Hour</i> |                  | <i>PM Peak Hour</i> |                  | <i>Daily</i>           |
|---------------------------------|-------------------------------|----------------------|---------------------|------------------|---------------------|------------------|------------------------|
|                                 |                               |                      | <i>(2-way)</i>      | <i>Inbound %</i> | <i>(2-way)</i>      | <i>Inbound %</i> | <i>Weekday (2-way)</i> |
|                                 | Athletic Fields               | fields               | 3.80                | 53%              | 28.00               | 69%              | 96.20                  |
|                                 | 90 Park & Ride Lot            | spaces               | 0.72                | 81%              | 0.62                | 23%              | 4.50                   |
|                                 | Athletic Fields (Saturday)    | fields               |                     |                  | 33.60               | 48%              | 240.00                 |
|                                 | 488 Soccer Complex            | fields               | 1.40                | 57%              | 20.60               | 69%              | 71.40                  |
|                                 | 488 Soccer Complex (Sat)      | fields               |                     |                  | 28.80               | 48%              | 117.40                 |
|                                 | 412 County Park               | acres                | 0.00                |                  | 0.07                | 50%              | 2.29                   |
|                                 | 417 Regional Park (Generator) | acres                | 0.17                | 60%              | 0.27                | 50%              | 14.58                  |

**TRIP RATE SOURCE:**

Trip Generation Manual (8th Edition), Institute of Transportation Engineers: 2008.

Average trip rates used, unless noted with \* then equations used

(1) ITE Land Code shown as the first 3 digits. Decimal shown for internal use by PHR+A for lookup table for trip rate variable.

^^ Saturday Average of max trips and average soccer park, derived based on K=0.14 to allow for peak use at 4.0 trips/space

Trip rate calculation = 2-way Trips (In + Out) / (Density) ; % inbound = trips in / (Total Peak Hour Trips)

(3) Effective trip rates calculated by land use:

For average rates =

For ITE equations =

\*\*

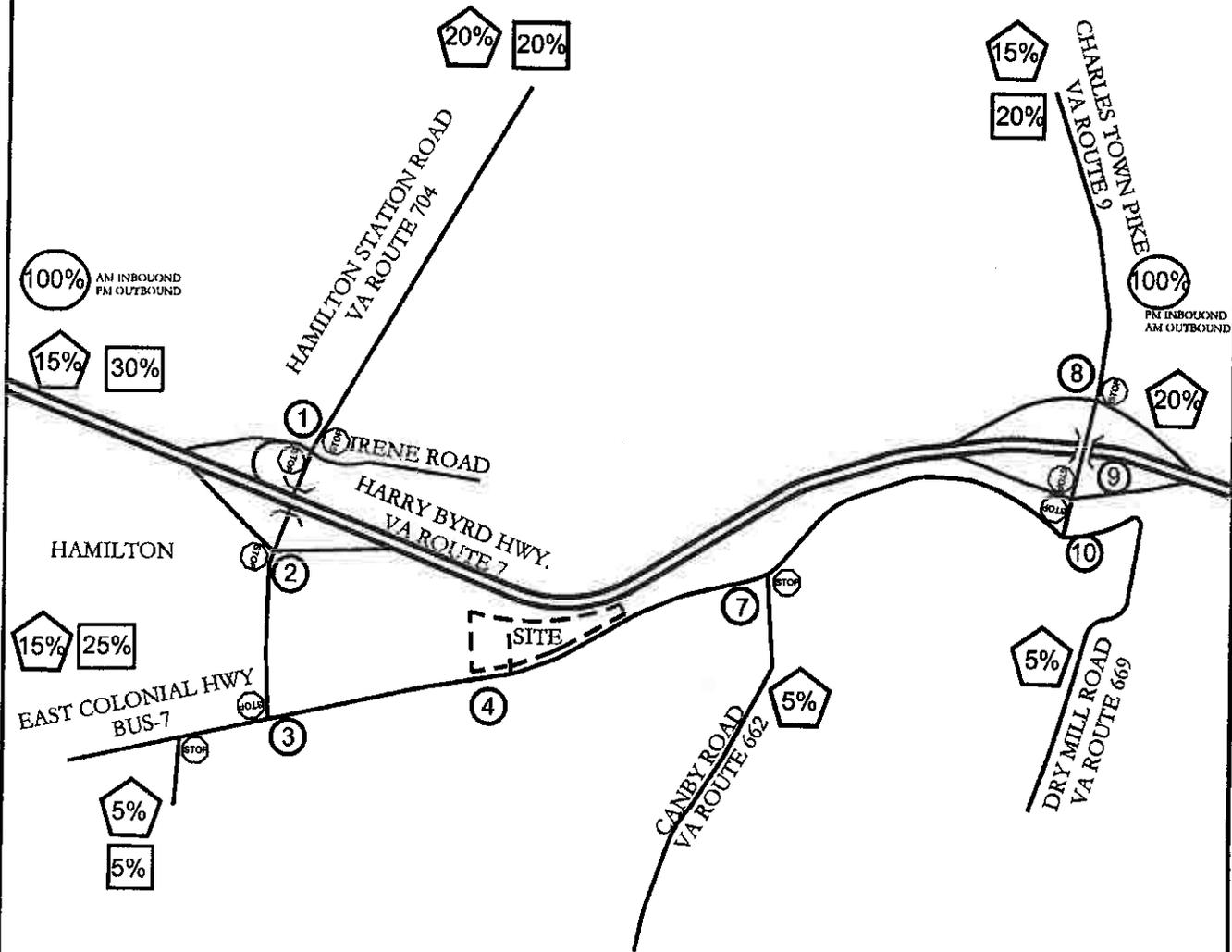
Trip Rate equations used to determine trips, effective rate Shown

Density \* ave. trip rate = 2-way Trips ; \* inbound percentage for Trips In

Density \* trip equation = 2-way Trips ; \* inbound percentage for Trips In



Not to Scale



**DISTRIBUTIONS**

-  RECREATIONAL % IN/OUT
-  PARK AND RIDE % IN/OUT
-  BUS TRIP DISTRIBUTIONS

NOTE:  
 INBOUND/OUTBOUND TRIPS DISTRIBUTIONS  
 FOR BUSES VARY BASED ON TIME OF DAY.  
 SEE APPENDIX FOR DETAILED DISTRIBUTIONS.

