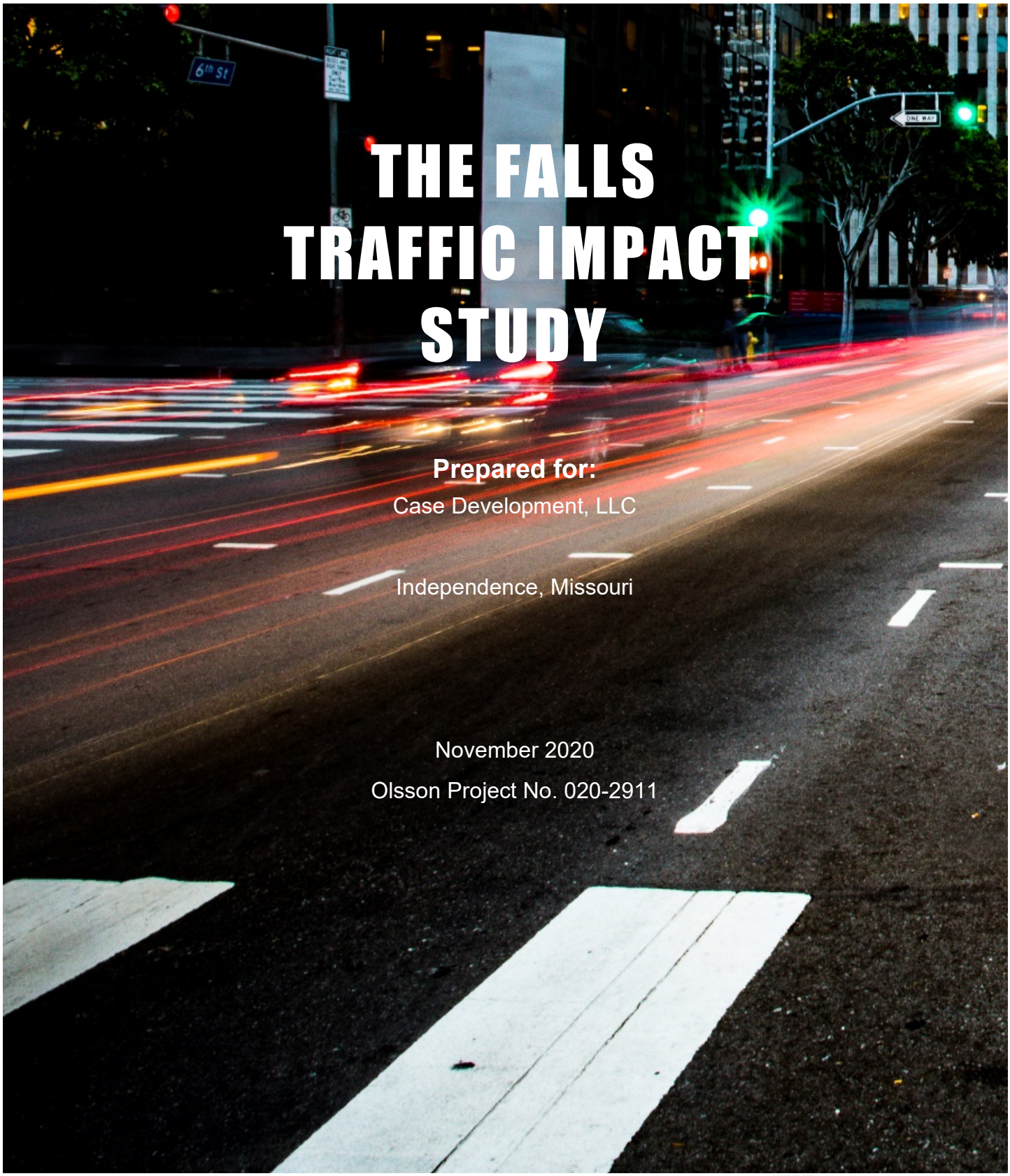

THE FALLS TRAFFIC IMPACT STUDY

Prepared for:

Case Development, LLC

Independence, Missouri

November 2020

Olsson Project No. 020-2911

olsson

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APPENDICES

1. INTRODUCTION

This report studies traffic impacts regarding a proposed multi-family development generally located in the southwest quadrant of I-70 and I-470 on the west side of Bass Pro Shops in Independence, Missouri.

This report will review the impacts of the proposed development on the existing roadway network and will recommend additional turn lanes, storage bays, and intersection control methods per Missouri Department of Transportation's (MoDOT's) Engineering Policy Guide (EPG), as appropriate for the following study intersections:

- Bass Pro Drive and Bluff Drive West
- Bass Pro Drive and Bluff Drive East
- Lee's Summit Road and Bass Pro Drive
- Bass Pro Drive and 46th Terrace
- All proposed site driveways, as appropriate

For this study, the following scenarios were analyzed:

- Existing Conditions
- Existing Plus Development Conditions
- Future Year 2040 Conditions

The approximate location of the development is show on the vicinity map, **Figure 1**.

FIGURE 1
Vicinity Map

The Falls Residential Development
Independence, MO

LEGEND

Site Location

2. DATA COLLECTION

The data collection effort included acquiring peak hour turning movement counts and intersection signal timings, as well as a documentation of current roadway geometrics. Traffic counts were collected on Tuesday, October 6th, 2020 at all study intersections listed in **Section 1.0**.

The counts were conducted during the typical weekday AM and PM peak periods from 7:00-9:00 AM and 4:00-6:00 PM. The AM peak hour period for the study intersections was determined to be from 8:00-9:00 AM. The PM peak hour period for the study intersections varied slightly between 4:45-6:15 PM.

Traffic counts were collected during the COVID-19 pandemic. Due to the pandemic, travel patterns along Kansas City metropolitan roadways have been impacted. 24-hour count data was collected along Lee's Summit Road to establish current average daily travel (ADT) volumes. This data was compared to data available from MoDOT. Based on a review of this data and discussions with City staff on the impact of COVID-19 restrictions on current travel patterns in this area, existing traffic volumes were increased by 10%. This adjustment was made to all turning movement volumes for both the AM and PM peak hour periods.

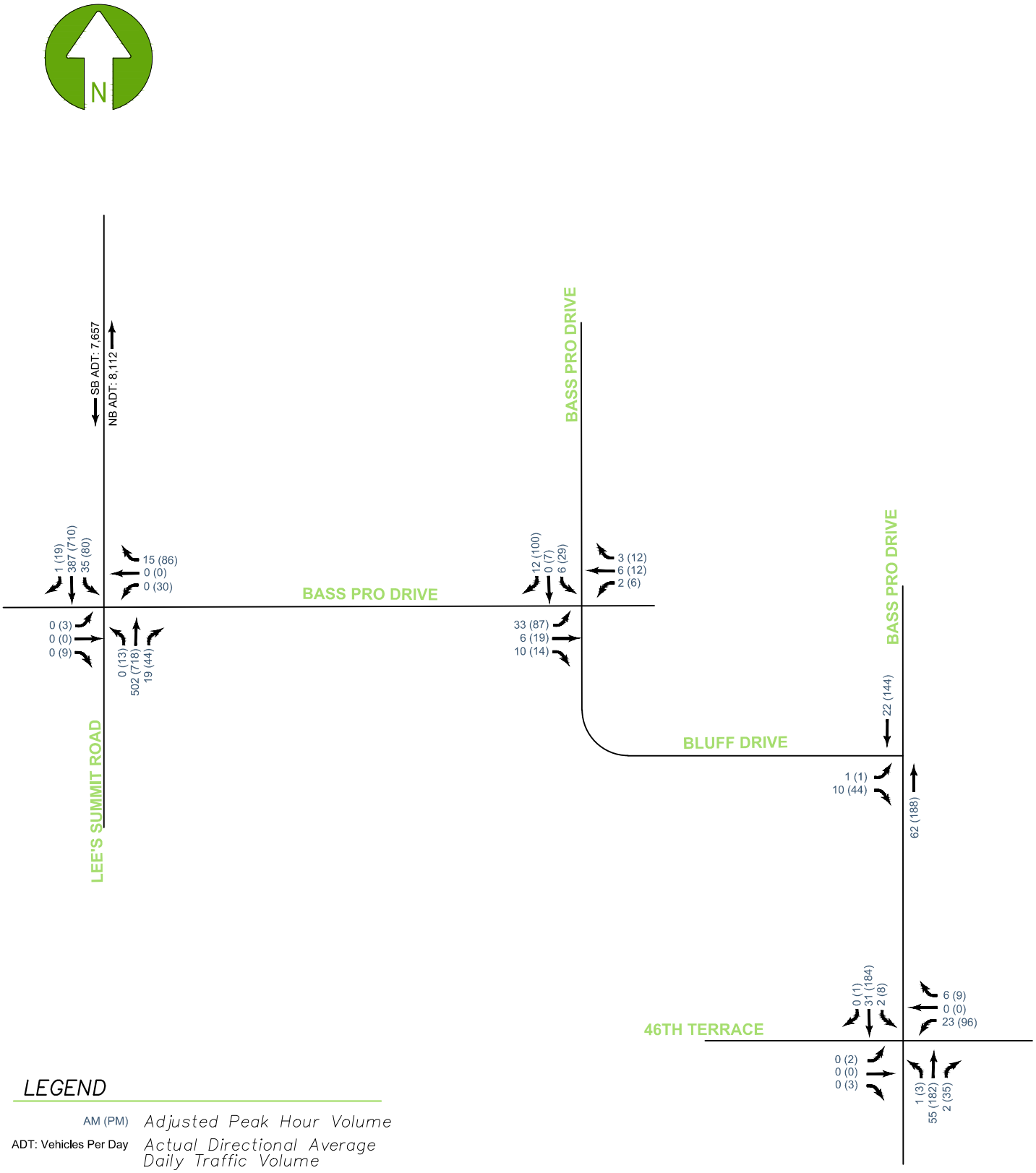
The existing (adjusted) peak hour volumes are illustrated in **Figure 2**. Count data collected for this study are provided in **Appendix A**.

Existing signal timing information for the signalized study intersection of Lee's Summit Road and Bass Pro Drive was obtained from the Mid-America Regional Council's (MARC) Central Traffic Control System (TranSuite). Basic signal timing information for the intersection of Bass Pro Drive and 46th Terrace was provided by the City of Independence.

FIGURE 2

Existing Conditions
Peak Hour Volumes

The Falls Residential Development
Independence, MO



LEGEND

AM (PM) *Adjusted Peak Hour Volume*

ADT: Vehicles Per Day *Actual Directional Average Daily Traffic Volume*

3. EXISTING CONDITIONS

Existing traffic conditions were evaluated to identify any existing deficiencies and to provide a baseline for comparative purposes.

3.1. Network Characteristics

Four roadways are located within the study area: Lee's Summit Road, Bass Pro Drive, East Bluff Drive, and 46th Terrace. Referencing *The City of Independence Thoroughfare Plan* and surveying the study area, current network characteristics were determined and are summarized in **Table 1**.

Table 1. Existing Network Summary.

Roadway	Functional Classification	Typical Section	Median Type	Posted Speed
Lee's Summit Road	Major Arterial	5-Lane	None	35 mph
Bass Pro Drive	Collector	2-Lane	None	25-30 mph**
East Bluff Drive	Local	1-Lane (Eastbound)	None	20 mph
46th Terrace	Collector	4-Lane	Raised	25 mph

*Two-way left turn lane

**30 mph west of E. Bluff Drive; 25 mph between roundabouts around Bass Pro Shop

The intersection of Lee's Summit Road and Bass Pro Drive is signalized with dedicated left-turn lanes provided for the northbound and southbound approaches. A dedicated right-turn lane is also provided for the westbound approach. Sidewalk is provided along both the east and west sides of Lee's Summit Road. The sidewalk network provides connection to the multi-use Waterfall Park Trail which is located along the north side of Bass Pro Drive. Pedestrian signal heads, push buttons and marked crosswalk are provided at all legs of the intersection except for the south leg.

The intersection of Bass Pro Drive and Bluff Drive West is a one lane roundabout. The roundabout services eastbound, westbound and southbound traffic; the south leg of the roundabout services southbound traffic only, northbound vehicular traffic is not present at the roundabout. Sidewalk with dedicated crosswalks are provided for all approaches.

The intersection of Bass Pro Drive and Bluff Drive West is a hybrid roundabout with one or two circulating lanes dependent upon approach. A dedicated single right-turn lane is provided in the eastbound direction, and a dedicated through lane is provided in the northbound direction. All other approaches include a standard through-left movement. A gate at the exit lane of the

roundabout for westbound traffic prevents vehicular traffic from continuing westbound on Bluff Drive. Sidewalk with dedicated crosswalks are provided for all approaches.

The intersection of Bass Pro Drive and 46th Terrace operates under signal control. Dedicated single left-turn lanes are provided for the northbound, southbound and westbound movements. A dedicated right-turn lane is provided in the westbound direction. Sidewalk is provided along both sides of Bass Pro Drive and along the north side of 46th Terrace. Pedestrian signal heads, push buttons, and marked crosswalks are provided to cross the east, south, and west legs of the intersection.

3.2. Existing Warrant Analysis

Turn Lane Warrants: MoDOT Access Management Guidelines, located in the EPG Section 940.9, were used to determine whether auxiliary turn lanes are currently warranted at the study intersections. In addition to the turn lane warrant, vehicular queuing, vehicular delay, as well as volume of turning vehicles were used when considering the need for a turn lane.

Right-Turn Lane

As stated in **Section 3.1**, dedicated right-turn lanes are currently provided for some movements at study intersections. Sections 940.9.8 and 940.9.9 of the EPG were used to evaluate if the right-turn lane warrant is met for approaches that do not have a dedicated right-turn lane provided under existing conditions.

Based on existing traffic volumes, no right-turn lanes are warranted under existing conditions.

Left-Turn Lane

As stated in **Section 3.1**, dedicated left-turn lanes are currently provided for some movements at study intersections, including at all 4-lane roadways. Section 940.9.1 of the EPG was used to evaluate if the left-turn lane warrant is met for approaches that do not have a dedicated left-turn lane provided under existing conditions.

Based on existing traffic volumes, no left-turn lanes are warranted under existing conditions.

Operations of the study intersections are presented in **Section 3.3**, which includes a review to determine if additional turn lanes (or additional storage) are recommended based on existing operations. Turn lane warrant analysis sheets are provided in **Appendix B**.

Signal Warrants: All existing study intersections currently operate under signal control or roundabout control. Thus, signal warrants were not completed under existing conditions.

Existing lane configurations and traffic control for the study network are illustrated in **Figure 3**.

3.3. Existing Capacity Analysis

Capacity analysis was performed for the study intersections utilizing the existing lane configurations and traffic control. Signalized and unsignalized intersection analysis was conducted using Synchro, Version 10, based on the Highway Capacity Manual (HCM) delay methodologies. Sidra (version 8.0) was used to conduct analysis of roundabout intersections. For simplicity, the amount of control delay is equated to a grade or Level of Service (LOS) based on thresholds of driver acceptance. The amount of delay is assigned a letter grade A through F, LOS A representing little or no delay and LOS F representing very high delay. **Table 2** shows the delays associated with each LOS grade for signalized and unsignalized intersections, respectively.

Table 2. Intersection LOS Criteria.

Level of Service	Average Control Delay (seconds)	
	Signalized	Unsignalized
A	< 10	< 10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50
Highway Capacity Manual (HCM 6th Edition)		

Results of the capacity analysis indicate that the signalized study intersections operate at a LOS C or better overall during the AM and PM peak hour periods. All individual movements at the signalized study intersections operate at a LOS D or better with acceptable queues.

Results of the capacity analysis indicate that the roundabout study intersections operate at a LOS A overall during the AM and PM peak hour periods. All individual movements at the roundabout study intersections operate at a LOS A with acceptable queues.

The existing conditions capacity analysis summary is illustrated in **Figure 4**. Detailed results are provided in **Appendix B**.

FIGURE 3

Existing Conditions
Lane Configuration and Traffic Control

The Falls Residential Development
Independence, MO

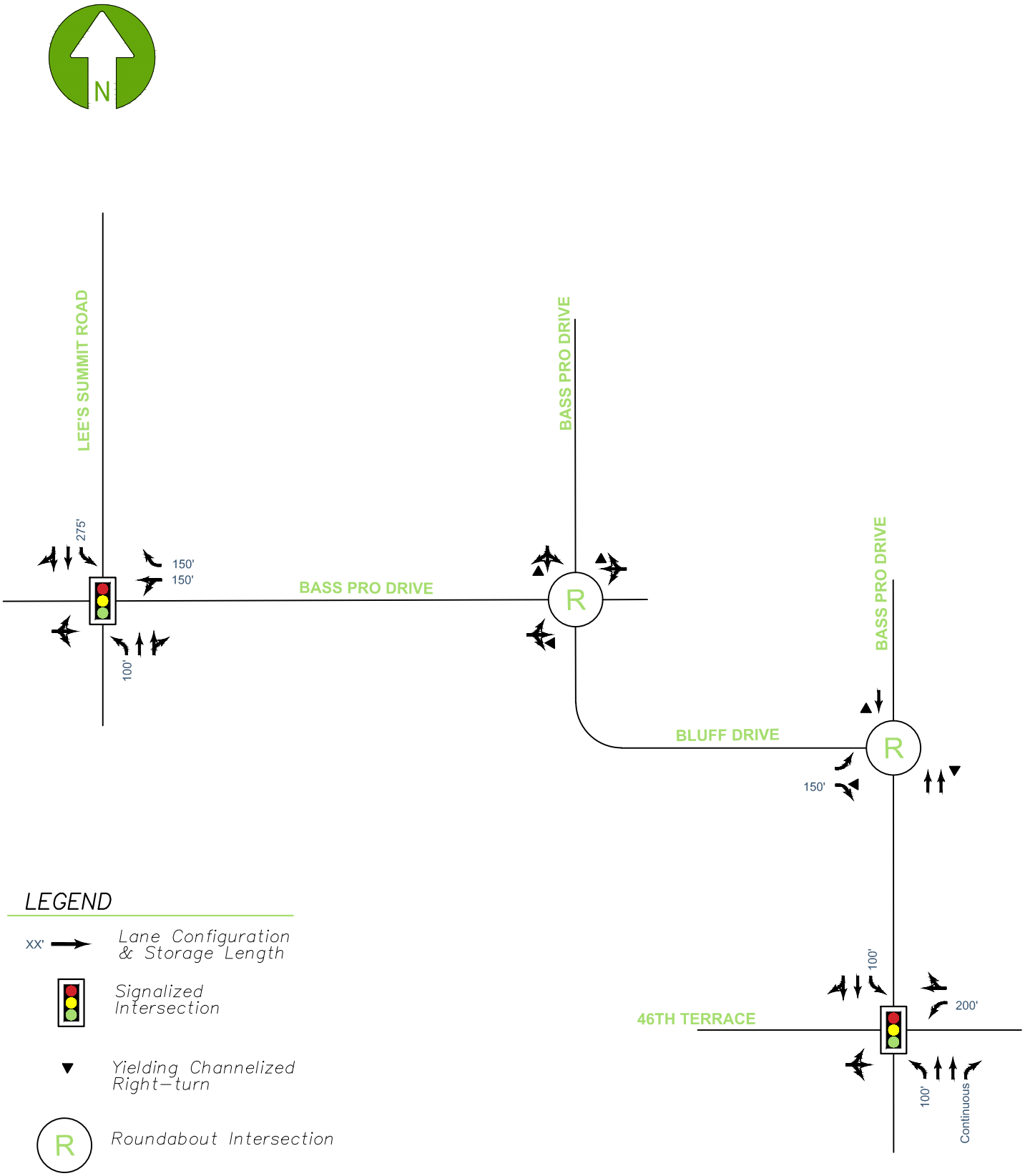
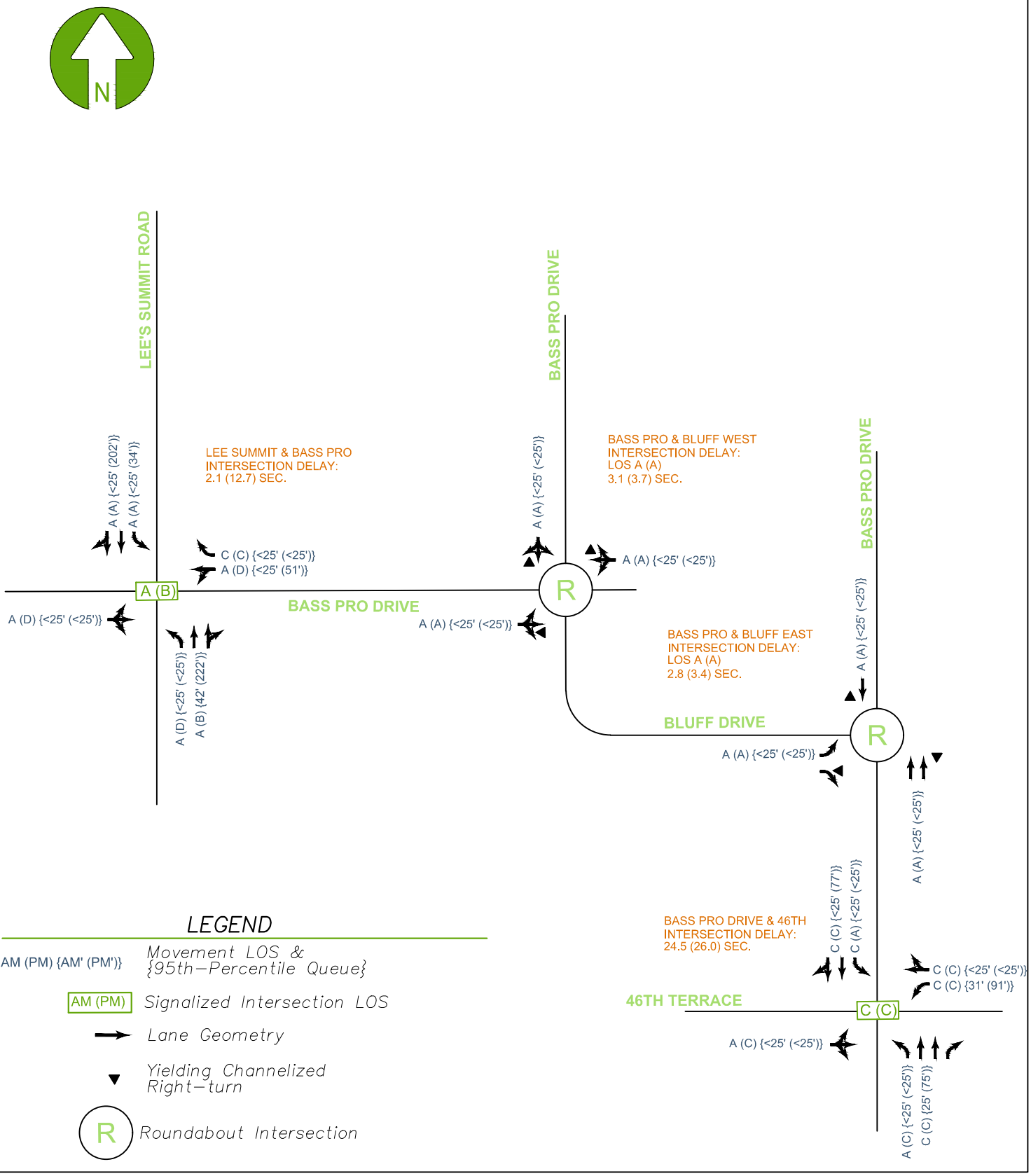


FIGURE 4

Existing Conditions
Capacity Analysis

The Falls Residential Development
Independence, MO



4. EXISTING PLUS DEVELOPMENT CONDITIONS

Conditions with the proposed development in place were evaluated to identify any potential geometric improvements that could be attributed to the additional traffic associated with the proposed development. The proposed development site is located in the southwest quadrant of I-70 and I-470 on the west side of Bass Pro Shops. The site is currently vacant. The proposed development condition will consist of 275 units of multi-family housing. The planned development site was previously zoned for approximately 91,000 square feet of commercial retail space. The proposed site plan is illustrated in **Figure 5**.

4.1. Proposed Development Trip Generation and Distribution

To determine the impact of potential site traffic on the roadway network, expected trips associated with the proposed site were generated and applied to the study network. The Institute of Transportation Engineers (ITE) provides methods for estimating traffic volumes of common land uses in the Trip Generation Manual (10th Edition). The land uses that most resemble the proposed site are Land Use Codes 220, Multifamily Housing (Low-Rise), and 221, Multifamily Housing (Mid-Rise). The designation of low and mid-rise residential is based on the number of floors for the multi-family building. The proposed site encompasses two and three-story buildings, thus this was considered in development of trip generation. City staff approved proposed trip generation.

Based on the *ITE Trip Generation Manual*, trip generation characteristics were developed for the proposed site. Trip generation characteristics expected for the site are shown in **Table 3**. Detailed ITE trip generation information can be found in **Appendix C**.

Table 3. Proposed Development Trip Generation.

Land Use	Size	Average Weekday	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
Multifamily Housing (Low-Rise)	38 Units	247	20	5	15	25	16	9
Multifamily Housing (Mid-Rise)	237 Units	1,290	80	21	59	102	63	39
Total		**1,537**	**100**	**26**	**74**	**127**	**79**	**48**

Trips were distributed through the network based on the anticipated land use, the surrounding area, and the existing distribution of trips in the vicinity of the proposed site. City staff approved trip distribution for the proposed site. Directional trip distribution percentages expected for the site are illustrated in **Table 4**.

Table 4. Proposed Development Trip Distribution.

Direction	Trip Distribution
Lee's Summit Road (North)	50%
Lee's Summit Road (South)	20%
Bass Pro Drive (South)	30%
TOTAL	**100%**

The expected trip distribution for the proposed development is shown in **Figure 6**. The resulting existing plus development volumes are illustrated in **Figure 7**.

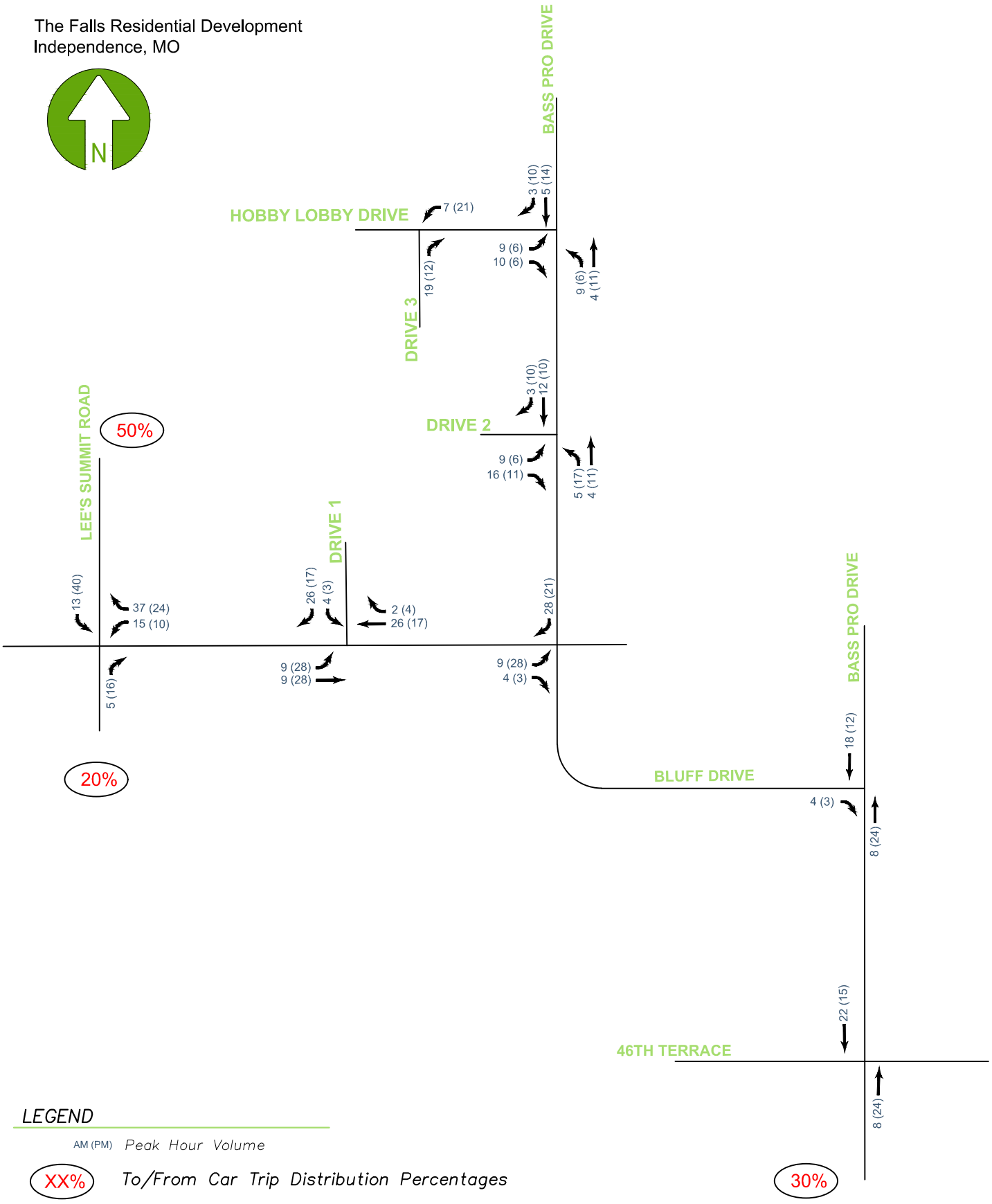
FIGURE 5
Site Plan

The Falls Residential Development
Independence, MO

FIGURE 6

Existing Plus Development
Trip Distribution

The Falls Residential Development
Independence, MO



LEGEND

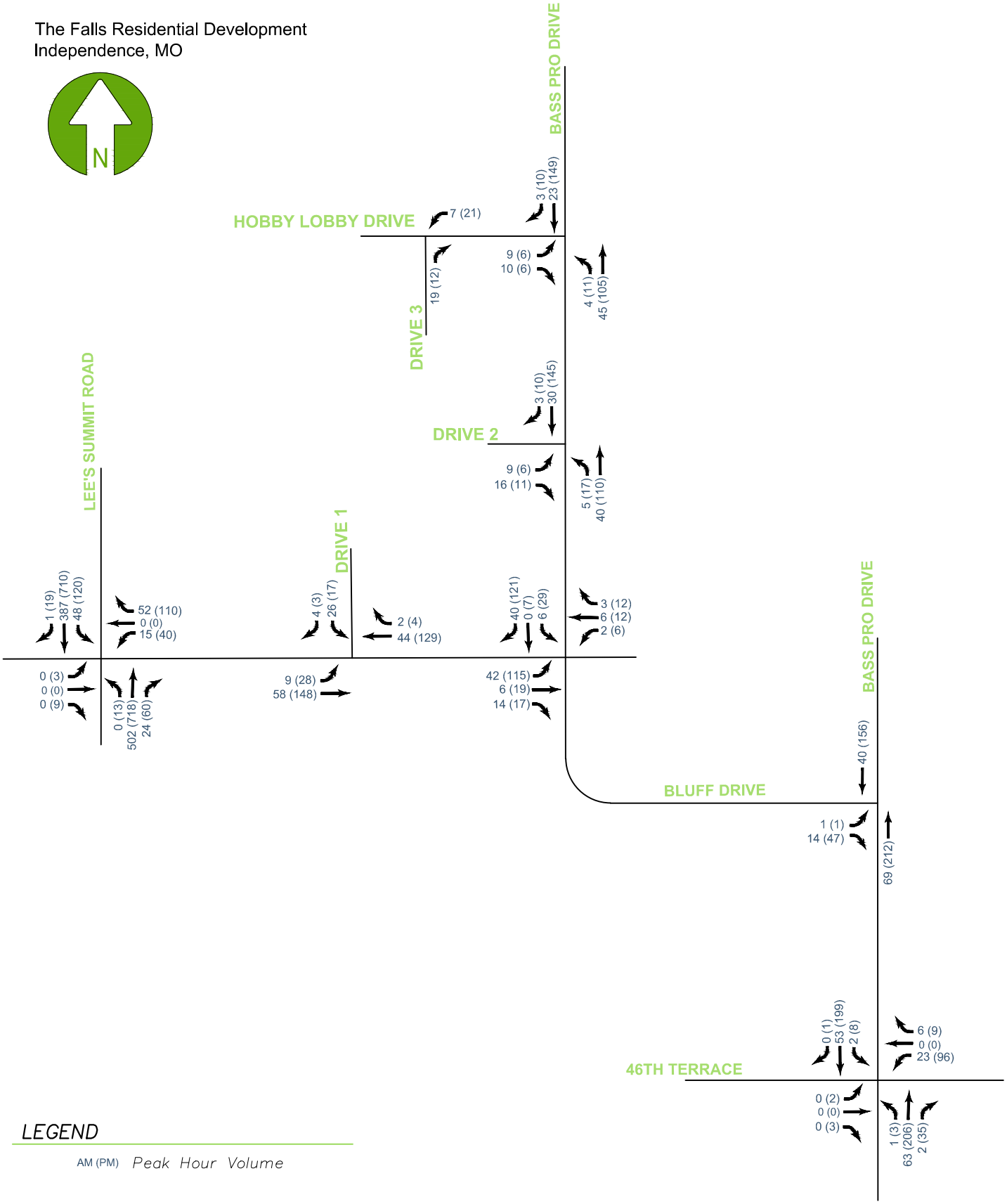
AM (PM) *Peak Hour Volume*

XX% *To/From Car Trip Distribution Percentages*

FIGURE 7

Existing Plus Development
Peak Hour Volumes

The Falls Residential Development
Independence, MO



LEGEND

AM (PM) *Peak Hour Volume*

4.2. Access Characteristics

As shown on the site plan (**Figure 5**), the proposed development is located on currently undeveloped land in the southwest quadrant of I-70 and I-470 on the west side of Bass Pro Shops. The development proposes two new full access drives on Bass Pro Drive. An existing drive, currently providing access to Hobby Lobby and Mardel Books, will be shared to provide access to the site.

Drive 1 is proposed as a full access located along the east-west section of Bass Pro Drive approximately 470 feet west of the Bass Pro Drive and Bluff Drive roundabout. The site plan illustrates the access with one entering lane and one exiting lane.

Drive 2 is proposed as a full access located along the north-south section of Bass Pro Drive approximately 390 feet north of the Bass Pro Drive and Bluff Drive roundabout. The access is offset from an existing driveway servicing Bass Pro by approximately 125 feet. The site plan illustrates the access with one entering lane and two exiting lanes.

Drive 3 is located west of Bass Pro Drive along an existing driveway currently servicing the Hobby Lobby and Mardel Books. The full access is proposed along the south side of the existing private drive approximately 125 feet west of Bass Pro Drive. The site plan illustrates the access with one entering lane and one exiting lane.

Drives 1 and 3 are proposed to provide tenant access to the site. Access gates, operated by remote openers, are located at Drives 1 and 3. The gates are set on the property allowing for approximately one vehicle to queue when accessing the site. Based on information provided by the site developer, it is anticipated that the wait time for residents entering the site will be minimal. Considering the volume of traffic associated with the proposed development, queuing of vehicles entering the site is expected to be minimal. Drive 2 is proposed to provide tenant and guest access to the site. The access will be gate controlled, but the gates are located internal to the site allowing guest access to parking and queuing areas. The presence of the gates at Drive 2 is not expected to have an impact on operations.

Access Spacing

Section 940.13 (Driveway Spacing) of the MoDOT Access Management Guidelines located in the EPG was referenced to evaluate the proposed spacing of Drive 1 and Drive 2. Drive 3 is located along a private, internal drive. Operations of adjacent intersections will be reviewed to determine if Drive 3 is located outside vehicular queuing of adjacent access.

Referencing Section 940.13 of the EPG, the centerline spacing between private driveways should be a minimum of 220 feet on urban, minor roadways. Bass Pro Drive meets the classification of a minor roadway.

Drive 1 is proposed with an access spacing of approximately 470 feet west of the roundabout at Bass Pro Drive and Bluff Drive. There are no other adjacent access points in close proximity to Drive 1. Drive 1 meets MoDOT access spacing guidelines.

Drive 2 is proposed with an access spacing of approximately 390 feet north of the roundabout at Bass Pro Drive and Bluff Drive. This meets MoDOT minimum guidelines. Drive 2 is proposed to be located approximately 125 feet south of an existing access for the Bass Pro development located along the east side of Bass Pro Drive. Drive 2 does not meet MoDOT minimum guidelines for drive spacing. Reviewing the existing Bass Pro access, the drive appears to operate as a service entrance, and is not expected to operate as a main access for the Bass Pro site. Drive 2 is located approximately 310 feet south of a main access drive for Bass Pro that would be expected to service primarily passenger vehicle traffic. Based on the limited use expected with the Bass Pro service drive, and the improved access spacing from the roundabout of Bass Pro Drive and Bluff Drive, the proposed location of Drive 2 is expected to be acceptable.

Drive 3 is proposed to be located along an existing private drive. The access is located approximately 125 feet west of Bass Pro Drive, which is expected to be acceptable.

Driveway Geometrics

The development proposes two full access points on Bass Pro Drive and one access point along an existing private drive. The proposed geometrics at all site driveways are provided in **Table 5.**

Table 5. Proposed Access Characteristics

Proposed Access	Public Roadway Intersected	Access Type	Proposed Throat Length	Proposed Width	Median Divided
Drive 1	Bass Pro Drive (east/west)	Full Access	78 feet	31 feet	No
Drive 2	Bass Pro Drive (north/south)	Full Access	52 feet	38 feet	No
Drive 3	Private Drive	Full Access	56 feet	28 feet	No

Referencing Section 940.16.4 (Driveway Width) of the EPG, driveways servicing less than 150 vehicles per hour during the peak hour period (or 1,500 vehicles per day) should have a driveway width between 28 feet and 42 feet for two-way access. All proposed driveway widths are within MoDOT guidelines.

Referencing Section 940.16.8 (Driveway Throat Length) of the EPG, driveways servicing less than 150 vehicles during the peak hour period (or 1,500 vehicles per day) should have a minimum throat length of 20 feet. The throat length of each drive exceeds recommended MoDOT minimum and is expected to be sufficient to accommodate expected vehicular queuing. The presence of gates at Drive 1 and 3 allows for queuing of 1 vehicle. Capacity analysis will be reviewed in **Section 4.4** to determine if adequate driveway throat length is provided to accommodate expected vehicular operations.

Intersection and Stopping Sight Distance

Intersection sight distance considers vehicles crossing or turning onto a roadway and the sight distance required to make the movement without impeding the speed of approaching motorists. The American Association of State Highway and Transportation Officials (AASHTO) *A Policy On Geometric Design of Highway and Streets* was referenced to determine the intersection sight distance requirements for the current stop approaches (proposed site drives). For the purposes of this review, sight distance criteria for Case B (intersections with stop control on the minor road) were reviewed.

Sight distance, cases B1 and B2, was reviewed for the proposed drive locations intersecting public roadways. Case B1 considers the left-turn movement from the minor street approach. Case B2 considers the right-turn movement from the minor street approach.

Stopping sight distance is the required distance for a vehicle to stop after noting an object in the roadway. Field measured and AASHTO required sight distances are provided in **Table 6.**

Table 6. Proposed Access Sight Distance

Proposed Access (posted speed limit)	Approach Sight Distance (Major Road) (ft.)		AASHTO Recommended Sight Distance (ft.)		Measured Stopping Sight Distance (ft.)		AASHTO Recommended Stopping Sight Distance (ft.)
	Case B1	Case B2	Case B1	Case B2	Left	Right	
Drive 1 (30 mph)	238*	335	290	470	486	354	200
Drive 2 (25 mph)	461	280	240	328	410	461	155

*Does not meet AASTHO recommended sight distance.

All drives have adequate stopping sight distance in both directions. Drive 1 does not meet intersection sight distance for case B1 (left-turn from minor street approach) by approximately 52 feet. Sight distance is limited at Drive 1 due to horizontal curvature of Bass Pro Drive west of Drive 1 and the presence of foliage. It is recommended to trim foliage along the north side of Bass Pro Drive to provide adequate sight distance for Drive 1. Design of the access point

should confirm adequate sight distance is provided. If removal of foliage does not provide adequate sight distance, relocation of the drive east may provide adequate sight distance. Foliage should be monitored to ensure growth does not restrict sight distance. Sight distance measurement field note sheets are provided in **Appendix C.**

4.3. Existing Plus Development Warrant Analysis

Turn Lane Warrants: Turn lane analysis was conducted per the MoDOT *EPG* as stated in **Section 3.2**.

Right-Turn Lane

No additional right-turn lanes are expected to be warranted based on existing plus development conditions.

Left-Turn Lane

No additional left-turn lanes are expected to be warranted based on existing plus development conditions.

Operations of the study intersections are presented in **Section 4.4**, which includes a review to determine if additional turn lanes (or additional storage) are recommended based on expected operations. Turn lane warrant analysis sheets are provided in **Appendix C**.

Signal Warrants: A traffic signal may be justified if traffic conditions meet any of the applicable nine signal warrants described in the 2009 Manual on Uniform Traffic Control Devices (MUTCD). The MUTCD provides criteria for conducting an engineering study to determine whether a traffic signal is appropriate at any intersection. Based on the data available, the Peak Hour Signal Warrant (Warrant 3) was evaluated at the unsignalized site driveways along Bass Pro Drive.

Based on expected traffic volumes, none of the unsignalized site driveways are expected to warrant signalization considering existing plus development volumes.

Operations of the study intersections are presented in **Section 4.4** and includes a review to determine if a signal or other alternative forms of traffic control are recommended based on expected existing plus development operations. Signal warrant analysis sheets are provided in **Appendix C**.

Existing plus development lane configurations and traffic control for the study network are illustrated in **Figure 8**.

4.4. Existing Plus Development Capacity Analysis

Capacity analysis was performed for existing plus development conditions using the methodologies described in **Section 3.3**. For most movements, peak hour factors observed under existing conditions were utilized for existing plus development conditions at existing study intersections. Peak hour factors for movements at new drive locations and for volumes that significantly changed from existing conditions were modified to represent expected conditions after development. Signal timings at signalized intersections were not modified.

Results of the analysis indicate that the signalized study intersections are expected to operate at a similar overall level of service compared to existing conditions. Signalized study intersections are expected to operate at a LOS C or better overall during the AM and PM peak hour periods. All individual movements at the signalized study intersections are expected to operate at a LOS D or better with acceptable queues.

Results of the capacity analysis indicate that the roundabout study intersections operate at a LOS A overall during the AM and PM peak hour periods. All individual movements at the roundabout study intersections operate at a LOS A with acceptable queues.

Unsignalized capacity analysis was conducted for the unsignalized site driveways. Based on the capacity analysis results, all movements at the unsignalized intersections are expected to operate at a LOS B or better with acceptable queues during both peak hour periods. Queues do not exceed one car length at either Drive 1 or Drive 3, therefore throat lengths are expected to be acceptable as proposed.

The existing plus development conditions capacity analysis summary are illustrated in **Figure 9**. Detailed results are provided in **Appendix C**.