**LEGEND**

-  INTERSECTION NUMBER
-  FUTURE SITE DRIVEWAY
-  STOP SIGN
-  INTERCHANGE BRIDGE



Site Trip Distributions  
 Scott Jenkins Memorial Park

**FIGURE 11**  
 February 2009  
 1360W-2-D

**Background 2010 Intersection Level of Service**

| Scenario  |            | 2010               |       | 2010               |       | 2010                |       |
|---|------------|--------------------|-------|--------------------|-------|---------------------|-------|
| Intersection  | Lane Group | AM Peak Background |       | PM Peak Background |       | Sat Peak Background |       |
|   |            | LOS                | Delay | LOS                | Delay | LOS                 | Delay |
| 1 VA RT 7 N Ramps/Irene Rd/Hamilton Station Rd<br><i>Unsignalized</i> | EBLTR      | B                  | 10.2  | A                  | 9.9   | A                   | 9.7   |
|   | EB         | B                  | 10.2  | A                  | 9.9   | A                   | 9.7   |
|   | WBLTR      | B                  | 12.6  | B                  | 13.7  | B                   | 11    |
|   | WB         | B                  | 12.6  | B                  | 13.7  | B                   | 11    |
|   | NBLTR      | A                  | 2     | A                  | 2.9   | A                   | 1     |
|   | NB         | A                  | 2     | A                  | 2.9   | A                   | 1     |
|   | SBLT       | A                  | 0.1   | A                  | 0.4   | A                   | 0.7   |
| 2 VA RT 7 S Ramps/Hamilton Station Rd<br><i>Unsignalized</i>          | EBLTR      | B                  | 12.7  | B                  | 12    | B                   | 10.2  |
|   | EB         | B                  | 12.7  | B                  | 12    | B                   | 10.2  |
|   | SBLT       | A                  | 3.8   | A                  | 0.6   | A                   | 0.9   |
|   | SB         | A                  | 3.8   | A                  | 0.6   | A                   | 0.9   |
| 3 E Colonial Hwy/Hamilton Station Rd<br><i>Unsignalized</i>           | EBLT       | A                  | 1.9   | A                  | 6.2   | A                   | 3.8   |
|   | EB         | A                  | 1.9   | A                  | 6.2   | A                   | 3.8   |
|   | SBLR       | B                  | 13    | B                  | 13.3  | B                   | 10.2  |
|   | SB         | B                  | 13    | B                  | 13.3  | B                   | 10.2  |
| 7 E Colonial Hwy/Canby Road<br><i>Unsignalized</i>                    | WBLT       | A                  | 0.4   | A                  | 0.3   | A                   | 0.8   |
|   | WB         | A                  | 0.4   | A                  | 0.3   | A                   | 0.8   |
|   | NBLR       | B                  | 14.3  | B                  | 11    | A                   | 9.9   |
|   | NB         | B                  | 14.3  | B                  | 11    | A                   | 9.9   |
| 8 VA RT 7 N Ramps/VA RT 9<br><i>Unsignalized</i>                      | WBLTR      | B                  | 13    | F                  | 679.1 | C                   | 22.6  |
|   | WB         | B                  | 13    | F                  | 679.1 | C                   | 22.6  |
|   | NBL        | B                  | 12.9  | A                  | 8.8   | A                   | 9.2   |
| 9 VA RT 7 S Ramps/VA RT 9<br><i>Unsignalized</i>                      | EBLTR      | F                  | N/A   | F                  | 64.8  | F                   | 88.3  |
|   | EB         | F                  | N/A   | F                  | 64.8  | F                   | 88.3  |
|   | SBL        | F                  | 60.7  | B                  | 10.8  | B                   | 10.2  |
| 10 E Colonial Hwy/Dry Mill Rd/VA RT 9<br><i>Unsignalized</i>          | EBLT       | A                  | 5.2   | A                  | 7.5   | A                   | 5.7   |
|   | SBL        | F                  | 105.8 | C                  | 16.2  | B                   | 12.3  |
|   | SBR        | A                  | 8.6   | B                  | 13    | A                   | 8.8   |
|   | SB         | F                  | 92.4  | B                  | 13.5  | A                   | 9.9   |