FIGURE 8

Existing Plus Development
Lane Configuration and Traffic Control

The Falls Residential Development
Independence, MO

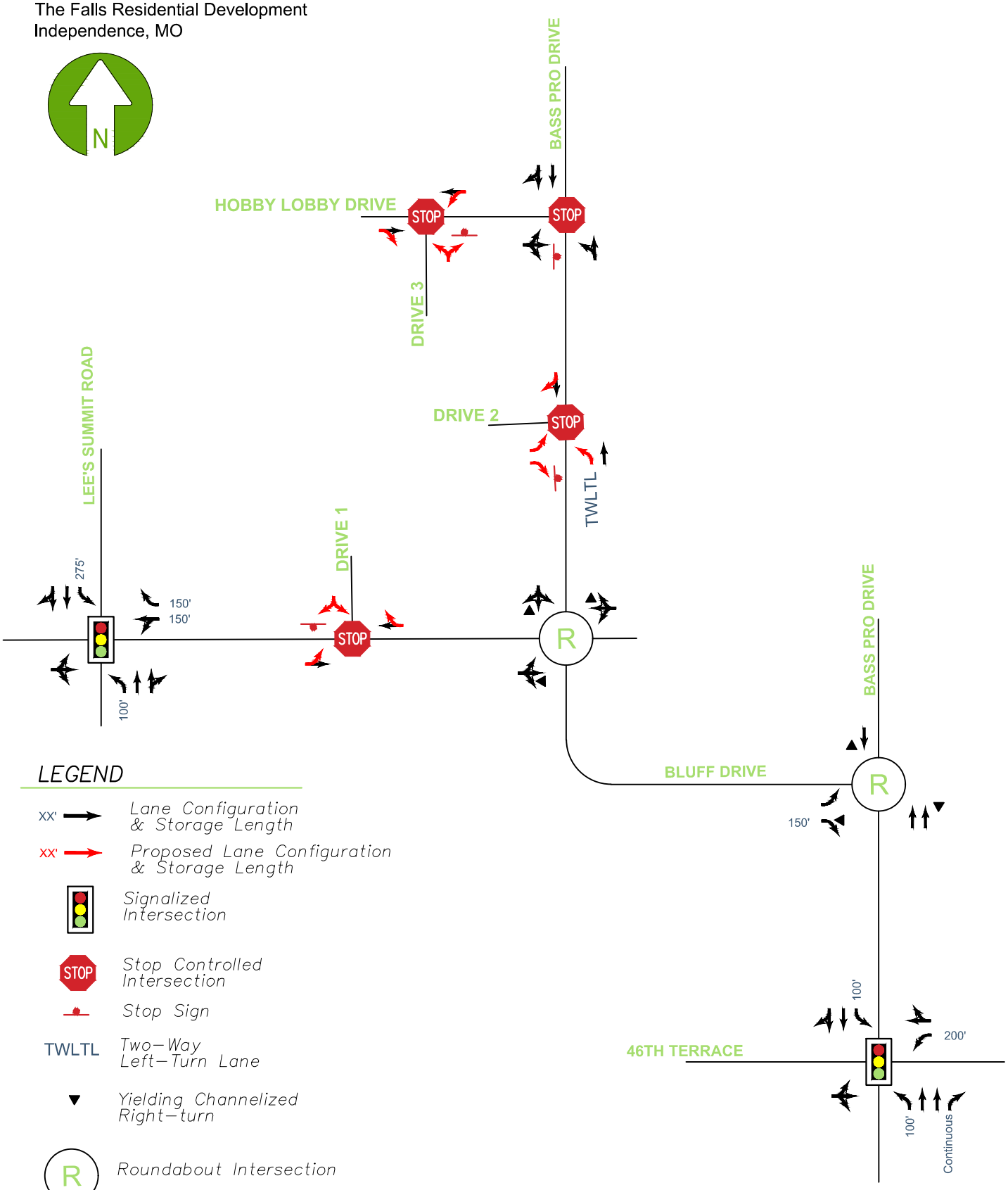
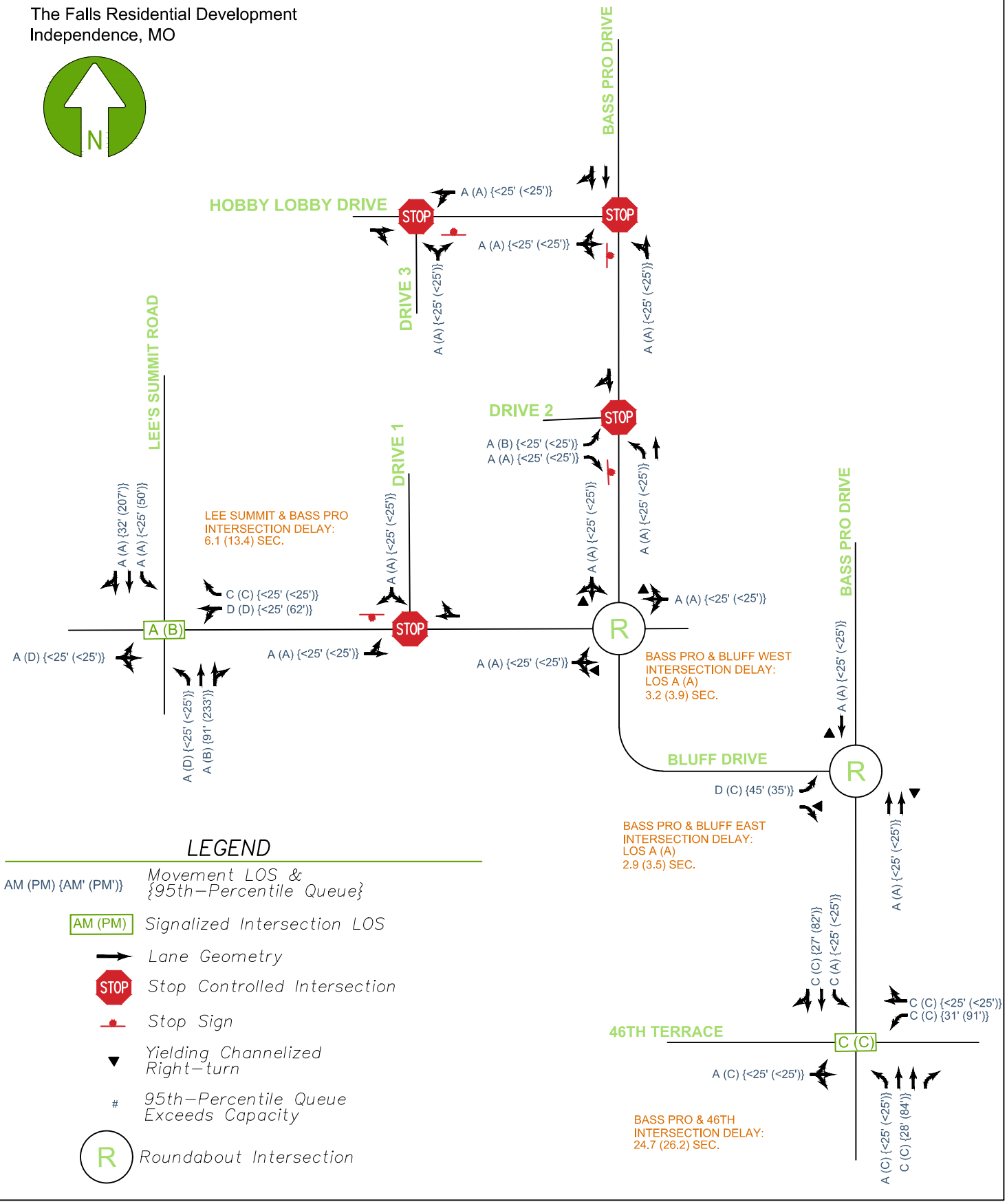


FIGURE 9

Existing Plus Development
Capacity Analysis

The Falls Residential Development
Independence, MO



LEGEND

AM (PM) {AM' (PM')}	Movement LOS & {95th-Percentile Queue}
AM (PM)	Signalized Intersection LOS
→	Lane Geometry
STOP	Stop Controlled Intersection
	Stop Sign
▼	Yielding Channelized Right-turn
#	95th-Percentile Queue Exceeds Capacity
R	Roundabout Intersection

5. FUTURE YEAR 2040 CONDITIONS

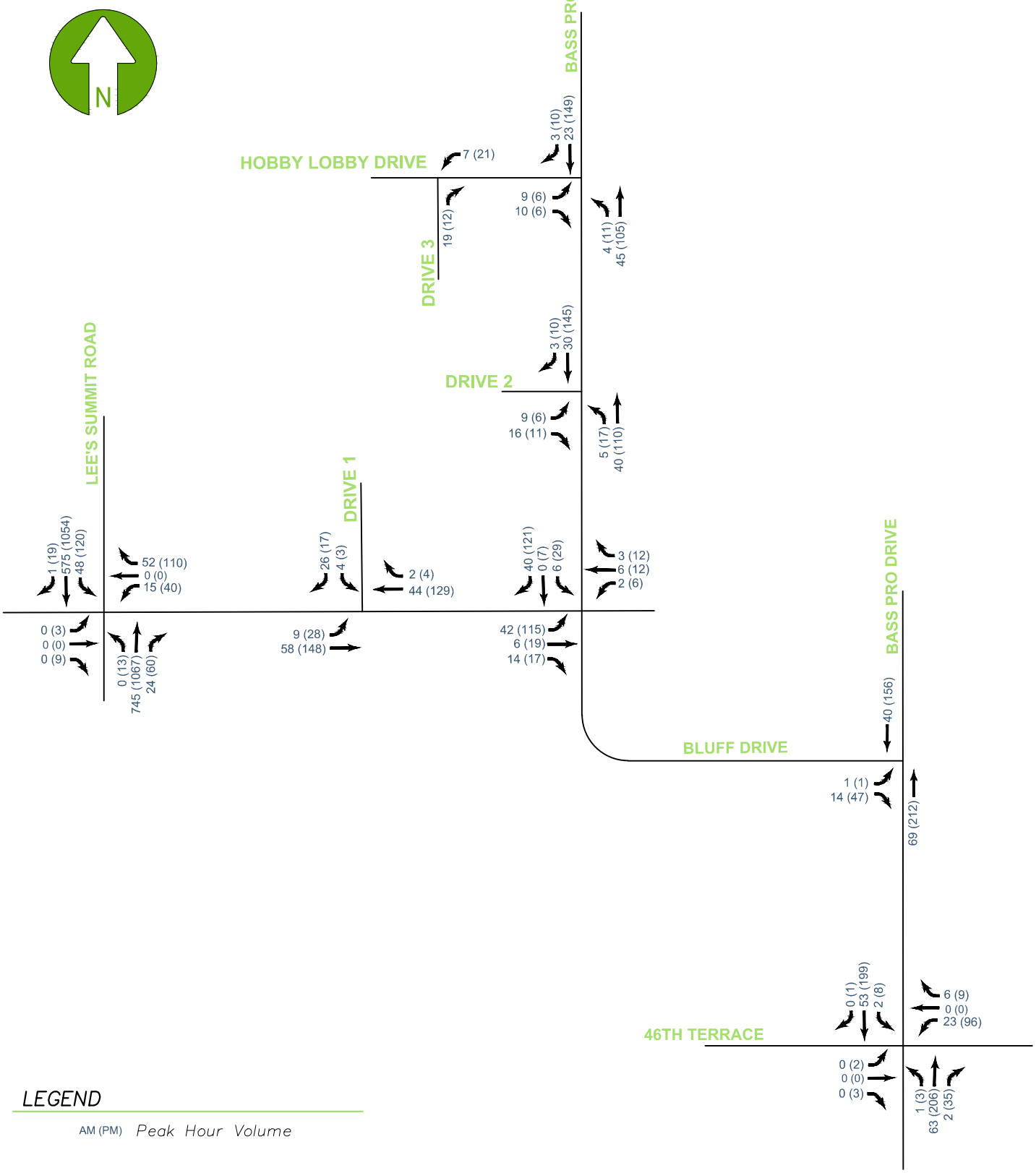
This scenario considers operations of the future roadway network for the AM and PM peak hour periods. Based on a review of the area and discussion with City staff, a growth rate of 2% was applied along Lee's Summit Road for north/south traffic. It is anticipated as development occurs along undeveloped land in the vicinity of the project site that traffic impact studies will be conducted to reflect those future operations.

The growth rate was applied to existing through traffic along Lee's Summit Road. Additional background traffic growth volumes were added to existing plus development trips at the intersection of Lee's Summit Road and Bass Pro Drive to obtain future year 2040 volumes. **Figure 10** illustrates the expected future year 2040 volumes. Additional information for the calculation of future year background traffic volumes is provided in **Appendix D**. It should be noted that future year volumes for remaining study intersections are not changed as a growth rate was not applied beyond Lee's Summit Road.

FIGURE 10

Future Year 2040
Peak Hour Volumes

The Falls Residential Development
Independence, MO



LEGEND

AM (PM) *Peak Hour Volume*

5.1. Future Year 2040 Warrant Analysis

Turn Lane Warrants: Turn lane warrants were reviewed per the MoDOT *EPG* as stated in **Section 3.2**, based on future year 2040 volumes.

Right-Turn Lane

Based on future traffic volumes, an additional northbound right-turn lane is expected to be warranted at the intersection of Lee's Summit Road and Bass Pro Drive for the PM peak hour period. It is recommended to observe future operations of the intersection and consider construction of the turn lane if future volumes are realized, the warrant is met for more than one peak hour period, and/or operations indicate a need for the turn lane.

Based on the future year 2040 capacity analysis, operations are at an acceptable level without an additional northbound right-turn lane. Thus, a northbound right-turn lane is not recommended at this time.

Left-Turn Lane

No additional left-turn lanes are expected to be warranted based on future year conditions.

Operations of the study intersections are presented in **Section 5.2**, which includes a review to determine if additional turn lanes (or additional storage) are recommended based on expected operations. Turn lane warrant analysis sheets are provided in **Appendix D**.

Future year 2040 lane configurations and traffic control for the study network are illustrated in **Figure 11**.

Signal Warrants: Signal warrants were reviewed using the methodologies described in **Section 4.3**, based on future year 2040 volumes. Based on expected traffic volumes, none of the unsignalized site driveways are expected to warrant signalization considering future year 2040 volumes. Signal warrant analysis sheets are provided in **Appendix D**.

5.2. Future Year 2040 Capacity Analysis

Capacity analysis was performed for future year 2040 conditions using the methodologies described in **Section 3.4**. Peak hour factors were not modified from the existing plus development scenario. Signal timings at signalized intersections were not modified.

Results of the analysis indicate that the signalized study intersections are expected to operate at a similar overall level of service compared to existing and existing plus development conditions. Signalized study intersections are expected to operate at a LOS C or better overall during the AM and PM peak hour periods. All individual movements at the signalized study intersections are expected to operate at a LOS D or better with acceptable queues.

Results of the capacity analysis indicate that the roundabout study intersections operate at a LOS A overall during the AM and PM peak hour periods. All individual movements at the roundabout study intersections operate at a LOS A with acceptable queues.

Unsignalized capacity analysis was conducted for the unsignalized site driveways. Based on the capacity analysis results, all movements at the unsignalized intersections are expected to operate at a LOS B or better with acceptable queues during both peak hour periods.

The future year 2040 capacity analysis summary is illustrated in **Figure 12**. Detailed results are provided in **Appendix D.**

FIGURE 11

Future Year 2040
Lane Configuration and Traffic Control

The Falls Residential Development
Independence, MO

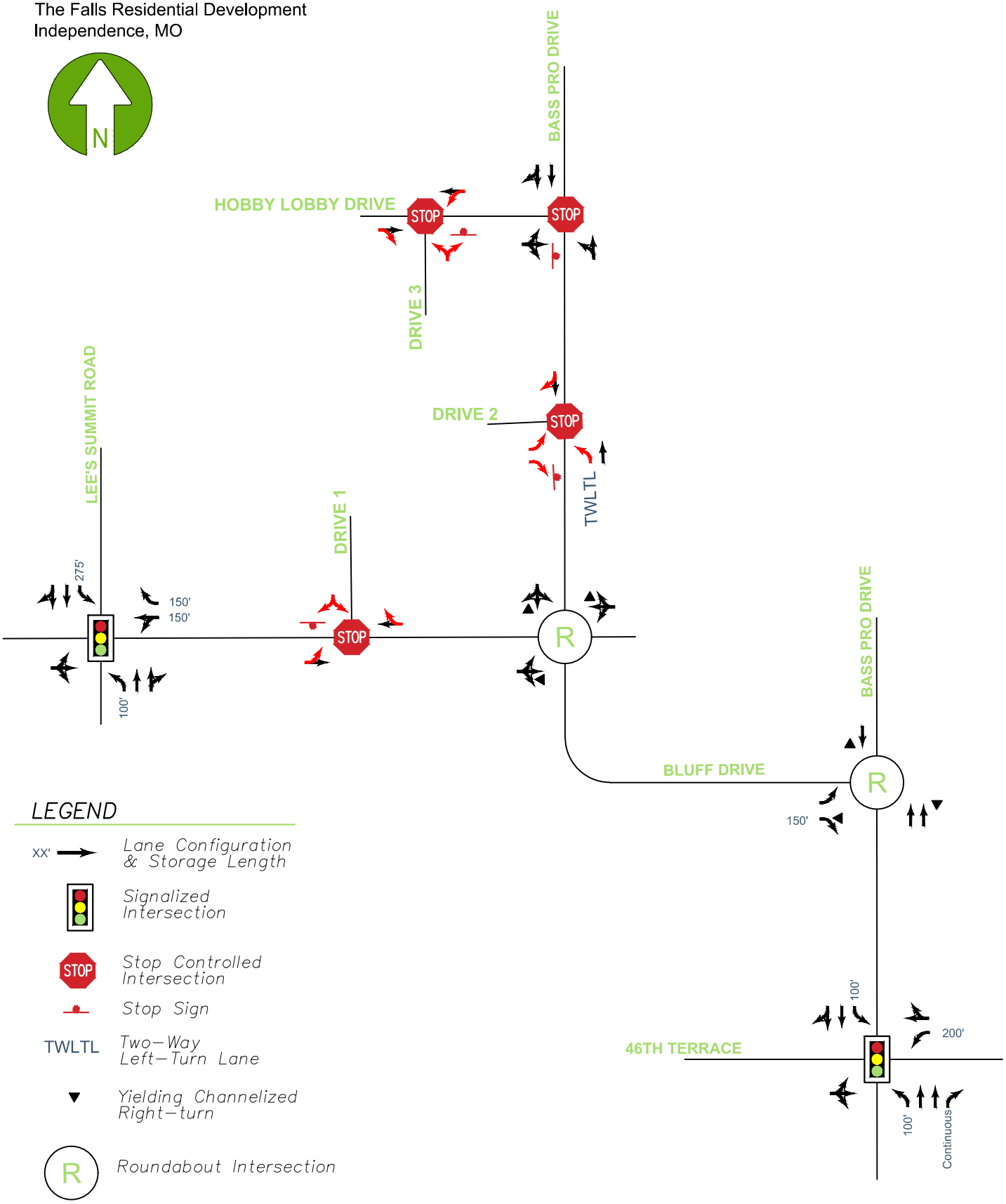
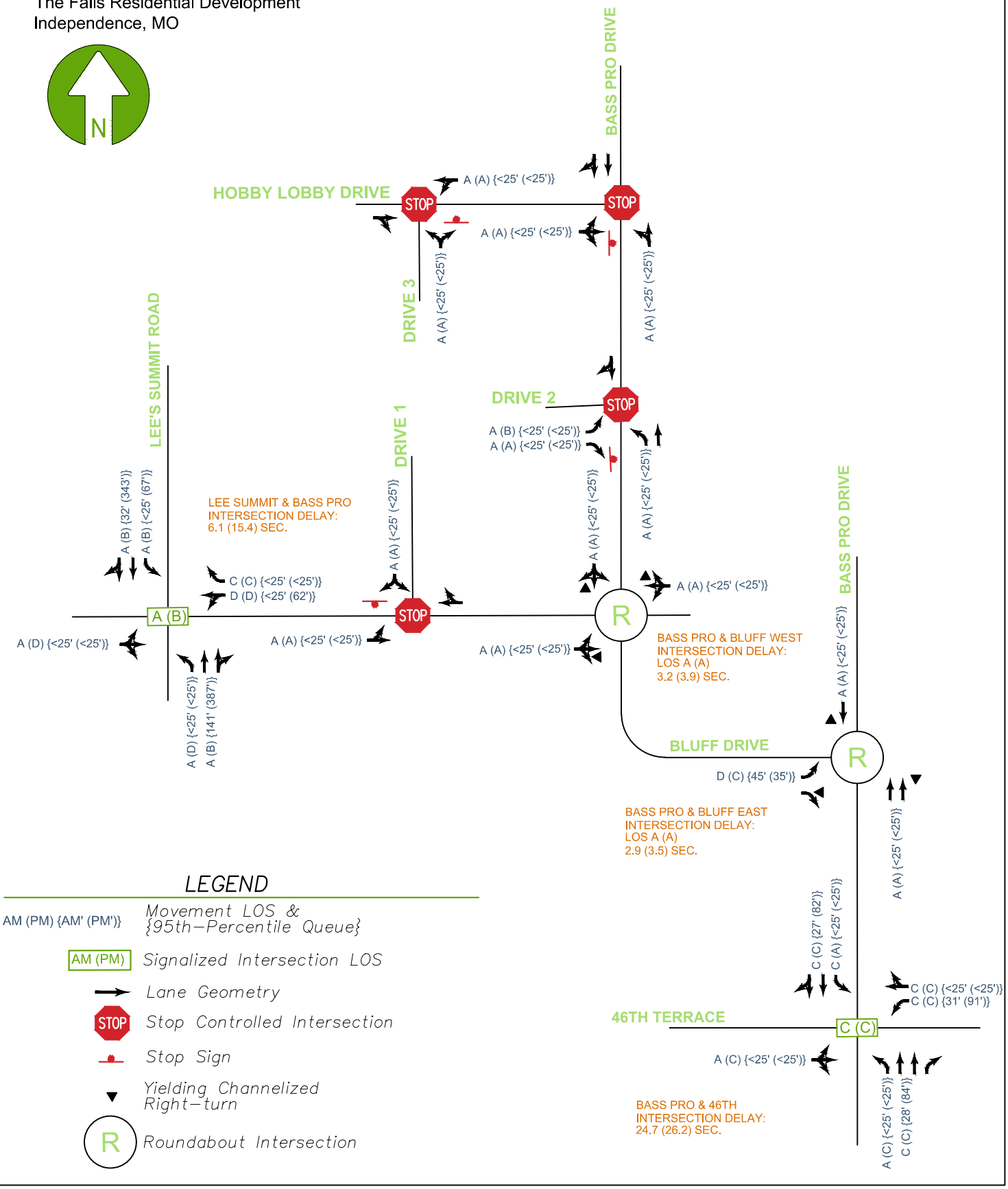


FIGURE 12

Future Year 2040
Capacity Analysis

The Falls Residential Development
Independence, MO



LEGEND

AM (PM) {AM' (PM')}	Movement LOS & {95th–Percentile Queue}
AM (PM)	Signalized Intersection LOS
	Lane Geometry
STOP	Stop Controlled Intersection
	Stop Sign
	Yielding Channelized Right–turn
R	Roundabout Intersection

6. SUMMARY

This report summarizes analysis conducted for The Falls multi-family residential development located in the southwest quadrant of I-70 and I-470 on the west side of Bass Pro Shops in Independence, Missouri.

6.1. Conclusions

The general findings to note for the traffic impact study include the following:

1. Traffic operations at the study intersections are not expected to be significantly impacted by the proposed development.
2. Drive 1 does not meet minimum sight distance for Case B1 (left turn movement from the minor street approach. Trimming foliage along the north side of Bass Pro Drive would be expected to improve conditions to meet minimum sight distance. Design should confirm adequate sight distance is obtained for the drive. Maintenance of foliage should be conducted to maintain sight distance.
3. Minimum intersection spacing is not met for Drive 2 from an existing service drive for the Bass Pro development located north of Drive 2 along the east side of Bass Pro Drive. The existing drive operates as a service entrance and is expected to serve a low volume of traffic, thus it is anticipated that the access spacing, as proposed, is acceptable.
4. For future conditions, the northbound right-turn movement should be monitored at the intersection of Lee's Summit Road and Bass Pro Drive. A turn lane should be considered if future volumes are realized, the warrant is met for more than one peak hour period, and/or operations indicate a need for the turn lane.

6.2. Recommendations

Based on review and analysis of the proposed development, the following improvements are recommended:

Existing Conditions

- There are no recommendations for this scenario.

Existing Plus Development Conditions

- Provide minimum sight distance at Bass Pro Drive and Drive 1.

Future Year 2040 Conditions

- There are no recommendations for this scenario.

APPENDIX A

Data Collection

Turning Movement Counts

Lee's Summit Road & Bass Pro Drive - TMC

Tue Oct 6, 2020
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786480, Location: 39.038235, -94.387693

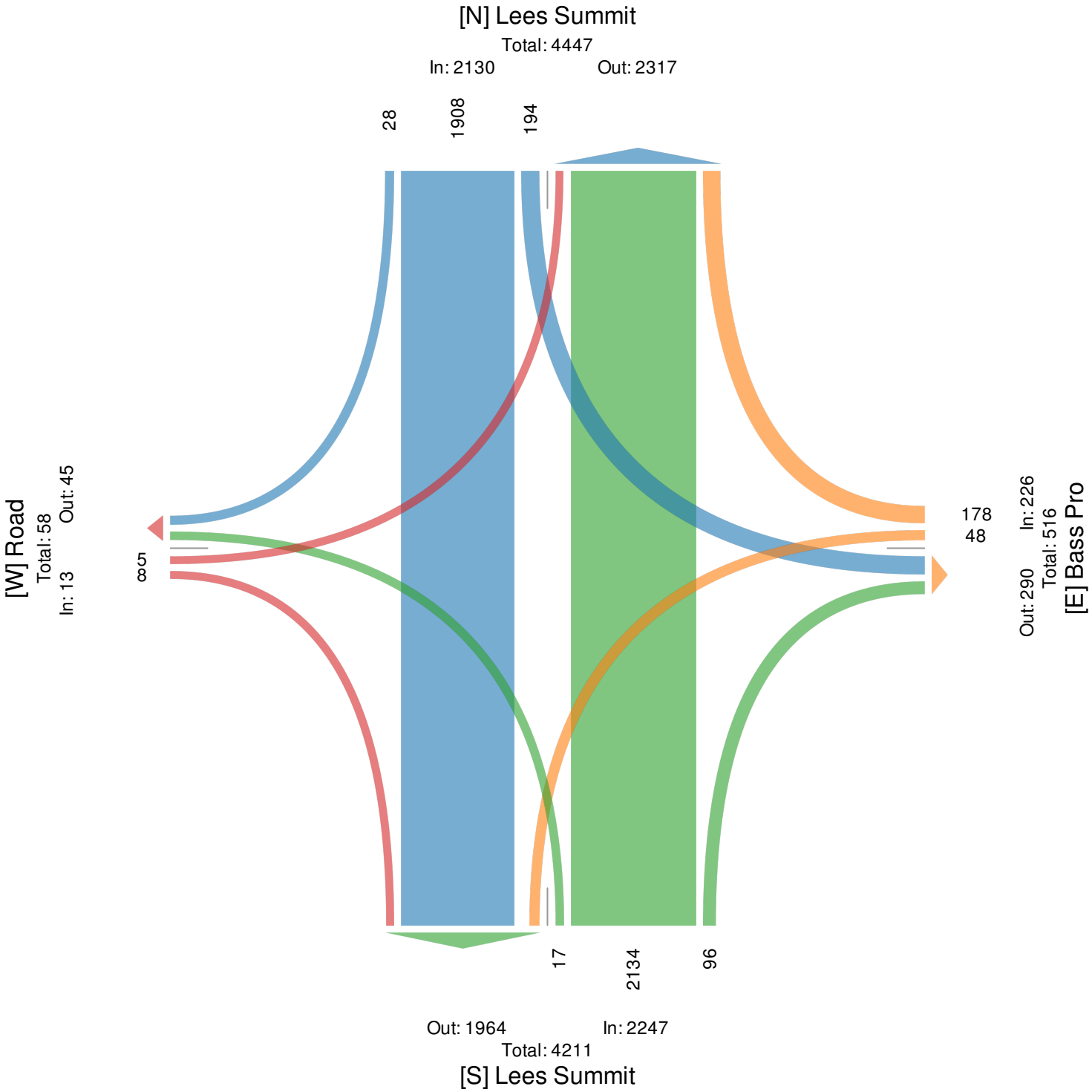
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Lees Summit					Bass Pro					Lees Summit					Road					
Direction	Southbound					Westbound					Northbound					Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2020-10-06 7:00AM	0	53	1	0	**54**	4	0	1	0	**5**	1	86	0	0	**87**	0	0	0	0	**0**	**146**
7:15AM	0	79	6	0	**85**	1	0	0	0	**1**	1	107	0	0	**108**	0	0	0	0	**0**	**194**
7:30AM	0	100	5	0	**105**	1	0	1	0	**2**	1	114	0	0	**115**	0	0	0	0	**0**	**222**
7:45AM	0	83	8	0	**91**	4	0	1	0	**5**	5	95	0	0	**100**	0	0	0	0	**0**	**196**
Hourly Total	0	315	20	0	**335**	10	0	3	0	**13**	8	402	0	0	**410**	0	0	0	0	**0**	**758**
8:00AM	1	90	4	0	**95**	0	0	0	0	**0**	1	104	0	0	**105**	0	0	0	0	**0**	**200**
8:15AM	0	86	9	0	**95**	2	0	0	0	**2**	6	142	0	0	**148**	0	0	0	0	**0**	**245**
8:30AM	0	90	9	0	**99**	6	0	0	0	**6**	7	112	0	0	**119**	0	0	0	0	**0**	**224**
8:45AM	0	86	10	0	**96**	6	0	0	0	**6**	3	98	0	0	**101**	0	0	0	0	**0**	**203**
Hourly Total	1	352	32	0	**385**	14	0	0	0	**14**	17	456	0	0	**473**	0	0	0	0	**0**	**872**
4:00PM	0	151	17	0	**168**	16	0	5	0	**21**	10	156	0	0	**166**	0	0	0	0	**0**	**355**
4:15PM	0	147	21	0	**168**	18	0	6	0	**24**	6	170	0	0	**176**	0	0	0	0	**0**	**368**
4:30PM	0	156	8	0	**164**	21	0	6	0	**27**	6	164	0	0	**170**	0	0	1	0	**1**	**362**
4:45PM	3	173	17	0	**193**	12	0	4	0	**16**	8	161	1	0	**170**	3	0	0	0	**3**	**382**
Hourly Total	3	627	63	0	**693**	67	0	21	0	**88**	30	651	1	0	**682**	3	0	1	0	**4**	**1467**
5:00PM	2	152	17	0	**171**	21	0	7	0	**28**	11	195	1	0	**207**	0	0	0	0	**0**	**406**
5:15PM	7	154	23	0	**184**	25	0	7	0	**32**	12	159	5	0	**176**	1	0	0	0	**1**	**393**
5:30PM	5	166	16	0	**187**	20	0	9	0	**29**	9	138	5	0	**152**	4	0	3	0	**7**	**375**
5:45PM	10	142	23	0	**175**	21	0	1	0	**22**	9	133	5	0	**147**	0	0	1	0	**1**	**345**
Hourly Total	24	614	79	0	**717**	87	0	24	0	**111**	41	625	16	0	**682**	5	0	4	0	**9**	**1519**
Total	28	1908	194	0	**2130**	178	0	48	0	**226**	96	2134	17	0	**2247**	8	0	5	0	**13**	**4616**
% Approach	1.3%	89.6%	9.1%	0%	-	78.8%	0%	21.2%	0%	-	4.3%	95.0%	0.8%	0%	-	61.5%	0%	38.5%	0%	-	-
% Total	0.6%	41.3%	4.2%	0%	**46.1%**	3.9%	0%	1.0%	0%	**4.9%**	2.1%	46.2%	0.4%	0%	**48.7%**	0.2%	0%	0.1%	0%	**0.3%**	-
Lights	28	1860	191	0	**2079**	178	0	48	0	**226**	94	2087	17	0	**2198**	8	0	5	0	**13**	4516
% Lights	100%	97.5%	98.5%	0%	**97.6%**	100%	0%	100%	0%	**100%**	97.9%	97.8%	100%	0%	**97.8%**	100%	0%	100%	0%	**100%**	97.8%
Articulated Trucks	0	13	0	0	**13**	0	0	0	0	**0**	0	16	0	0	**16**	0	0	0	0	**0**	29
% Articulated Trucks	0%	0.7%	0%	0%	**0.6%**	0%	0%	0%	0%	**0%**	0%	0.7%	0%	0%	**0.7%**	0%	0%	0%	0%	**0%**	0.6%
Motorized Vehicles	0	35	3	0	**38**	0	0	0	0	**0**	2	31	0	0	**33**	0	0	0	0	**0**	71
% Motorized Vehicles	0%	1.8%	1.5%	0%	**1.8%**	0%	0%	0%	0%	**0%**	2.1%	1.5%	0%	0%	**1.5%**	0%	0%	0%	0%	**0%**	1.5%

*L: Left, R: Right, T: Thru, U: U-Turn

Lee's Summit Road & Bass Pro Drive - TMC
Tue Oct 6, 2020
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786480, Location: 39.038235, -94.387693

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Lee's Summit Road & Bass Pro Drive - TMC
Tue Oct 6, 2020
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786480, Location: 39.038235, -94.387693

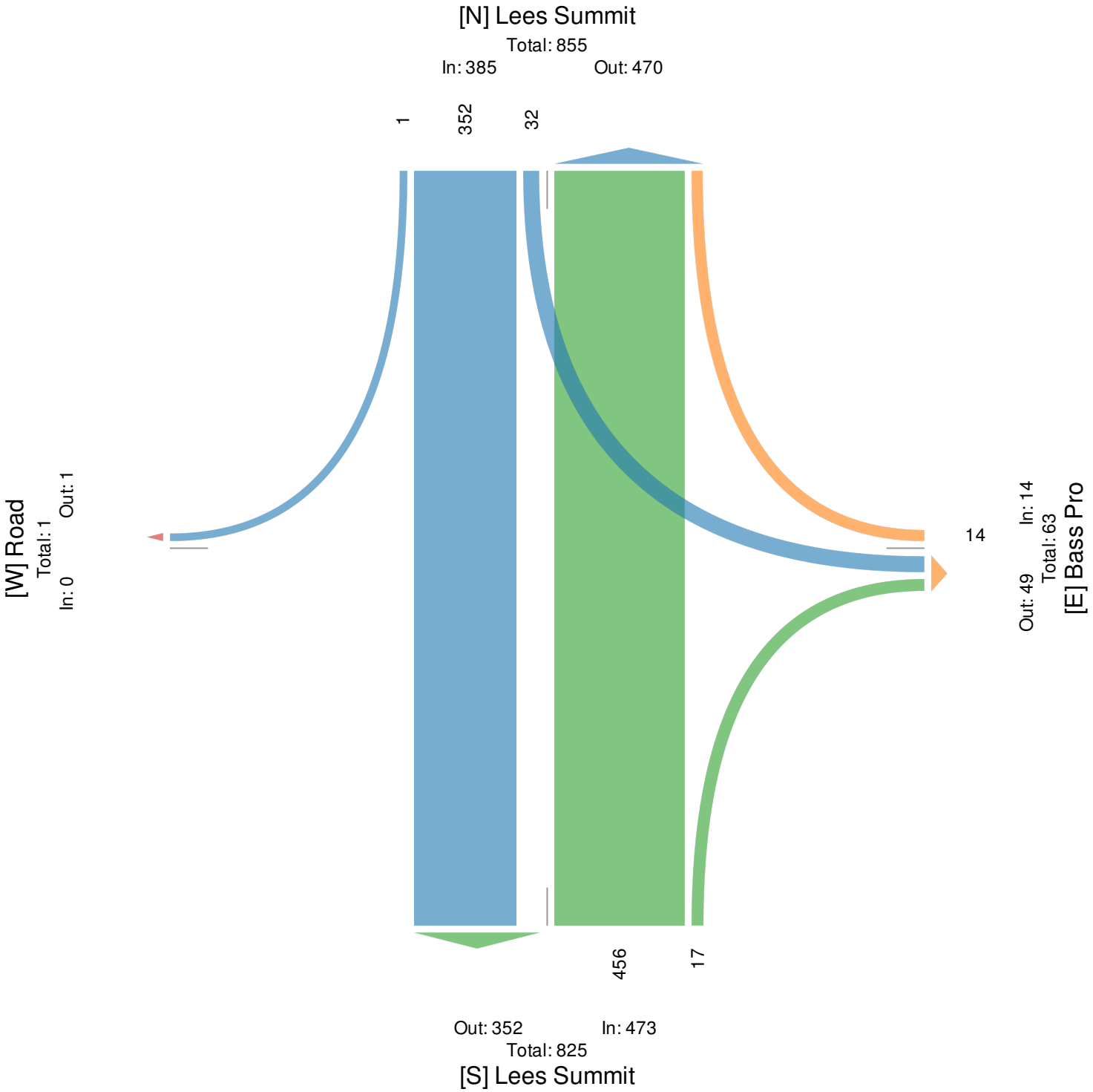
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Lees Summit					Bass Pro					Lees Summit					Road					
Direction	Southbound					Westbound					Northbound					Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2020-10-06 8:00AM	1	90	4	0	**95**	0	0	0	0	**0**	1	104	0	0	**105**	0	0	0	0	**0**	**200**
8:15AM	0	86	9	0	**95**	2	0	0	0	**2**	6	142	0	0	**148**	0	0	0	0	**0**	**245**
8:30AM	0	90	9	0	**99**	6	0	0	0	**6**	7	112	0	0	**119**	0	0	0	0	**0**	**224**
8:45AM	0	86	10	0	**96**	6	0	0	0	**6**	3	98	0	0	**101**	0	0	0	0	**0**	**203**
Total	1	352	32	0	**385**	14	0	0	0	**14**	17	456	0	0	**473**	0	0	0	0	**0**	**872**
% Approach	0.3%	91.4%	8.3%	0%	-	100%	0%	0%	0%	-	3.6%	96.4%	0%	0%	-	0%	0%	0%	0%	-	-
% Total	0.1%	40.4%	3.7%	0%	**44.2%**	1.6%	0%	0%	0%	**1.6%**	1.9%	52.3%	0%	0%	**54.2%**	0%	0%	0%	0%	**0%**	-
PHF	0.250	0.978	0.800	-	**0.972**	0.583	-	-	-	**0.583**	0.607	0.803	-	-	**0.799**	-	-	-	-	-	0.890
Lights	1	334	32	0	**367**	14	0	0	0	**14**	15	431	0	0	**446**	0	0	0	0	**0**	827
% Lights	100%	94.9%	100%	0%	**95.3%**	100%	0%	0%	0%	**100%**	88.2%	94.5%	0%	0%	**94.3%**	0%	0%	0%	0%	-	94.8%
Articulated Trucks	0	6	0	0	**6**	0	0	0	0	**0**	0	9	0	0	**9**	0	0	0	0	**0**	15
% Articulated Trucks	0%	1.7%	0%	0%	**1.6%**	0%	0%	0%	0%	**0%**	0%	2.0%	0%	0%	**1.9%**	0%	0%	0%	0%	-	1.7%
Motorized Vehicles	0	12	0	0	**12**	0	0	0	0	**0**	2	16	0	0	**18**	0	0	0	0	**0**	30
% Motorized Vehicles	0%	3.4%	0%	0%	**3.1%**	0%	0%	0%	0%	**0%**	11.8%	3.5%	0%	0%	**3.8%**	0%	0%	0%	0%	-	3.4%

*L: Left, R: Right, T: Thru, U: U-Turn

Lee's Summit Road & Bass Pro Drive - TMC
Tue Oct 6, 2020
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786480, Location: 39.038235, -94.387693

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Lee's Summit Road & Bass Pro Drive - TMC

Tue Oct 6, 2020
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786480, Location: 39.038235, -94.387693

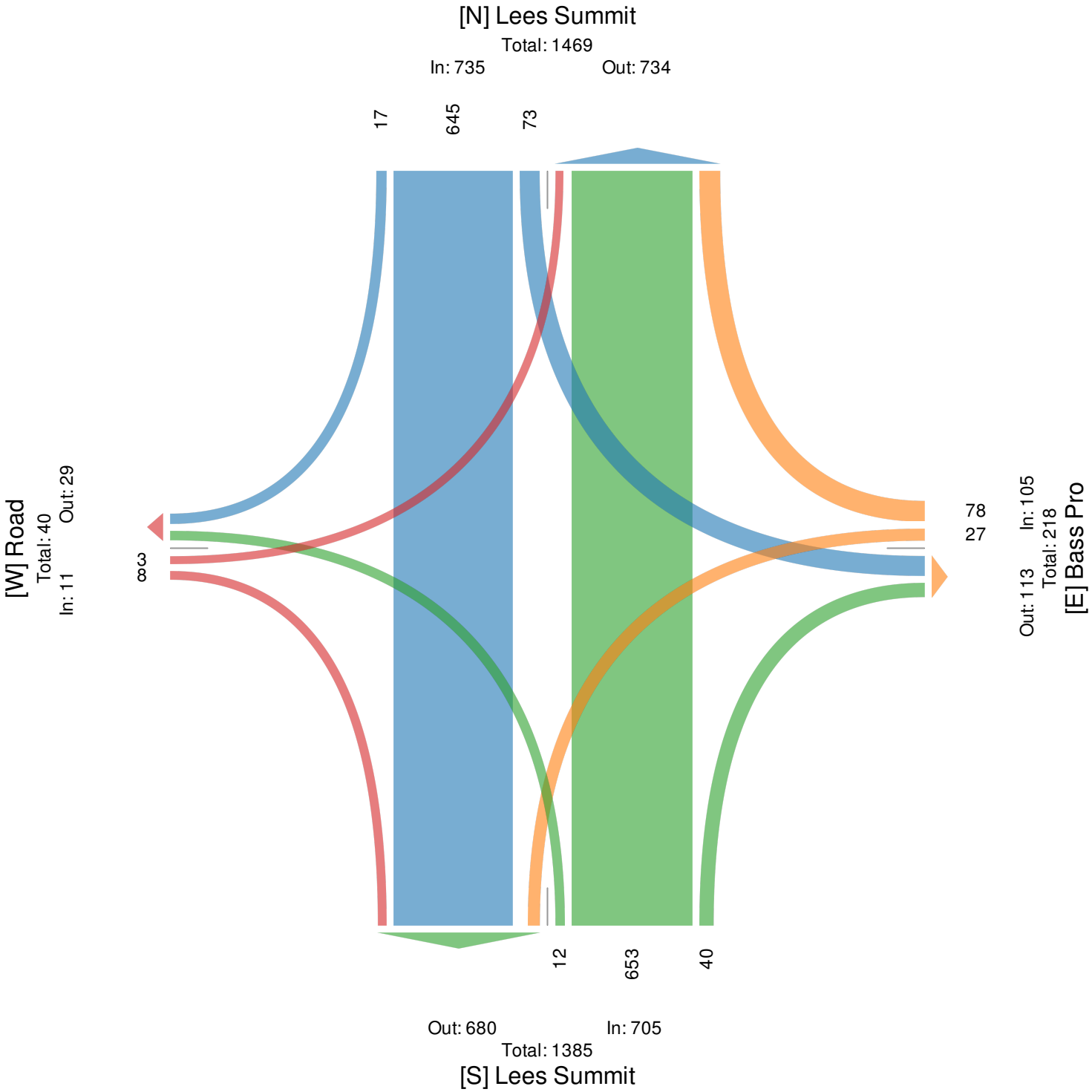
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Lees Summit					Bass Pro					Lees Summit					Road					
Direction	Southbound					Westbound					Northbound					Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2020-10-06 4:45PM	3	173	17	0	**193**	12	0	4	0	**16**	8	161	1	0	**170**	3	0	0	0	**3**	**382**
5:00PM	2	152	17	0	**171**	21	0	7	0	**28**	11	195	1	0	**207**	0	0	0	0	**0**	**406**
5:15PM	7	154	23	0	**184**	25	0	7	0	**32**	12	159	5	0	**176**	1	0	0	0	**1**	**393**
5:30PM	5	166	16	0	**187**	20	0	9	0	**29**	9	138	5	0	**152**	4	0	3	0	**7**	**375**
Total	17	645	73	0	**735**	78	0	27	0	**105**	40	653	12	0	**705**	8	0	3	0	**11**	**1556**
% Approach	2.3%	87.8%	9.9%	0%	-	74.3%	0%	25.7%	0%	-	5.7%	92.6%	1.7%	0%	-	72.7%	0%	27.3%	0%	-	-
% Total	1.1%	41.5%	4.7%	0%	**47.2%**	5.0%	0%	1.7%	0%	**6.7%**	2.6%	42.0%	0.8%	0%	**45.3%**	0.5%	0%	0.2%	0%	**0.7%**	-
PHF	0.607	0.932	0.793	-	**0.952**	0.780	-	0.750	-	**0.820**	0.833	0.837	0.600	-	**0.851**	0.500	-	0.250	-	**0.393**	0.958
Lights	17	635	73	0	**725**	78	0	27	0	**105**	40	650	12	0	**702**	8	0	3	0	**11**	1543
% Lights	100%	98.4%	100%	0%	**98.6%**	100%	0%	100%	0%	**100%**	100%	99.5%	100%	0%	**99.6%**	100%	0%	100%	0%	**100%**	99.2%
Articulated Trucks	0	2	0	0	**2**	0	0	0	0	**0**	0	2	0	0	**2**	0	0	0	0	**0**	4
% Articulated Trucks	0%	0.3%	0%	0%	**0.3%**	0%	0%	0%	0%	**0%**	0%	0.3%	0%	0%	**0.3%**	0%	0%	0%	0%	**0%**	0.3%
Motorized Vehicles	0	8	0	0	**8**	0	0	0	0	**0**	0	1	0	0	**1**	0	0	0	0	**0**	9
% Motorized Vehicles	0%	1.2%	0%	0%	**1.1%**	0%	0%	0%	0%	**0%**	0%	0.2%	0%	0%	**0.1%**	0%	0%	0%	0%	**0%**	0.6%

*L: Left, R: Right, T: Thru, U: U-Turn

Lee's Summit Road & Bass Pro Drive - TMC
Tue Oct 6, 2020
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786480, Location: 39.038235, -94.387693

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Bass Pro Drive & Bluff Drive (West Side) - TMC