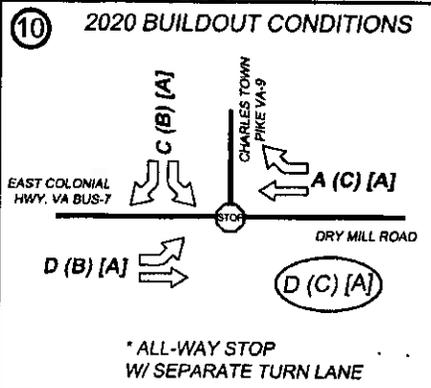
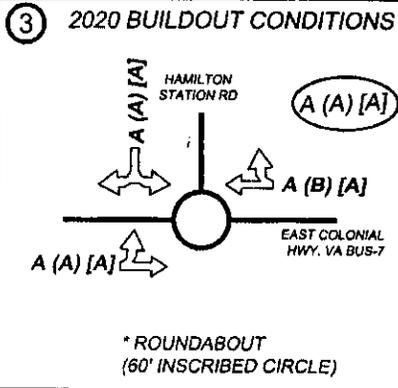
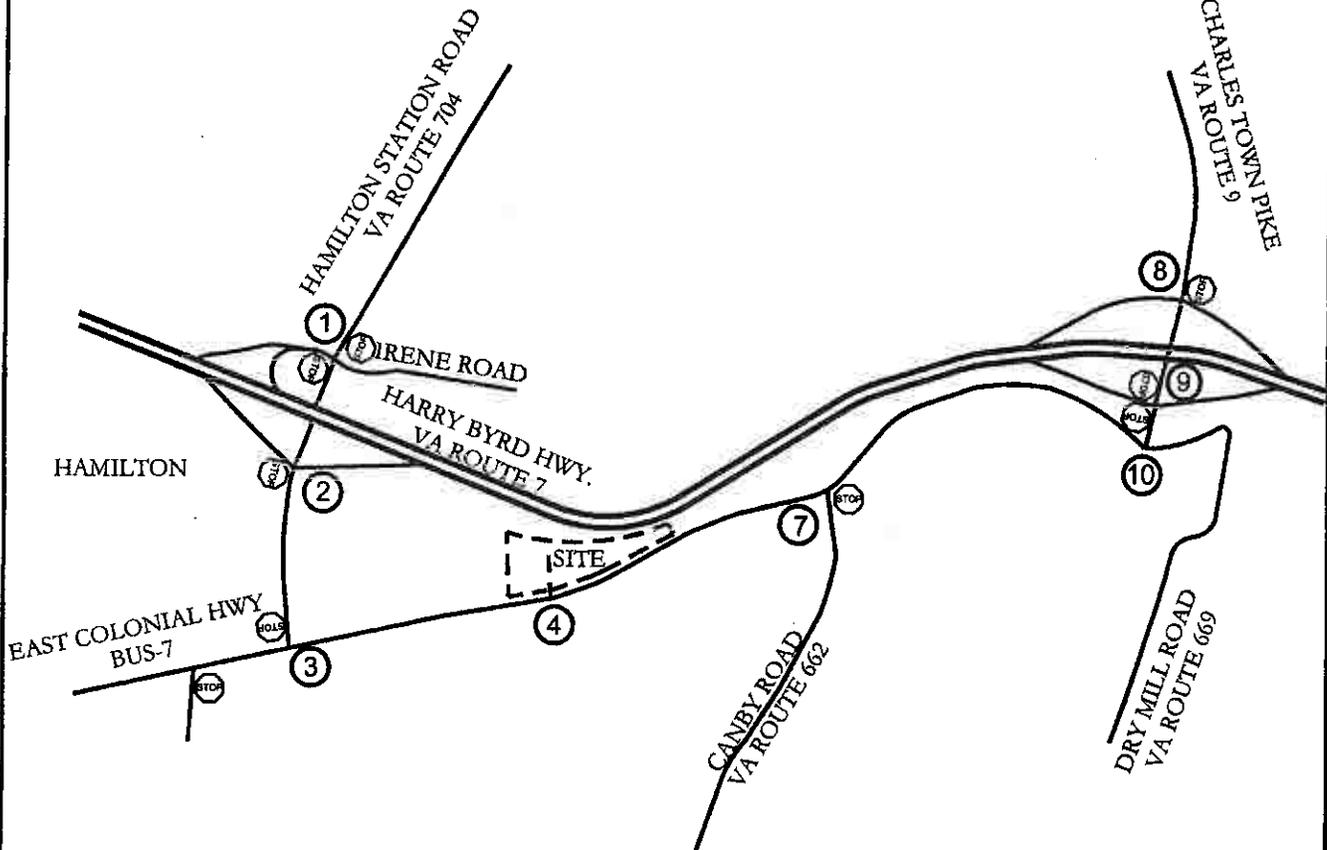
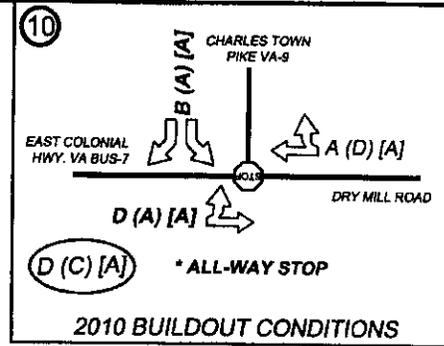
**Total 2010 Intersection Level of Service**