Tue Oct 6, 2020
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786481, Location: 39.037982, -94.371903

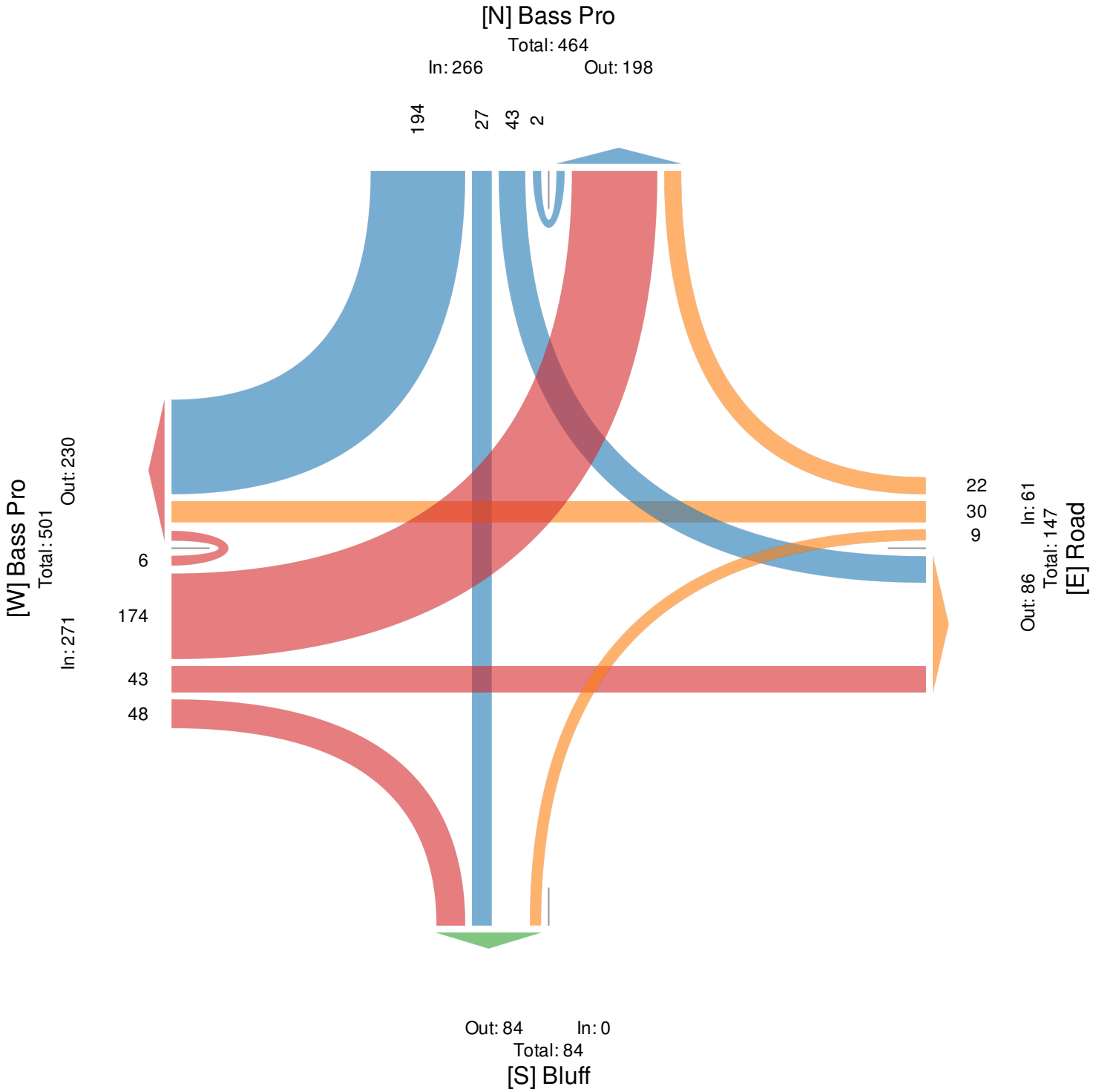
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Bass Pro					Road					Bluff					Bass Pro					
Direction	Southbound					Westbound					Northbound					Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2020-10-06 7:00AM	3	0	0	1	**4**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	1	1	**2**	**6**
7:15AM	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	1	4	2	0	**7**	**7**
7:30AM	3	0	0	1	**4**	0	0	0	0	**0**	0	0	0	0	**0**	2	0	5	0	**7**	**11**
7:45AM	3	0	1	0	**4**	0	1	0	0	**1**	0	0	0	0	**0**	2	0	9	1	**12**	**17**
Hourly Total	9	0	1	2	**12**	0	1	0	0	**1**	0	0	0	0	**0**	5	4	17	2	**28**	**41**
8:00AM	1	0	1	0	**2**	3	1	0	0	**4**	0	0	0	0	**0**	2	1	2	0	**5**	**11**
8:15AM	3	0	0	0	**3**	0	0	1	0	**1**	0	0	0	0	**0**	4	1	9	0	**14**	**18**
8:30AM	4	0	0	0	**4**	0	1	0	0	**1**	0	0	0	0	**0**	1	1	11	0	**13**	**18**
8:45AM	3	0	4	0	**7**	0	3	1	0	**4**	0	0	0	0	**0**	2	2	8	0	**12**	**23**
Hourly Total	11	0	5	0	**16**	3	5	2	0	**10**	0	0	0	0	**0**	9	5	30	0	**44**	**70**
4:00PM	24	4	5	0	**33**	4	4	1	0	**9**	0	0	0	0	**0**	3	4	18	0	**25**	**67**
4:15PM	17	3	1	0	**21**	1	3	0	0	**4**	0	0	0	0	**0**	4	6	15	0	**25**	**50**
4:30PM	23	7	5	0	**35**	2	4	1	0	**7**	0	0	0	0	**0**	7	2	8	0	**17**	**59**
4:45PM	19	7	0	0	**26**	1	2	0	0	**3**	0	0	0	0	**0**	7	5	11	0	**23**	**52**
Hourly Total	83	21	11	0	**115**	8	13	2	0	**23**	0	0	0	0	**0**	21	17	52	0	**90**	**228**
5:00PM	21	1	4	0	**26**	4	5	1	0	**10**	0	0	0	0	**0**	3	7	14	0	**24**	**60**
5:15PM	26	2	9	0	**37**	3	2	1	0	**6**	0	0	0	0	**0**	4	4	20	1	**29**	**72**
5:30PM	26	0	7	0	**33**	2	3	1	0	**6**	0	0	0	0	**0**	4	5	19	2	**30**	**69**
5:45PM	18	3	6	0	**27**	2	1	2	0	**5**	0	0	0	0	**0**	2	1	22	1	**26**	**58**
Hourly Total	91	6	26	0	**123**	11	11	5	0	**27**	0	0	0	0	**0**	13	17	75	4	**109**	**259**
Total	194	27	43	2	**266**	22	30	9	0	**61**	0	0	0	0	**0**	48	43	174	6	**271**	**598**
% Approach	72.9%	10.2%	16.2%	0.8%	-	36.1%	49.2%	14.8%	0%	-	0%	0%	0%	0%	-	17.7%	15.9%	64.2%	2.2%	-	-
% Total	32.4%	4.5%	7.2%	0.3%	**44.5%**	3.7%	5.0%	1.5%	0%	**10.2%**	0%	0%	0%	0%	**0%**	8.0%	7.2%	29.1%	1.0%	**45.3%**	-
Lights	194	27	43	2	**266**	22	30	9	0	**61**	0	0	0	0	**0**	48	43	170	6	**267**	594
% Lights	100%	100%	100%	100%	**100%**	100%	100%	100%	0%	**100%**	0%	0%	0%	0%	-	100%	100%	97.7%	100%	**98.5%**	99.3%
Articulated Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	-	0%	0%	0%	0%	**0%**	0%
Motorized Vehicles	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	4	0	**4**	4
% Motorized Vehicles	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	-	0%	0%	2.3%	0%	**1.5%**	0.7%

*L: Left, R: Right, T: Thru, U: U-Turn

Bass Pro Drive & Bluff Drive (West Side) - TMC
Tue Oct 6, 2020
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786481, Location: 39.037982, -94.371903

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Bass Pro Drive & Bluff Drive (West Side) - TMC

Tue Oct 6, 2020
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786481, Location: 39.037982, -94.371903

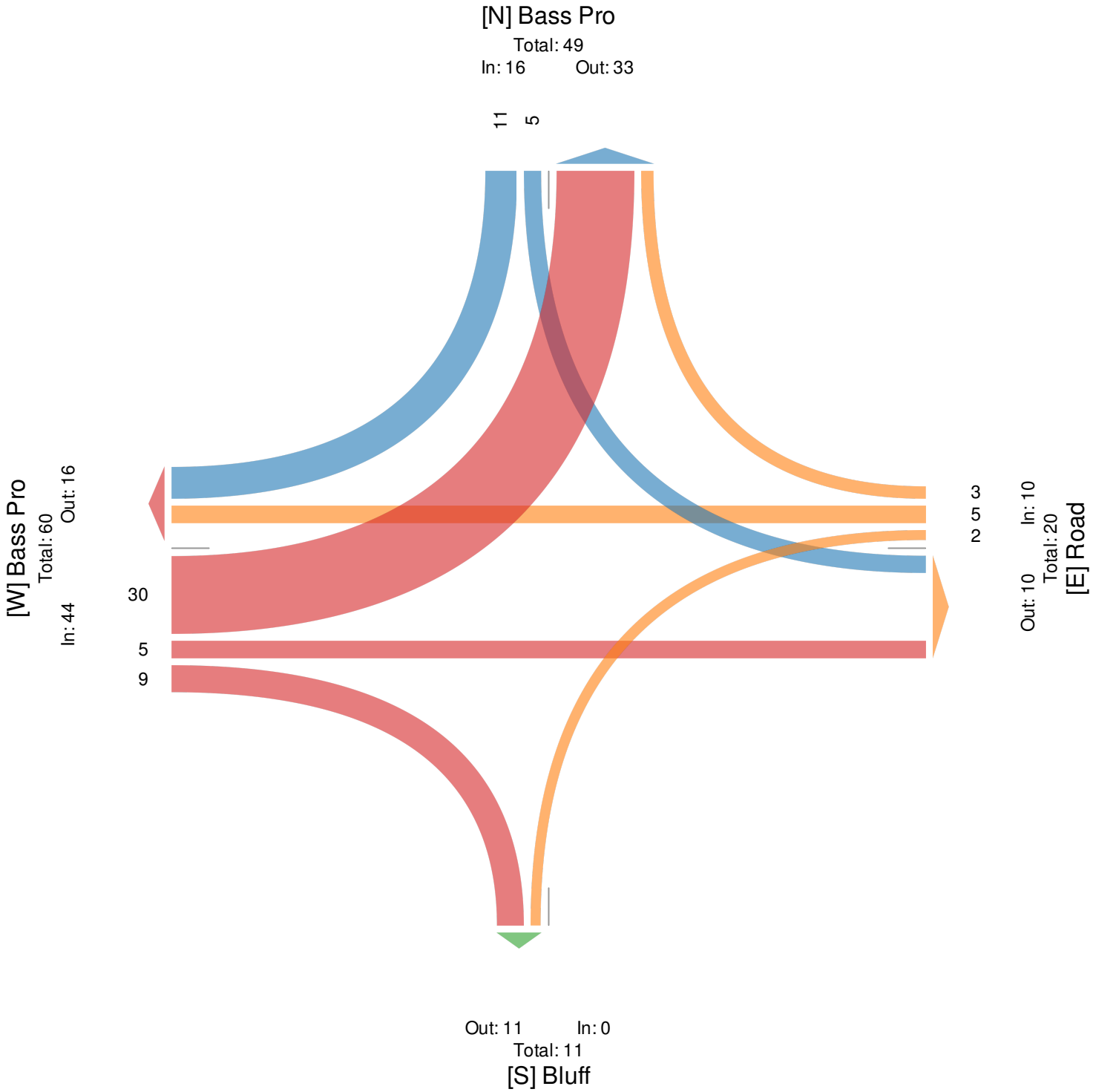
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Bass Pro					Road					Bluff					Bass Pro					
Direction	Southbound					Westbound					Northbound					Eastbound					
Time	R	T	L	U	**App**	R	T	L	U	**App**	R	T	L	U	**App**	R	T	L	U	**App**	**Int**
2020-10-06 8:00AM	1	0	1	0	**2**	3	1	0	0	**4**	0	0	0	0	**0**	2	1	2	0	**5**	**11**
8:15AM	3	0	0	0	**3**	0	0	1	0	**1**	0	0	0	0	**0**	4	1	9	0	**14**	**18**
8:30AM	4	0	0	0	**4**	0	1	0	0	**1**	0	0	0	0	**0**	1	1	11	0	**13**	**18**
8:45AM	3	0	4	0	**7**	0	3	1	0	**4**	0	0	0	0	**0**	2	2	8	0	**12**	**23**
Total	11	0	5	0	**16**	3	5	2	0	**10**	0	0	0	0	**0**	9	5	30	0	**44**	**70**
% Approach	68.8%	0%	31.3%	0%	-	30.0%	50.0%	20.0%	0%	-	0%	0%	0%	0%	-	20.5%	11.4%	68.2%	0%	-	-
% Total	15.7%	0%	7.1%	0%	**22.9%**	4.3%	7.1%	2.9%	0%	**14.3%**	0%	0%	0%	0%	**0%**	12.9%	7.1%	42.9%	0%	**62.9%**	-
PHF	0.688	-	0.313	-	**0.571**	0.250	0.417	0.500	-	**0.625**	-	-	-	-	-	0.563	0.625	0.682	-	**0.786**	0.761
Lights	11	0	5	0	**16**	3	5	2	0	**10**	0	0	0	0	**0**	9	5	29	0	**43**	69
% Lights	100%	0%	100%	0%	**100%**	100%	100%	100%	0%	**100%**	0%	0%	0%	0%	-	100%	100%	96.7%	0%	**97.7%**	98.6%
Articulated Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	-	0%	0%	0%	0%	**0%**	0%
Motorized Vehicles	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	1	0	**1**	1
% Motorized Vehicles	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	-	0%	0%	3.3%	0%	**2.3%**	1.4%

*L: Left, R: Right, T: Thru, U: U-Turn

Bass Pro Drive & Bluff Drive (West Side) - TMC
Tue Oct 6, 2020
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786481, Location: 39.037982, -94.371903

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Bass Pro Drive & Bluff Drive (West Side) - TMC

Tue Oct 6, 2020
PM Peak (5 PM - 6 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786481, Location: 39.037982, -94.371903

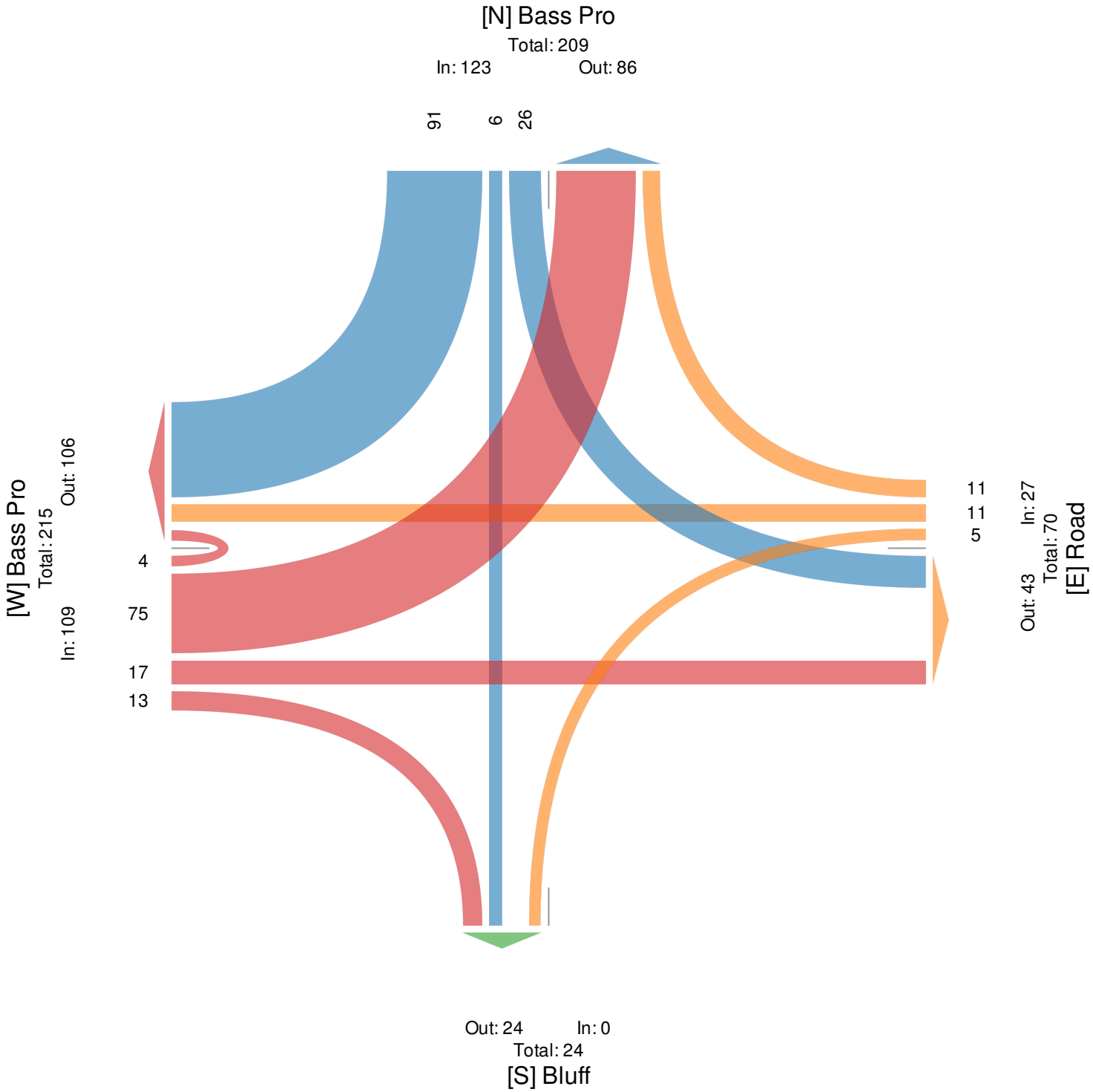
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Bass Pro					Road					Bluff					Bass Pro					
Direction	Southbound					Westbound					Northbound					Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2020-10-06 5:00PM	21	1	4	0	**26**	4	5	1	0	**10**	0	0	0	0	**0**	3	7	14	0	**24**	**60**
5:15PM	26	2	9	0	**37**	3	2	1	0	**6**	0	0	0	0	**0**	4	4	20	1	**29**	**72**
5:30PM	26	0	7	0	**33**	2	3	1	0	**6**	0	0	0	0	**0**	4	5	19	2	**30**	**69**
5:45PM	18	3	6	0	**27**	2	1	2	0	**5**	0	0	0	0	**0**	2	1	22	1	**26**	**58**
Total	91	6	26	0	**123**	11	11	5	0	**27**	0	0	0	0	**0**	13	17	75	4	**109**	**259**
% Approach	74.0%	4.9%	21.1%	0%	-	40.7%	40.7%	18.5%	0%	-	0%	0%	0%	0%	-	11.9%	15.6%	68.8%	3.7%	-	-
% Total	35.1%	2.3%	10.0%	0%	**47.5%**	4.2%	4.2%	1.9%	0%	**10.4%**	0%	0%	0%	0%	**0%**	5.0%	6.6%	29.0%	1.5%	**42.1%**	-
PHF	0.875	0.500	0.722	-	**0.831**	0.688	0.550	0.625	-	**0.675**	-	-	-	-	-	0.813	0.607	0.852	0.500	**0.908**	0.899
Lights	91	6	26	0	**123**	11	11	5	0	**27**	0	0	0	0	**0**	13	17	75	4	**109**	259
% Lights	100%	100%	100%	0%	**100%**	100%	100%	100%	0%	**100%**	0%	0%	0%	0%	-	100%	100%	100%	100%	**100%**	100%
Articulated Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	-	0%	0%	0%	0%	**0%**	0%
Motorized Vehicles	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0
% Motorized Vehicles	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	-	0%	0%	0%	0%	**0%**	0%

*L: Left, R: Right, T: Thru, U: U-Turn

Bass Pro Drive & Bluff Drive (West Side) - TMC
Tue Oct 6, 2020
PM Peak (5 PM - 6 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786481, Location: 39.037982, -94.371903

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Bass Pro Drive & Bluff Drive (East Side) - TMC

Tue Oct 6, 2020
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786482, Location: 39.036874, -94.364993

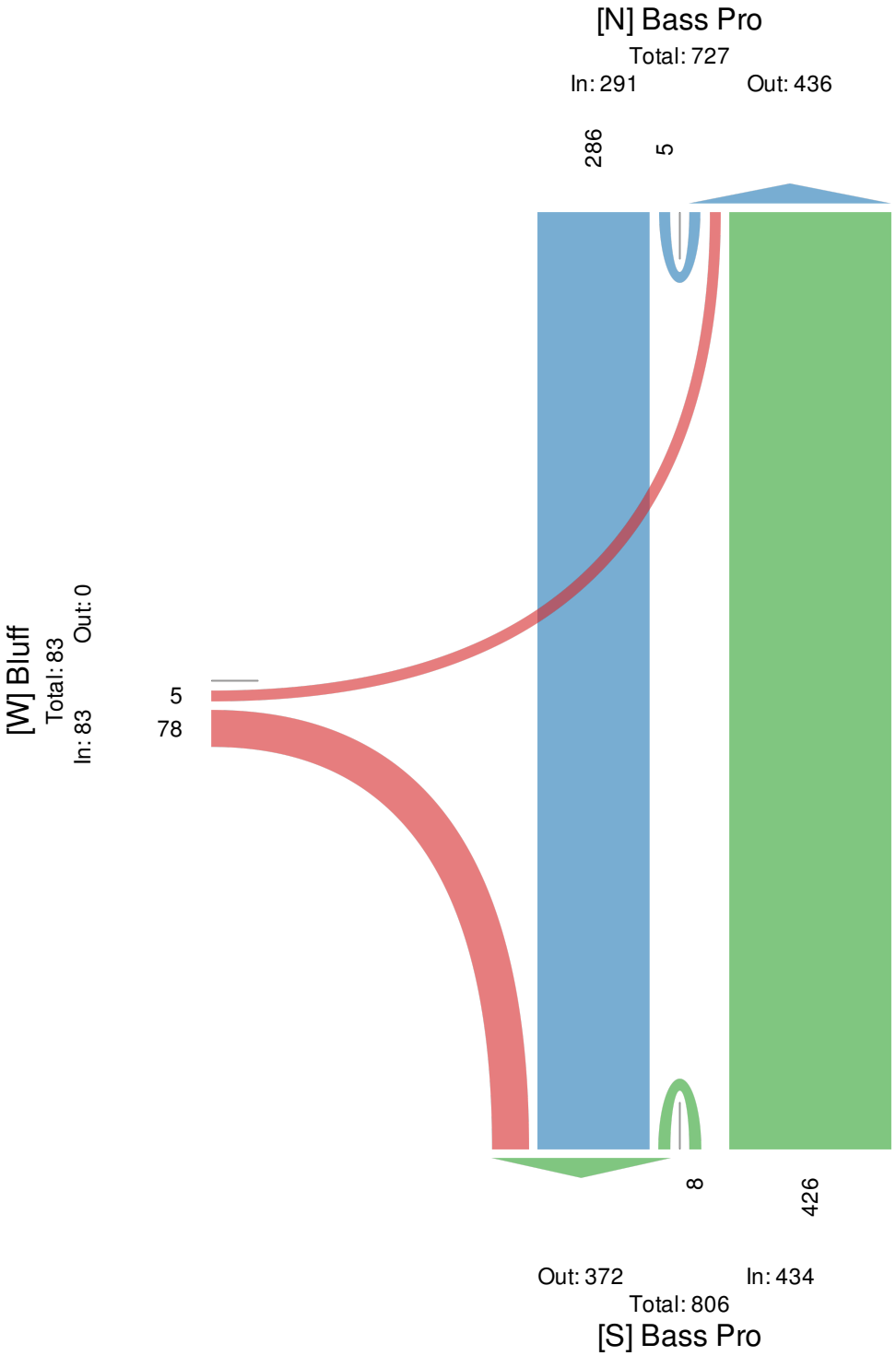
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Bass Pro					East					Bass Pro					Bluff					
Direction	Southbound					Westbound					Northbound					Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2020-10-06 7:00AM	0	2	0	0	**2**	0	0	0	0	**0**	0	4	0	0	**4**	0	0	0	0	**0**	**6**
7:15AM	0	1	0	0	**1**	0	0	0	0	**0**	0	1	0	0	**1**	0	0	1	0	**1**	**3**
7:30AM	0	5	0	0	**5**	0	0	0	0	**0**	0	14	0	1	**15**	1	0	0	0	**1**	**21**
7:45AM	0	8	0	0	**8**	0	0	0	0	**0**	0	10	0	0	**10**	3	0	0	0	**3**	**21**
Hourly Total	0	16	0	0	**16**	0	0	0	0	**0**	0	29	0	1	**30**	4	0	1	0	**5**	**51**
8:00AM	0	7	0	0	**7**	0	0	0	0	**0**	0	7	0	0	**7**	2	0	0	0	**2**	**16**
8:15AM	0	5	0	0	**5**	0	0	0	0	**0**	0	8	0	0	**8**	4	0	1	0	**5**	**18**
8:30AM	0	6	0	1	**7**	0	0	0	0	**0**	0	18	0	0	**18**	0	0	0	0	**0**	**25**
8:45AM	0	2	0	0	**2**	0	0	0	0	**0**	0	23	0	0	**23**	3	0	0	0	**3**	**28**
Hourly Total	0	20	0	1	**21**	0	0	0	0	**0**	0	56	0	0	**56**	9	0	1	0	**10**	**87**
4:00PM	0	32	0	0	**32**	0	0	0	0	**0**	0	52	0	0	**52**	9	0	0	0	**9**	**93**
4:15PM	0	27	0	0	**27**	0	0	0	0	**0**	0	47	0	2	**49**	7	0	0	0	**7**	**83**
4:30PM	0	27	0	0	**27**	0	0	0	0	**0**	0	45	0	0	**45**	14	0	0	0	**14**	**86**
4:45PM	0	35	0	0	**35**	0	0	0	0	**0**	0	32	0	1	**33**	14	0	1	0	**15**	**83**
Hourly Total	0	121	0	0	**121**	0	0	0	0	**0**	0	176	0	3	**179**	44	0	1	0	**45**	**345**
5:00PM	0	41	0	1	**42**	0	0	0	0	**0**	0	47	0	1	**48**	5	0	0	0	**5**	**95**
5:15PM	0	32	0	1	**33**	0	0	0	0	**0**	0	31	0	1	**32**	4	0	2	0	**6**	**71**
5:30PM	0	27	0	0	**27**	0	0	0	0	**0**	0	45	0	0	**45**	5	0	0	0	**5**	**77**
5:45PM	0	29	0	2	**31**	0	0	0	0	**0**	0	42	0	2	**44**	7	0	0	0	**7**	**82**
Hourly Total	0	129	0	4	**133**	0	0	0	0	**0**	0	165	0	4	**169**	21	0	2	0	**23**	**325**
Total	0	286	0	5	**291**	0	0	0	0	**0**	0	426	0	8	**434**	78	0	5	0	**83**	**808**
% Approach	0%	98.3%	0%	1.7%	-	0%	0%	0%	0%	-	0%	98.2%	0%	1.8%	-	94.0%	0%	6.0%	0%	-	-
% Total	0%	35.4%	0%	0.6%	**36.0%**	0%	0%	0%	0%	**0%**	0%	52.7%	0%	1.0%	**53.7%**	9.7%	0%	0.6%	0%	**10.3%**	-
Lights	0	274	0	5	**279**	0	0	0	0	**0**	0	421	0	8	**429**	78	0	5	0	**83**	791
% Lights	0%	95.8%	0%	100%	**95.9%**	0%	0%	0%	0%	-	0%	98.8%	0%	100%	**98.8%**	100%	0%	100%	0%	**100%**	97.9%
Articulated Trucks	0	3	0	0	**3**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	3
% Articulated Trucks	0%	1.0%	0%	0%	**1.0%**	0%	0%	0%	0%	-	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0.4%
Motorized Vehicles	0	9	0	0	**9**	0	0	0	0	**0**	0	5	0	0	**5**	0	0	0	0	**0**	14
% Motorized Vehicles	0%	3.1%	0%	0%	**3.1%**	0%	0%	0%	0%	-	0%	1.2%	0%	0%	**1.2%**	0%	0%	0%	0%	**0%**	1.7%

*L: Left, R: Right, T: Thru, U: U-Turn

Bass Pro Drive & Bluff Drive (East Side) - TMC
Tue Oct 6, 2020
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786482, Location: 39.036874, -94.364993

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Bass Pro Drive & Bluff Drive (East Side) - TMC

Tue Oct 6, 2020
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786482, Location: 39.036874, -94.364993

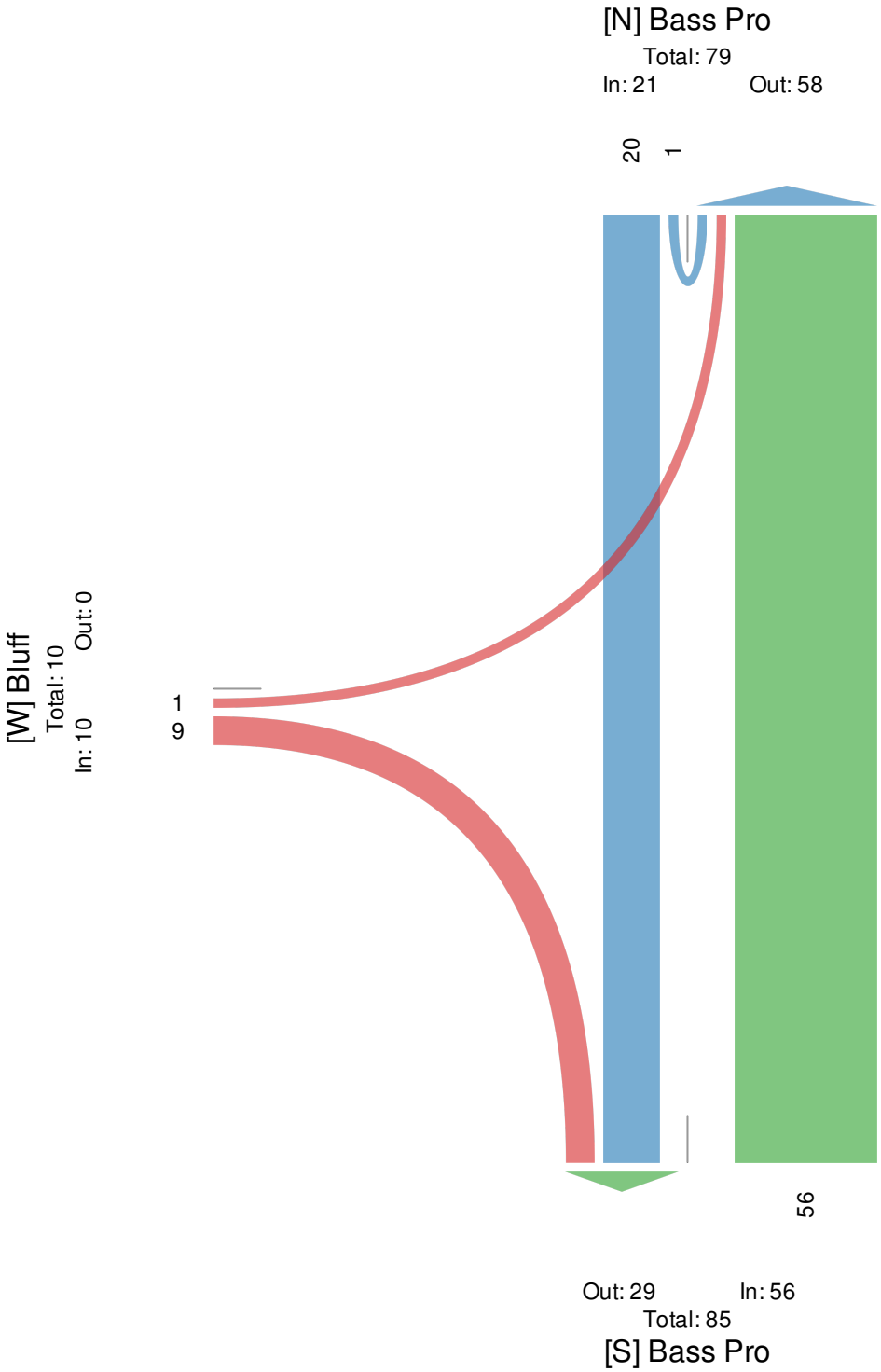
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg / Direction	Bass Pro Southbound					East Westbound					Bass Pro Northbound					Bluff Eastbound					
Time	R	T	L	U	**App**	R	T	L	U	**App**	R	T	L	U	**App**	R	T	L	U	**App**	**Int**
2020-10-06 8:00AM	0	7	0	0	**7**	0	0	0	0	**0**	0	7	0	0	**7**	2	0	0	0	**2**	**16**
8:15AM	0	5	0	0	**5**	0	0	0	0	**0**	0	8	0	0	**8**	4	0	1	0	**5**	**18**
8:30AM	0	6	0	1	**7**	0	0	0	0	**0**	0	18	0	0	**18**	0	0	0	0	**0**	**25**
8:45AM	0	2	0	0	**2**	0	0	0	0	**0**	0	23	0	0	**23**	3	0	0	0	**3**	**28**
Total	0	20	0	1	**21**	0	0	0	0	**0**	0	56	0	0	**56**	9	0	1	0	**10**	**87**
% Approach	0%	95.2%	0%	4.8%	-	0%	0%	0%	0%	-	0%	100%	0%	0%	-	90.0%	0%	10.0%	0%	-	-
% Total	0%	23.0%	0%	1.1%	**24.1%**	0%	0%	0%	0%	**0%**	0%	64.4%	0%	0%	**64.4%**	10.3%	0%	1.1%	0%	**11.5%**	-
PHF	-	0.714	-	0.250	**0.750**	-	-	-	-	-	-	0.609	-	-	**0.609**	0.563	-	0.250	-	**0.500**	0.777
Lights	0	18	0	1	**19**	0	0	0	0	**0**	0	56	0	0	**56**	9	0	1	0	**10**	85
% Lights	0%	90.0%	0%	100%	**90.5%**	0%	0%	0%	0%	-	0%	100%	0%	0%	**100%**	100%	0%	100%	0%	**100%**	97.7%
Articulated Trucks	0	1	0	0	**1**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	1
% Articulated Trucks	0%	5.0%	0%	0%	**4.8%**	0%	0%	0%	0%	-	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	1.1%
Motorized Vehicles	0	1	0	0	**1**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	1
% Motorized Vehicles	0%	5.0%	0%	0%	**4.8%**	0%	0%	0%	0%	-	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	1.1%

*L: Left, R: Right, T: Thru, U: U-Turn

Bass Pro Drive & Bluff Drive (East Side) - TMC
Tue Oct 6, 2020
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786482, Location: 39.036874, -94.364993

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Bass Pro Drive & Bluff Drive (East Side) - TMC

Tue Oct 6, 2020
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786482, Location: 39.036874, -94.364993

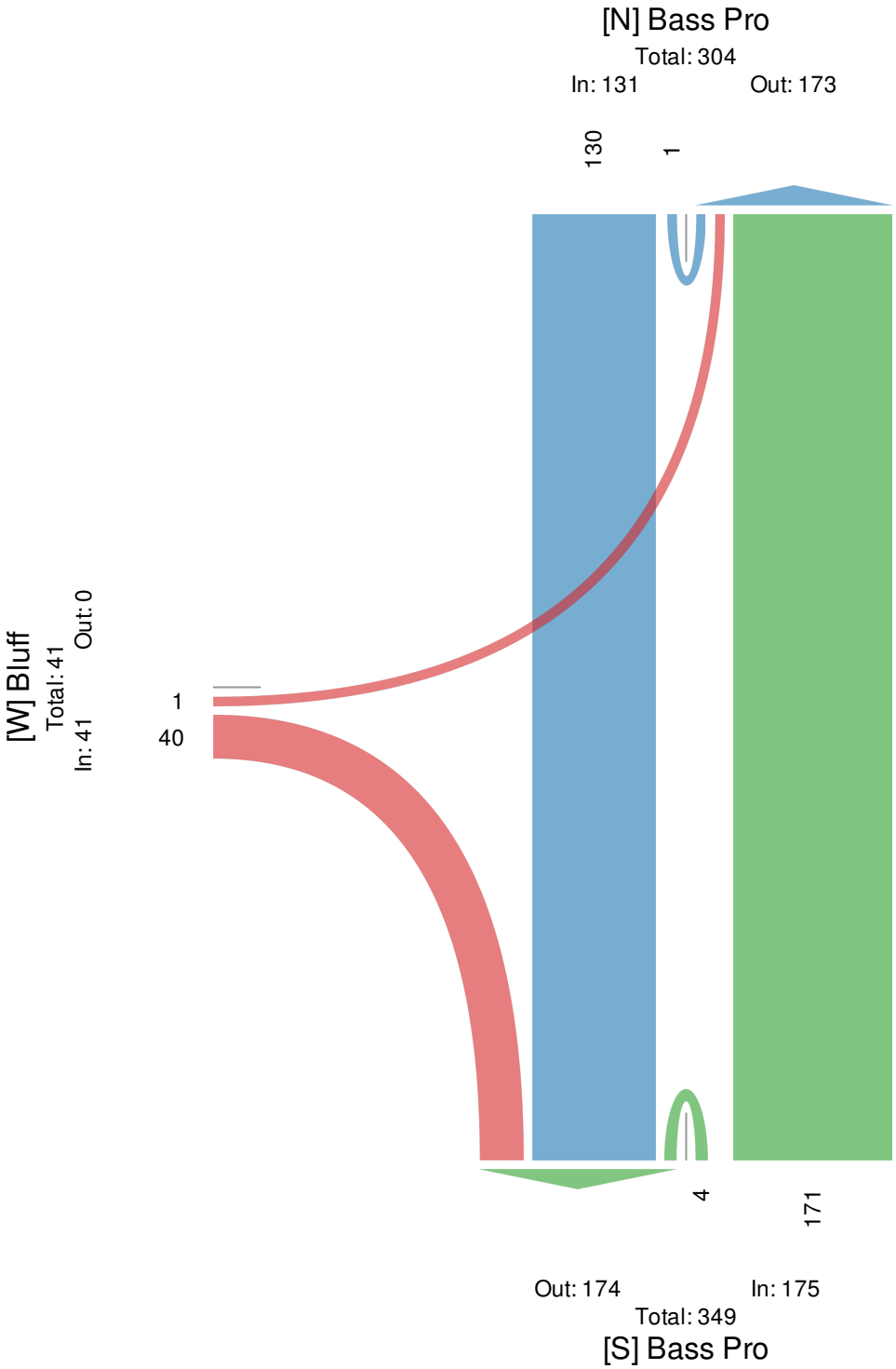
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg / Direction	Bass Pro Southbound					East Westbound					Bass Pro Northbound					Bluff Eastbound					
Time	R	T	L	U	**App**	R	T	L	U	**App**	R	T	L	U	**App**	R	T	L	U	**App**	**Int**
2020-10-06 4:15PM	0	27	0	0	**27**	0	0	0	0	**0**	0	47	0	2	**49**	7	0	0	0	**7**	**83**
4:30PM	0	27	0	0	**27**	0	0	0	0	**0**	0	45	0	0	**45**	14	0	0	0	**14**	**86**
4:45PM	0	35	0	0	**35**	0	0	0	0	**0**	0	32	0	1	**33**	14	0	1	0	**15**	**83**
5:00PM	0	41	0	1	**42**	0	0	0	0	**0**	0	47	0	1	**48**	5	0	0	0	**5**	**95**
Total	0	130	0	1	**131**	0	0	0	0	**0**	0	171	0	4	**175**	40	0	1	0	**41**	**347**
% Approach	0%	99.2%	0%	0.8%	-	0%	0%	0%	0%	-	0%	97.7%	0%	2.3%	-	97.6%	0%	2.4%	0%	-	-
% Total	0%	37.5%	0%	0.3%	**37.8%**	0%	0%	0%	0%	**0%**	0%	49.3%	0%	1.2%	**50.4%**	11.5%	0%	0.3%	0%	**11.8%**	-
PHF	-	0.793	-	0.250	**0.780**	-	-	-	-	-	-	0.910	-	0.500	**0.893**	0.714	-	0.250	-	**0.683**	0.913
Lights	0	129	0	1	**130**	0	0	0	0	**0**	0	170	0	4	**174**	40	0	1	0	**41**	345
% Lights	0%	99.2%	0%	100%	**99.2%**	0%	0%	0%	0%	-	0%	99.4%	0%	100%	**99.4%**	100%	0%	100%	0%	**100%**	99.4%
Articulated Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	-	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%
Motorized Vehicles	0	1	0	0	**1**	0	0	0	0	**0**	0	1	0	0	**1**	0	0	0	0	**0**	2
% Motorized Vehicles	0%	0.8%	0%	0%	**0.8%**	0%	0%	0%	0%	-	0%	0.6%	0%	0%	**0.6%**	0%	0%	0%	0%	**0%**	0.6%

*L: Left, R: Right, T: Thru, U: U-Turn

Bass Pro Drive & Bluff Drive (East Side) - TMC
Tue Oct 6, 2020
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786482, Location: 39.036874, -94.364993

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



46th Terrace & S Cliff Ave - TMC

Tue Oct 6, 2020
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786479, Location: 39.035785, -94.364517

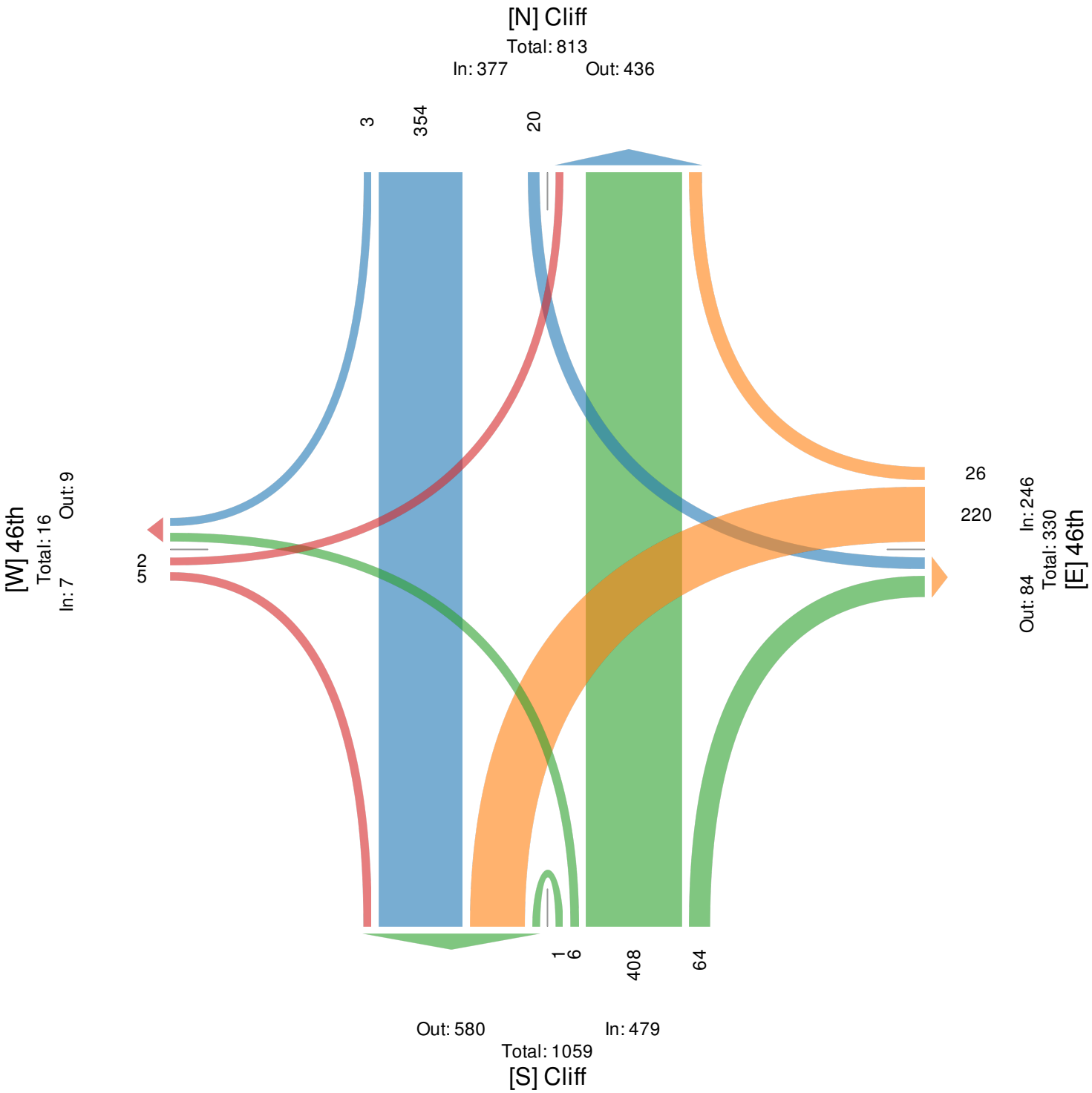
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Cliff					46th					Cliff					46th					
Direction	Southbound					Westbound					Northbound					Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2020-10-06 7:00AM	0	2	0	0	**2**	0	0	1	0	**1**	0	4	0	0	**4**	0	0	0	0	**0**	**7**
7:15AM	0	1	0	0	**1**	0	0	2	0	**2**	1	1	0	0	**2**	0	0	0	0	**0**	**5**
7:30AM	0	7	0	0	**7**	0	0	4	0	**4**	0	15	0	0	**15**	1	0	0	0	**1**	**27**
7:45AM	0	10	1	0	**11**	0	0	3	0	**3**	1	12	0	0	**13**	0	0	0	0	**0**	**27**
Hourly Total	0	20	1	0	**21**	0	0	10	0	**10**	2	32	0	0	**34**	1	0	0	0	**1**	**66**
8:00AM	0	9	0	0	**9**	0	0	6	0	**6**	0	6	1	0	**7**	0	0	0	0	**0**	**22**
8:15AM	0	7	1	0	**8**	2	0	3	0	**5**	0	6	0	0	**6**	0	0	0	0	**0**	**19**
8:30AM	0	8	0	0	**8**	1	0	6	0	**7**	1	17	0	0	**18**	0	0	0	0	**0**	**33**
8:45AM	0	4	1	0	**5**	2	0	6	0	**8**	1	21	0	1	**23**	0	0	0	0	**0**	**36**
Hourly Total	0	28	2	0	**30**	5	0	21	0	**26**	2	50	1	1	**54**	0	0	0	0	**0**	**110**
4:00PM	0	41	2	0	**43**	4	0	25	0	**29**	4	48	0	0	**52**	0	0	0	0	**0**	**124**
4:15PM	1	31	3	0	**35**	3	0	26	0	**29**	9	45	0	0	**54**	0	0	1	0	**1**	**119**
4:30PM	0	42	2	0	**44**	1	0	24	0	**25**	11	43	0	0	**54**	1	0	1	0	**2**	**125**
4:45PM	0	47	2	0	**49**	2	0	14	0	**16**	4	31	1	0	**36**	0	0	0	0	**0**	**101**
Hourly Total	1	161	9	0	**171**	10	0	89	0	**99**	28	167	1	0	**196**	1	0	2	0	**3**	**469**
5:00PM	0	47	0	0	**47**	2	0	23	0	**25**	8	46	2	0	**56**	2	0	0	0	**2**	**130**
5:15PM	1	34	3	0	**38**	1	0	41	0	**42**	6	31	1	0	**38**	1	0	0	0	**1**	**119**
5:30PM	1	27	3	0	**31**	5	0	17	0	**22**	6	42	1	0	**49**	0	0	0	0	**0**	**102**
5:45PM	0	37	2	0	**39**	3	0	19	0	**22**	12	40	0	0	**52**	0	0	0	0	**0**	**113**
Hourly Total	2	145	8	0	**155**	11	0	100	0	**111**	32	159	4	0	**195**	3	0	0	0	**3**	**464**
Total	3	354	20	0	**377**	26	0	220	0	**246**	64	408	6	1	**479**	5	0	2	0	**7**	**1109**
% Approach	0.8%	93.9%	5.3%	0%	-	10.6%	0%	89.4%	0%	-	13.4%	85.2%	1.3%	0.2%	-	71.4%	0%	28.6%	0%	-	-
% Total	0.3%	31.9%	1.8%	0%	**34.0%**	2.3%	0%	19.8%	0%	**22.2%**	5.8%	36.8%	0.5%	0.1%	**43.2%**	0.5%	0%	0.2%	0%	**0.6%**	-
Lights	3	342	20	0	**365**	25	0	218	0	**243**	64	404	5	1	**474**	5	0	2	0	**7**	1089
% Lights	100%	96.6%	100%	0%	**96.8%**	96.2%	0%	99.1%	0%	**98.8%**	100%	99.0%	83.3%	100%	**99.0%**	100%	0%	100%	0%	**100%**	98.2%
Articulated Trucks	0	3	0	0	**3**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	3
% Articulated Trucks	0%	0.8%	0%	0%	**0.8%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0.3%
Motorized Vehicles	0	9	0	0	**9**	1	0	2	0	**3**	0	4	1	0	**5**	0	0	0	0	**0**	17
% Motorized Vehicles	0%	2.5%	0%	0%	**2.4%**	3.8%	0%	0.9%	0%	**1.2%**	0%	1.0%	16.7%	0%	**1.0%**	0%	0%	0%	0%	**0%**	1.5%

*L: Left, R: Right, T: Thru, U: U-Turn

46th Terrace & S Cliff Ave - TMC
Tue Oct 6, 2020
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786479, Location: 39.035785, -94.364517

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



46th Terrace & S Cliff Ave - TMC

Tue Oct 6, 2020
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786479, Location: 39.035785, -94.364517

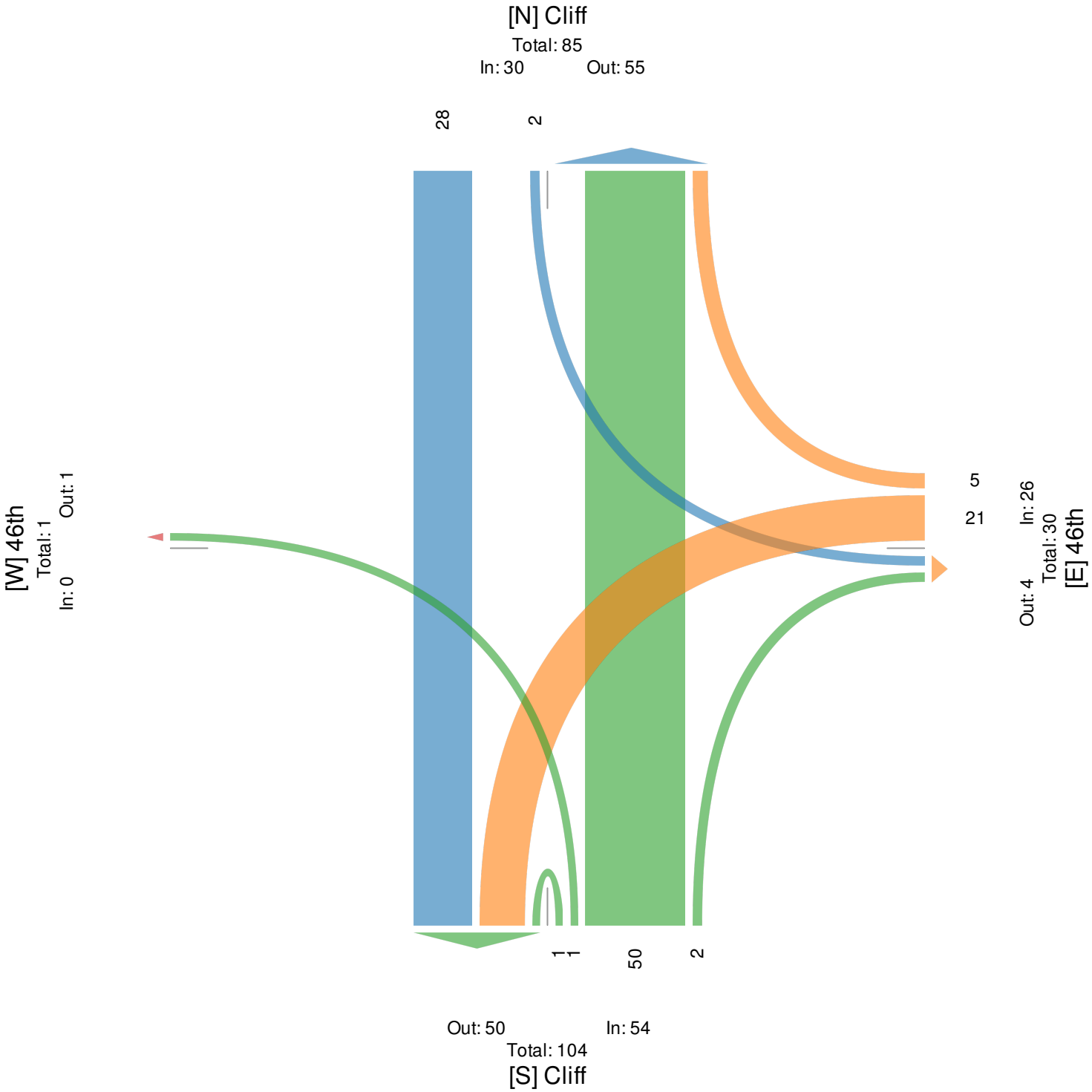
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Cliff					46th					Cliff					46th					
Direction	Southbound					Westbound					Northbound					Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2020-10-06 8:00AM	0	9	0	0	**9**	0	0	6	0	**6**	0	6	1	0	**7**	0	0	0	0	**0**	**22**
8:15AM	0	7	1	0	**8**	2	0	3	0	**5**	0	6	0	0	**6**	0	0	0	0	**0**	**19**
8:30AM	0	8	0	0	**8**	1	0	6	0	**7**	1	17	0	0	**18**	0	0	0	0	**0**	**33**
8:45AM	0	4	1	0	**5**	2	0	6	0	**8**	1	21	0	1	**23**	0	0	0	0	**0**	**36**
Total	0	28	2	0	**30**	5	0	21	0	**26**	2	50	1	1	**54**	0	0	0	0	**0**	**110**
% Approach	0%	93.3%	6.7%	0%	-	19.2%	0%	80.8%	0%	-	3.7%	92.6%	1.9%	1.9%	-	0%	0%	0%	0%	-	-
% Total	0%	25.5%	1.8%	0%	**27.3%**	4.5%	0%	19.1%	0%	**23.6%**	1.8%	45.5%	0.9%	0.9%	**49.1%**	0%	0%	0%	0%	**0%**	-
PHF	-	0.778	0.500	-	**0.833**	0.625	-	0.875	-	**0.813**	0.500	0.595	0.250	0.250	**0.587**	-	-	-	-	-	0.764
Lights	0	26	2	0	**28**	5	0	21	0	**26**	2	50	0	1	**53**	0	0	0	0	**0**	107
% Lights	0%	92.9%	100%	0%	**93.3%**	100%	0%	100%	0%	**100%**	100%	100%	0%	100%	**98.1%**	0%	0%	0%	0%	-	97.3%
Articulated Trucks	0	1	0	0	**1**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	1
% Articulated Trucks	0%	3.6%	0%	0%	**3.3%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	-	0.9%
Motorized Vehicles	0	1	0	0	**1**	0	0	0	0	**0**	0	0	1	0	**1**	0	0	0	0	**0**	2
% Motorized Vehicles	0%	3.6%	0%	0%	**3.3%**	0%	0%	0%	0%	**0%**	0%	0%	100%	0%	**1.9%**	0%	0%	0%	0%	-	1.8%

*L: Left, R: Right, T: Thru, U: U-Turn

46th Terrace & S Cliff Ave - TMC
Tue Oct 6, 2020
AM Peak (8 AM - 9 AM)
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786479, Location: 39.035785, -94.364517

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



46th Terrace & S Cliff Ave - TMC

Tue Oct 6, 2020
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786479, Location: 39.035785, -94.364517

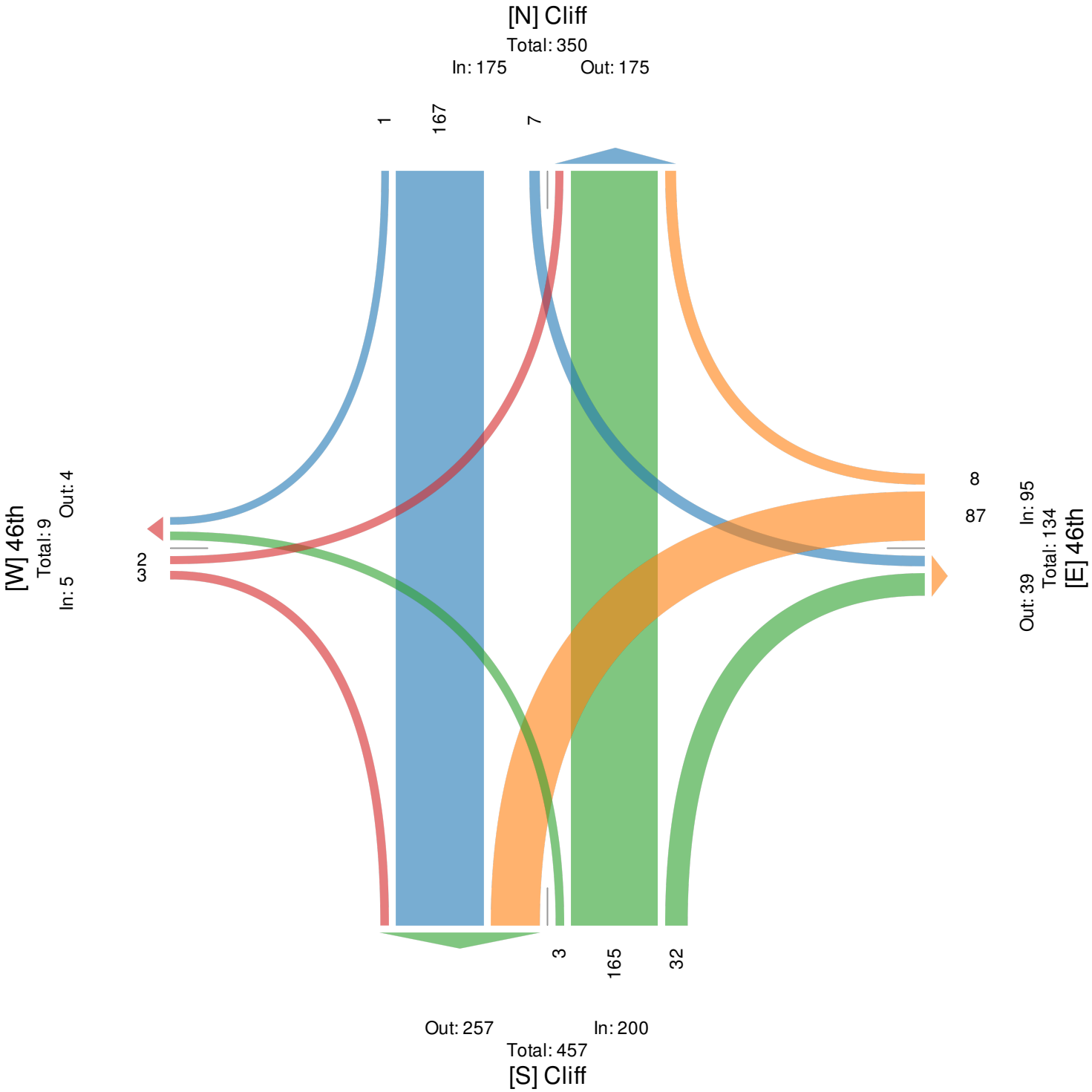
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg / Direction	Cliff Southbound					46th Westbound					Cliff Northbound					46th Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2020-10-06 4:15PM	1	31	3	0	**35**	3	0	26	0	**29**	9	45	0	0	**54**	0	0	1	0	**1**	**119**
4:30PM	0	42	2	0	**44**	1	0	24	0	**25**	11	43	0	0	**54**	1	0	1	0	**2**	**125**
4:45PM	0	47	2	0	**49**	2	0	14	0	**16**	4	31	1	0	**36**	0	0	0	0	**0**	**101**
5:00PM	0	47	0	0	**47**	2	0	23	0	**25**	8	46	2	0	**56**	2	0	0	0	**2**	**130**
Total	1	167	7	0	**175**	8	0	87	0	**95**	32	165	3	0	**200**	3	0	2	0	**5**	**475**
% Approach	0.6%	95.4%	4.0%	0%	-	8.4%	0%	91.6%	0%	-	16.0%	82.5%	1.5%	0%	-	60.0%	0%	40.0%	0%	-	-
% Total	0.2%	35.2%	1.5%	0%	**36.8%**	1.7%	0%	18.3%	0%	**20.0%**	6.7%	34.7%	0.6%	0%	**42.1%**	0.6%	0%	0.4%	0%	**1.1%**	-
PHF	0.250	0.888	0.583	-	**0.893**	0.667	-	0.837	-	**0.819**	0.727	0.897	0.375	-	**0.893**	0.375	-	0.500	-	**0.625**	0.913
Lights	1	166	7	0	**174**	8	0	87	0	**95**	32	164	3	0	**199**	3	0	2	0	**5**	473
% Lights	100%	99.4%	100%	0%	**99.4%**	100%	0%	100%	0%	**100%**	100%	99.4%	100%	0%	**99.5%**	100%	0%	100%	0%	**100%**	99.6%
Articulated Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%
Motorized Vehicles	0	1	0	0	**1**	0	0	0	0	**0**	0	1	0	0	**1**	0	0	0	0	**0**	2
% Motorized Vehicles	0%	0.6%	0%	0%	**0.6%**	0%	0%	0%	0%	**0%**	0%	0.6%	0%	0%	**0.5%**	0%	0%	0%	0%	**0%**	0.4%

*L: Left, R: Right, T: Thru, U: U-Turn

46th Terrace & S Cliff Ave - TMC
Tue Oct 6, 2020
PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Motorized Vehicles)
All Movements
ID: 786479, Location: 39.035785, -94.364517

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



MH Corbin Traffic Analyzer Study

Computer Generated Summary Report

City: INDEPENDENCE

Street: LEE'S SUMMIT RD

Location: LOCATION 3

A study of vehicle traffic was conducted with the device having serial number 403865. The study was done in the NB COMBINED lane at LEE'S SUMMIT RD in INDEPENDENCE, MO in JACKSON county. The study began on 10/06/2020 at 12:00 AM and concluded on 10/07/2020 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 8,112 vehicles passed through the location with a peak volume of 213 on 10/06/2020 at [05:00 PM-05:15 PM] and a minimum volume of 1 on 10/06/2020 at [03:15 AM-03:30 AM]. The AADT count for this study was 8,112.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 40 - 45 MPH range or lower. The average speed for all classified vehicles was 43 MPH with 68.63% vehicles exceeding the posted speed of 40 MPH. 4.53% percent of the total vehicles were traveling in excess of 55 MPH. The mode speed for this traffic study was 40MPH and the 85th percentile was 49.69 MPH.

< to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to >
0	5	1	7	88	597	1834	2613	1828	732	221	70	23	15	37

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 7727 which represents 96 percent of the total classified vehicles. The number of Single Unit in the study was 217 which represents 3 percent of the total classified vehicles. The number of Multi Unit in the study was 127 which represents 2 percent of the total classified vehicles. The number of Unclassified in the study was 0 which represents 0 percent of the total classified vehicles.

< to 23	24 to 38	39 to 99	100 to >											
7727	217	127	0											

CHART 2

HEADWAY

During the peak traffic period, on 10/06/2020 at [05:00 PM-05:15 PM] the average headway between vehicles was 4.206 seconds. During the slowest traffic period, on 10/06/2020 at [03:15 AM-03:30 AM] the average headway between vehicles was 450 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 59.00 and 109.00 degrees F.

MH Corbin Traffic Analyzer Study

Computer Generated Summary Report

City: INDEPENDENCE

Street: LEE'S SUMMIT RD

Location: LOCATION 3

A study of vehicle traffic was conducted with the device having serial number 403527. The study was done in the SB COMBINED lane at LEE'S SUMMIT RD in INDEPENDENCE, MO in JACKSON county. The study began on 10/06/2020 at 12:00 AM and concluded on 10/07/2020 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 7,657 vehicles passed through the location with a peak volume of 195 on 10/06/2020 at [10:30 AM-10:45 AM] and a minimum volume of 2 on 10/06/2020 at [02:45 AM-03:00 AM]. The AADT count for this study was 7,657.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 40 - 45 MPH range or lower. The average speed for all classified vehicles was 45 MPH with 77.36% vehicles exceeding the posted speed of 40 MPH. 6.61% percent of the total vehicles were traveling in excess of 55 MPH. The mode speed for this traffic study was 40MPH and the 85th percentile was 51.59 MPH.

< to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to >
0	6	8	40	129	393	1141	2335	2097	933	305	104	30	23	39

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 7255 which represents 96 percent of the total classified vehicles. The number of Single Unit in the study was 206 which represents 3 percent of the total classified vehicles. The number of Multi Unit in the study was 122 which represents 2 percent of the total classified vehicles. The number of Unclassified in the study was 0 which represents 0 percent of the total classified vehicles.

< to 23	24 to 38	39 to 99	100 to >											
7255	206	122	0											

CHART 2

HEADWAY

During the peak traffic period, on 10/06/2020 at [10:30 AM-10:45 AM] the average headway between vehicles was 4.592 seconds. During the slowest traffic period, on 10/06/2020 at [02:45 AM-03:00 AM] the average headway between vehicles was 300 seconds.

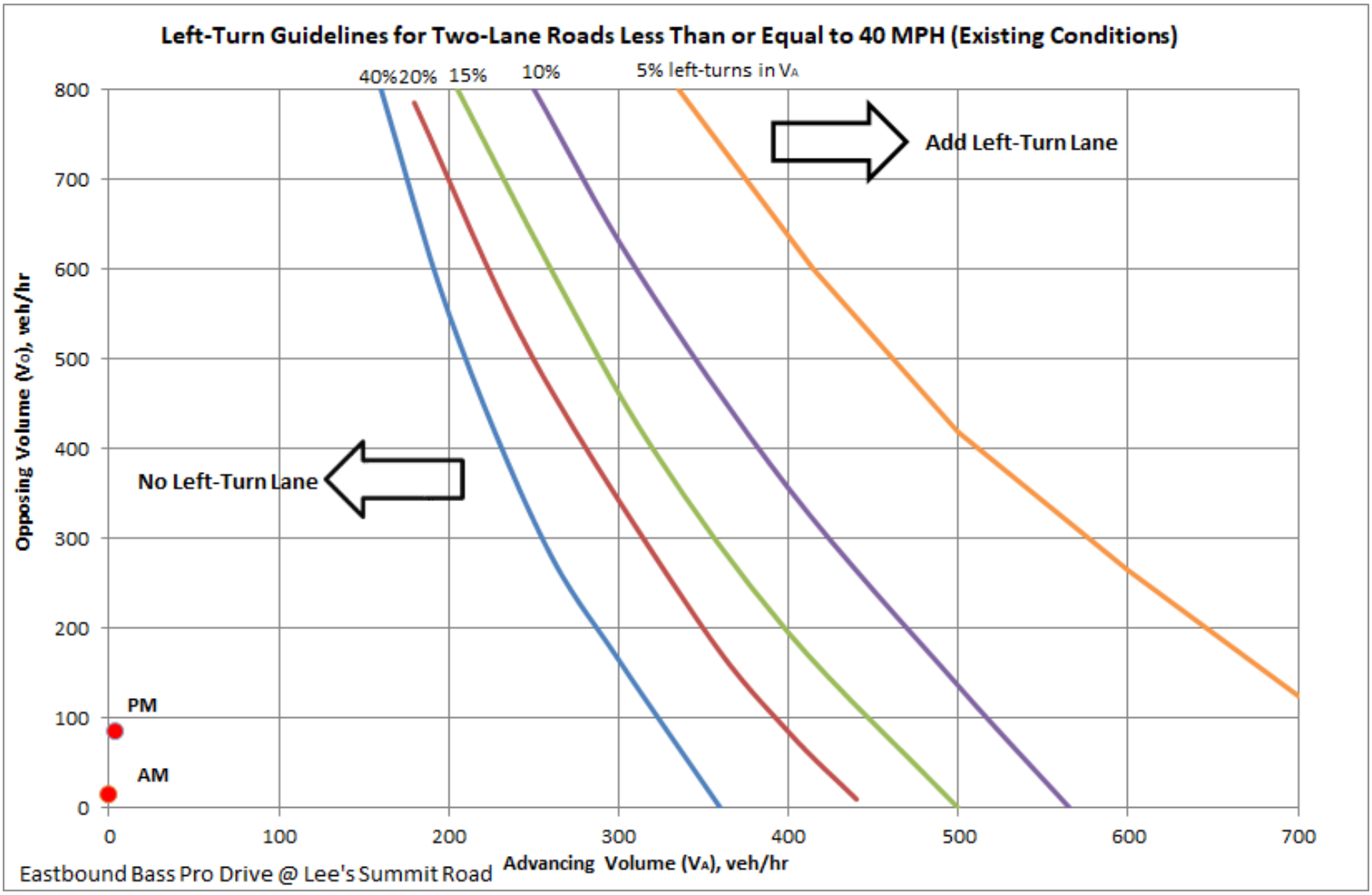
WEATHER

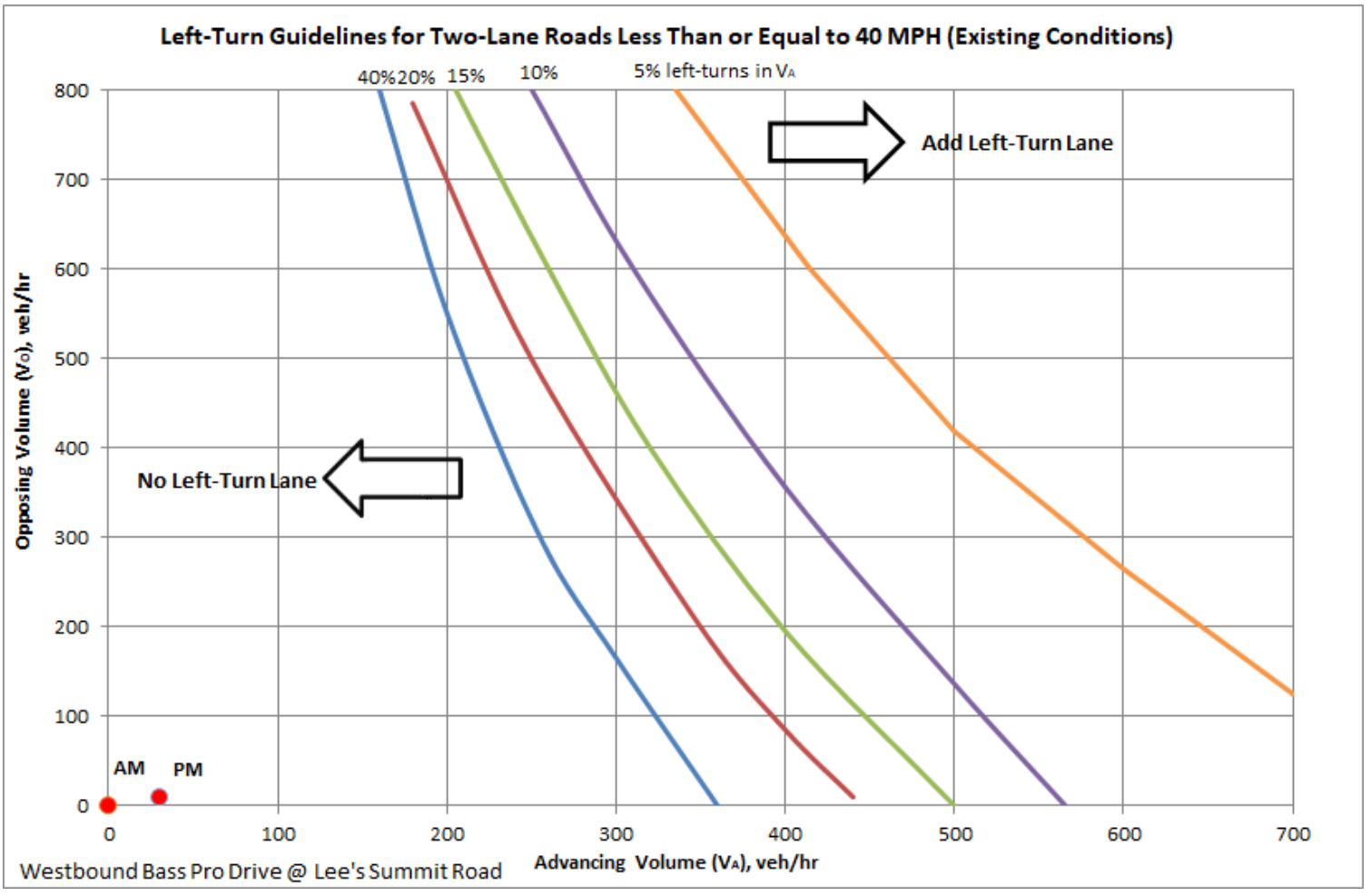
The roadway surface temperature over the period of the study varied between 59.00 and 109.00 degrees F.

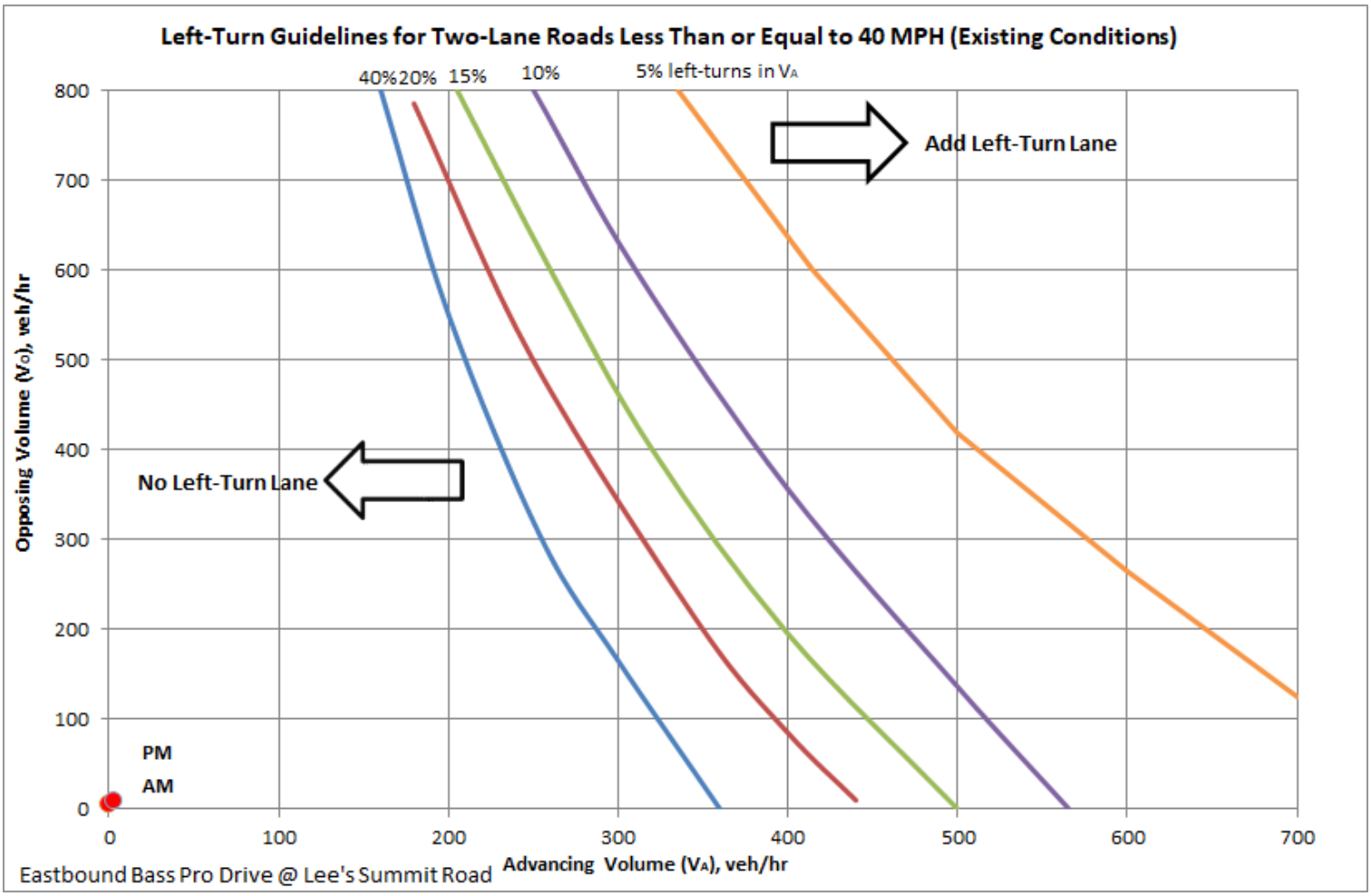
APPENDIX B

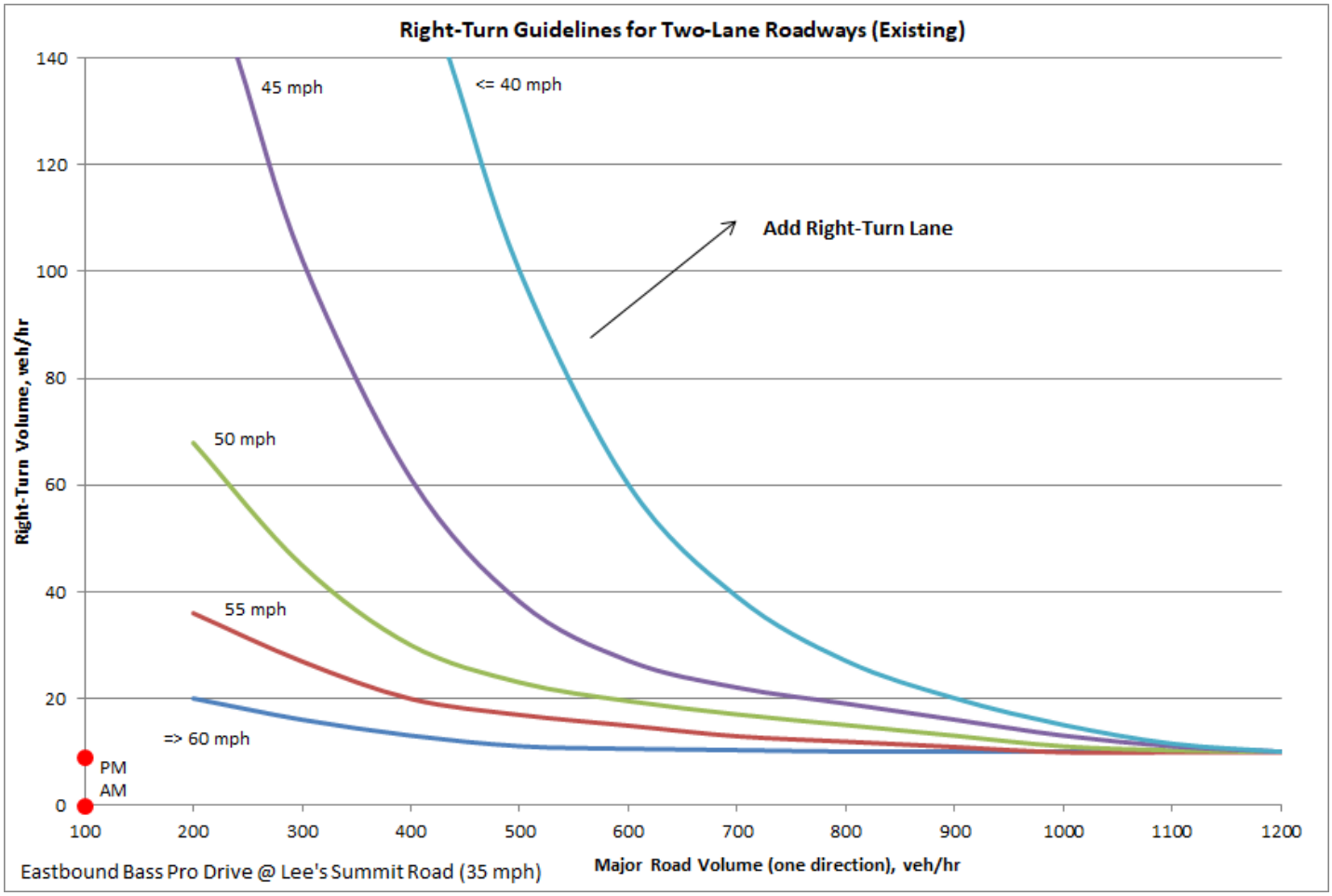
Existing Conditions

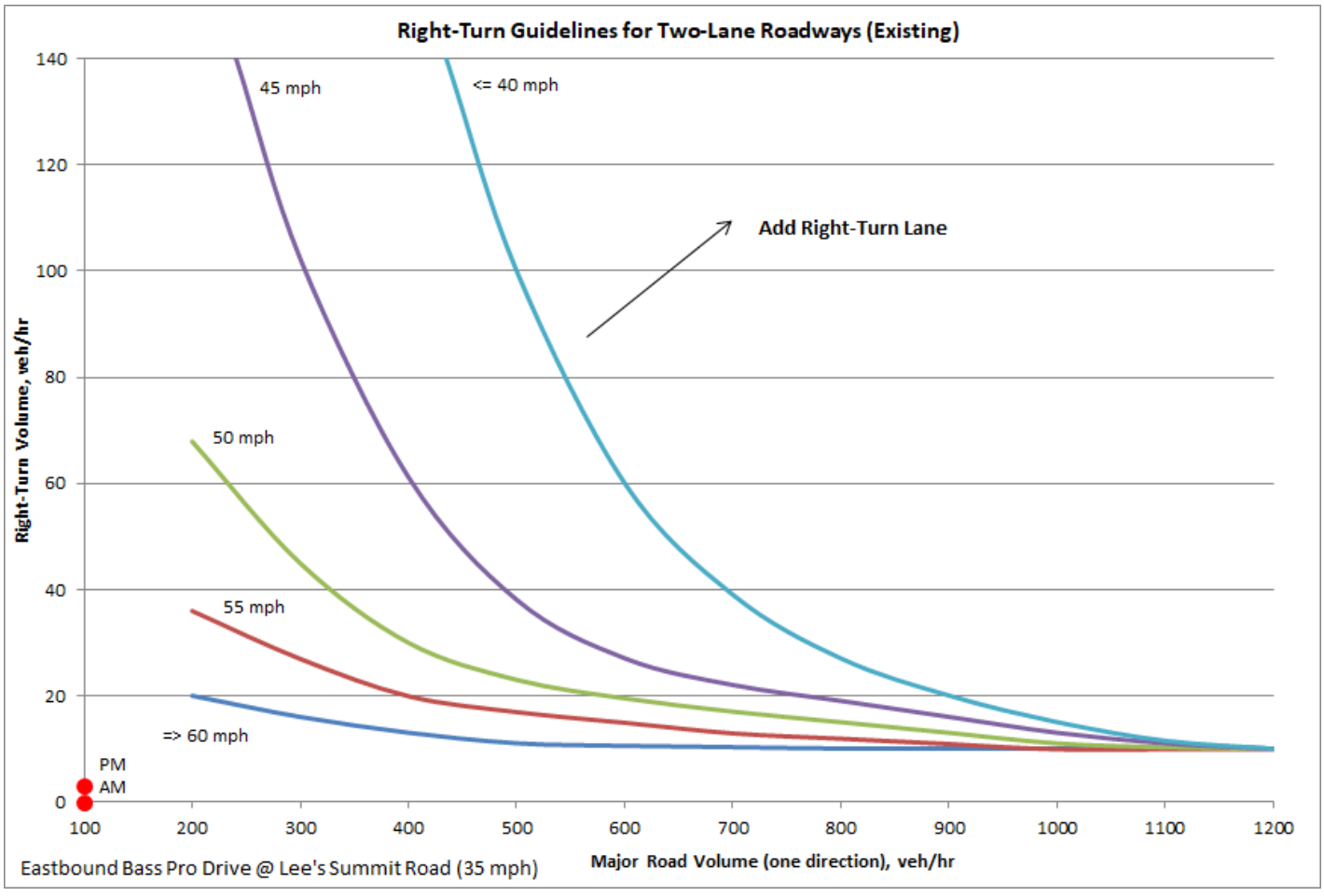
1 Turn Lane Warrants

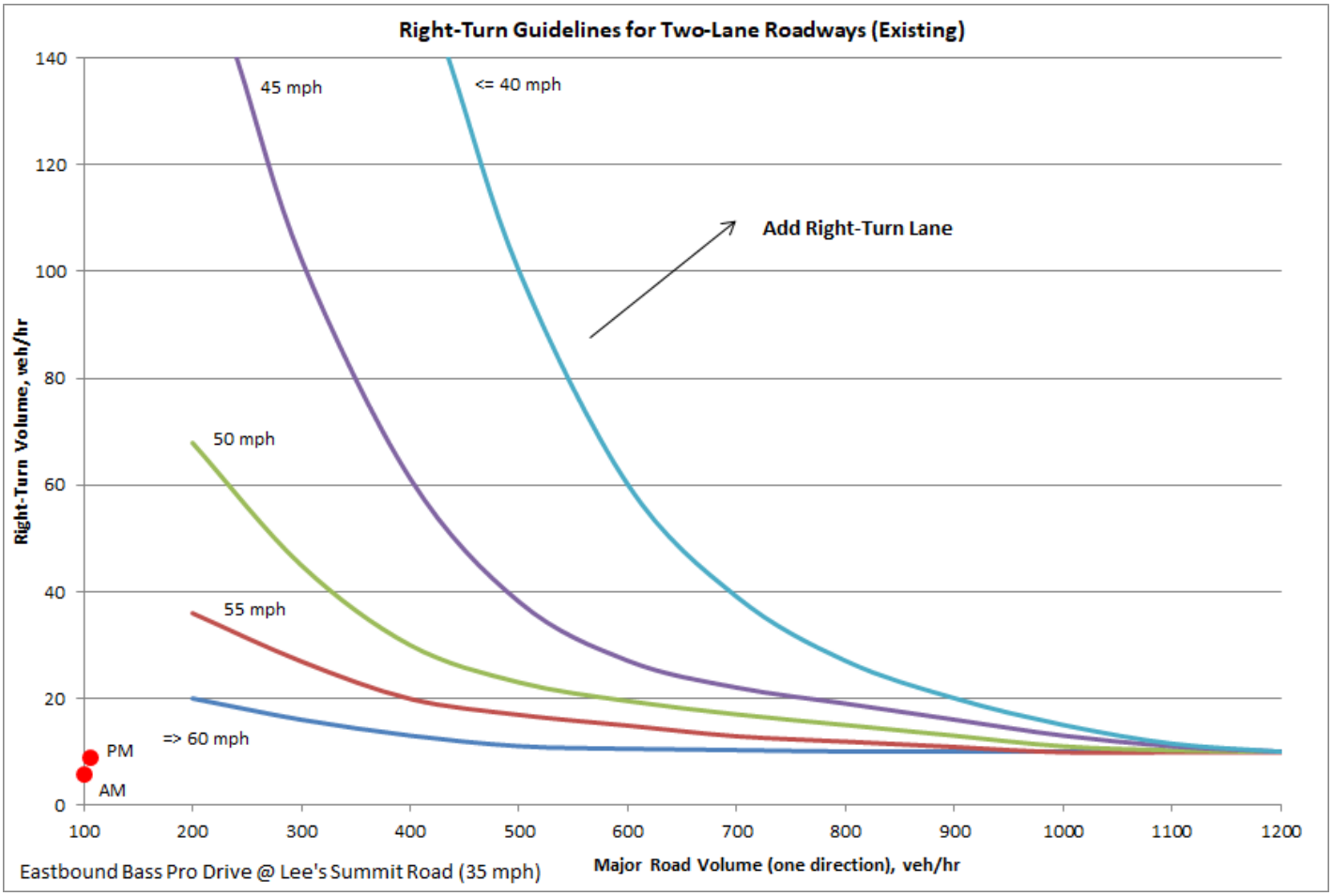

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Existing Conditions)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Eastbound Bass Pro Drive @ Lee's Summit Road