| Scenario   |            | 2010          |       | 2010          |       | 2010           |       |
|--|------------|---------------|-------|---------------|-------|----------------|-------|
| Intersection   | Lane Group | AM Peak Total |       | PM Peak Total |       | Sat Peak Total |       |
|  |            | LOS           | Delay | LOS           | Delay | LOS            | Delay |
| 1 VA RT 7 N<br>Ramps/Irene<br>Rd/Hamilton<br>Station Rd<br><br><i>Unsignalized</i> | EBLTR      | B             | 10.5  | B             | 10.3  | A              | 9.8   |
|  | EB         | B             | 10.5  | B             | 10.3  | A              | 9.8   |
|  | WBLTR      | B             | 13.3  | C             | 16    | B              | 11.2  |
|  | WB         | B             | 13.3  | C             | 16    | B              | 11.2  |
|  | NBLTR      | A             | 2.4   | A             | 3.7   | A              | 1.2   |
|  | NB         | A             | 2.4   | A             | 3.7   | A              | 1.2   |
|  | SBLT       | A             | 0.1   | A             | 0.3   | A              | 0.6   |
| 2 VA RT 7 S<br>Ramps/Hamilton<br>Station Rd<br><br><i>Unsignalized</i>             | EBLTR      | B             | 13    | B             | 12.8  | B              | 10.2  |
|  | EB         | B             | 13    | B             | 12.8  | B              | 10.2  |
|  | SBLT       | A             | 3.5   | A             | 0.6   | A              | 0.9   |
|  | SB         | A             | 3.5   | A             | 0.6   | A              | 0.9   |
| 3 E Colonial<br>Hwy/Hamilton<br>Station Rd<br><br><i>Unsignalized</i>              | EBLT       | A             | 1.8   | A             | 6.4   | A              | 3.7   |
|  | EB         | A             | 1.8   | A             | 6.4   | A              | 3.7   |
|  | SBLR       | C             | 22.4  | C             | 16.9  | B              | 10.6  |
|  | SB         | C             | 22.4  | C             | 16.9  | B              | 10.6  |
| 4 E Colonial<br>Hwy/Site<br>Entrance<br><br><i>Unsignalized</i>                    | EBL        | A             | 7.6   | A             | 8.2   | A              | 7.4   |
|  | SBL        | C             | 23.8  | B             | 13    | B              | 10.7  |
|  | SBR        | A             | 8.7   | B             | 11.5  | A              | 8.8   |
|  | SB         | B             | 13.7  | B             | 11.8  | A              | 9.5   |
| 5 Site<br>Entrance/Bus<br>Access<br><br><i>Unsignalized</i>                        | WBLR       | A             | 9.5   | A             | 9.5   | A              | 0     |
|  | WB         | A             | 9.5   | A             | 9.5   | A              | 0     |
| 6 Site<br>Entrance/Kiss &<br>Ride Access<br><br><i>Unsignalized</i>                | WBLR       | A             | 9     | A             | 9.3   | A              | 0     |
|  | WB         | A             | 9     | A             | 9.3   | A              | 0     |
|  | SBLT       | A             | 0     | A             | 0     | A              | 0     |
| 7 E Colonial<br>Hwy/Canby<br>Road<br><br><i>Unsignalized</i>                       | WBLT       | A             | 0.3   | A             | 0.3   | A              | 0.7   |
|  | WB         | A             | 0.3   | A             | 0.3   | A              | 0.7   |
|  | NBLR       | B             | 14.8  | B             | 11.5  | A              | 10    |
|  | NB         | B             | 14.8  | B             | 11.5  | A              | 10    |
| 8 VA RT 7 N<br>Ramps/VA RT 9<br><br><i>Unsignalized</i>                            | WBLTR      | B             | 13.2  | F             | 743.7 | C              | 23.4  |
|  | WB         | B             | 13.2  | F             | 743.7 | C              | 23.4  |
|  | NBL        | B             | 13.1  | A             | 9.1   | A              | 9.2   |
| 9 VA RT 7 S<br>Ramps/VA RT 9<br><br><i>Unsignalized</i>                            | EBLTR      | F             | N/A   | F             | 72.3  | F              | 90.6  |
|  | EB         | F             | N/A   | F             | 72.3  | F              | 90.6  |
|  | SBL        | F             | 63.6  | B             | 11    | B              | 10.3  |
| 10 E Colonial<br>Hwy/Dry Mill<br>Rd/VA RT 9<br><br><i>Unsignalized</i>             | EBLT       | A             | 5.3   | A             | 8.2   | A              | 5.8   |
|  | SBL        | F             | 117.3 | C             | 17.5  | B              | 12.5  |
|  | SBR        | A             | 8.8   | B             | 13.8  | A              | 8.9   |
|  | SB         | F             | 89    | B             | 14.2  | A              | 9.9   |



Not to Scale

\* For site intersection 4 E Colonial Highway/Site Driveway  
Please see Figure 14 for lane configuration and Table 8A/8B for Level of Service.



**LEGEND**

- ① INTERSECTION NUMBERS
- ↔↔↔ LANE CONFIGURATION
- STOP STOP SIGN
- XXX (XXX) [XXX] AM (PM) [SAT] PEAK HOUR APPROACH LEVEL OF SERVICE
- X (X) [X] AM (PM) [SAT] OVERALL INTERSECTION LEVEL OF SERVICE



Mitigation Measures  
Scott Jenkins Memorial Park

**FIGURE 18**  
February 2009  
1.301b-211

**Total (2010) Left Turn Warrant @ E Colonial Hwy/Site Driveway**

**Design Year: 2010 - Design Speed 50MPH**

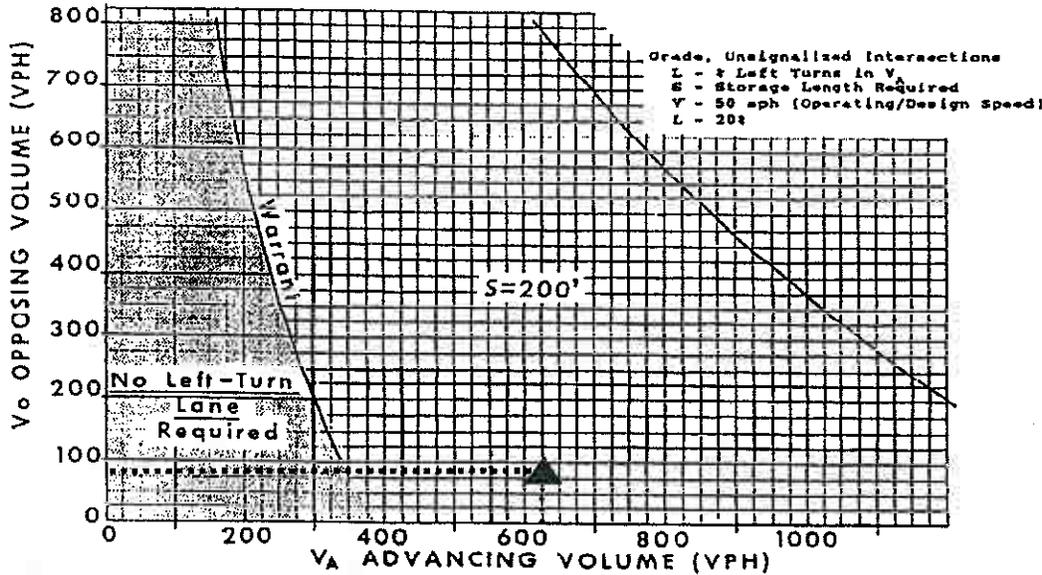


FIGURE C-1-1.11

|                       |                            |                |                |
|-----------------------|----------------------------|----------------|----------------|
|                       | <b>Peak Hour:</b>          | <b>AM</b> ▲    | <b>PM</b> ◆    |
| <b>E Colonial Hwy</b> | <b>Advancing Vol (Va):</b> | <b>624 VPH</b> | <b>131 VPH</b> |
| <b>Advancing - EB</b> | <b>Opposing Vol (Vo):</b>  | <b>86 VPH</b>  | <b>360 VPH</b> |
| <b>Opposing - WB</b>  | <b>Left Turns:</b>         | <b>113 VPH</b> | <b>34 VPH</b>  |
|                       | <b>% Left Turns (L):</b>   | <b>18.1%</b>   | <b>26.0%</b>   |