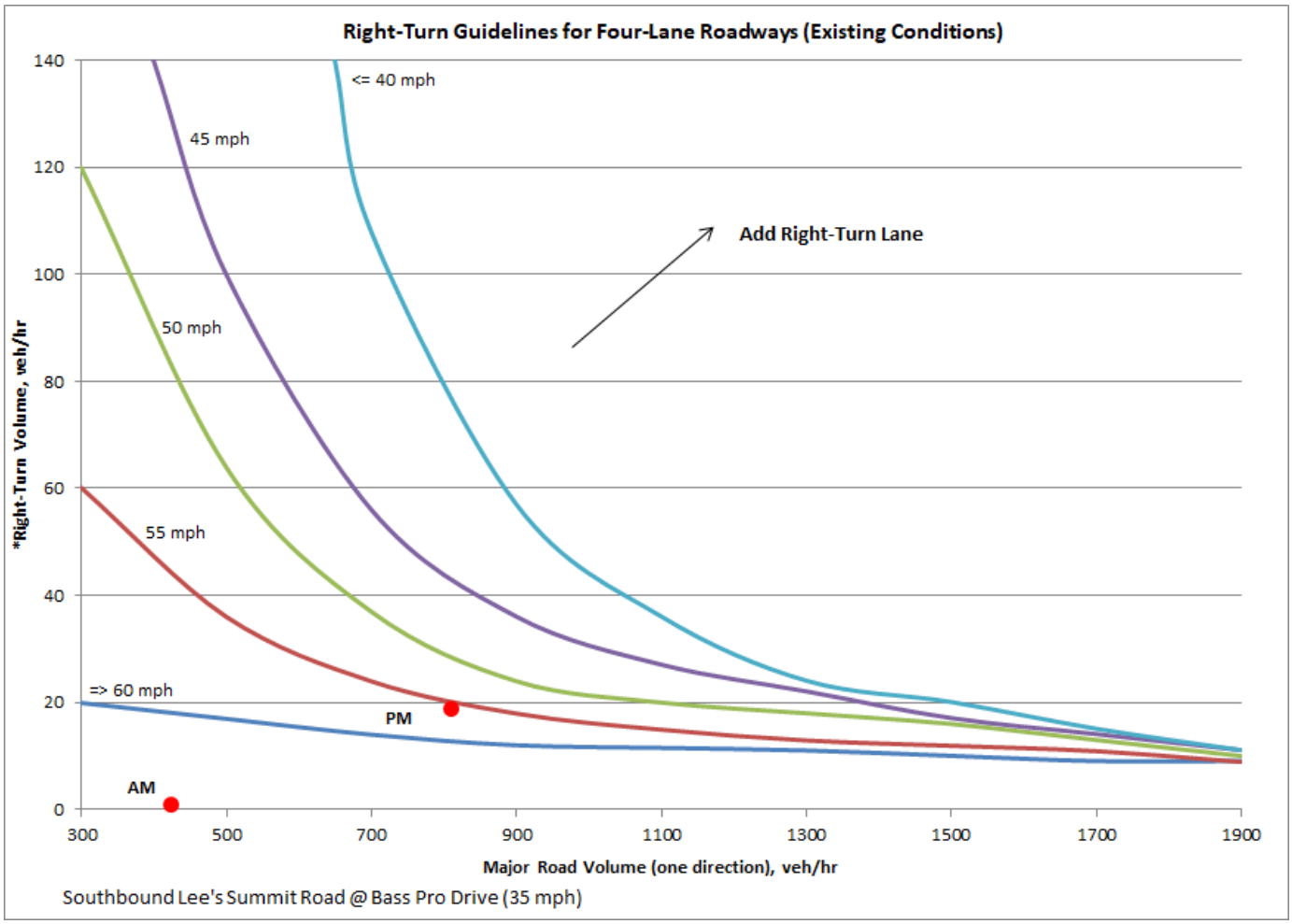

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Existing Conditions)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
AM
PM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Westbound Bass Pro Drive @ Lee's Summit Road


Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Existing Conditions)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Eastbound Bass Pro Drive @ Lee's Summit Road

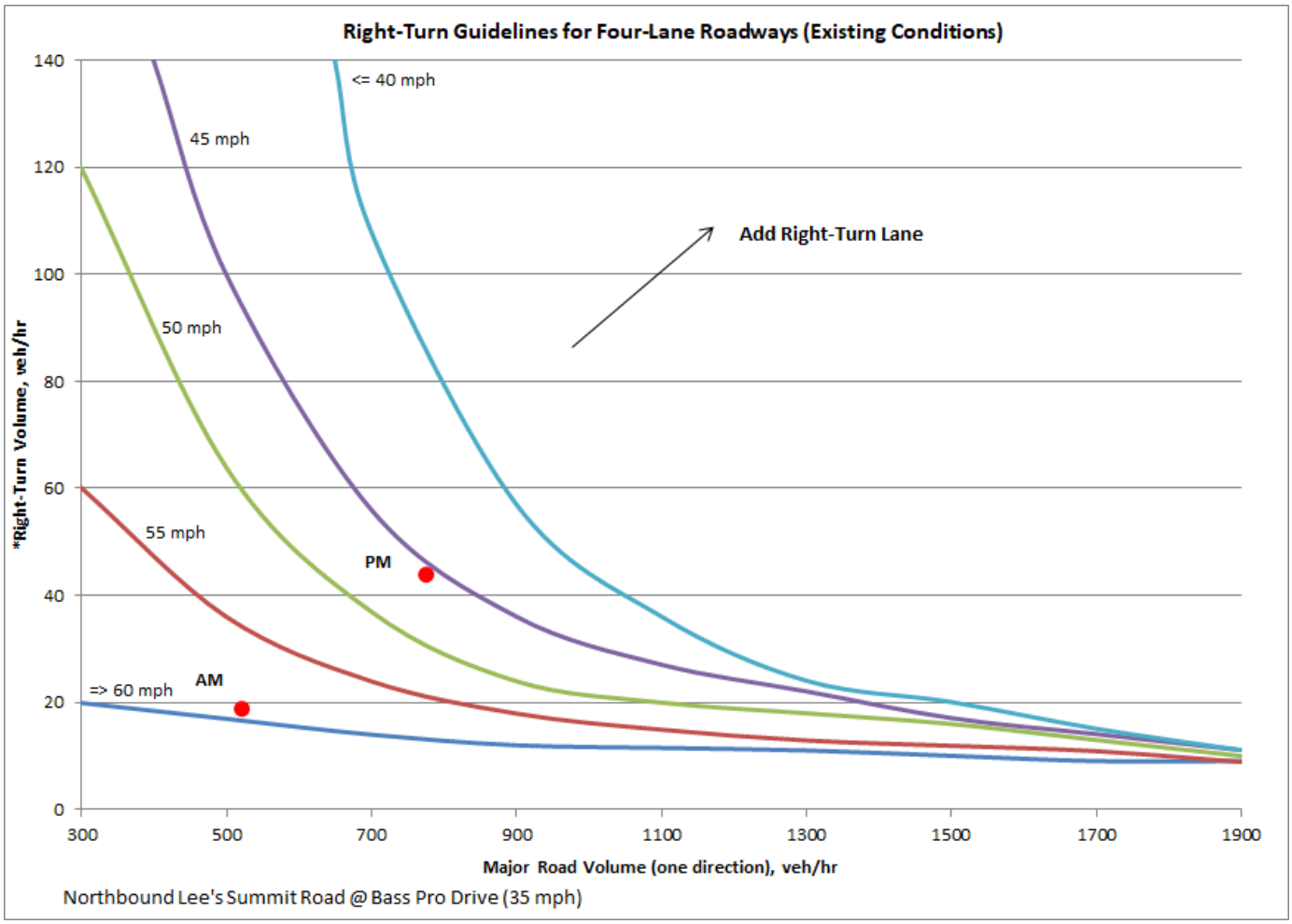

Right-Turn Guidelines for Two-Lane Roadways (Existing)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
PM
AM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Eastbound Bass Pro Drive @ Lee's Summit Road (35 mph)


Right-Turn Guidelines for Two-Lane Roadways (Existing)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
PM
AM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Eastbound Bass Pro Drive @ Lee's Summit Road (35 mph)

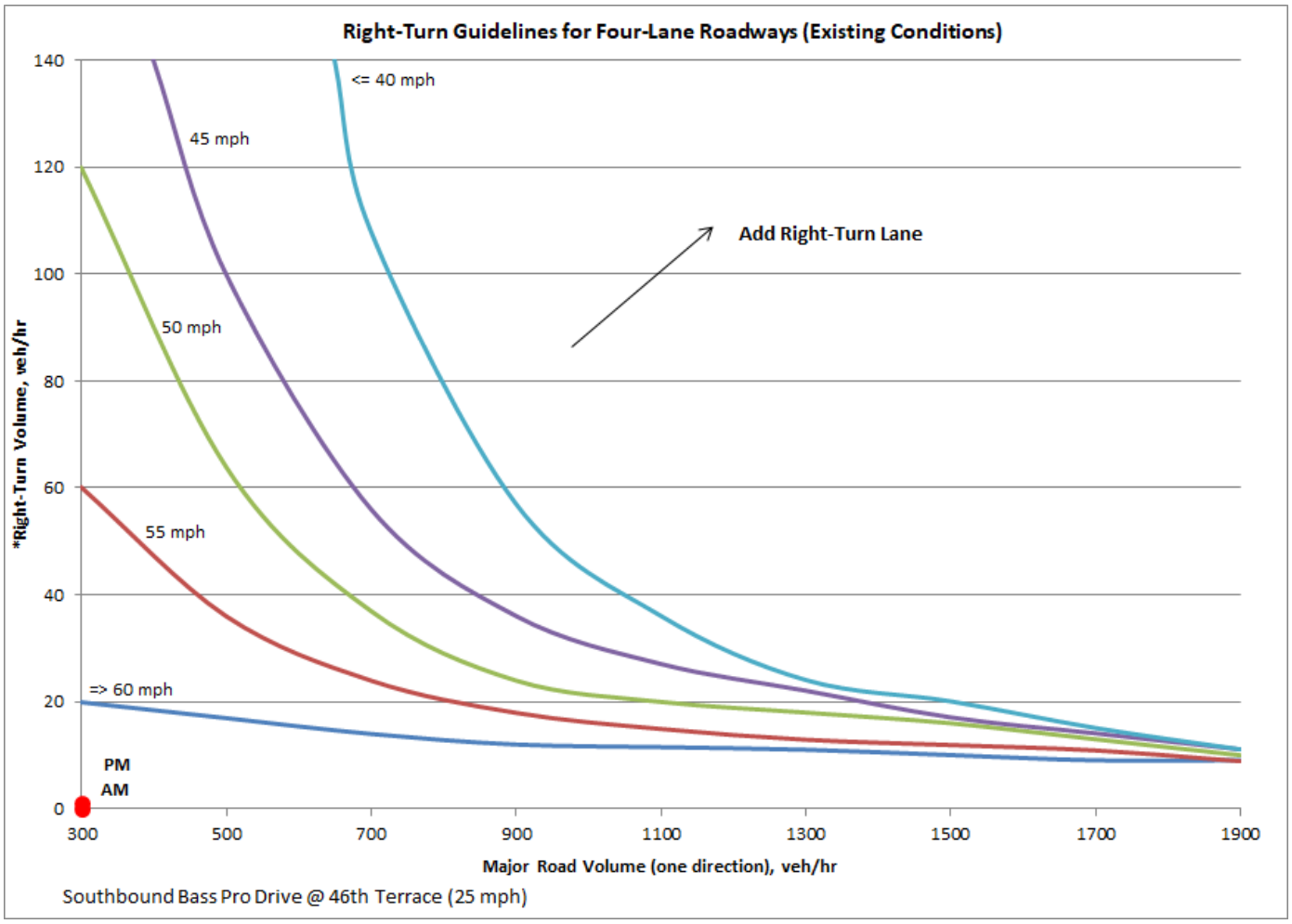

Right-Turn Guidelines for Two-Lane Roadways (Existing)
140
120
100
80
60
40
20
0
Right-Turn Volume, veh/hr
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
PM
AM
100
200
300
400
500
600
700
800
900
1000
1100
1200
Major Road Volume (one direction), veh/hr
Eastbound Bass Pro Drive @ Lee's Summit Road (35 mph)



Southbound Lee's Summit Road @ Bass Pro Drive (35 mph)



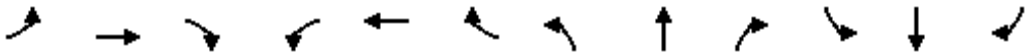
Northbound Lee's Summit Road @ Bass Pro Drive (35 mph)


Right-Turn Guidelines for Four-Lane Roadways (Existing Conditions)
*Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
<= 40 mph
45 mph
50 mph
55 mph
=> 60 mph
Add Right-Turn Lane
PM
AM
140
120
100
80
60
40
20
0
300
500
700
900
1100
1300
1500
1700
1900
Southbound Bass Pro Drive @ 46th Terrace (25 mph)

2 Capacity Analysis

Lane Group	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	26	10	4	93	4	4	40
v/c Ratio	0.07	0.01	0.00	0.10	0.01	0.01	0.04
Control Delay	25.4	0.0	7.0	25.3	0.0	24.5	24.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.4	0.0	7.0	25.3	0.0	24.5	24.7
Queue Length 50th (ft)	11	0	1	21	0	2	8
Queue Length 95th (ft)	31	0	1	25	0	6	18
Internal Link Dist (ft)		126		607			77
Turn Bay Length (ft)			100			150	
Base Capacity (vph)	376	1078	834	943	502	472	943
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.01	0.00	0.10	0.01	0.01	0.04

Intersection Summary

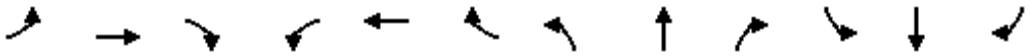


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	23	0	6	1	55	2	2	31	0
Future Volume (vph)	0	0	0	23	0	6	1	55	2	2	31	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor				1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt				1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1770	1583		1770	3539	1583	1770	3539	
Flt Permitted				0.76	1.00		0.73	1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1410	1583		1359	3539	1583	1770	3539	
Peak-hour factor, PHF	1.00	1.00	1.00	0.88	1.00	0.62	0.25	0.59	0.50	0.50	0.78	1.00
Adj. Flow (vph)	0	0	0	26	0	10	4	93	4	4	40	0
RTOR Reduction (vph)	0	0	0	0	7	0	0	0	3	0	0	0
Lane Group Flow (vph)	0	0	0	26	3	0	4	93	1	4	40	0
Turn Type				Perm	NA		pm+pt	NA	Perm	Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2			
Actuated Green, G (s)				24.0	24.0		48.0	24.0	24.0	24.0	24.0	
Effective Green, g (s)				24.0	24.0		48.0	24.0	24.0	24.0	24.0	
Actuated g/C Ratio				0.27	0.27		0.53	0.27	0.27	0.27	0.27	
Clearance Time (s)				6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Grp Cap (vph)				376	422		834	943	422	472	943	
v/s Ratio Prot					0.00		0.00	c0.03		c0.00	0.01	
v/s Ratio Perm				c0.02			0.00		0.00			
v/c Ratio				0.07	0.01		0.00	0.10	0.00	0.01	0.04	
Uniform Delay, d1				24.7	24.2		9.8	24.9	24.2	24.3	24.5	
Progression Factor				1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2				0.4	0.0		0.0	0.2	0.0	0.0	0.1	
Delay (s)				25.0	24.3		9.8	25.1	24.2	24.3	24.6	
Level of Service				C	C		A	C	C	C	C	
Approach Delay (s)		0.0			24.8			24.4			24.5	
Approach LOS		A			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.06		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	26	659	44	399
v/c Ratio	0.05	0.23	0.06	0.11
Control Delay	0.2	2.6	0.5	0.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	0.2	2.6	0.5	0.1
Queue Length 50th (ft)	0	32	0	0
Queue Length 95th (ft)	0	42	0	0
Internal Link Dist (ft)		1425		1381
Turn Bay Length (ft)			265	
Base Capacity (vph)	564	2875	775	3532
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.05	0.23	0.06	0.11

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	15	0	502	19	35	387	1
Future Volume (vph)	0	0	0	0	0	15	0	502	19	35	387	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)						5.7		5.5		5.7	5.7	
Lane Util. Factor						1.00		0.95		1.00	0.95	
Frt						0.85		0.99		1.00	1.00	
Flt Protected						1.00		1.00		0.95	1.00	
Satd. Flow (prot)						1583		3514		1770	3534	
Flt Permitted						1.00		1.00		0.36	1.00	
Satd. Flow (perm)						1583		3514		664	3534	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	0.58	1.00	0.80	0.61	0.80	0.98	0.25
Adj. Flow (vph)	0	0	0	0	0	26	0	628	31	44	395	4
RTOR Reduction (vph)	0	0	0	0	0	24	0	1	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	2	0	658	0	44	399	0
Turn Type						pm+ov	Prot	NA		pm+pt	NA	
Protected Phases	8	8		4	4	1	5	2		1	6	
Permitted Phases						4				6		
Actuated Green, G (s)						3.7		45.3		54.5	60.2	
Effective Green, g (s)						3.7		45.3		54.5	60.2	
Actuated g/C Ratio						0.06		0.75		0.91	1.00	
Clearance Time (s)						5.7		5.5		5.7	5.7	
Vehicle Extension (s)						3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)						97		2644		669	3534	
v/s Ratio Prot						0.00		c0.19		0.00	c0.11	
v/s Ratio Perm										0.06		
v/c Ratio						0.02		0.25		0.07	0.11	
Uniform Delay, d1						26.5		2.3		0.6	0.0	
Progression Factor						1.00		1.00		1.00	1.00	
Incremental Delay, d2						0.1		0.2		0.0	0.1	
Delay (s)						26.6		2.5		0.6	0.1	
Level of Service						C		A		A	A	
Approach Delay (s)		0.0			26.6			2.5			0.1	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	2.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	60.2	Sum of lost time (s)	23.2
Intersection Capacity Utilization	28.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

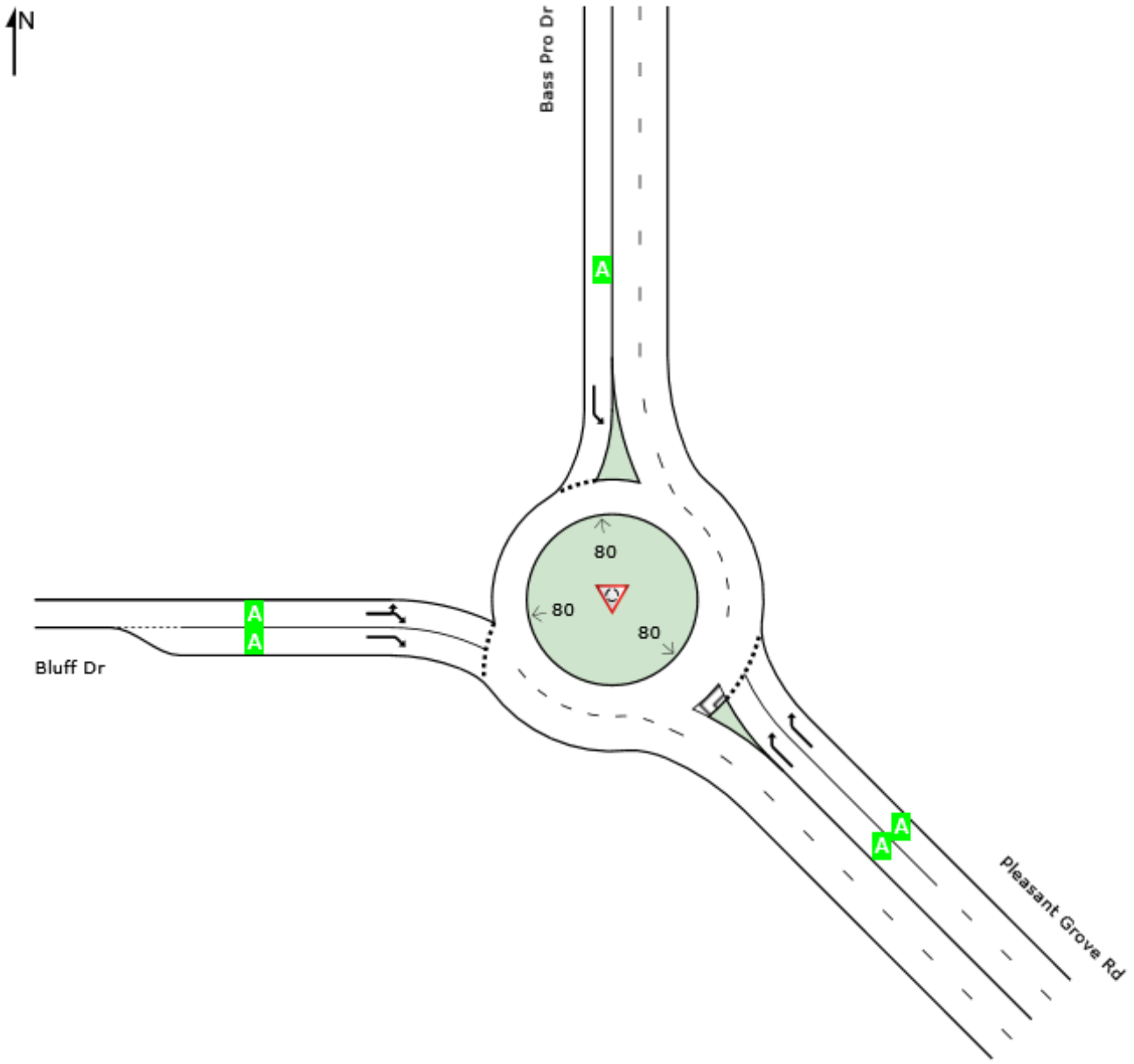
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [East Roundabout (Existing AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [East Roundabout (Existing AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
SouthEast: Pleasant Grove Rd													
Lane 1	51	2.0	1387	0.037	100	2.9	LOS A	0.1	3.6	Full	1600	0.0	0.0
Lane 2[d]	51	2.0	1387	0.037	100	2.9	LOS A	0.1	3.6	Full	1600	0.0	0.0
Approach	102	2.0		0.037		2.9	LOS A	0.1	3.6				
North: Bass Pro Dr													
Lane 1[d]	31	2.0	1353	0.023	100	2.8	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	31	2.0		0.023		2.8	LOS A	0.0	0.0				
West: Bluff Dr													
Lane 1	11	2.0	1353	0.008	100	2.7	LOS A	0.0	0.8	Full	1600	0.0	0.0
Lane 2[d]	11	2.0	1353	0.008	100	2.7	LOS A	0.0	0.8	Short	115	0.0	NA
Approach	22	2.0		0.008		2.7	LOS A	0.0	0.8				
Intersection	154	2.0		0.037		2.8	LOS A	0.1	3.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

SouthEast: Pleasant Grove Rd

Mov. From SE To Exit:	R1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	51	51	2.0	1387	0.037	100	NA	NA
Lane 2	51	51	2.0	1387	0.037	100	NA	NA
Approach	102	102	2.0		0.037			

North: Bass Pro Dr

Mov. From N To Exit:	L1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	31	31	2.0	1353	0.023	100	NA	NA

Approach	31	31	2.0		0.023				
West: Bluff Dr									
Mov.	L2	R1	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane
From W To Exit:	N	SE			veh/h	v/c	%	%	No.
Lane 1	4	7	11	2.0	1353	0.008	100	NA	NA
Lane 2	-	11	11	2.0	1353	0.008	100	0.0	1
Approach	4	18	22	2.0		0.008			
	Total	%HV	Deg.Satn (v/c)						
Intersection	154	2.0		0.037					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Pleasant Grove Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

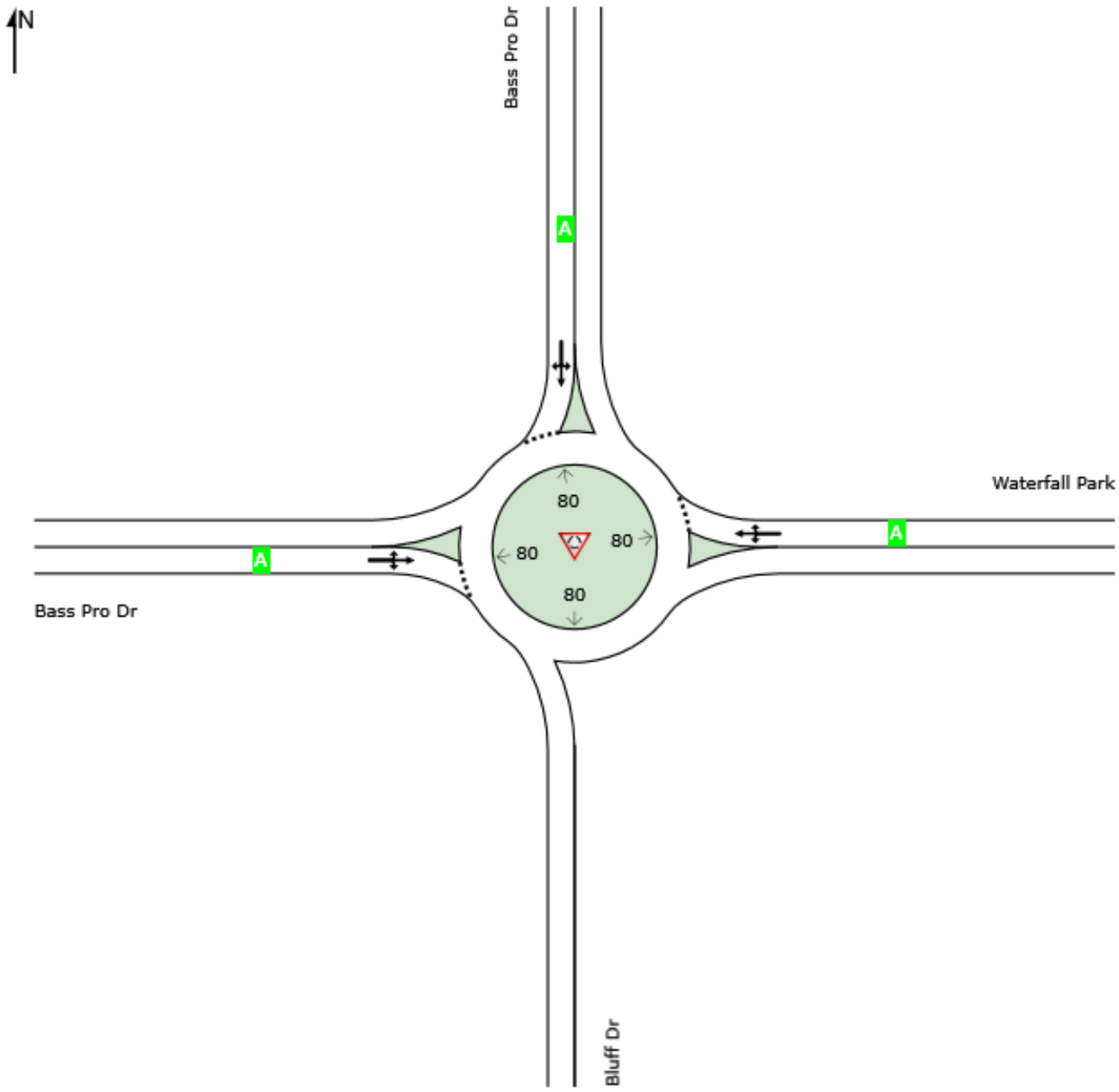
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [West Roundabout (Existing AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	East	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [West Roundabout (Existing AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
East: Waterfall Park													
Lane 1[d]	30	2.0	1286	0.024	100	3.0	LOS A	0.1	2.5	Full	1600	0.0	0.0
Approach	30	2.0		0.024		3.0	LOS A	0.1	2.5				
North: Bass Pro Dr													
Lane 1[d]	41	2.0	1327	0.031	100	3.0	LOS A	0.1	3.3	Full	1600	0.0	0.0
Approach	41	2.0		0.031		3.0	LOS A	0.1	3.3				
West: Bass Pro Dr													
Lane 1[d]	76	2.0	1315	0.058	100	3.2	LOS A	0.3	6.4	Full	1600	0.0	0.0
Approach	76	2.0		0.058		3.2	LOS A	0.3	6.4				
Intersection	147	2.0		0.058		3.1	LOS A	0.3	6.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

East: Waterfall Park

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	14	12	30	2.0	1286	0.024	100	NA	NA
Approach	4	14	12	30	2.0		0.024			

North: Bass Pro Dr

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	4	17	41	2.0	1327	0.031	100	NA	NA
Approach	19	4	17	41	2.0		0.031			

West: Bass Pro Dr

Mov. From W	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	49	10	18	76	2.0	1315	0.058	100	NA	NA
Approach	49	10	18	76	2.0		0.058			

	Total	%HV	Deg.Satn (v/c)
Intersection	147	2.0	0.058

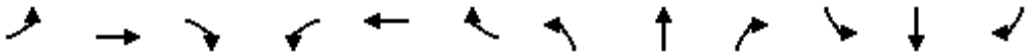
Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Bluff Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Waterfall Park Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	12	114	13	8	202	48	14	211
v/c Ratio	0.02	0.31	0.01	0.02	0.21	0.10	0.02	0.22
Control Delay	0.0	29.1	0.0	24.7	26.4	0.4	7.6	26.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.0	29.1	0.0	24.7	26.4	0.4	7.6	26.3
Queue Length 50th (ft)	0	52	0	3	46	0	3	48
Queue Length 95th (ft)	0	91	0	6	75	0	7	77
Internal Link Dist (ft)	137		126		607			77
Turn Bay Length (ft)				100			150	
Base Capacity (vph)	509	372	972	472	943	502	782	942
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.31	0.01	0.02	0.21	0.10	0.02	0.22

Intersection Summary

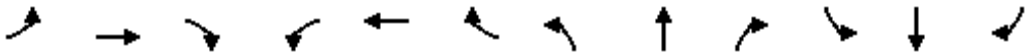


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	3	96	0	9	3	182	35	8	184	1
Future Volume (vph)	2	0	3	96	0	9	3	182	35	8	184	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt		0.91		1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1667		1770	1583		1770	3539	1583	1770	3529	
Flt Permitted		0.95		0.75	1.00		0.95	1.00	1.00	0.62	1.00	
Satd. Flow (perm)		1610		1397	1583		1770	3539	1583	1164	3529	
Peak-hour factor, PHF	0.50	1.00	0.38	0.84	1.00	0.67	0.38	0.90	0.73	0.58	0.89	0.25
Adj. Flow (vph)	4	0	8	114	0	13	8	202	48	14	207	4
RTOR Reduction (vph)	0	9	0	0	10	0	0	0	35	0	1	0
Lane Group Flow (vph)	0	3	0	114	3	0	8	202	13	14	210	0
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2	6		
Actuated Green, G (s)		24.0		24.0	24.0		24.0	24.0	24.0	48.0	24.0	
Effective Green, g (s)		24.0		24.0	24.0		24.0	24.0	24.0	48.0	24.0	
Actuated g/C Ratio		0.27		0.27	0.27		0.27	0.27	0.27	0.53	0.27	
Clearance Time (s)		6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Grp Cap (vph)		429		372	422		472	943	422	782	941	
v/s Ratio Prot					0.00		0.00	0.06		c0.00	c0.06	
v/s Ratio Perm		0.00		c0.08					0.01	0.00		
v/c Ratio		0.01		0.31	0.01		0.02	0.21	0.03	0.02	0.22	
Uniform Delay, d1		24.2		26.4	24.3		24.3	25.7	24.4	9.9	25.7	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.0		2.1	0.0		0.1	0.5	0.1	0.0	0.5	
Delay (s)		24.3		28.5	24.3		24.4	26.2	24.5	9.9	26.3	
Level of Service		C		C	C		C	C	C	A	C	
Approach Delay (s)		24.3			28.0			25.8			25.3	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	30	40	110	22	908	101	794
v/c Ratio	0.11	0.22	0.29	0.13	0.45	0.22	0.31
Control Delay	0.8	36.7	6.0	37.0	12.6	6.4	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.8	36.7	6.0	37.0	12.6	6.4	9.2
Queue Length 50th (ft)	0	17	0	9	115	10	49
Queue Length 95th (ft)	0	51	20	22	222	34	202
Internal Link Dist (ft)	480	785			1425		1381
Turn Bay Length (ft)				110		265	
Base Capacity (vph)	460	610	428	243	2010	500	2584
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.07	0.26	0.09	0.45	0.20	0.31

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	0	9	30	0	86	13	718	44	80	710	19
Future Volume (vph)	3	0	9	30	0	86	13	718	44	80	710	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8			6.2	5.7	5.5	5.5		5.7	5.7	
Lane Util. Factor		1.00			1.00	1.00	1.00	0.95		1.00	0.95	
Frt		0.92			1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1678			1770	1583	1770	3508		1770	3518	
Flt Permitted		0.98			0.95	1.00	0.95	1.00		0.23	1.00	
Satd. Flow (perm)		1678			1770	1583	1770	3508		434	3518	
Peak-hour factor, PHF	0.25	1.00	0.50	0.75	1.00	0.78	0.60	0.84	0.83	0.79	0.93	0.61
Adj. Flow (vph)	12	0	18	40	0	110	22	855	53	101	763	31
RTOR Reduction (vph)	0	29	0	0	0	94	0	3	0	0	2	0
Lane Group Flow (vph)	0	1	0	0	40	16	22	905	0	101	792	0
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA		pm+pt	NA	
Protected Phases	8	8		4	4	1	5	2		1	6	
Permitted Phases						4				6		
Actuated Green, G (s)		2.0			4.4	11.7	2.5	44.8		56.9	49.6	
Effective Green, g (s)		2.0			4.4	11.7	2.5	44.8		56.9	49.6	
Actuated g/C Ratio		0.02			0.05	0.14	0.03	0.55		0.70	0.61	
Clearance Time (s)		5.8			6.2	5.7	5.5	5.5		5.7	5.7	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		41			95	226	54	1923		421	2135	
v/s Ratio Prot		c0.00			c0.02	0.01	0.01	c0.26		c0.02	c0.23	
v/s Ratio Perm						0.00				0.15		
v/c Ratio		0.02			0.42	0.07	0.41	0.47		0.24	0.37	
Uniform Delay, d1		38.9			37.4	30.3	38.9	11.2		5.2	8.1	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			3.0	0.1	4.9	0.8		0.3	0.5	
Delay (s)		39.1			40.4	30.4	43.8	12.1		5.5	8.6	
Level of Service		D			D	C	D	B		A	A	
Approach Delay (s)		39.1			33.1			12.8			8.3	
Approach LOS		D			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	81.7	Sum of lost time (s)	23.2
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

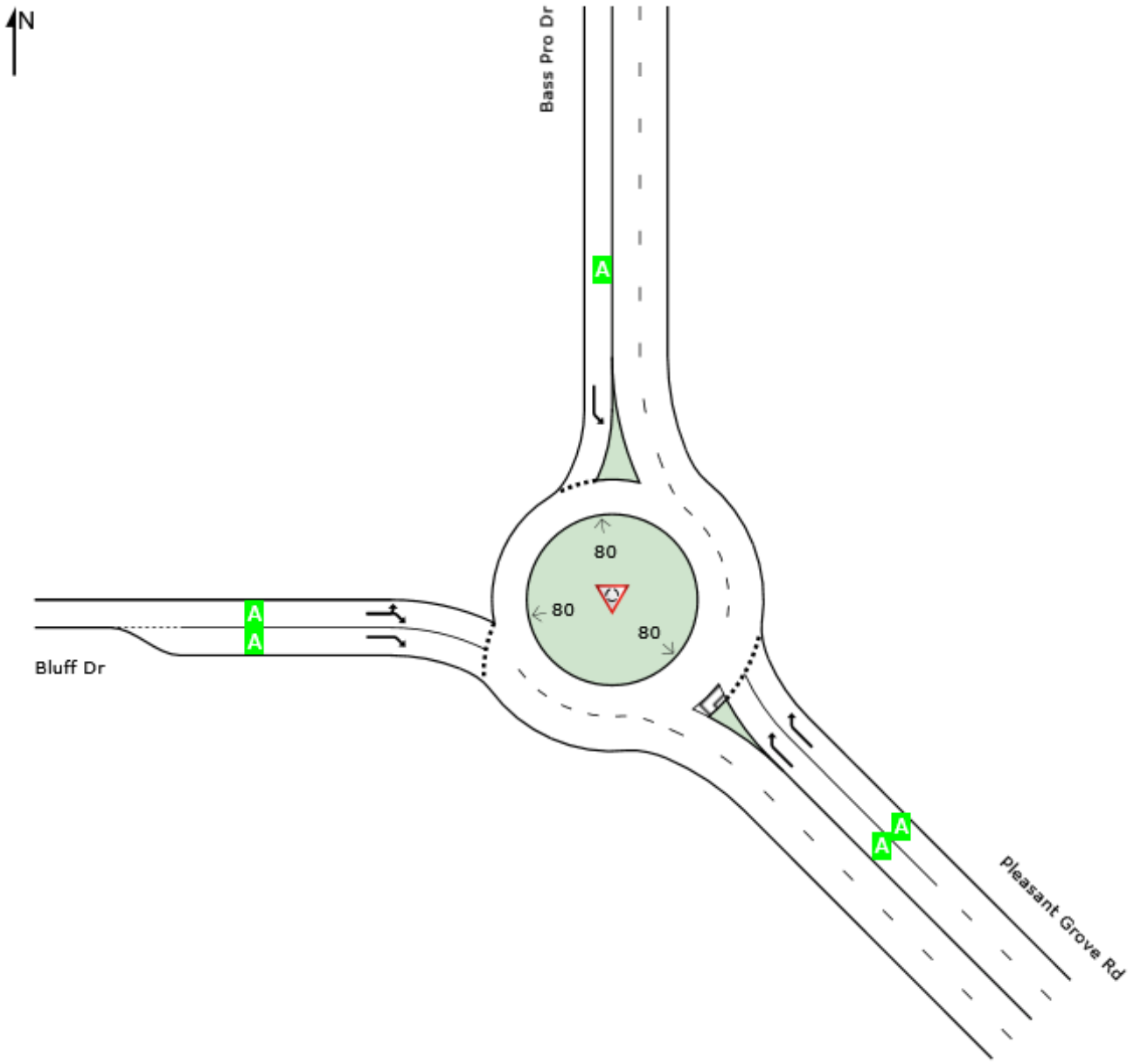
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [East Roundabout (Existing PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [East Roundabout (Existing PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
SouthEast: Pleasant Grove Rd													
Lane 1	103	2.0	1387	0.074	100	3.2	LOS A	0.3	7.7	Full	1600	0.0	0.0
Lane 2[d]	103	2.0	1387	0.074	100	3.2	LOS A	0.3	7.7	Full	1600	0.0	0.0
Approach	207	2.0		0.074		3.2	LOS A	0.3	7.7				
North: Bass Pro Dr													
Lane 1[d]	182	2.0	1353	0.135	100	3.7	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	182	2.0		0.135		3.7	LOS A	0.0	0.0				
West: Bluff Dr													
Lane 1	33	2.0	1175	0.028	100	3.3	LOS A	0.1	2.7	Full	1600	0.0	0.0
Lane 2[d]	33	2.0	1175	0.028	100	3.3	LOS A	0.1	2.7	Short	115	0.0	NA
Approach	66	2.0		0.028		3.3	LOS A	0.1	2.7				
Intersection	455	2.0		0.135		3.4	LOS A	0.3	7.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

SouthEast: Pleasant Grove Rd

Mov. From SE To Exit:	R1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	103	103	2.0	1387	0.074	100	NA	NA
Lane 2	103	103	2.0	1387	0.074	100	NA	NA
Approach	207	207	2.0		0.074			

North: Bass Pro Dr

Mov. From N To Exit:	L1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	182	182	2.0	1353	0.135	100	NA	NA

Approach	182	182	2.0			0.135			
West: Bluff Dr									
Mov.	L2	R1	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane
From W To Exit:	N	SE			veh/h	v/c	%	%	No.
Lane 1	4	29	33	2.0	1175	0.028	100	NA	NA
Lane 2	-	33	33	2.0	1175	0.028	100	0.0	1
Approach	4	62	66	2.0		0.028			
	Total	%HV	Deg.Satn (v/c)						
Intersection	455	2.0		0.135					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Pleasant Grove Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

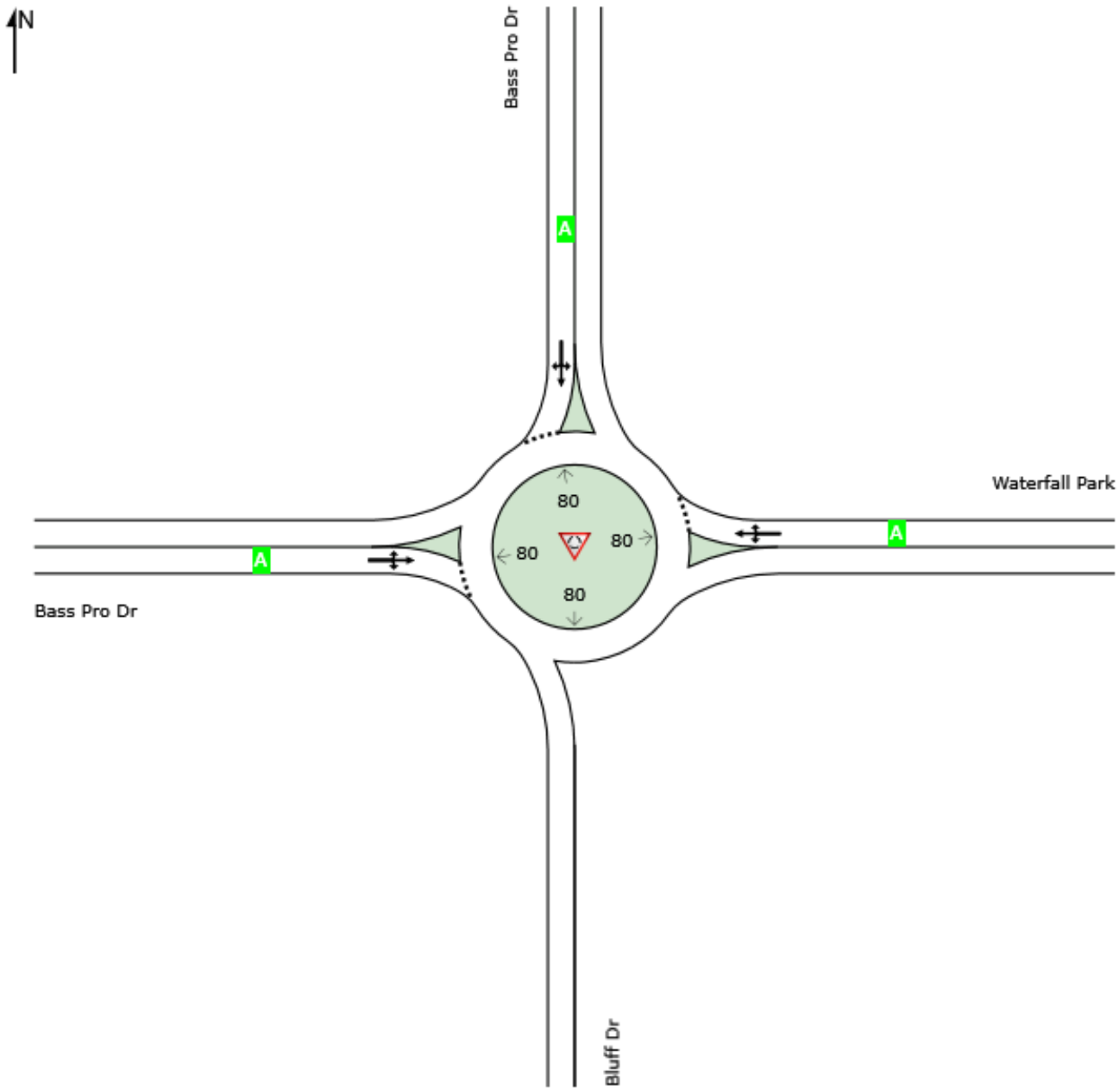
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [West Roundabout (Existing PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	East	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [West Roundabout (Existing PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
East: Waterfall Park													
Lane 1[d]	49	2.0	1216	0.040	100	3.3	LOS A	0.2	4.3	Full	1600	0.0	0.0
Approach	49	2.0		0.040		3.3	LOS A	0.2	4.3				
North: Bass Pro Dr													
Lane 1[d]	168	2.0	1309	0.128	100	3.8	LOS A	0.6	15.2	Full	1600	0.0	0.0
Approach	168	2.0		0.128		3.8	LOS A	0.6	15.2				
West: Bass Pro Dr													
Lane 1[d]	151	2.0	1266	0.119	100	3.8	LOS A	0.5	13.8	Full	1600	0.0	0.0
Approach	151	2.0		0.119		3.8	LOS A	0.5	13.8				
Intersection	368	2.0		0.128		3.7	LOS A	0.6	15.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

East: Waterfall Park

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	22	17	49	2.0	1216	0.040	100	NA	NA
Approach	10	22	17	49	2.0		0.040			

North: Bass Pro Dr

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	40	14	114	168	2.0	1309	0.128	100	NA	NA
Approach	40	14	114	168	2.0		0.128			

West: Bass Pro Dr

Mov. From W	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	102	31	17	151	2.0	1266	0.119	100	NA	NA
Approach	102	31	17	151	2.0		0.119			

	Total	%HV	Deg.Satn (v/c)
Intersection	368	2.0	0.128

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Bluff Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Waterfall Park Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

APPENDIX C

Existing Plus Development

1 Trip Generation

Daily Trip Generation (Proposed Site)

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	Daily Trips	Trip Distribution Enter	Trip Distribution Exit	Daily Trips Enter	Daily Trips Exit
220	Multifamily Housing (Low-Rise)	38	Units	Equation	247	50%	50%	124	123
221	Multifamily Housing (Mid-Rise)	237	Units	Equation	1,290	50%	50%	645	645
Total					**1,537**			**769**	**768**

AM Peak Hour Trip Generation

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	AM Peak Hour Trips	Trip Distribution Enter	Trip Distribution Exit	AM Peak Hour Trips Enter	AM Peak Hour Trips Exit
220	Multifamily Housing (Low-Rise)	38	Units	Equation	20	23%	77%	5	15
221	Multifamily Housing (Mid-Rise)	237	Units	Equation	80	26%	74%	21	59
Total					**100**			**26**	**74**

PM Peak Hour Trip Generation

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	PM Peak Hour Trips	Trip Distribution Enter	Trip Distribution Exit	PM Peak Hour Trips Enter	PM Peak Hour Trips Exit
220	Multifamily Housing (Low-Rise)	38	Units	Equation	25	63%	37%	16	9
221	Multifamily Housing (Mid-Rise)	237	Units	Equation	102	61%	39%	63	39
Total					**127**			**79**	**48**

Land Use: 220
Multifamily Housing (Low-Rise)

Description

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have one or two levels (floors). Multifamily housing (mid-rise) (Land Use 221), multifamily housing (high-rise) (Land Use 222), and off-campus student apartment (Land Use 225) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the low-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the three sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.72 residents per occupied dwelling unit.