Figure Source: VDOT Road Design Manual, Calculations by PHR+A

**Left Turn Lane Warrant - Satisfied**

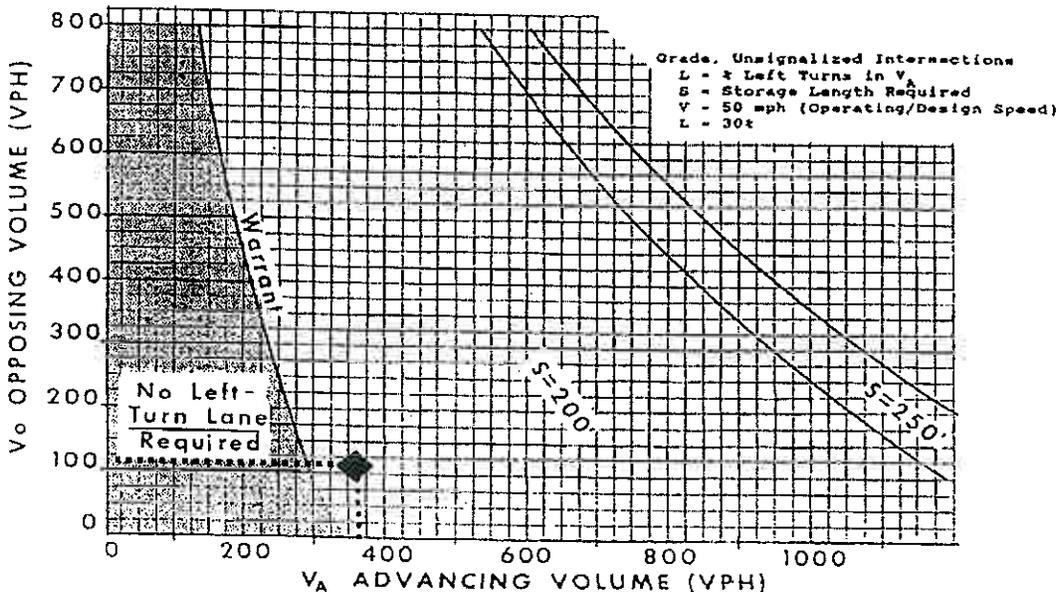
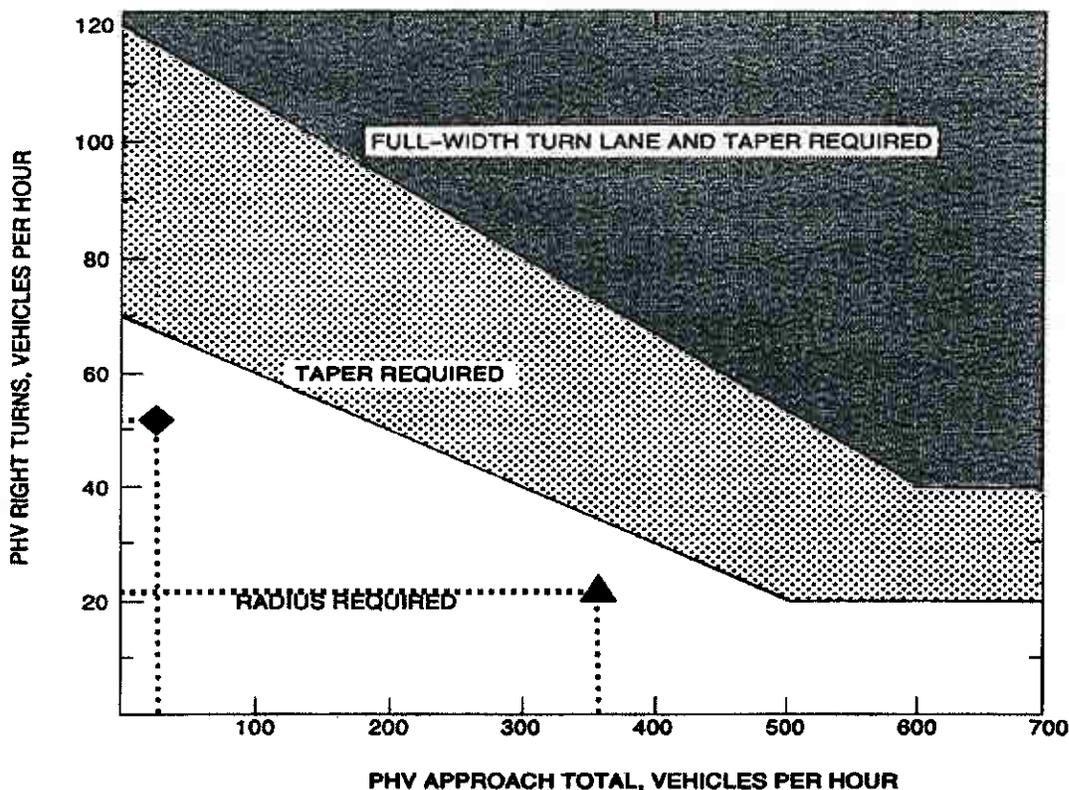


FIGURE C-1-1.12

**Total (2010) Right Turn Warrant @ E Colonial Hwy/Site Driveway**

Design Year: 2010



|   |                   |             |             |
|---|-------------------|-------------|-------------|
|   | <b>Peak Hour:</b> | <b>AM ▲</b> | <b>PM ◆</b> |
| <b>E Colonial Hwy Westbound Approach:</b> | 51 VPH            |             | 360 VPH     |
| <b>Right Turns</b>                        | 35 VPH            |             | 21 VPH      |
| <b>% Right Turns</b>                      | 68.6%             |             | 5.8%        |

Figure Source: VDOT Road Design Manual, Calculations by PHR+A

**Right Turn Lane Warrant - Not Satisfied**

**LEGEND**

PHV - Peak Hour Volume (also Design Hourly Volume equivalent)

**Adjustment for Right Turns**

For posted speeds at or under 70 km/h (45 mph), PHV right turns > 40, and PHV total < 300.

Adjusted right turns - PHV Right Turns - 20

If PHV is not known use formula:  $PHV = ADT \times K \times D$

K = the percent of AADT occurring in the peak hour  
D = the percent of traffic in the peak direction of flow

Note: An average of 11% for K x D will suffice.

FIGURE C-1-8 GUIDELINES FOR RIGHT TURN TREATMENT (2-LANE HIGHWAY)

**Table 10**  
**Turn Lane Calculations**

**Site Entrance on Business Route 7**  
Turn Bay Length Requirements and Accommodations

| Location                                       | Storage Length (95% Queue)* | Deceleration Length | Taper   | Maximum Length (Storage + Deceleration + Taper) | Alternative Length (Storage + Deceleration) | Provided** | Comments               |
|--|-----------------------------|---------------------|---------|---|---|------------|------------------------|
| <b>East Colonial Hwy/Site Entrance</b>         |                             |                     |         |   |   |            |                        |
| <b>Design Speed</b>                            |                             | 55 MPH              |         |   |   |            |                        |
| EBL  | 100 ft.                     | 485 ft.             | 180 ft. | 765 ft.   | 585 ft.                                     | 510 ft.    | Substandard @ 55 MPH   |
| WBR  | 25 ft.                      | 485 ft.             | 180 ft. | 690 ft.   | 510 ft.                                     | 600 ft.    | Substandard @ 55 MPH   |
| <b>Site Entrance</b>                           |                             |                     |         |   |   |            |                        |
| SBL  | 40 ft.                      | 170                 | 0       | 210 ft.   | 210 ft.                                     | 120 ft.    | Substandard @ < 30 MPH |
| SBR  | 25 ft.                      | 170                 | 100     | 295 ft.   | 195 ft.                                     | 120 ft.    | Substandard @ < 30 MPH |
| <b>Transition Left turn lane @ MUTCD shift</b> |                             |                     |         |   |   |            |                        |
| EBL  |                             |                     | 600     |   |   | 600 ft.    |                        |

\*\*Taper included in Deceleration Length.

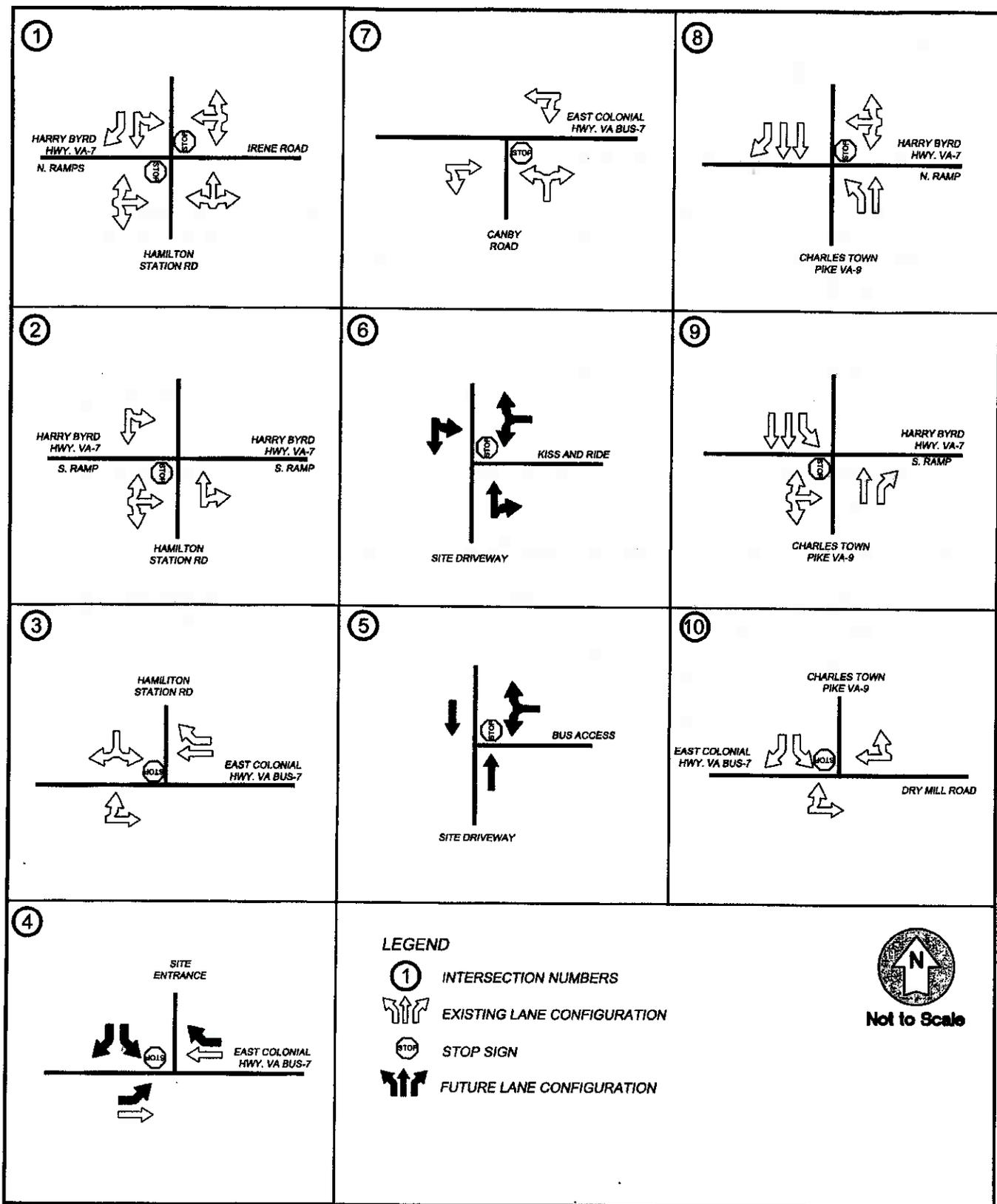
600 ft. Substandard Provided vs. Alternative Storage length