For the two sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96.2 percent of the total dwelling units were occupied.

This land use included data from a wide variety of units with different sizes, price ranges, locations, and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Time-of-day distribution data for this land use are presented in Appendix A. For the 10 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:45 and 5:45 p.m., respectively. For the one site with Saturday data, the overall highest vehicle volume was counted between 9:45 and 10:45 a.m. For the one site with Sunday data, the overall highest vehicle volume was counted between 11:45 a.m. and 12:45 p.m.

For the one dense multi-use urban site with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:00 and 8:00 a.m. and 6:15 and 7:15 p.m., respectively.

For the three sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.72 residents per occupied dwelling unit.

The average numbers of person trips per vehicle trip at the five general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.13 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.21 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in British Columbia (CAN), California, District of Columbia, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Minnesota, New Jersey, New York, Ontario, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, and Washington.

It is expected that the number of bedrooms and number of residents are likely correlated to the number of trips generated by a residential site. Many of the studies included in this land use did not indicate the total number of bedrooms. To assist in the future analysis of this land use, it is important that this information be collected and included in trip generation data submissions.

Source Numbers

168, 187, 188, 204, 211, 300, 305, 306, 319, 320, 321, 357, 390, 412, 418, 525, 530, 571, 579, 583, 864, 868, 869, 870, 896, 903, 918, 946, 947, 948, 951

Land Use: 221
Multifamily Housing (Mid-Rise)

Description

Mid-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have between three and 10 levels (floors). Multifamily housing (low-rise) (Land Use 220), multifamily housing (high-rise) (Land Use 222), off-campus student apartment (Land Use 225), and mid-rise residential with 1st-floor commercial (Land Use 231) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the mid-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the six sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.46 residents per occupied dwelling unit.

For the five sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 95.7 percent of the total dwelling units were occupied.

Time-of-day distribution data for this land use are presented in Appendix A. For the eight general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:00 and 8:00 a.m. and 4:45 and 5:45 p.m., respectively.

For the four dense multi-use urban sites with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:15 and 5:15 p.m., respectively. For the three center city core sites with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 6:45 and 7:45 a.m. and 5:00 and 6:00 p.m., respectively.

For the six sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.46 residents per occupied dwelling unit.

For the five sites for which data were provided for both occupied dwelling units and total dwelling units, an average of 95.7 percent of the units were occupied.

The average numbers of person trips per vehicle trip at the five center city core sites at which both person trip and vehicle trip data were collected were as follows:

- 1.84 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.94 during Weekday, AM Peak Hour of Generator
- 2.07 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.59 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 32 dense multi-use urban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.90 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.90 during Weekday, AM Peak Hour of Generator
- 2.00 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.08 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 13 general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.56 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.88 during Weekday, AM Peak Hour of Generator
- 1.70 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.07 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), British Columbia (CAN), California, Delaware, District of Columbia, Florida, Georgia, Illinois, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, Ontario, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Utah, Virginia, and Wisconsin.

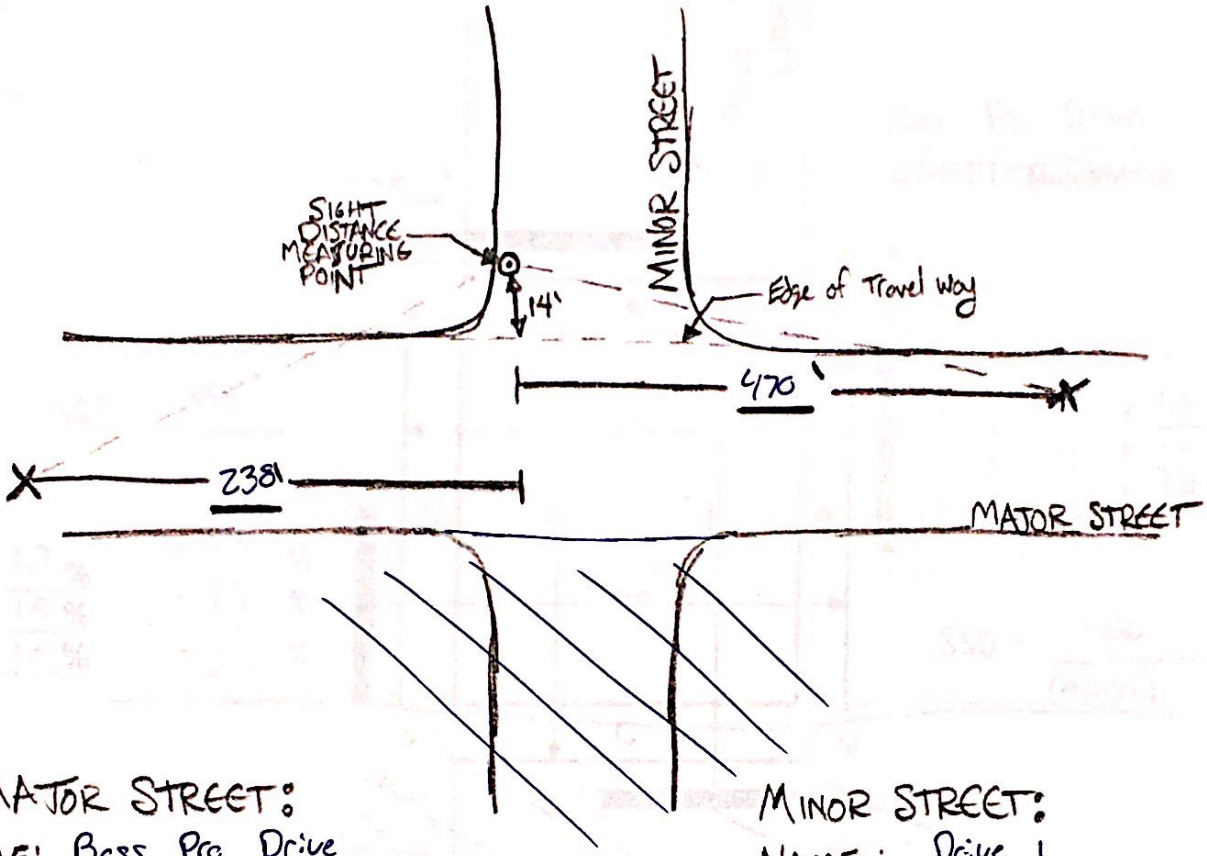
Source Numbers

168, 188, 204, 305, 306, 321, 357, 390, 436, 525, 530, 579, 638, 818, 857, 866, 901, 904, 910, 912, 918, 934, 936, 939, 944, 947, 948, 949, 959, 963, 964, 966, 967, 969, 970

2 Sight Distance Field Sheets

OLSSON ASSOCIATES

INTERSECTION SIGHT DISTANCE:



MAJOR STREET:
NAME: Bass Pro Drive
SPEED: 30 mph

MINOR STREET:
NAME: Drive 1
SPEED: - mph

Drive 1 ≈ 470 ft
west of roundabout

NORTH

project: 020-2911 "The Falls"				
subject Field Review				
drawn by: JSC	date: 10/22/20	project no.: 020-2911	sheet 1	of 3

Intersection Data Sheet

CROSSWALK DISTANCE:

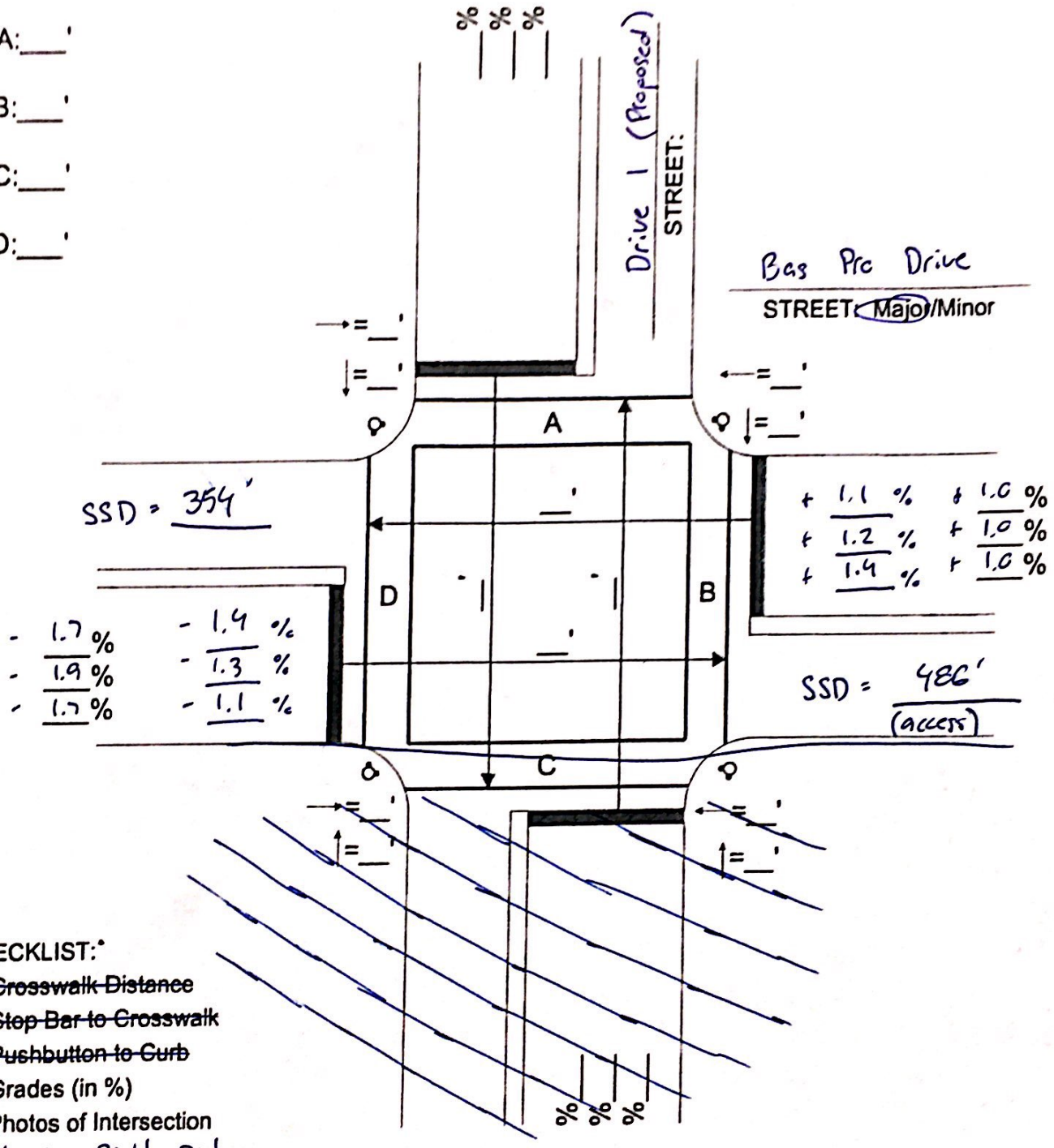
A:___'

B:___'

C:___'

D:___'

NTS



CHECKLIST:

- ~~Crosswalk Distance~~
- ~~Stop Bar to Crosswalk~~
- ~~Pushbutton to Curb~~
- ☒ Grades (in %)
- ☒ Photos of Intersection
- ☒ Stopping Sight Distance

Pedestrian Information

Crosswalks:
Major St./Minor St./Both

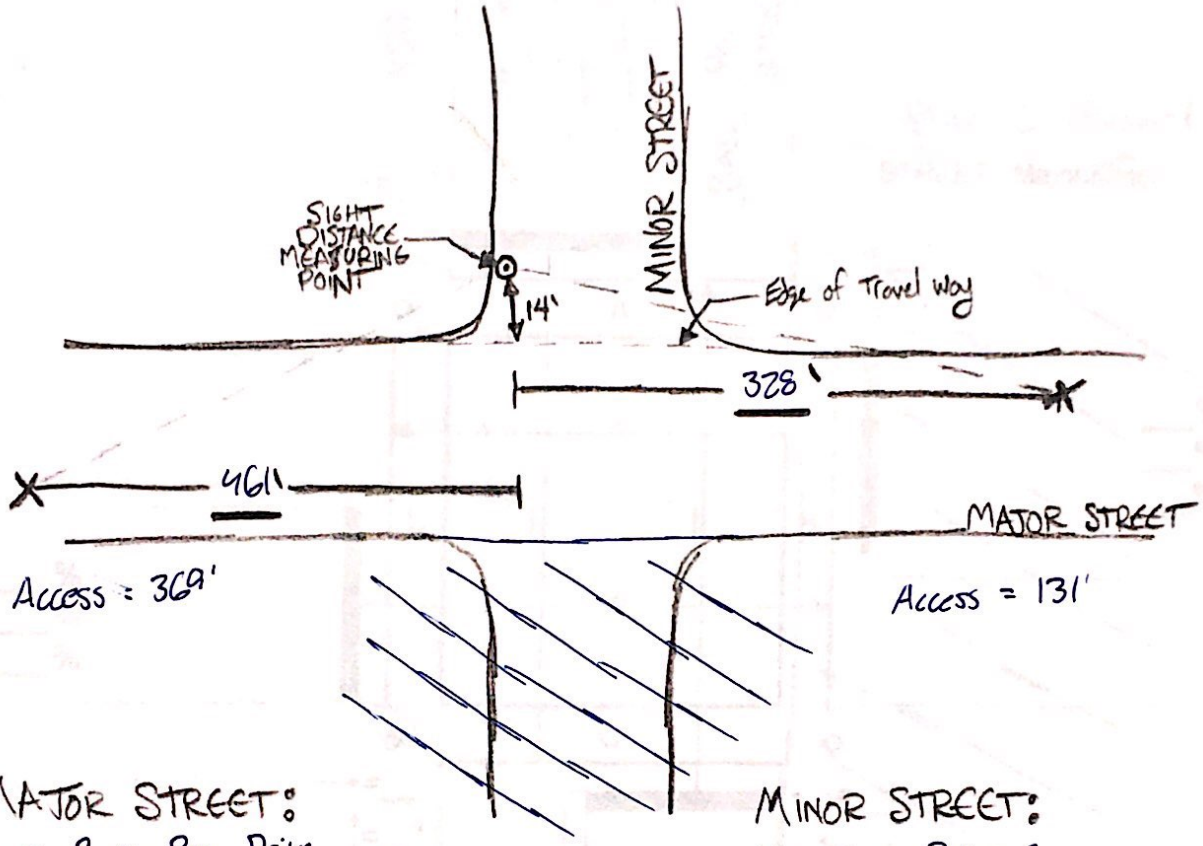
Pushbuttons:
Major St./Minor St./Both

USE AN ARROW TO DEFINE THE UPHILL SIDE ON GRADES. (%)

PROJECT NO: XXXX-XXXX	020-2941	OLSSON ASSOCIATES 7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	EXHIBIT
DRAWN BY: JRC	JSC 10/22/20		1
DATE: 05/13/13			

OLSSON ASSOCIATES

INTERSECTION SIGHT DISTANCE:



MAJOR STREET:
NAME: Bass Pro Drive
SPEED: 25 mph

MINOR STREET:
NAME: Drive 2
SPEED: - mph

Drive 2 ≈ 310 ft
south of Bass Pro Access (main)

NORTH

project: The Falls
subject Field Review
drawn by: JSC date: 10/22/20 project no.: 020-2911 sheet 2 of 3

Intersection Data Sheet

CROSSWALK DISTANCE:

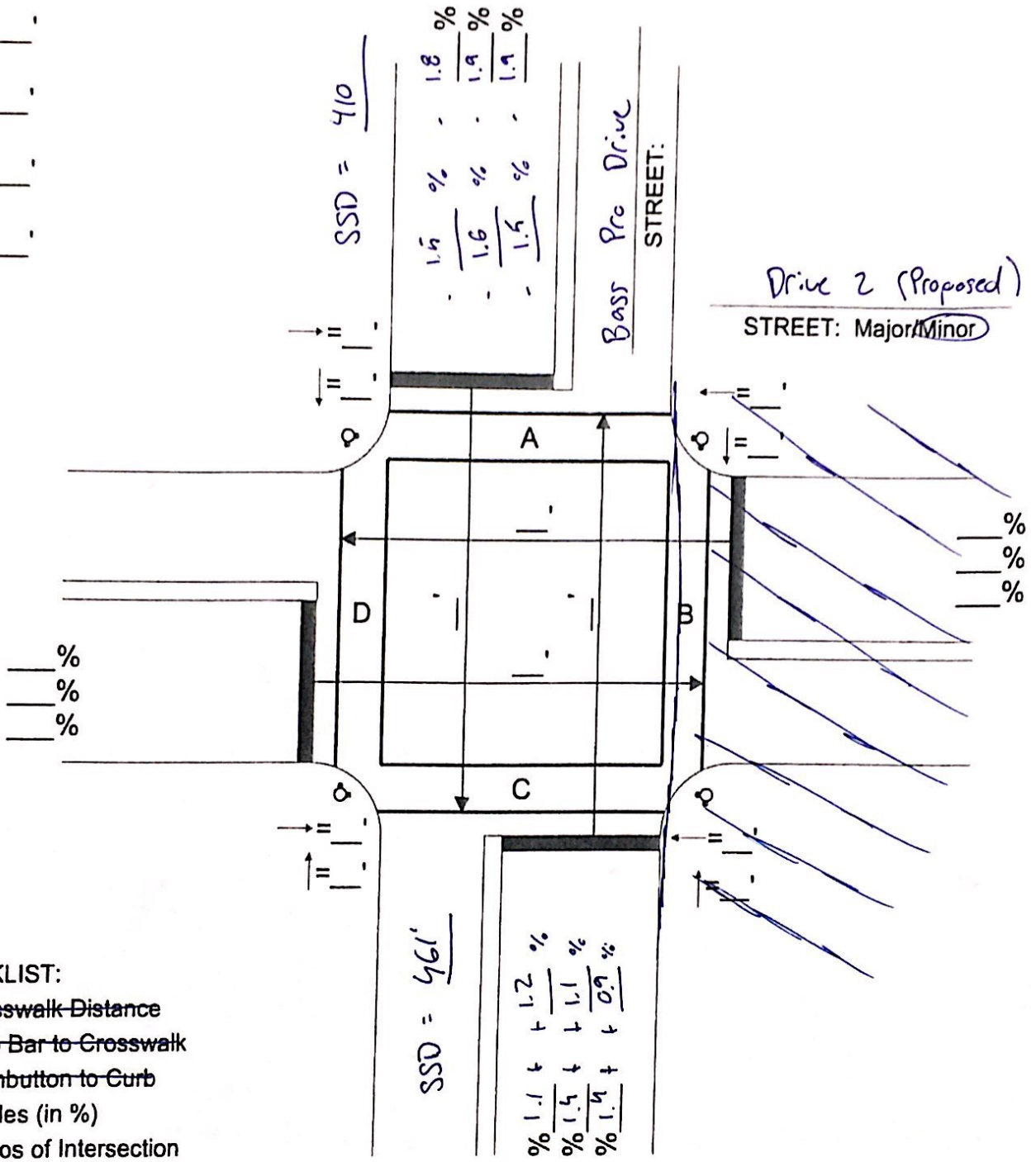
A:___'

B:___'

C:___'

D:___'

NTS



CHECKLIST:

- ~~Crosswalk Distance~~
- ~~Stop Bar to Crosswalk~~
- ~~Pushbutton to Curb~~
- Grades (in %)
- Photos of Intersection
- Stopping Sight Distance

Pedestrian Information

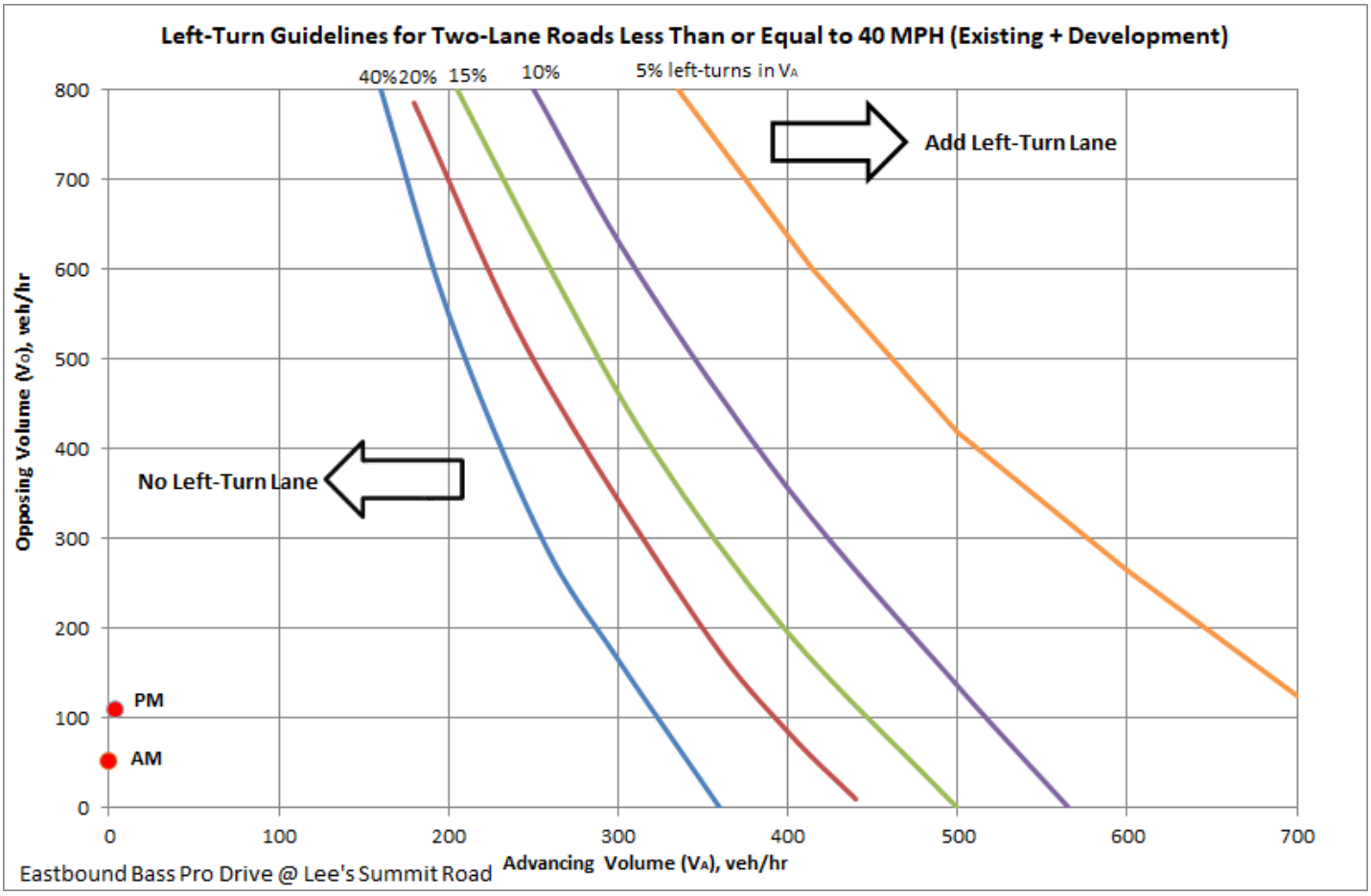
Crosswalks:
Major St./Minor St./Both

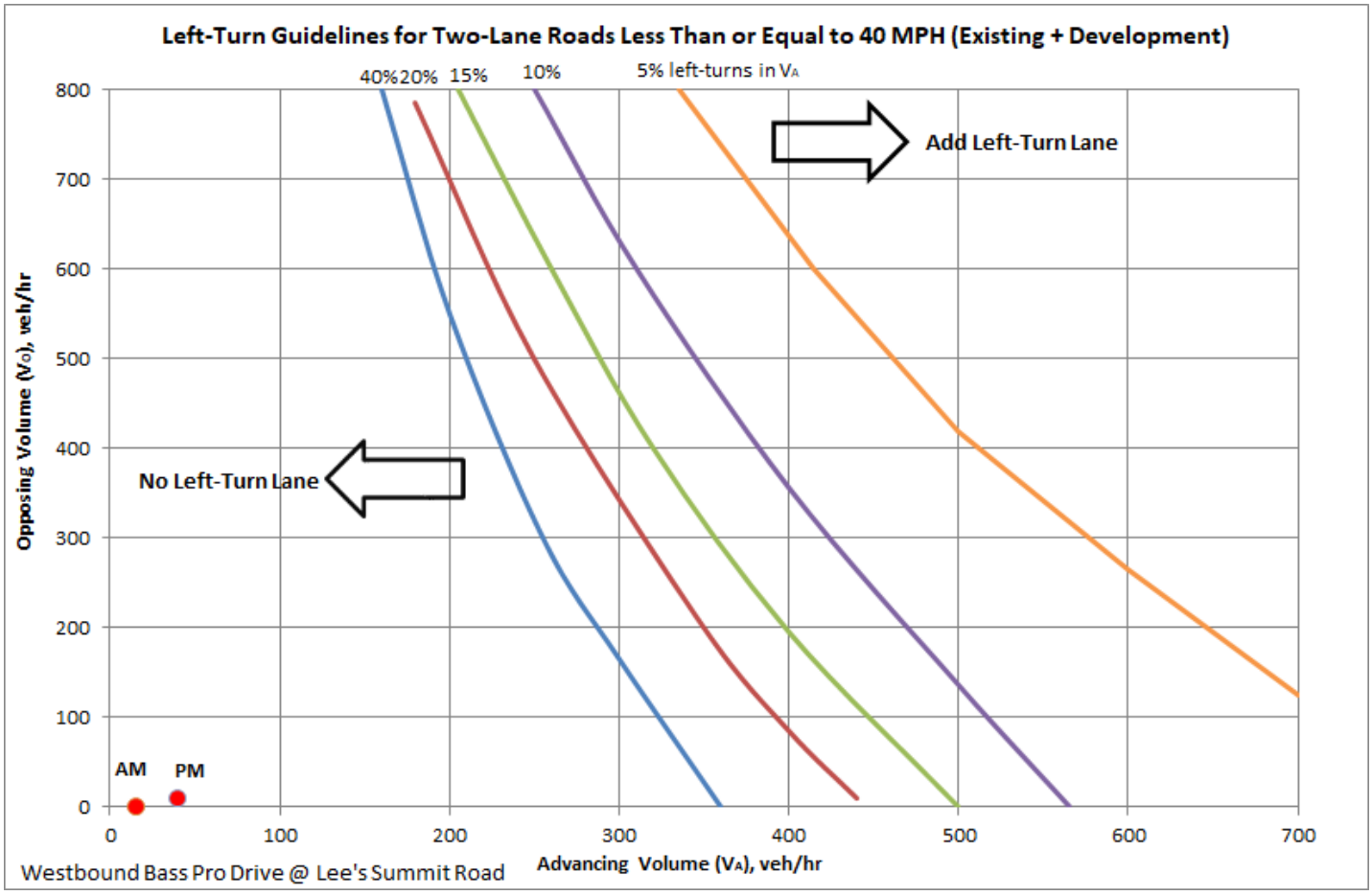
Pushbuttons:
Major St./Minor St./Both

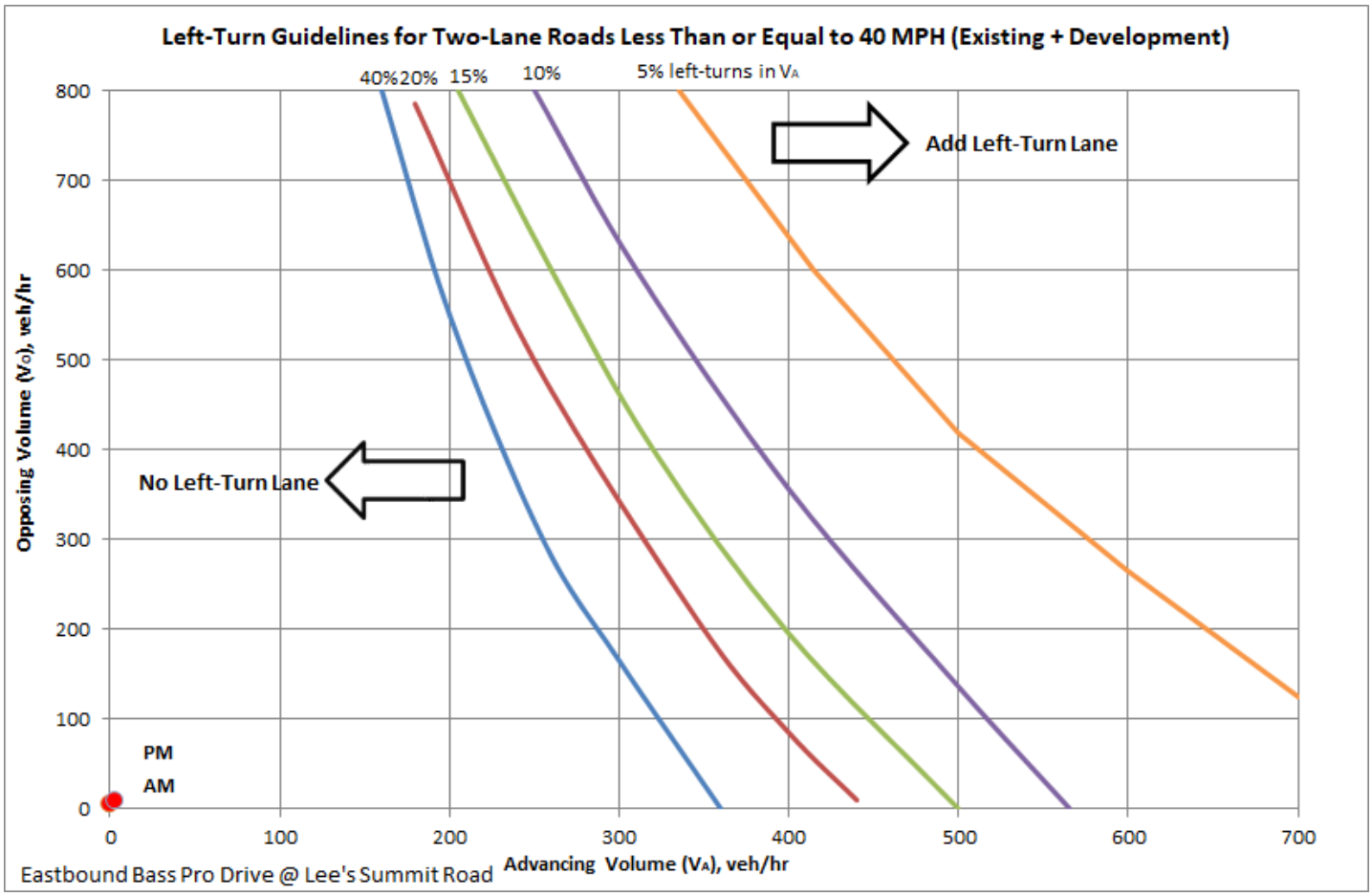
USE AN ARROW TO DEFINE THE UPHILL SIDE ON GRADES. (%)

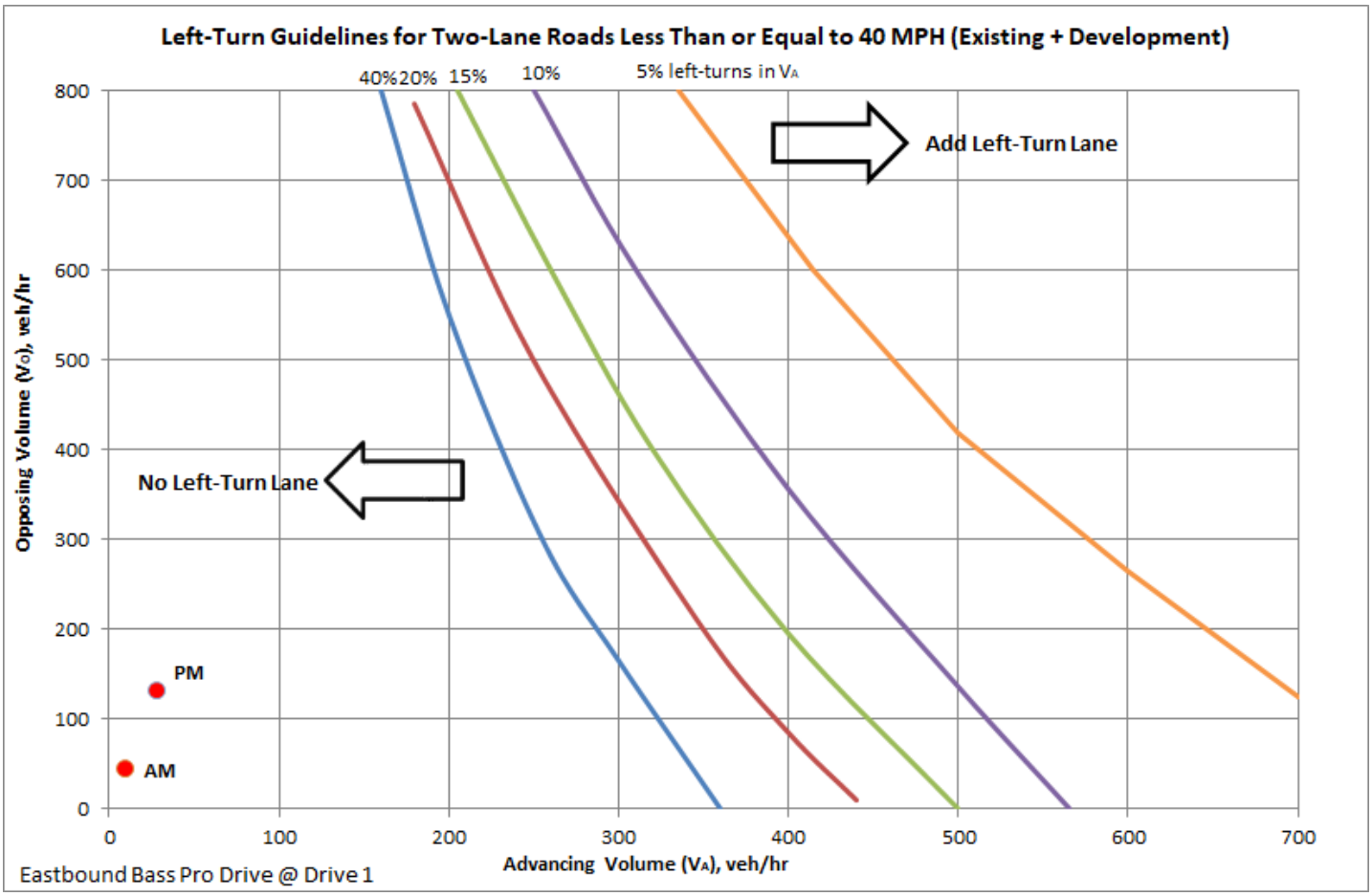
PROJECT NO: XXXX-XXXX	020-2911	OLSSON ASSOCIATES	7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	EXHIBIT
DRAWN BY: JRC	JSC 10/22/20			2
DATE: 05/13/13				

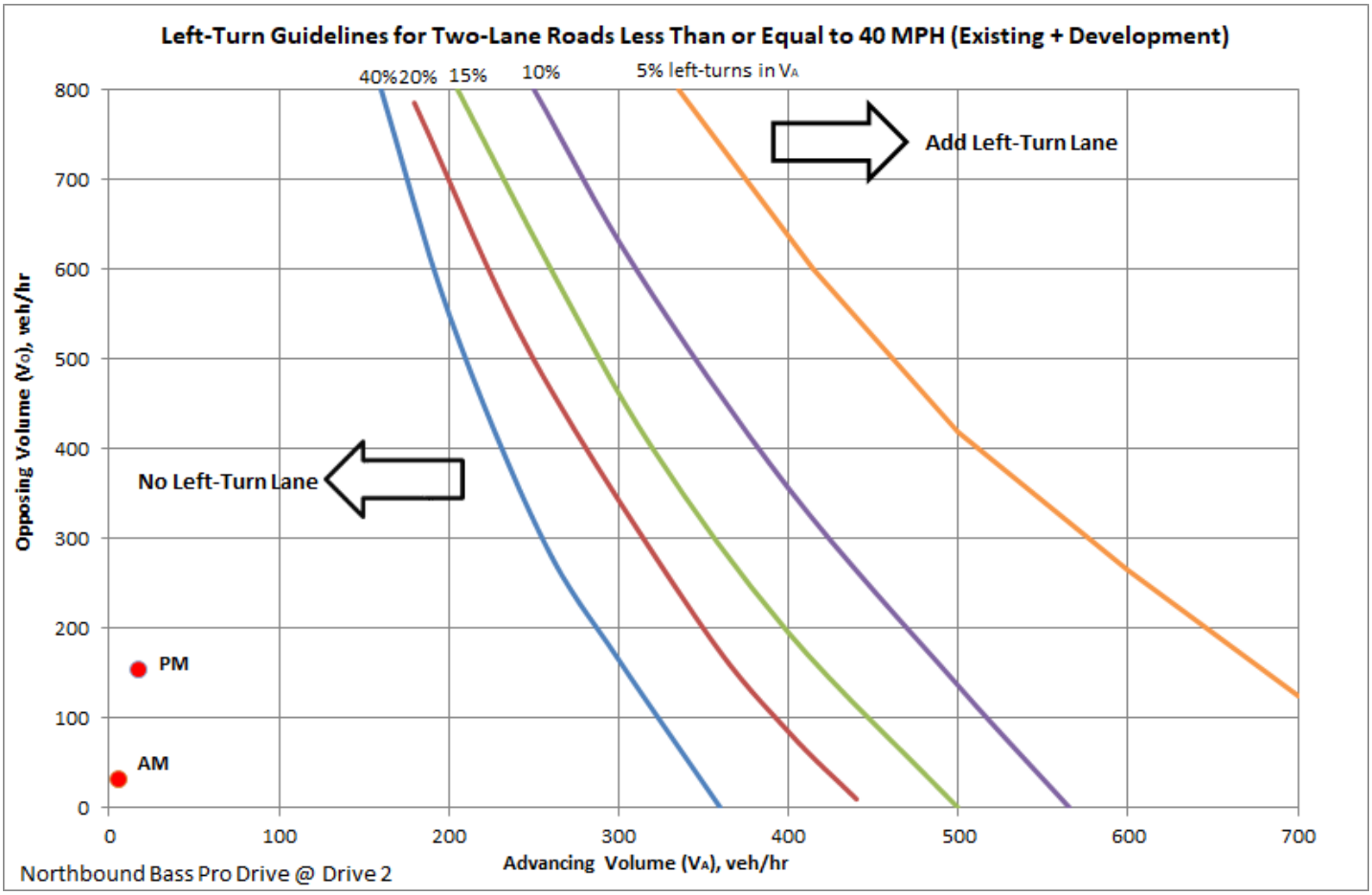
3 Turn Lane Warrants

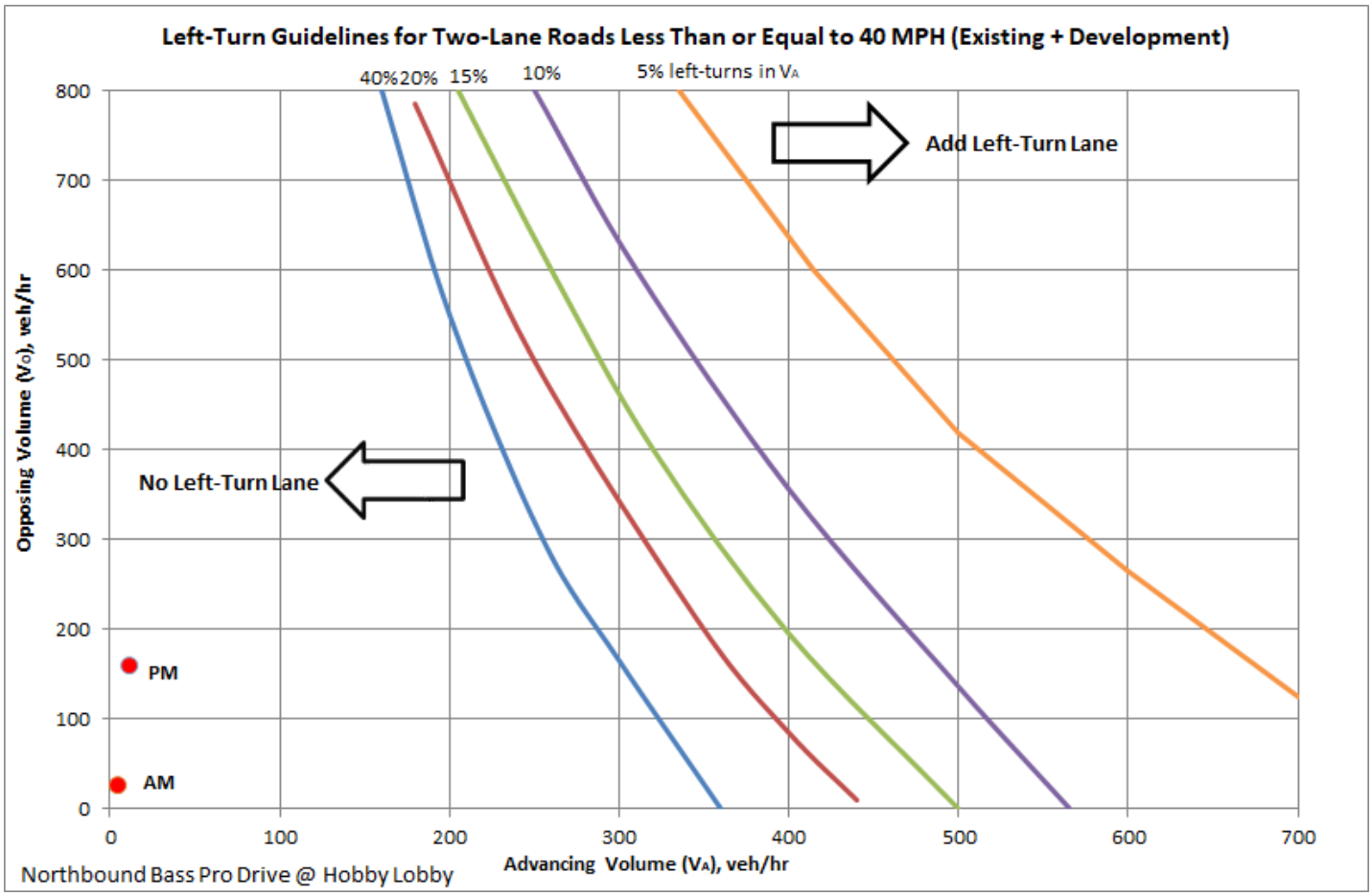

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Existing + Development)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Eastbound Bass Pro Drive @ Lee's Summit Road