| Location                                       | Storage Length (95% Queue)* | Deceleration Length | Taper   | Maximum Length (Storage + Deceleration + Taper) | Alternative Length (Storage + Deceleration) | Provided** | Comments   |
|--|-----------------------------|---------------------|---------|---|---|------------|--|
| <b>East Colonial Hwy/Site Entrance</b>         |                             |                     |         |   |   |            |  |
| <b>Design Speed</b>                            |                             | 50 MPH              |         |   |   |            |  |
| WBL  | 100 ft.                     | 410 ft.             | 180 ft. | 690 ft.   | 510 ft.                                     | 510 ft.    | Proposed Design Speed Reduction from 55 MPH, proximity to Town, State Scenic Hwy |
| EBR  | 25 ft.                      | 410 ft.             | 180 ft. | 615 ft.   | 435 ft.                                     | 600 ft.    |  |
| <b>Site Entrance</b>                           |                             |                     |         |   |   |            |  |
| SBL  | 40 ft.                      | 170                 | 0       | 210 ft.   | 210 ft.                                     | 120 ft.    | Substandard @ < 30 MPH   |
| SBR  | 25 ft.                      | 170                 | 100     | 295 ft.   | 195 ft.                                     | 120 ft.    | Substandard @ < 30 MPH   |
| <b>Transition Left turn lane @ MUTCD shift</b> |                             |                     |         |   |   |            |  |
| EBL  |                             |                     | 600     |   |   | 600 ft.    |  |

| Location                               | Storage Length (95% Queue)* | Deceleration Length | Taper   | Maximum Length (Storage + Deceleration + Taper) | Alternative Length (Storage + Deceleration) | Provided** | Comments |
|--|-----------------------------|---------------------|---------|---|---|------------|----------|
| <b>East Colonial Hwy/Site Entrance</b> |                             |                     |         |   |   |            |          |
| <b>Design Speed</b>                    |                             | 50 MPH              |         |   |   |            |          |
| WBL                                    | 100 ft.                     | 350 ft.             | 100 ft. | 550 ft.   | 450 ft.                                     | 510 ft.    |          |
| EBR                                    | 25 ft.                      | 350 ft.             | 100 ft. | 475 ft.   | 375 ft.                                     | 600 ft.    |          |

Left Turns In AM 156 Actual Distribution (Park&Ride/Fields) 75.6%

Left Turns Out AM 162 Actual Distribution (Park&Ride/Fields) 24.1%



**Future Roadway Lane Geometry**  
**Scott Jenkins Memorial Park**

**FIGURE 14**  
 February 2009  
 130/8-2 e

Background 2020 Intersection Level of Service

| Scenario   |            | 2020               |              | 2020               |               | 2020                |              |
|--|------------|--------------------|--------------|--------------------|---------------|---------------------|--------------|
| Intersection   | Lane Group | AM Peak Background |              | PM Peak Background |               | Sat Peak Background |              |
|  |            | LOS                | Delay        | LOS                | Delay         | LOS                 | Delay        |
| 1 VA RT 7 N<br>Ramps/Irene<br>Rd/Hamilton<br>Station Rd<br><br><i>Unsignalized</i> | EBLTR      | B                  | 11.5         | B                  | 11.3          | B                   | 10.5         |
|  | <b>EB</b>  | <b>B</b>           | <b>11.5</b>  | <b>B</b>           | <b>11.3</b>   | <b>B</b>            | <b>10.5</b>  |
|  | WBLTR      | C                  | 16.1         | C                  | 18.7          | B                   | 12.9         |
|  | <b>WB</b>  | <b>C</b>           | <b>16.1</b>  | <b>C</b>           | <b>18.7</b>   | <b>B</b>            | <b>12.9</b>  |
|  | NBLTR      | A                  | 2.1          | A                  | 3.1           | A                   | 1.1          |
|  | <b>NB</b>  | <b>A</b>           | <b>2.1</b>   | <b>A</b>           | <b>3.1</b>    | <b>A</b>            | <b>1.1</b>   |
|  | SBLT       | A                  | 0.2          | A                  | 0.4           | A                   | 0.7          |
| 2 VA RT 7 S<br>Ramps/Hamilton<br>Station Rd<br><i>Unsignalized</i>                 | EBLTR      | C                  | 18.7         | C                  | 15.7          | B                   | 11.3         |
|  | <b>EB</b>  | <b>C</b>           | <b>18.7</b>  | <b>C</b>           | <b>15.7</b>   | <b>B</b>            | <b>11.3</b>  |
|  | SBLT       | A                  | 4.1          | A                  | 0.6           | A                   | 1            |
|  | <b>SB</b>  | <b>A</b>           | <b>4.1</b>   | <b>A</b>           | <b>0.6</b>    | <b>A</b>            | <b>1</b>     |
| 3 E Colonial<br>Hwy/Hamilton<br>Station Rd<br><i>Unsignalized</i>                  | EBLT       | A                  | 2.5          | A                  | 7.6           | A                   | 4.2          |
|  | <b>EB</b>  | <b>A</b>           | <b>2.5</b>   | <b>A</b>           | <b>7.6</b>    | <b>A</b>            | <b>4.2</b>   |
|  | SBLR       | D                  | 26.2         | C                  | 23.4          | B                   | 12           |
|  | <b>SB</b>  | <b>D</b>           | <b>26.2</b>  | <b>C</b>           | <b>23.4</b>   | <b>B</b>            | <b>12</b>    |
| 7 E Colonial<br>Hwy/Canby<br>Road<br><i>Unsignalized</i>                           | WBLT       | A                  | 0.5          | A                  | 0.3           | A                   | 0.8          |
|  | <b>WB</b>  | <b>A</b>           | <b>0.5</b>   | <b>A</b>           | <b>0.3</b>    | <b>A</b>            | <b>0.8</b>   |
|  | NBLR       | C                  | 18.9         | B                  | 12.7          | A                   | 10.7         |
|  | <b>NB</b>  | <b>C</b>           | <b>18.9</b>  | <b>B</b>           | <b>12.7</b>   | <b>A</b>            | <b>10.7</b>  |
| 8 VA RT 7 N<br>Ramps/VA RT 9<br><i>Unsignalized</i>                                | WBLTR      | D                  | 28.7         | F                  | N/A           | F                   | 155.3        |
|  | <b>WB</b>  | <b>D</b>           | <b>28.7</b>  | <b>F</b>           | <b>N/A</b>    | <b>F</b>            | <b>155.3</b> |
|  | NBL        | C                  | 20.1         | A                  | 9.9           | B                   | 10.6         |
| 9 VA RT 7 S<br>Ramps/VA RT 9<br><i>Unsignalized</i>                                | EBLTR      | F                  | N/A          | F                  | 1061.3        | F                   | N/A          |
|  | <b>EB</b>  | <b>F</b>           | <b>N/A</b>   | <b>F</b>           | <b>1061.3</b> | <b>F</b>            | <b>N/A</b>   |
|  | SBL        | F                  | 364.2        | C                  | 18.7          | C                   | 17.8         |
| 10 E Colonial<br>Hwy/Dry Mill<br>Rd/VA RT 9<br><i>Unsignalized</i>                 | EBLT       | A                  | 6            | A                  | 9.3           | A                   | 6            |
|  | SBL        | F                  | 881.6        | C                  | 24.8          | C                   | 15.6         |
|  | SBR        | A                  | 8.7          | C                  | 17.4          | A                   | 9.1          |
|  | <b>SB</b>  | <b>F</b>           | <b>760.5</b> | <b>C</b>           | <b>18.6</b>   | <b>B</b>            | <b>11.1</b>  |