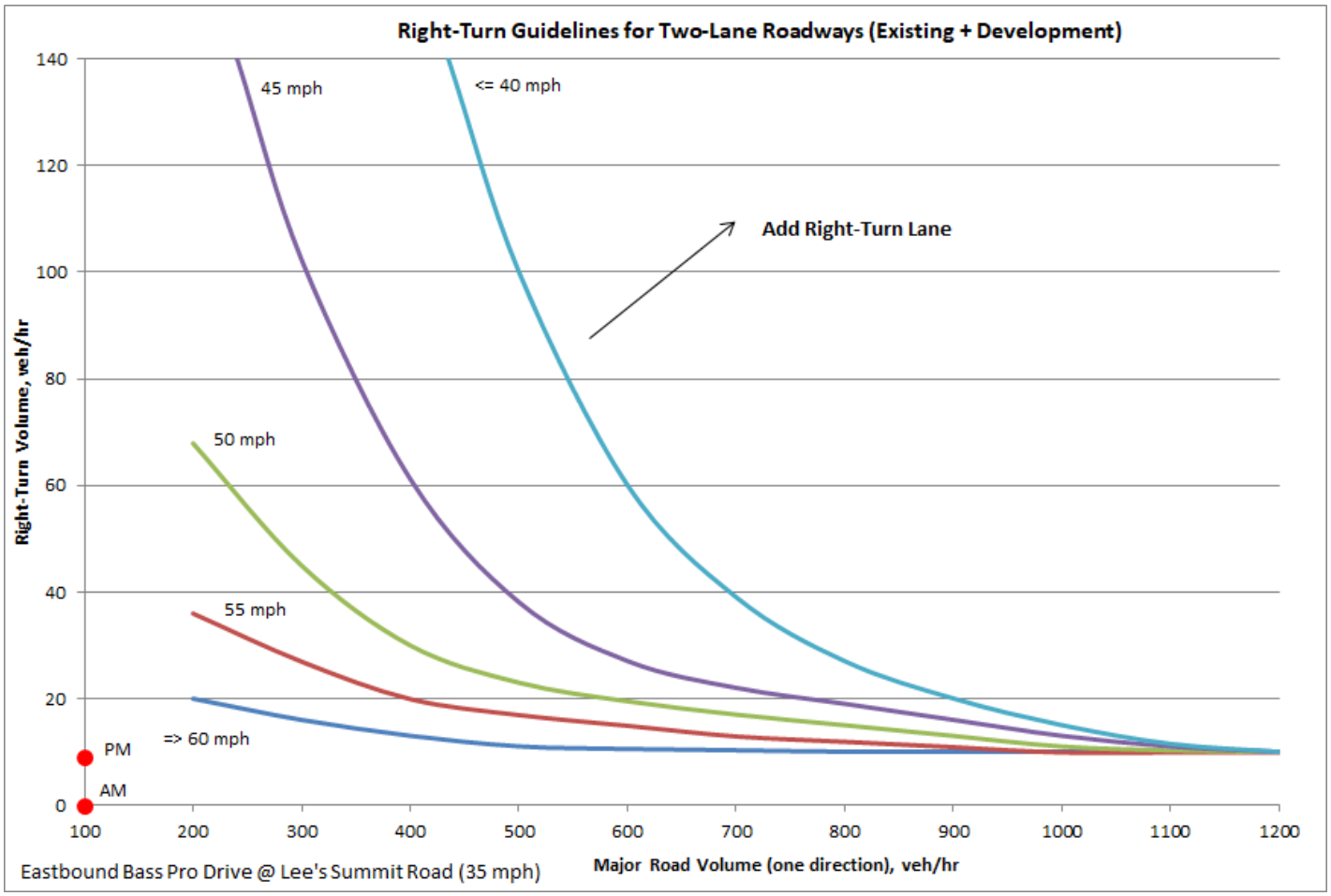

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Existing + Development)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
AM
PM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Westbound Bass Pro Drive @ Lee's Summit Road

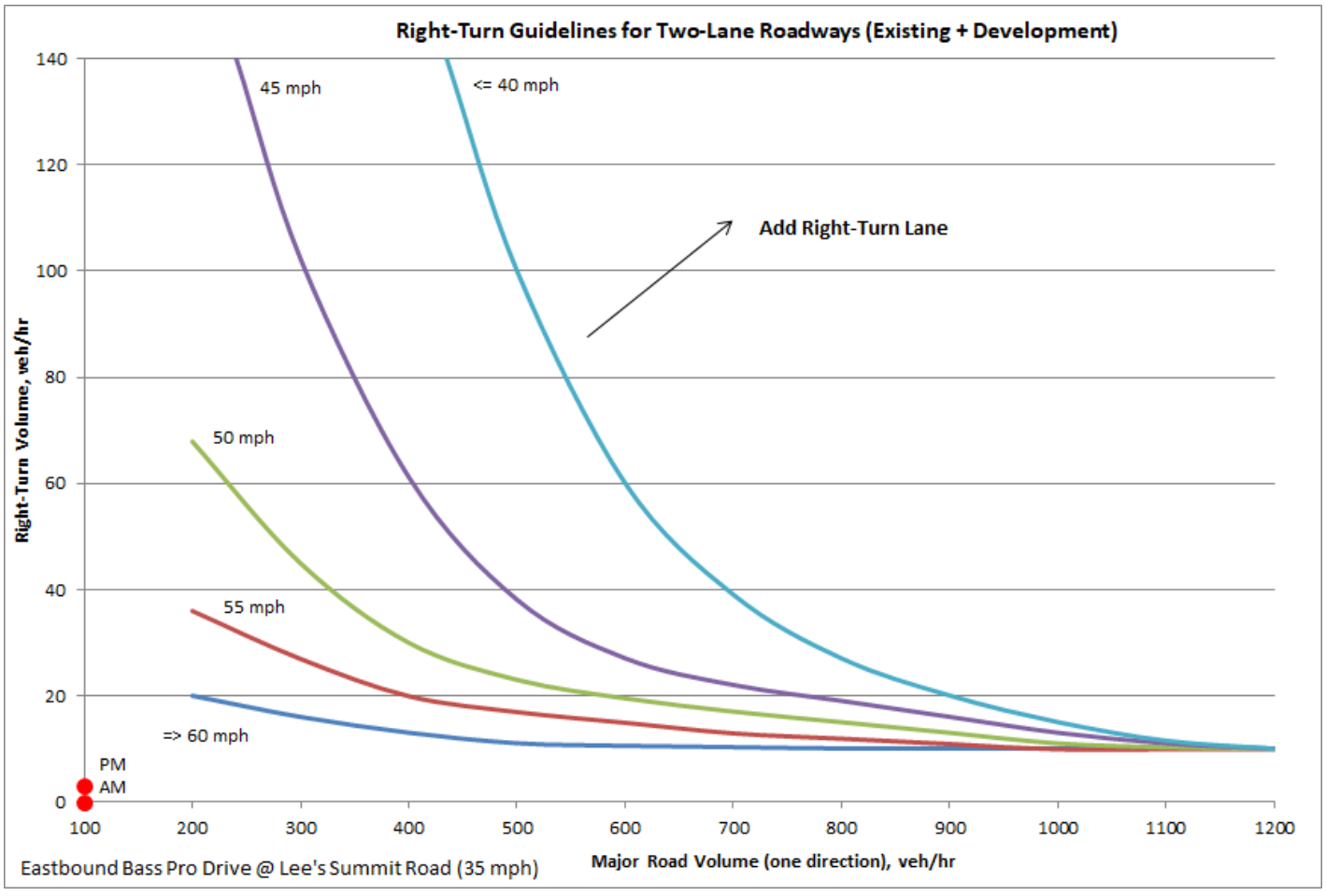

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Existing + Development)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Eastbound Bass Pro Drive @ Lee's Summit Road

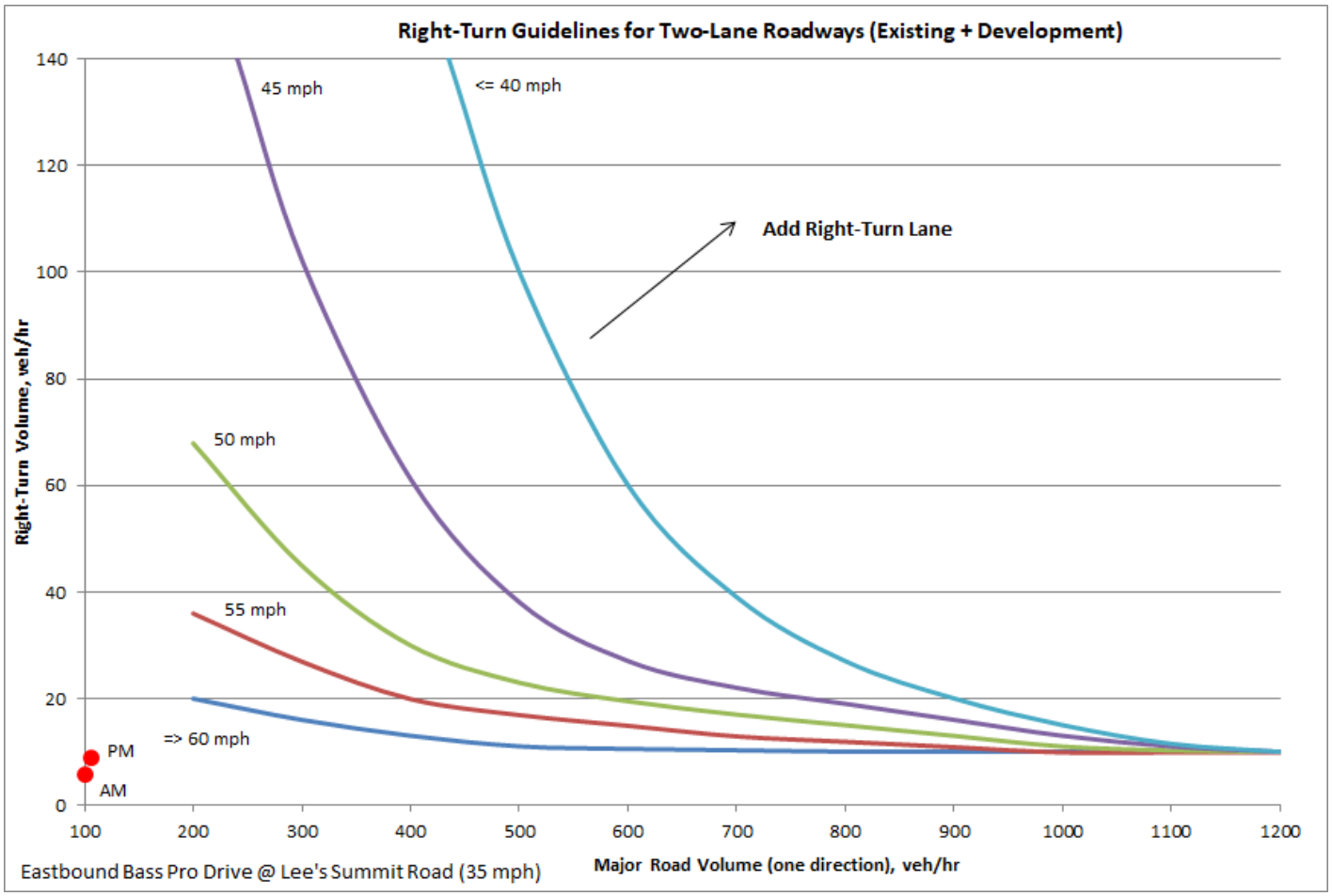

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Existing + Development)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Eastbound Bass Pro Drive @ Drive 1

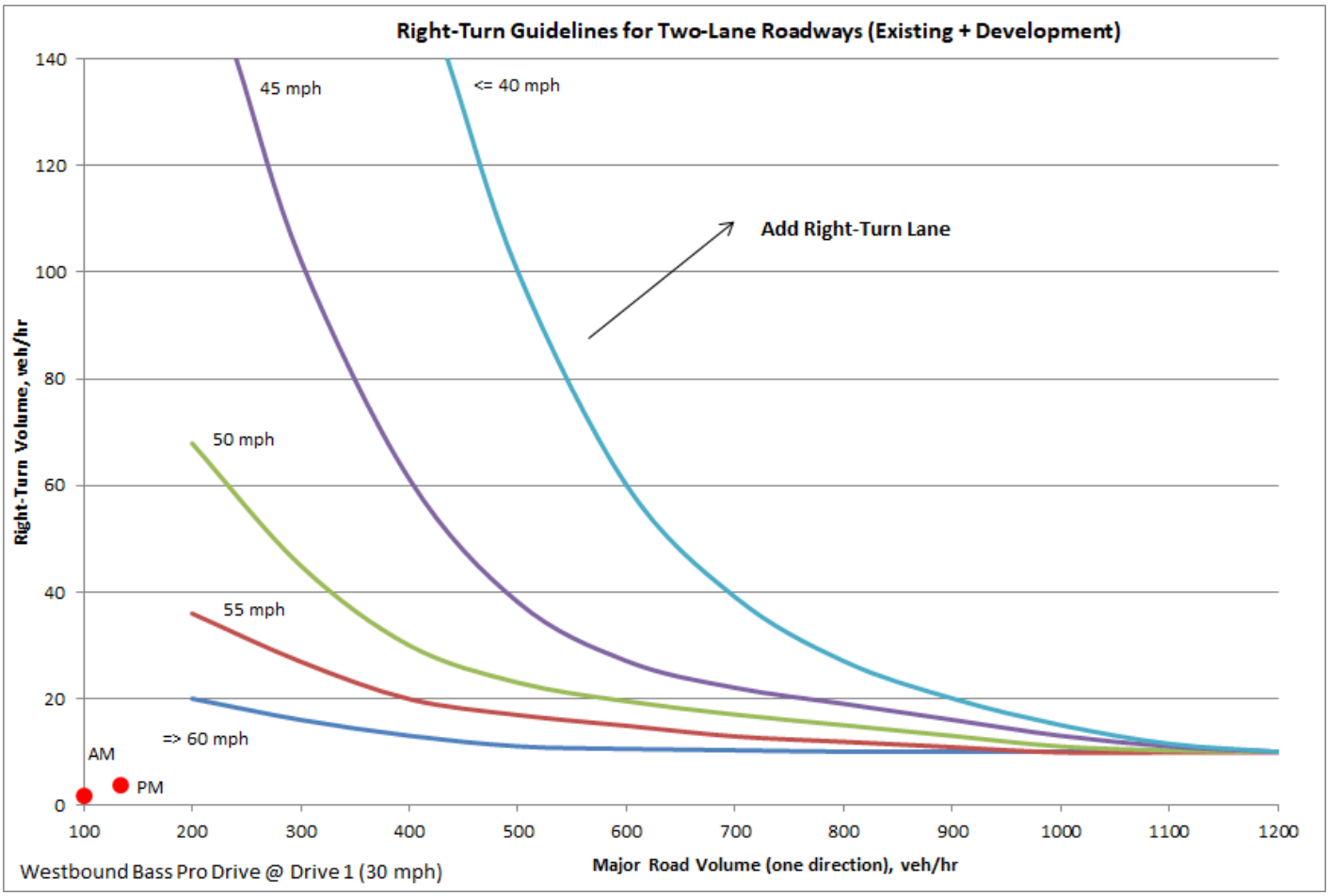

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Existing + Development)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Northbound Bass Pro Drive @ Drive 2

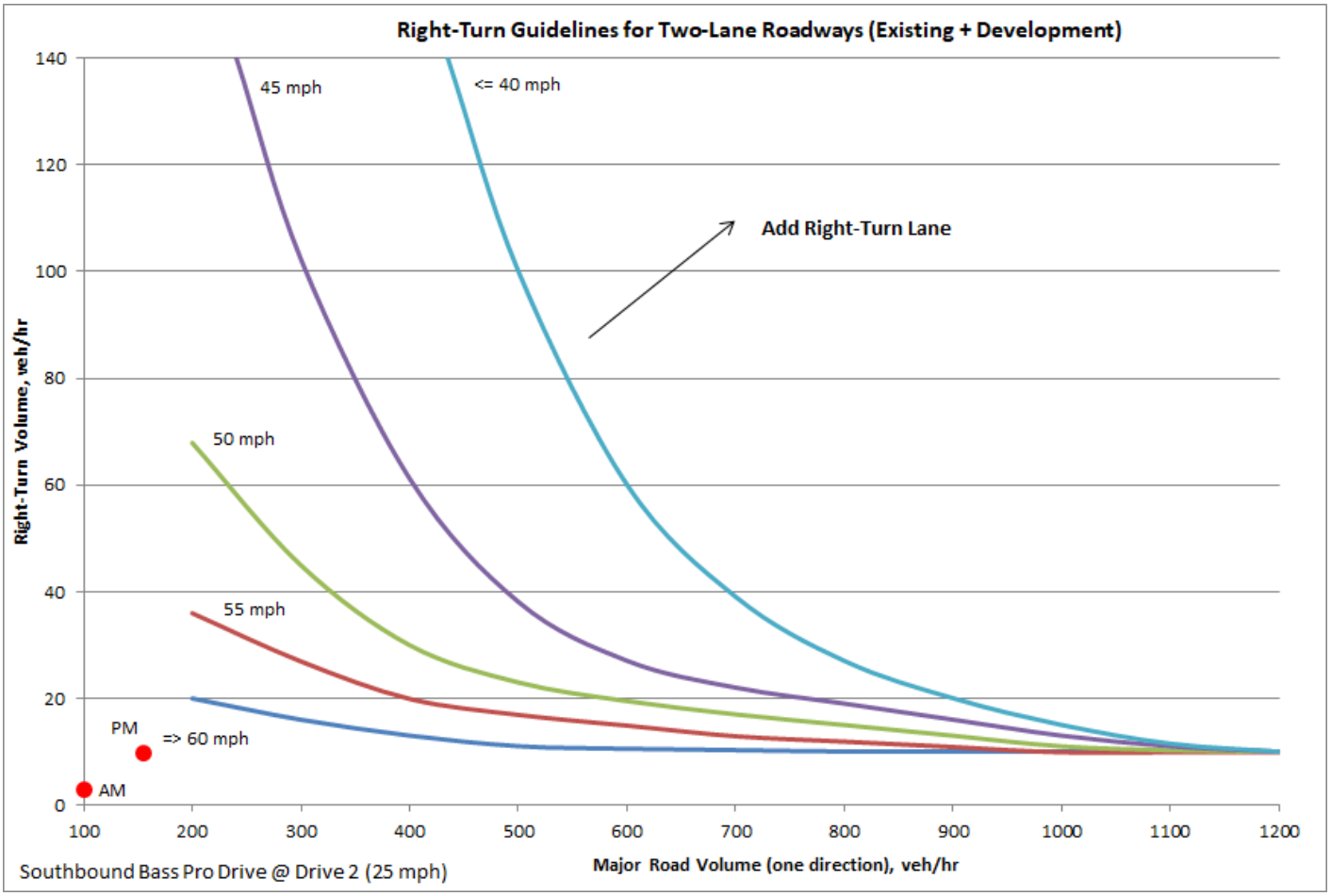

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Existing + Development)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Northbound Bass Pro Drive @ Hobby Lobby

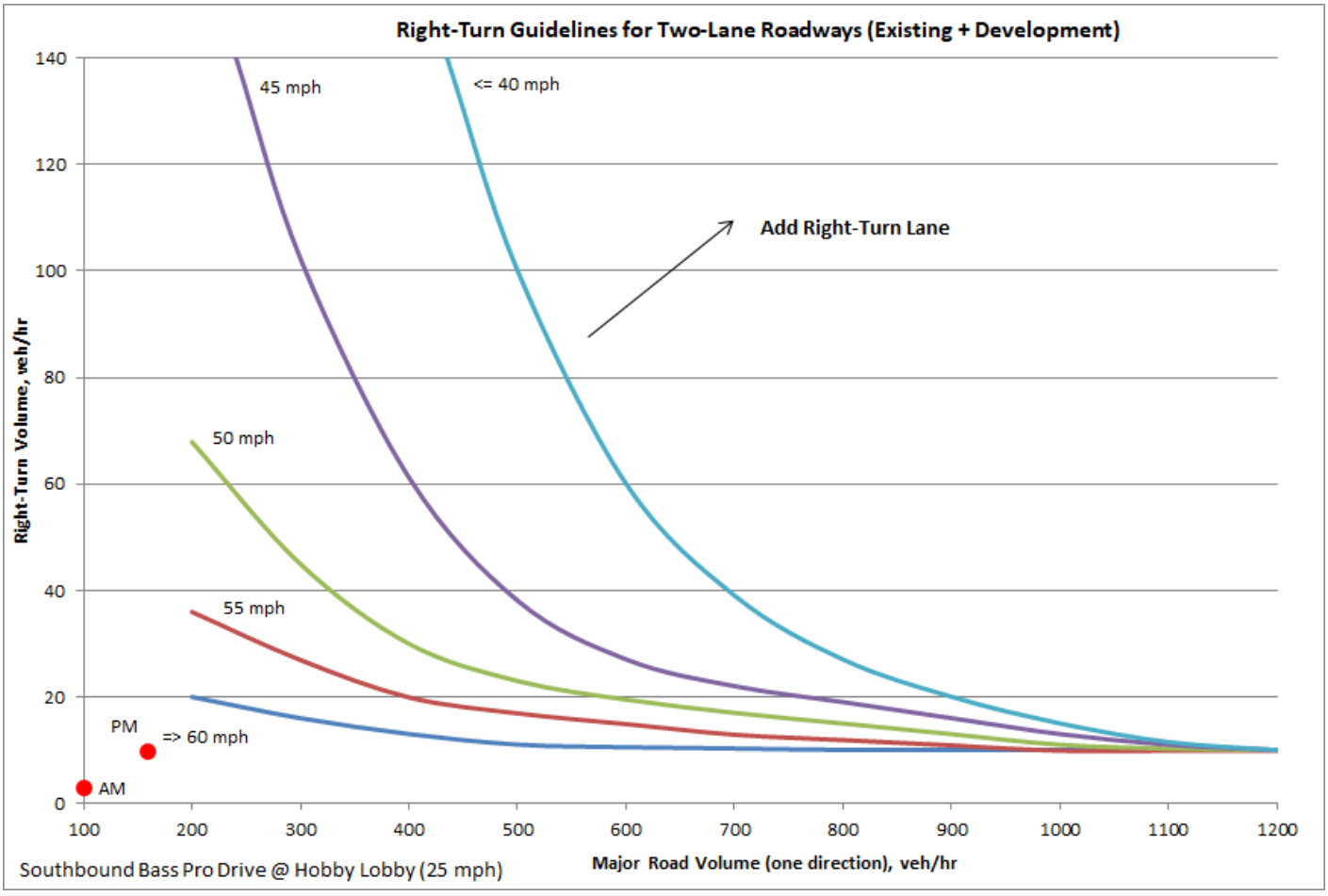

Right-Turn Guidelines for Two-Lane Roadways (Existing + Development)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
PM
AM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Eastbound Bass Pro Drive @ Lee's Summit Road (35 mph)

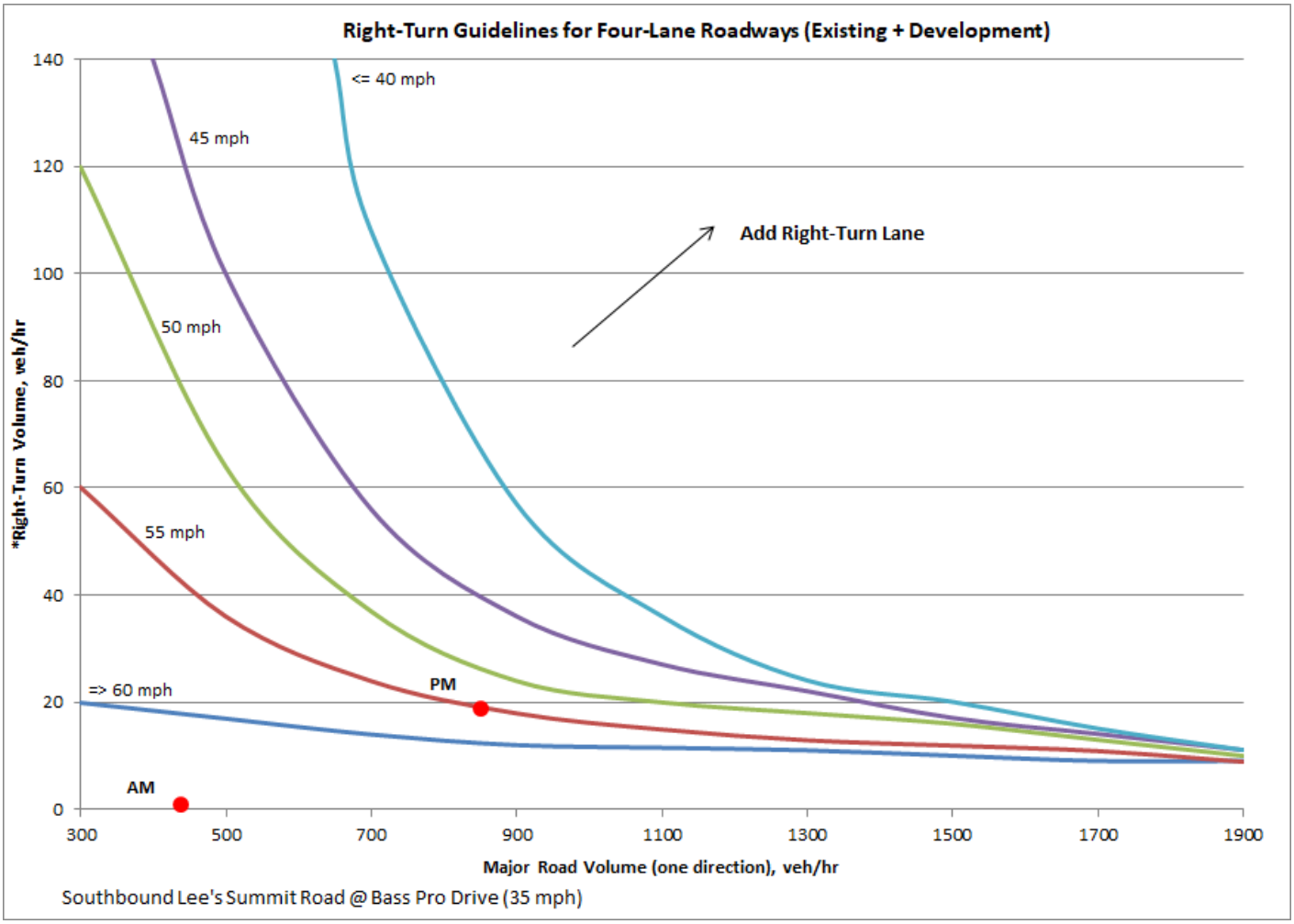

Right-Turn Guidelines for Two-Lane Roadways (Existing + Development)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
PM
AM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Eastbound Bass Pro Drive @ Lee's Summit Road (35 mph)


Right-Turn Guidelines for Two-Lane Roadways (Existing + Development)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
PM
AM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Eastbound Bass Pro Drive @ Lee's Summit Road (35 mph)

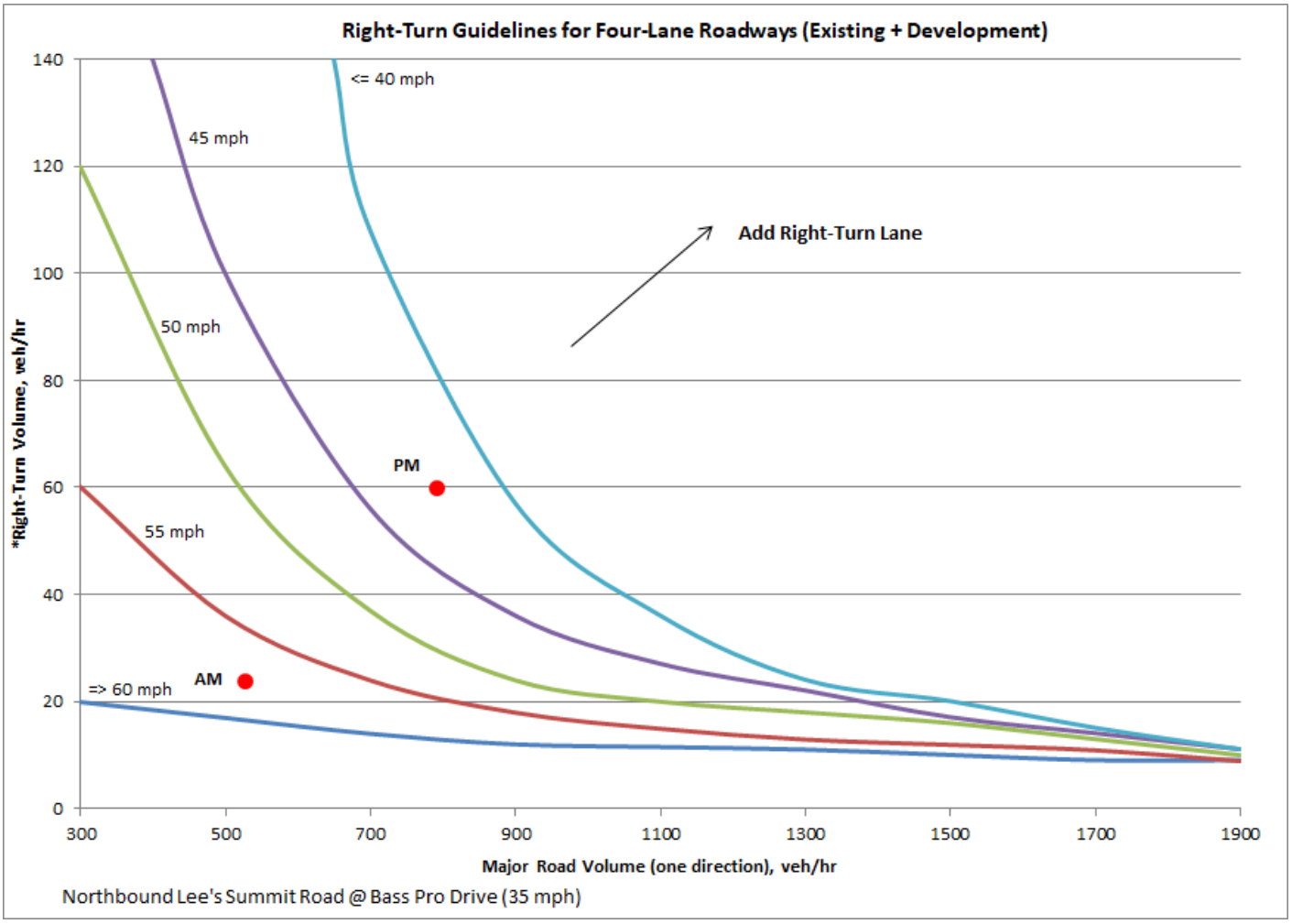

Right-Turn Guidelines for Two-Lane Roadways (Existing + Development)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
AM
PM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Westbound Bass Pro Drive @ Drive 1 (30 mph)


Right-Turn Guidelines for Two-Lane Roadways (Existing + Development)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
PM
=> 60 mph
AM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Southbound Bass Pro Drive @ Drive 2 (25 mph)

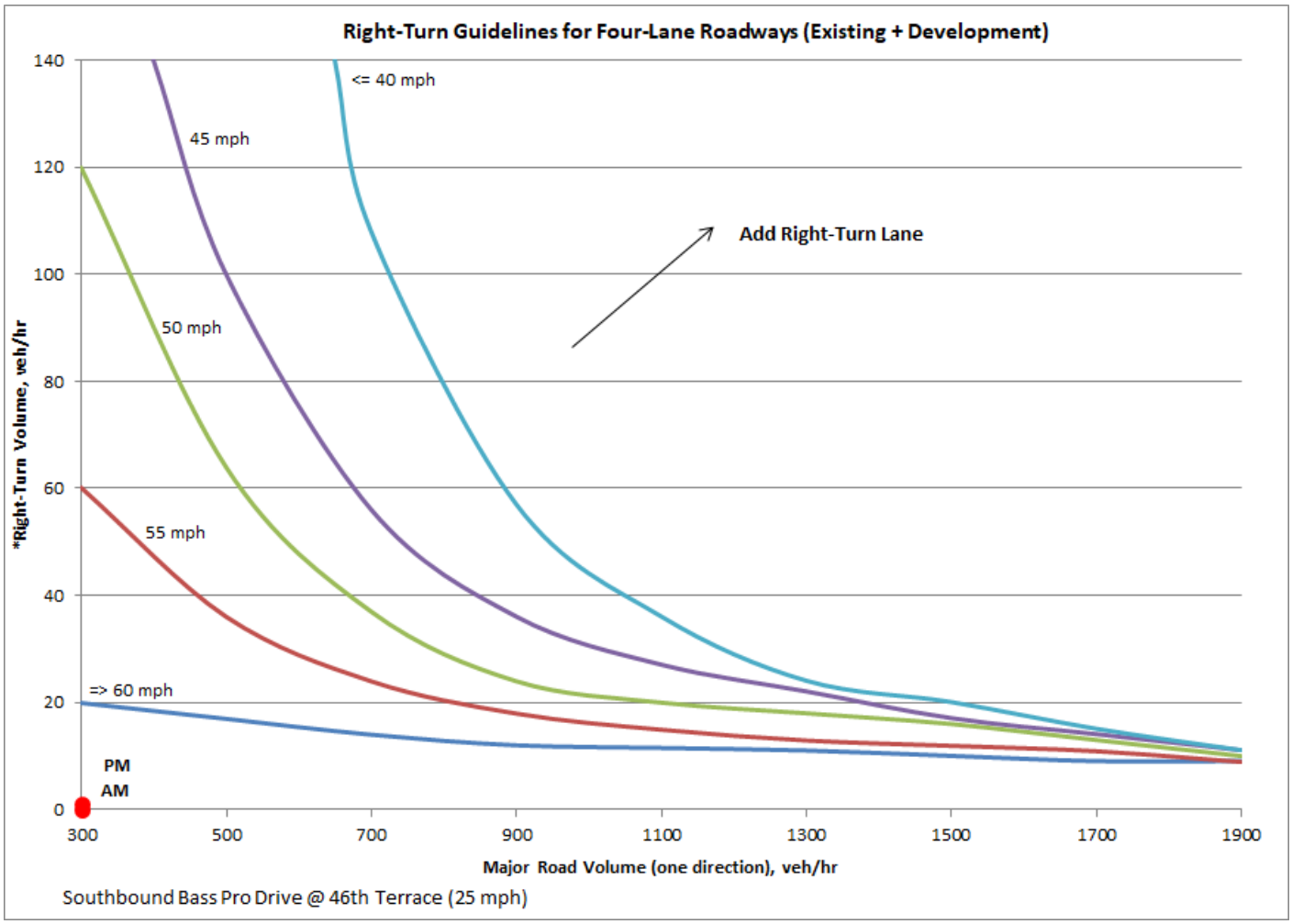

Right-Turn Guidelines for Two-Lane Roadways (Existing + Development)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
PM
=> 60 mph
AM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Southbound Bass Pro Drive @ Hobby Lobby (25 mph)



Southbound Lee's Summit Road @ Bass Pro Drive (35 mph)

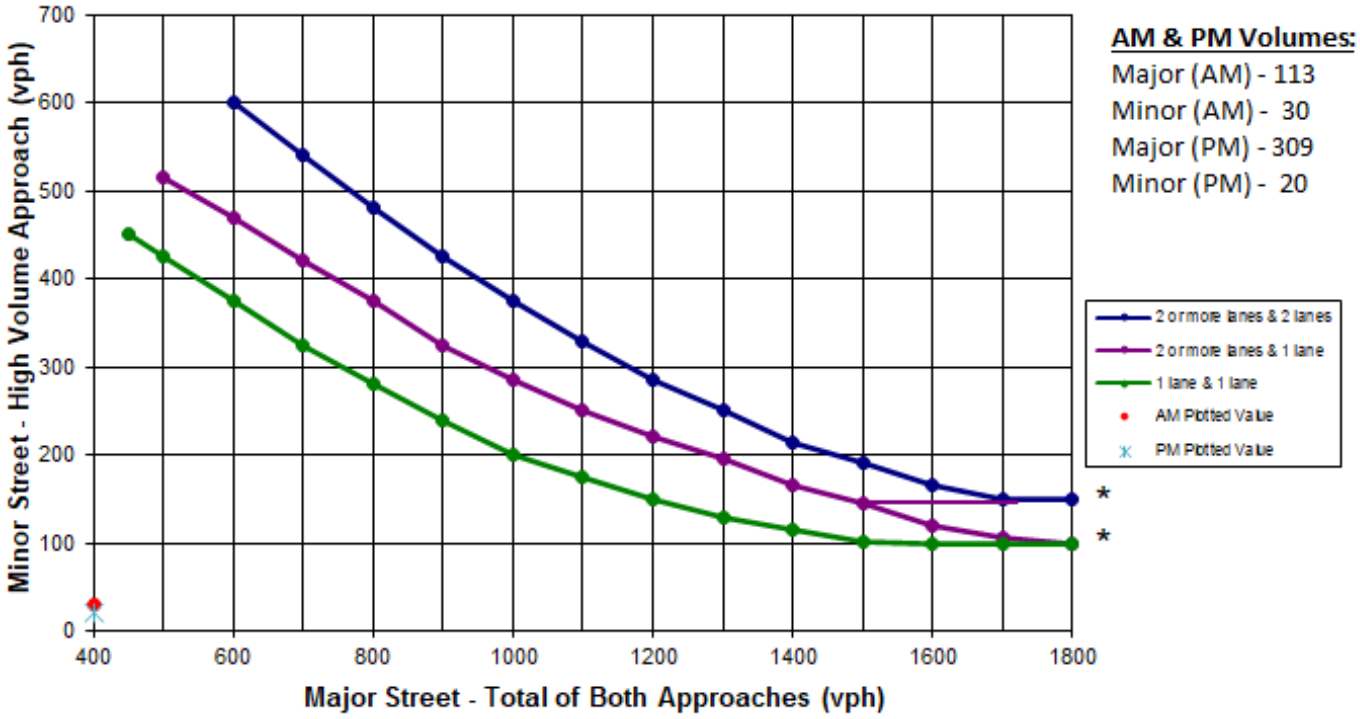


Northbound Lee's Summit Road @ Bass Pro Drive (35 mph)


Right-Turn Guidelines for Four-Lane Roadways (Existing + Development)
140
120
100
80
60
40
20
0
*Right-Turn Volume, veh/hr
<= 40 mph
45 mph
50 mph
55 mph
=> 60 mph
Add Right-Turn Lane
PM
AM
300
500
700
900
1100
1300
1500
1700
1900
Major Road Volume (one direction), veh/hr
Southbound Bass Pro Drive @ 46th Terrace (25 mph)

4 Signal Warrants

Peak Hour Volume Warrant (Existing Plus Development)
Drive 1 & Bass Pro Drive

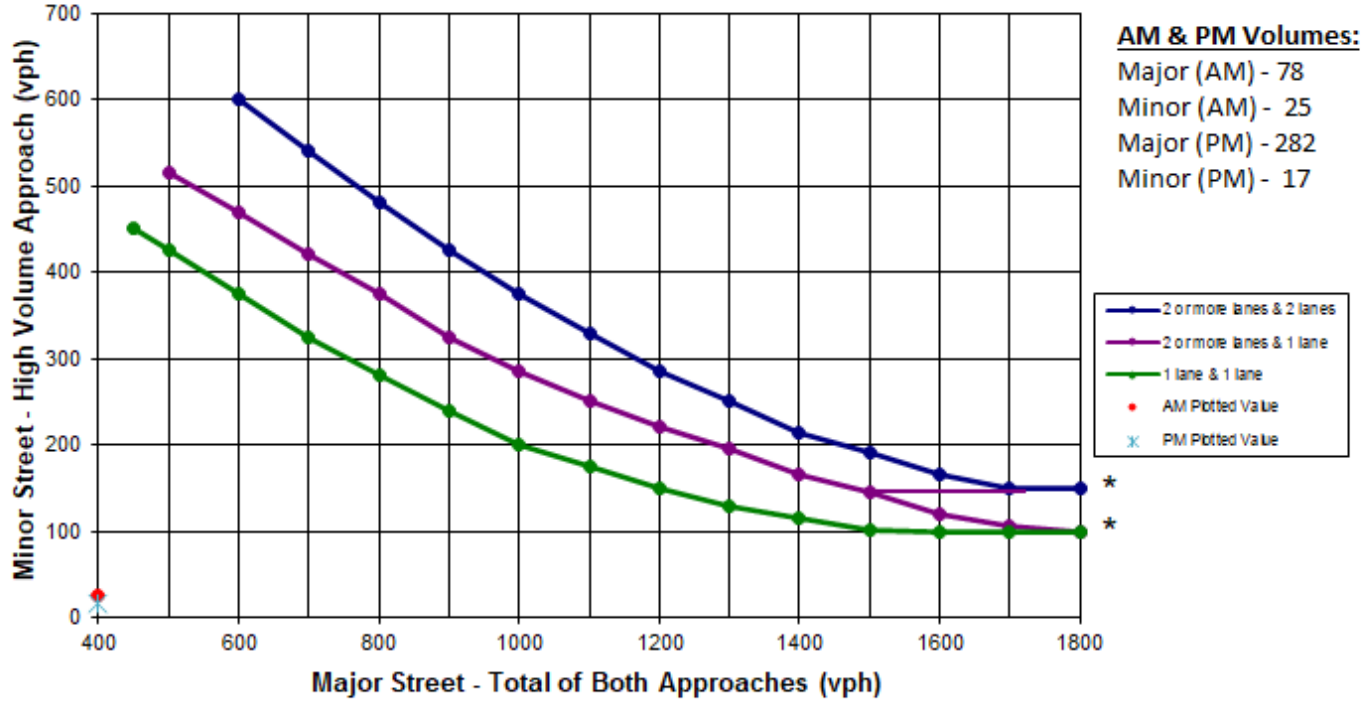


AM & PM Volumes:

Major (AM) - 113
Minor (AM) - 30
Major (PM) - 309
Minor (PM) - 20

*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

Peak Hour Volume Warrant (Existing Plus Development)
Drive 2 & Bass Pro Drive

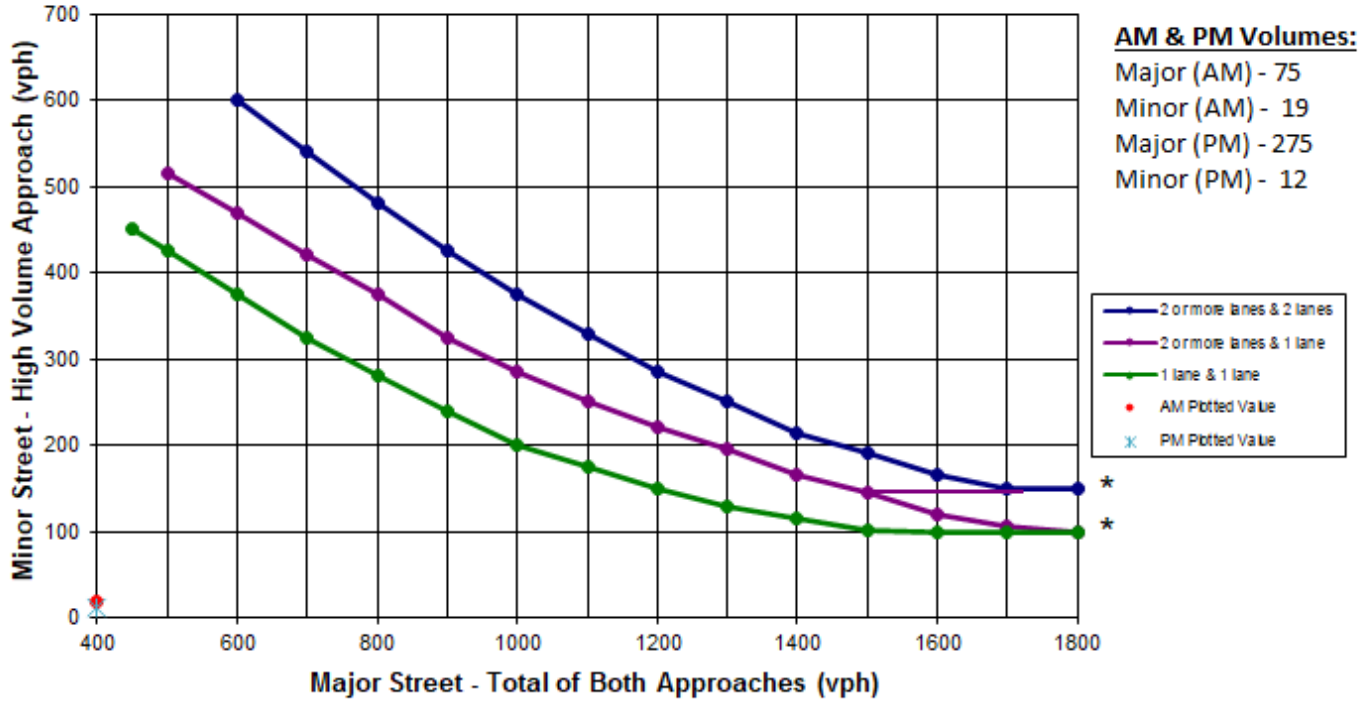


AM & PM Volumes:

Major (AM) - 78
Minor (AM) - 25
Major (PM) - 282
Minor (PM) - 17

*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

Peak Hour Volume Warrant (Existing Plus Development)
Hobby Lobby Drive & Bass Pro Drive