**Total 2020 Intersection Level of Service**

| Scenario  |            | 2020          |       | 2020          |        | 2020           |       |
|---|------------|---------------|-------|---------------|--------|----------------|-------|
| Intersection  | Lane Group | AM Peak Total |       | PM Peak Total |        | Sat Peak Total |       |
|   |            | LOS           | Delay | LOS           | Delay  | LOS            | Delay |
| 1 VA RT 7 N Ramps/Irene Rd/Hamilton Station Rd<br><i>Unsignalized</i> | EBLTR      | B             | 11.9  | B             | 12.4   | B              | 10.9  |
|   | EB         | B             | 11.9  | B             | 12.4   | B              | 10.9  |
|   | WBLTR      | C             | 17.3  | C             | 24.7   | B              | 13.9  |
|   | WB         | C             | 17.3  | C             | 24.7   | B              | 13.9  |
|   | NBLTR      | A             | 2.5   | A             | 3.8    | A              | 1.5   |
|   | NB         | A             | 2.5   | A             | 3.8    | A              | 1.5   |
|   | SBLT       | A             | 0.1   | A             | 0.3    | A              | 0.6   |
| 2 VA RT 7 S Ramps/Hamilton Station Rd<br><i>Unsignalized</i>          | EBLTR      | C             | 20.2  | C             | 17.9   | B              | 11.5  |
|   | EB         | C             | 20.2  | C             | 17.9   | B              | 11.5  |
|   | SBLT       | A             | 4     | A             | 0.6    | A              | 0.9   |
|   | SB         | A             | 4     | A             | 0.6    | A              | 0.9   |
| 3 E Colonial Hwy/Hamilton Station Rd<br><i>Unsignalized</i>           | EBLT       | A             | 2.5   | A             | 8.2    | A              | 4.3   |
|   | EB         | A             | 2.5   | A             | 8.2    | A              | 4.3   |
|   | SBLR       | F             | 141.8 | F             | 140.9  | C              | 16.6  |
|   | SB         | F             | 141.8 | F             | 140.9  | C              | 16.6  |
| 4 E Colonial Hwy/Site Entrance<br><i>Unsignalized</i>                 | EBL        | A             | 7.7   | A             | 9      | A              | 7.7   |
|   | SBL        | E             | 35.4  | C             | 19.3   | B              | 13.3  |
|   | SBR        | A             | 8.8   | B             | 14     | A              | 9.2   |
|   | SB         | C             | 18.1  | C             | 15.3   | B              | 10.9  |
| 5 Site Entrance/Bus Access<br><i>Unsignalized</i>                     | WBLR       | A             | 9.6   | B             | 10.3   | A              | 0     |
|   | WB         | A             | 9.6   | B             | 10.3   | A              | 0     |
| 6 Site Entrance/Kiss & Ride Access<br><i>Unsignalized</i>             | WBLR       | A             | 9.1   | B             | 10.1   | A              | 0     |
|   | WB         | A             | 9.1   | B             | 10.1   | A              | 0     |
|   | SBLT       | A             | 0     | A             | 0      | A              | 0     |
| 7 E Colonial Hwy/Canby Road<br><i>Unsignalized</i>                    | WBLT       | A             | 0.3   | A             | 0.3    | A              | 0.6   |
|   | WB         | A             | 0.3   | A             | 0.3    | A              | 0.6   |
|   | NBLR       | C             | 19.9  | B             | 14.3   | B              | 11.3  |
|   | NB         | C             | 19.9  | B             | 14.3   | B              | 11.3  |
| 8 VA RT 7 N Ramps/VA RT 9<br><i>Unsignalized</i>                      | WBLTR      | D             | 32.6  | F             | N/A    | F              | 183.5 |
|   | WB         | D             | 32.6  | F             | N/A    | F              | 183.5 |
|   | NBL        | C             | 20.5  | B             | 10.5   | B              | 10.7  |
| 9 VA RT 7 S Ramps/VA RT 9<br><i>Unsignalized</i>                      | EBLTR      | F             | N/A   | F             | 1390.5 | F              | N/A   |
|   | EB         | F             | N/A   | F             | 1390.5 | F              | N/A   |
|   | SBL        | F             | 374.7 | C             | 20.8   | C              | 19.2  |
| 10 E Colonial Hwy/Dry Mill Rd/VA RT 9<br><i>Unsignalized</i>          | EBLT       | A             | 6.2   | B             | 10.3   | A              | 6.2   |
|   | SBL        | F             | 955.6 | D             | 29.2   | C              | 16.8  |
|   | SBR        | A             | 9     | C             | 20.8   | A              | 9.2   |
|   | SB         | F             | 737.4 | C             | 21.7   | B              | 11    |