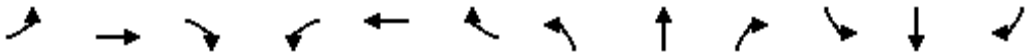


*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

5 Capacity Analysis

Lane Group	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	26	10	4	107	4	4	68
v/c Ratio	0.07	0.01	0.00	0.11	0.01	0.01	0.07
Control Delay	25.4	0.0	7.0	25.4	0.0	24.5	25.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.4	0.0	7.0	25.4	0.0	24.5	25.0
Queue Length 50th (ft)	11	0	1	24	0	2	15
Queue Length 95th (ft)	31	0	1	28	0	6	27
Internal Link Dist (ft)		126		607			77
Turn Bay Length (ft)			100			150	
Base Capacity (vph)	376	1061	824	943	502	472	943
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.01	0.00	0.11	0.01	0.01	0.07

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	23	0	6	1	63	2	2	53	0
Future Volume (vph)	0	0	0	23	0	6	1	63	2	2	53	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor				1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt				1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1770	1583		1770	3539	1583	1770	3539	
Flt Permitted				0.76	1.00		0.71	1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1410	1583		1323	3539	1583	1770	3539	
Peak-hour factor, PHF	1.00	1.00	1.00	0.88	1.00	0.62	0.25	0.59	0.50	0.50	0.78	1.00
Adj. Flow (vph)	0	0	0	26	0	10	4	107	4	4	68	0
RTOR Reduction (vph)	0	0	0	0	7	0	0	0	3	0	0	0
Lane Group Flow (vph)	0	0	0	26	3	0	4	107	1	4	68	0
Turn Type				Perm	NA		pm+pt	NA	Perm	Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2			
Actuated Green, G (s)				24.0	24.0		48.0	24.0	24.0	24.0	24.0	
Effective Green, g (s)				24.0	24.0		48.0	24.0	24.0	24.0	24.0	
Actuated g/C Ratio				0.27	0.27		0.53	0.27	0.27	0.27	0.27	
Clearance Time (s)				6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Grp Cap (vph)				376	422		824	943	422	472	943	
v/s Ratio Prot					0.00		0.00	c0.03		c0.00	0.02	
v/s Ratio Perm				c0.02			0.00		0.00			
v/c Ratio				0.07	0.01		0.00	0.11	0.00	0.01	0.07	
Uniform Delay, d1				24.7	24.2		9.8	25.0	24.2	24.3	24.7	
Progression Factor				1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2				0.4	0.0		0.0	0.2	0.0	0.0	0.1	
Delay (s)				25.0	24.3		9.8	25.2	24.2	24.3	24.8	
Level of Service				C	C		A	C	C	C	C	
Approach Delay (s)		0.0			24.8			24.6			24.8	
Approach LOS		A			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.06		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	10	4	45	23	3
Future Vol, veh/h	9	10	4	45	23	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	11	4	49	25	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	84	14	28	0	-	0
Stage 1	27	-	-	-	-	-
Stage 2	57	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	913	1063	1585	-	-	-
Stage 1	992	-	-	-	-	-
Stage 2	965	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	910	1063	1585	-	-	-
Mov Cap-2 Maneuver	910	-	-	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	965	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	0.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1585	-	985	-	-
HCM Lane V/C Ratio	0.003	-	0.021	-	-
HCM Control Delay (s)	7.3	0	8.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	7.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	7	0	0	19
Future Vol, veh/h	0	0	7	0	0	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	8	0	0	21

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	17	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	16	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	1001	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	1007	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	996	1084
Mov Cap-2 Maneuver	-	-	-	-	996	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	1002	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.019	-	-	0.005	-
HCM Control Delay (s)	8.4	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	58	44	2	4	26
Future Vol, veh/h	9	58	44	2	4	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	63	48	2	4	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	50	0	-	0	132	49
Stage 1	-	-	-	-	49	-
Stage 2	-	-	-	-	83	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1557	-	-	-	862	1020
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	940	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1557	-	-	-	856	1020
Mov Cap-2 Maneuver	-	-	-	-	856	-
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	940	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1557	-	-	-	995
HCM Lane V/C Ratio	0.006	-	-	-	0.033
HCM Control Delay (s)	7.3	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	16	5	40	30	3
Future Vol, veh/h	9	16	5	40	30	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	17	5	43	33	3

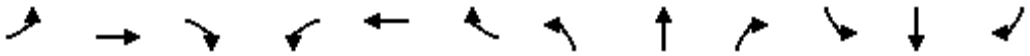
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	88	35	36	0	-	0
Stage 1	35	-	-	-	-	-
Stage 2	53	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	913	1038	1575	-	-	-
Stage 1	987	-	-	-	-	-
Stage 2	970	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	910	1038	1575	-	-	-
Mov Cap-2 Maneuver	861	-	-	-	-	-
Stage 1	984	-	-	-	-	-
Stage 2	970	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1575	-	861	1038	-	-
HCM Lane V/C Ratio	0.003	-	0.011	0.017	-	-
HCM Control Delay (s)	7.3	0	9.2	8.5	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0.1	-	-

Lane Group	WBT	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	15	90	667	60	399
v/c Ratio	0.08	0.30	0.26	0.09	0.12
Control Delay	27.2	8.3	4.7	1.6	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	27.2	8.3	4.7	1.6	1.0
Queue Length 50th (ft)	5	0	33	0	0
Queue Length 95th (ft)	22	9	91	12	32
Internal Link Dist (ft)	785		1425		1381
Turn Bay Length (ft)				265	
Base Capacity (vph)	703	378	2555	737	3342
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.02	0.24	0.26	0.08	0.12

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	15	0	52	0	502	24	48	387	1
Future Volume (vph)	0	0	0	15	0	52	0	502	24	48	387	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.2	5.7		5.5		5.7	5.7	
Lane Util. Factor					1.00	1.00		0.95		1.00	0.95	
Frt					1.00	0.85		0.99		1.00	1.00	
Flt Protected					0.95	1.00		1.00		0.95	1.00	
Satd. Flow (prot)					1770	1583		3508		1770	3534	
Flt Permitted					0.95	1.00		1.00		0.35	1.00	
Satd. Flow (perm)					1770	1583		3508		650	3534	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	0.58	1.00	0.80	0.61	0.80	0.98	0.25
Adj. Flow (vph)	0	0	0	15	0	90	0	628	39	60	395	4
RTOR Reduction (vph)	0	0	0	0	0	81	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	15	9	0	665	0	60	399	0
Turn Type				Split	NA	pm+ov	Prot	NA		pm+pt	NA	
Protected Phases	8	8		4	4	1	5	2		1	6	
Permitted Phases						4				6		
Actuated Green, G (s)					1.2	6.3		42.8		53.4	53.4	
Effective Green, g (s)					1.2	6.3		42.8		53.4	53.4	
Actuated g/C Ratio					0.02	0.09		0.64		0.80	0.80	
Clearance Time (s)					6.2	5.7		5.5		5.7	5.7	
Vehicle Extension (s)					3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)					31	149		2257		607	2837	
v/s Ratio Prot					c0.01	0.00		c0.19		0.01	c0.11	
v/s Ratio Perm						0.00				0.07		
v/c Ratio					0.48	0.06		0.29		0.10	0.14	
Uniform Delay, d1					32.3	27.4		5.2		1.6	1.5	
Progression Factor					1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2					11.4	0.2		0.3		0.1	0.1	
Delay (s)					43.8	27.6		5.5		1.7	1.6	
Level of Service					D	C		A		A	A	
Approach Delay (s)		0.0			29.9			5.5			1.6	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	66.5	Sum of lost time (s)	23.2
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

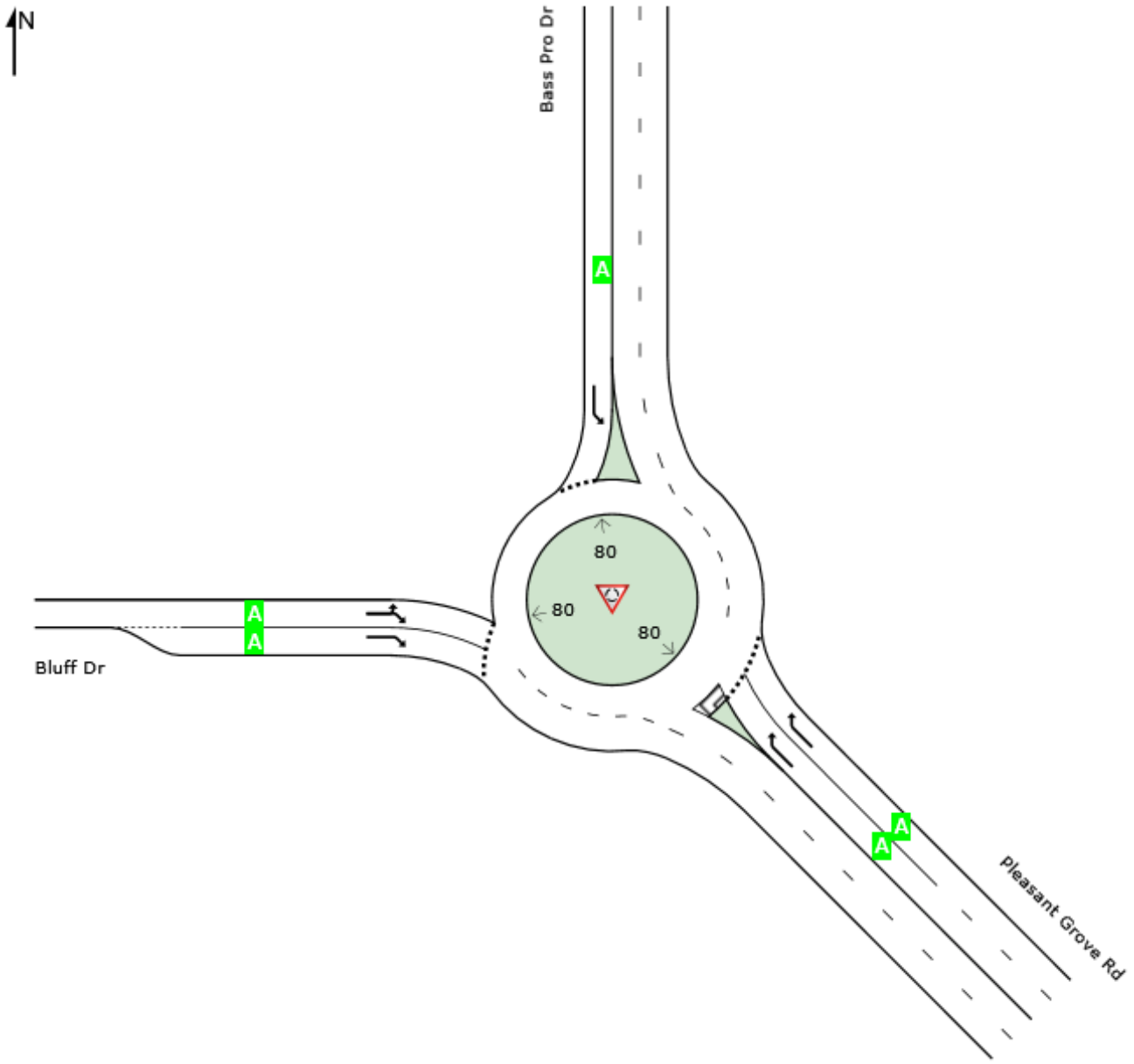
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [East Roundabout (Ex+Dev AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [East Roundabout (Ex+Dev AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
SouthEast: Pleasant Grove Rd													
Lane 1	57	2.0	1387	0.041	100	2.9	LOS A	0.2	4.1	Full	1600	0.0	0.0
Lane 2[d]	57	2.0	1387	0.041	100	2.9	LOS A	0.2	4.1	Full	1600	0.0	0.0
Approach	113	2.0		0.041		2.9	LOS A	0.2	4.1				
North: Bass Pro Dr													
Lane 1[d]	56	2.0	1353	0.042	100	3.0	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	56	2.0		0.042		3.0	LOS A	0.0	0.0				
West: Bluff Dr													
Lane 1	15	2.0	1321	0.011	100	2.8	LOS A	0.0	1.1	Full	1600	0.0	0.0
Lane 2[d]	15	2.0	1321	0.011	100	2.8	LOS A	0.0	1.1	Short	115	0.0	NA
Approach	29	2.0		0.011		2.8	LOS A	0.0	1.1				
Intersection	198	2.0		0.042		2.9	LOS A	0.2	4.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

SouthEast: Pleasant Grove Rd

Mov. From SE To Exit:	R1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	57	57	2.0	1387	0.041	100	NA	NA
Lane 2	57	57	2.0	1387	0.041	100	NA	NA
Approach	113	113	2.0		0.041			

North: Bass Pro Dr

Mov. From N To Exit:	L1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	56	56	2.0	1353	0.042	100	NA	NA

Approach	56	56	2.0		0.042				
West: Bluff Dr									
Mov. From W To Exit:	L2 N	R1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	11	15	2.0	1321	0.011	100	NA	NA
Lane 2	-	15	15	2.0	1321	0.011	100	0.0	1
Approach	4	25	29	2.0		0.011			
	Total	%HV	Deg.Satn (v/c)						
Intersection	198	2.0		0.042					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Pleasant Grove Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

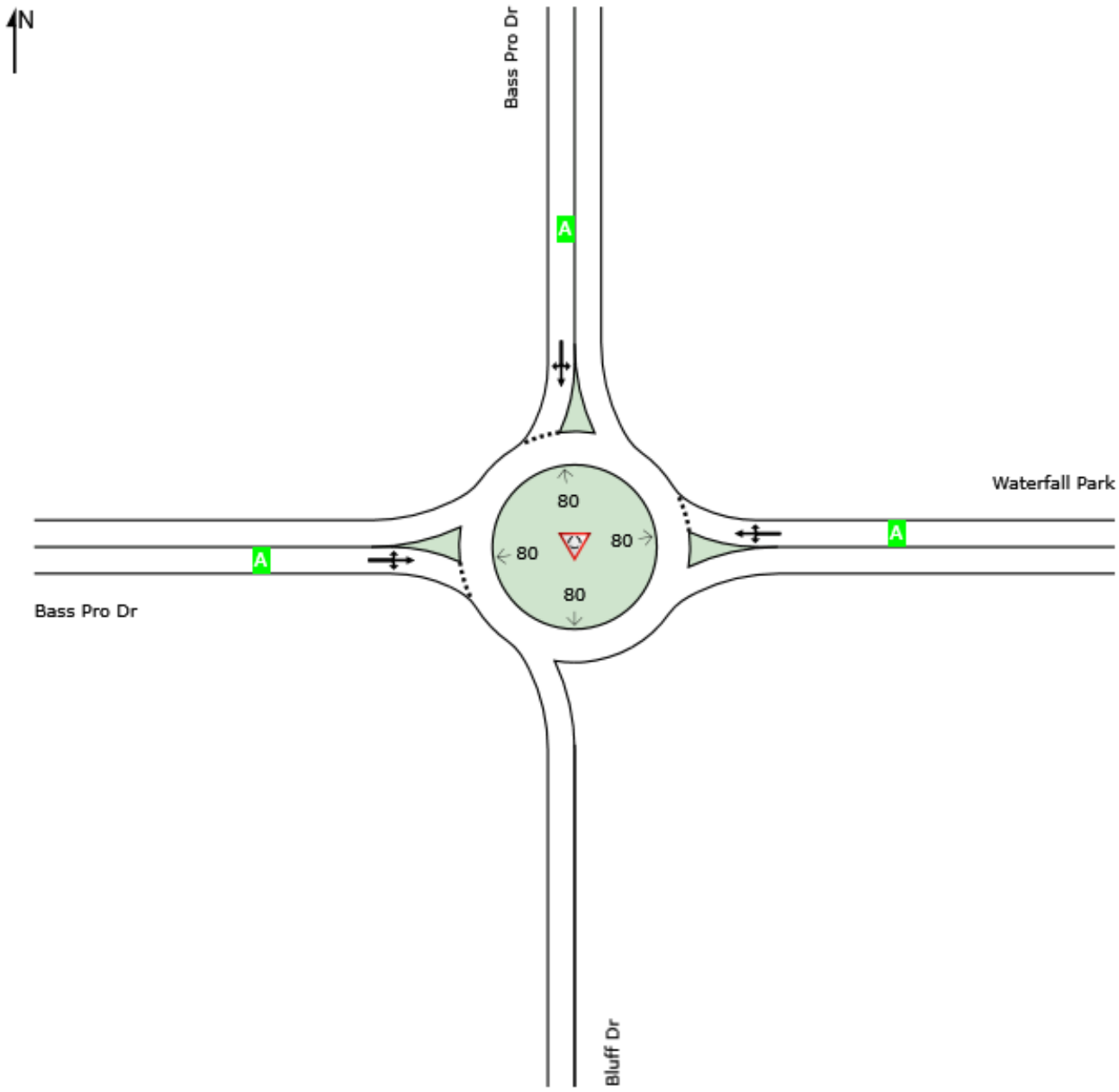
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [West Roundabout (Ex+Dev AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	East	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [West Roundabout (Ex+Dev AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
East: Waterfall Park													
Lane 1[d]	30	2.0	1269	0.024	100	3.0	LOS A	0.1	2.5	Full	1600	0.0	0.0
Approach	30	2.0		0.024		3.0	LOS A	0.1	2.5				
North: Bass Pro Dr													
Lane 1[d]	81	2.0	1327	0.061	100	3.2	LOS A	0.3	6.8	Full	1600	0.0	0.0
Approach	81	2.0		0.061		3.2	LOS A	0.3	6.8				
West: Bass Pro Dr													
Lane 1[d]	96	2.0	1315	0.073	100	3.3	LOS A	0.3	8.2	Full	1600	0.0	0.0
Approach	96	2.0		0.073		3.3	LOS A	0.3	8.2				
Intersection	208	2.0		0.073		3.2	LOS A	0.3	8.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

East: Waterfall Park

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	14	12	30	2.0	1269	0.024	100	NA	NA
Approach	4	14	12	30	2.0		0.024			

North: Bass Pro Dr

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	4	58	81	2.0	1327	0.061	100	NA	NA
Approach	19	4	58	81	2.0		0.061			

West: Bass Pro Dr

Mov. From W	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	62	10	25	96	2.0	1315	0.073	100	NA	NA
Approach	62	10	25	96	2.0		0.073			

	Total	%HV	Deg.Satn (v/c)
Intersection	208	2.0	0.073

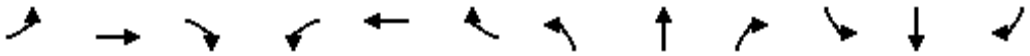
Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Bluff Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Waterfall Park Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	12	114	13	8	229	48	14	228
v/c Ratio	0.02	0.31	0.01	0.02	0.24	0.10	0.02	0.24
Control Delay	0.0	29.1	0.0	24.7	26.7	0.4	7.6	26.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.0	29.1	0.0	24.7	26.7	0.4	7.6	26.5
Queue Length 50th (ft)	0	52	0	3	53	0	3	53
Queue Length 95th (ft)	0	91	0	6	84	0	7	82
Internal Link Dist (ft)	137		126		607			77
Turn Bay Length (ft)				100			150	
Base Capacity (vph)	509	372	953	472	943	502	774	942
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.31	0.01	0.02	0.24	0.10	0.02	0.24

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	3	96	0	9	3	206	35	8	199	1
Future Volume (vph)	2	0	3	96	0	9	3	206	35	8	199	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt		0.91		1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1667		1770	1583		1770	3539	1583	1770	3530	
Flt Permitted		0.95		0.75	1.00		0.95	1.00	1.00	0.61	1.00	
Satd. Flow (perm)		1610		1397	1583		1770	3539	1583	1134	3530	
Peak-hour factor, PHF	0.50	1.00	0.38	0.84	1.00	0.67	0.38	0.90	0.73	0.58	0.89	0.25
Adj. Flow (vph)	4	0	8	114	0	13	8	229	48	14	224	4
RTOR Reduction (vph)	0	9	0	0	10	0	0	0	35	0	1	0
Lane Group Flow (vph)	0	3	0	114	3	0	8	229	13	14	227	0
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2	6		
Actuated Green, G (s)		24.0		24.0	24.0		24.0	24.0	24.0	48.0	24.0	
Effective Green, g (s)		24.0		24.0	24.0		24.0	24.0	24.0	48.0	24.0	
Actuated g/C Ratio		0.27		0.27	0.27		0.27	0.27	0.27	0.53	0.27	
Clearance Time (s)		6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Grp Cap (vph)		429		372	422		472	943	422	774	941	
v/s Ratio Prot					0.00		0.00	c0.06		c0.00	0.06	
v/s Ratio Perm		0.00		c0.08					0.01	0.00		
v/c Ratio		0.01		0.31	0.01		0.02	0.24	0.03	0.02	0.24	
Uniform Delay, d1		24.2		26.4	24.3		24.3	25.9	24.4	9.9	25.9	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.0		2.1	0.0		0.1	0.6	0.1	0.0	0.6	
Delay (s)		24.3		28.5	24.3		24.4	26.5	24.5	9.9	26.5	
Level of Service		C		C	C		C	C	C	A	C	
Approach Delay (s)		24.3			28.0			26.1			25.5	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	26.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	6	11	105	149	10
Future Vol, veh/h	6	6	11	105	149	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	7	12	114	162	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	306	87	173	0	-	0
Stage 1	168	-	-	-	-	-
Stage 2	138	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	674	955	1402	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	888	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	668	955	1402	-	-	-
Mov Cap-2 Maneuver	668	-	-	-	-	-
Stage 1	837	-	-	-	-	-
Stage 2	888	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.7	0.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1402	-	786	-	-
HCM Lane V/C Ratio	0.009	-	0.017	-	-
HCM Control Delay (s)	7.6	0	9.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	7.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	21	0	0	12
Future Vol, veh/h	0	0	21	0	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	23	0	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	47	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	46	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	963	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	950	1084
Mov Cap-2 Maneuver	-	-	-	-	950	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	962	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.012	-	-	0.014	-
HCM Control Delay (s)	8.4	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	28	148	129	4	3	17
Future Vol, veh/h	28	148	129	4	3	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	30	161	140	4	3	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	144	0	-	0	363	142
Stage 1	-	-	-	-	142	-
Stage 2	-	-	-	-	221	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1438	-	-	-	636	906
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	816	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1438	-	-	-	621	906
Mov Cap-2 Maneuver	-	-	-	-	621	-
Stage 1	-	-	-	-	865	-
Stage 2	-	-	-	-	816	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1438	-	-	-	848
HCM Lane V/C Ratio	0.021	-	-	-	0.026
HCM Control Delay (s)	7.6	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	11	17	110	145	10
Future Vol, veh/h	6	11	17	110	145	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	12	18	120	158	11

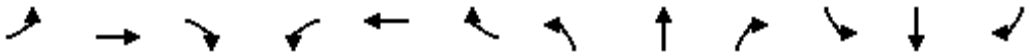
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	320	164	169	0	-	0
Stage 1	164	-	-	-	-	-
Stage 2	156	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	673	881	1409	-	-	-
Stage 1	865	-	-	-	-	-
Stage 2	872	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	664	881	1409	-	-	-
Mov Cap-2 Maneuver	696	-	-	-	-	-
Stage 1	853	-	-	-	-	-
Stage 2	872	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1409	-	696	881	-	-
HCM Lane V/C Ratio	0.013	-	0.009	0.014	-	-
HCM Control Delay (s)	7.6	0	10.2	9.1	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

Lane Group	EBT	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	30	53	141	22	927	152	794
v/c Ratio	0.11	0.27	0.33	0.13	0.47	0.34	0.31
Control Delay	0.8	37.5	5.6	37.6	13.3	7.3	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.8	37.5	5.6	37.6	13.3	7.3	9.4
Queue Length 50th (ft)	0	23	0	9	126	16	51
Queue Length 95th (ft)	0	62	21	23	233	50	207
Internal Link Dist (ft)	480	785			1425		1381
Turn Bay Length (ft)				110		265	
Base Capacity (vph)	456	602	455	240	1978	482	2580
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.09	0.31	0.09	0.47	0.32	0.31

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	0	9	40	0	110	13	718	60	120	710	19
Future Volume (vph)	3	0	9	40	0	110	13	718	60	120	710	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8			6.2	5.7	5.5	5.5		5.7	5.7	
Lane Util. Factor		1.00			1.00	1.00	1.00	0.95		1.00	0.95	
Frt		0.92			1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1678			1770	1583	1770	3498		1770	3518	
Flt Permitted		0.98			0.95	1.00	0.95	1.00		0.22	1.00	
Satd. Flow (perm)		1678			1770	1583	1770	3498		410	3518	
Peak-hour factor, PHF	0.25	1.00	0.50	0.75	1.00	0.78	0.60	0.84	0.83	0.79	0.93	0.61
Adj. Flow (vph)	12	0	18	53	0	141	22	855	72	152	763	31
RTOR Reduction (vph)	0	29	0	0	0	119	0	4	0	0	2	0
Lane Group Flow (vph)	0	1	0	0	53	22	22	923	0	152	792	0
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA		pm+pt	NA	
Protected Phases	8	8		4	4	1	5	2		1	6	
Permitted Phases						4				6		
Actuated Green, G (s)		2.0			4.8	12.8	2.5	44.8		58.3	50.3	
Effective Green, g (s)		2.0			4.8	12.8	2.5	44.8		58.3	50.3	
Actuated g/C Ratio		0.02			0.06	0.15	0.03	0.54		0.70	0.61	
Clearance Time (s)		5.8			6.2	5.7	5.5	5.5		5.7	5.7	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		40			102	244	53	1892		420	2137	
v/s Ratio Prot		c0.00			c0.03	0.01	0.01	c0.26		c0.03	c0.23	
v/s Ratio Perm						0.01				0.22		
v/c Ratio		0.02			0.52	0.09	0.42	0.49		0.36	0.37	
Uniform Delay, d1		39.4			37.9	30.0	39.4	11.8		5.7	8.2	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			4.4	0.2	5.2	0.9		0.5	0.5	
Delay (s)		39.6			42.3	30.2	44.6	12.7		6.2	8.7	
Level of Service		D			D	C	D	B		A	A	
Approach Delay (s)		39.6			33.5			13.5			8.3	
Approach LOS		D			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	82.8	Sum of lost time (s)	23.2
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

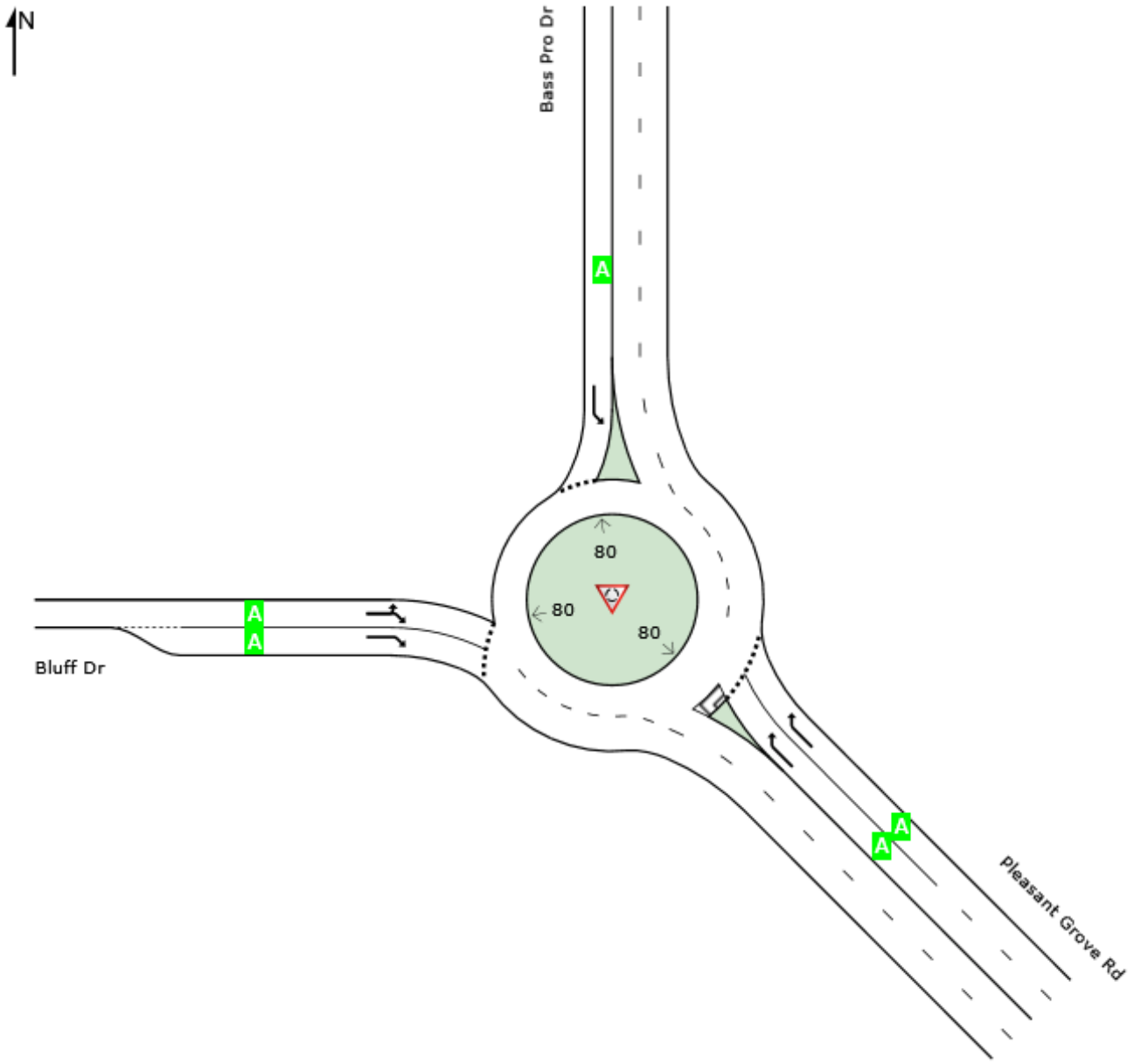
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [East Roundabout (Ex+Dev PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [East Roundabout (Ex+Dev PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
SouthEast: Pleasant Grove Rd													
Lane 1	116	2.0	1387	0.084	100	3.3	LOS A	0.3	8.8	Full	1600	0.0	0.0
Lane 2[d]	116	2.0	1387	0.084	100	3.3	LOS A	0.3	8.8	Full	1600	0.0	0.0
Approach	233	2.0		0.084		3.3	LOS A	0.3	8.8				
North: Bass Pro Dr													
Lane 1[d]	197	2.0	1353	0.146	100	3.8	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	197	2.0		0.146		3.8	LOS A	0.0	0.0				
West: Bluff Dr													
Lane 1	35	2.0	1159	0.030	100	3.4	LOS A	0.1	2.9	Full	1600	0.0	0.0
Lane 2[d]	35	2.0	1159	0.030	100	3.4	LOS A	0.1	2.9	Short	115	0.0	NA
Approach	70	2.0		0.030		3.4	LOS A	0.1	2.9				
Intersection	501	2.0		0.146		3.5	LOS A	0.3	8.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

SouthEast: Pleasant Grove Rd

Mov. From SE To Exit:	R1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	116	116	2.0	1387	0.084	100	NA	NA
Lane 2	116	116	2.0	1387	0.084	100	NA	NA
Approach	233	233	2.0		0.084			

North: Bass Pro Dr

Mov. From N To Exit:	L1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	197	197	2.0	1353	0.146	100	NA	NA

Approach	197	197	2.0		0.146				
West: Bluff Dr									
Mov. From W To Exit:	L2 N	R1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	31	35	2.0	1159	0.030	100	NA	NA
Lane 2	-	35	35	2.0	1159	0.030	100	0.0	1
Approach	4	66	70	2.0		0.030			
	Total	%HV	Deg.Satn (v/c)						
Intersection	501	2.0		0.146					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Pleasant Grove Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

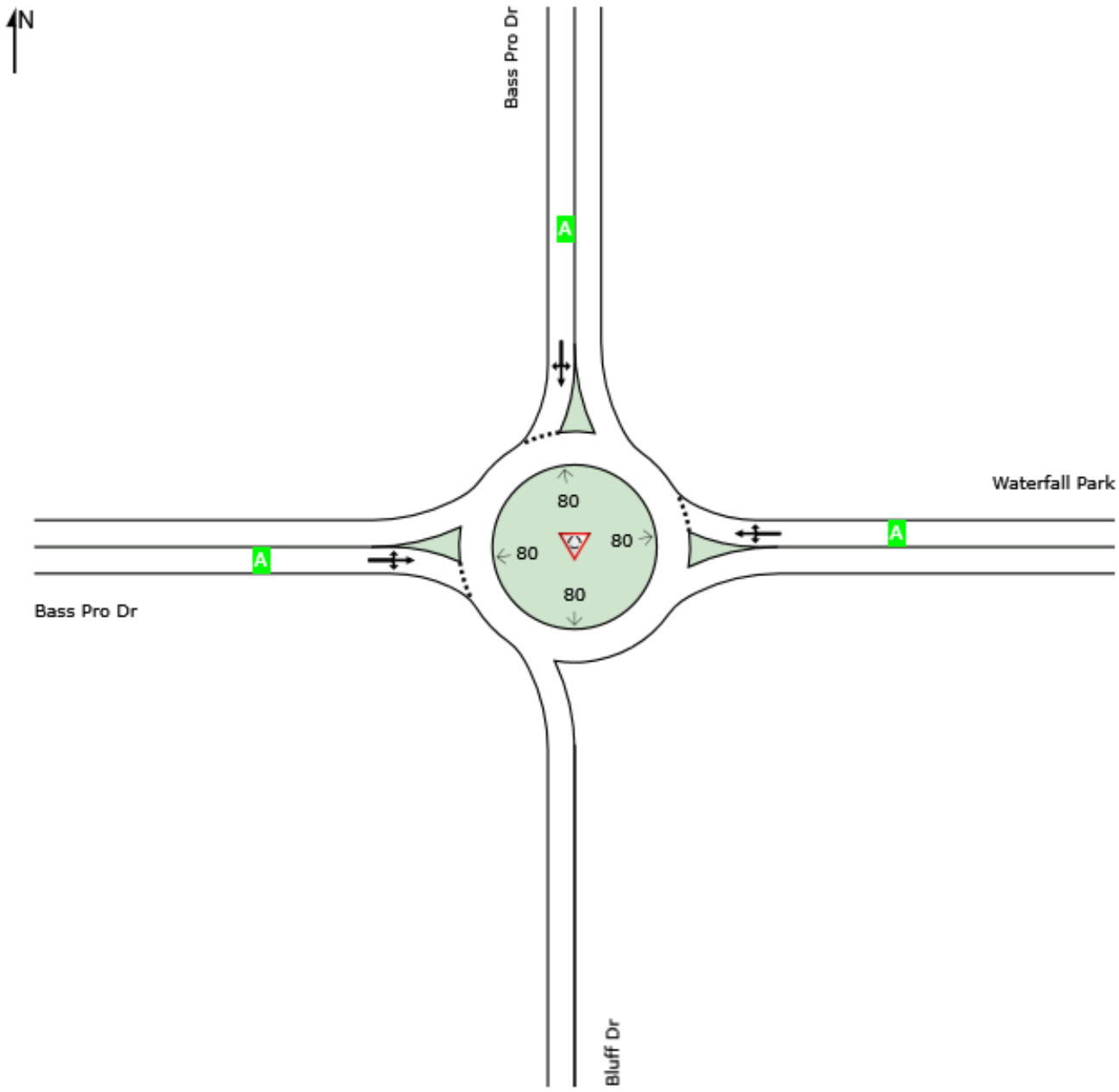
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [West Roundabout (Ex+Dev PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	East	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [West Roundabout (Ex+Dev PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
East: Waterfall Park													
Lane 1[d]	49	2.0	1175	0.042	100	3.4	LOS A	0.2	4.4	Full	1600	0.0	0.0
Approach	49	2.0		0.042		3.4	LOS A	0.2	4.4				
North: Bass Pro Dr													
Lane 1[d]	192	2.0	1309	0.146	100	4.0	LOS A	0.7	17.7	Full	1600	0.0	0.0
Approach	192	2.0		0.146		4.0	LOS A	0.7	17.7				
West: Bass Pro Dr													
Lane 1[d]	187	2.0	1266	0.148	100	4.1	LOS A	0.7	17.7	Full	1600	0.0	0.0
Approach	187	2.0		0.148		4.1	LOS A	0.7	17.7				
Intersection	428	2.0		0.148		3.9	LOS A	0.7	17.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

East: Waterfall Park

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	22	17	49	2.0	1175	0.042	100	NA	NA
Approach	10	22	17	49	2.0		0.042			

North: Bass Pro Dr

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	40	14	138	192	2.0	1309	0.146	100	NA	NA
Approach	40	14	138	192	2.0		0.146			

West: Bass Pro Dr

Mov. From W	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	135	31	21	187	2.0	1266	0.148	100	NA	NA
Approach	135	31	21	187	2.0		0.148			

	Total	%HV	Deg.Satn (v/c)
Intersection	428	2.0	0.148

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Bluff Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Waterfall Park Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

APPENDIX D

Future 2040

1 Background Traffic Growth

Annual Growth Rate
2%

Lee's Summit Road & Bass Pro Drive

AM PEAK HOUR

Existing Volumes

	1	387	35	
0	Existing Volumes			15
0				0
0				0
	0	502	19	

PM PEAK HOUR

Existing Volumes

	19	710	80	
3	Existing Volumes			86
0				0
9				30
	13	718	44	

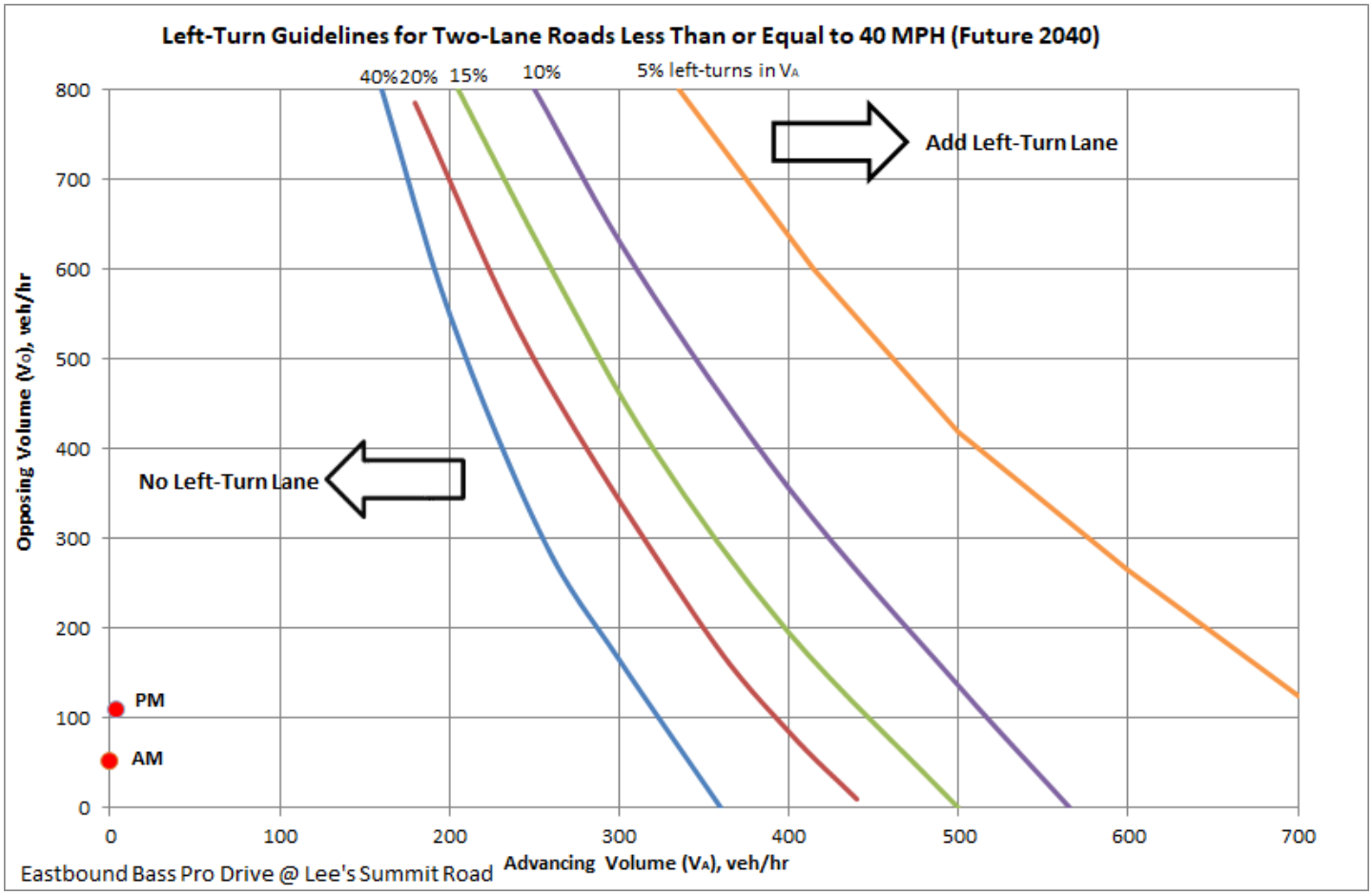
2040 AM Growth

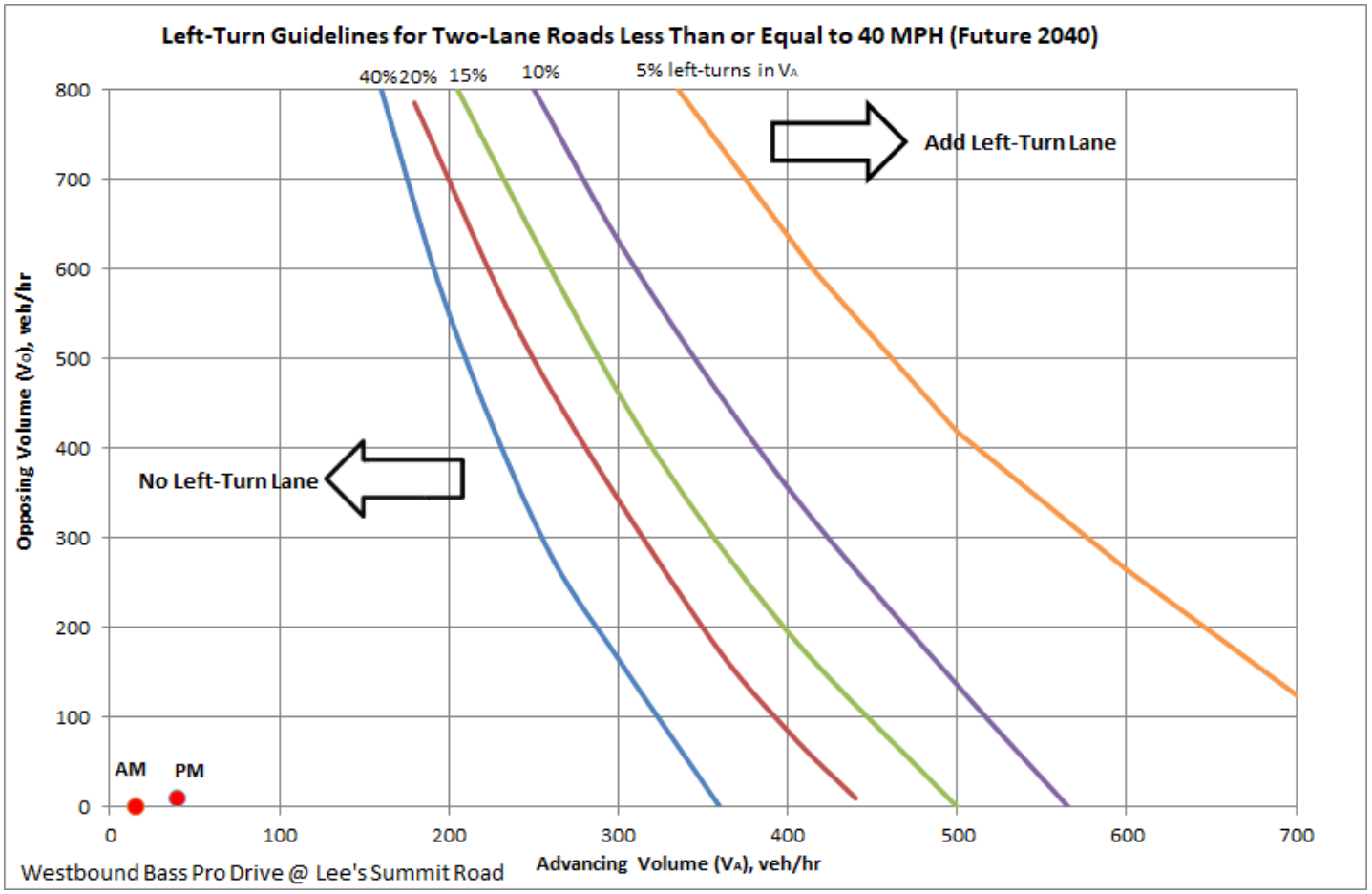
	0	188	0	
0	2% Annual Growth Volumes			0
0				0
0				0
	0	244	0	

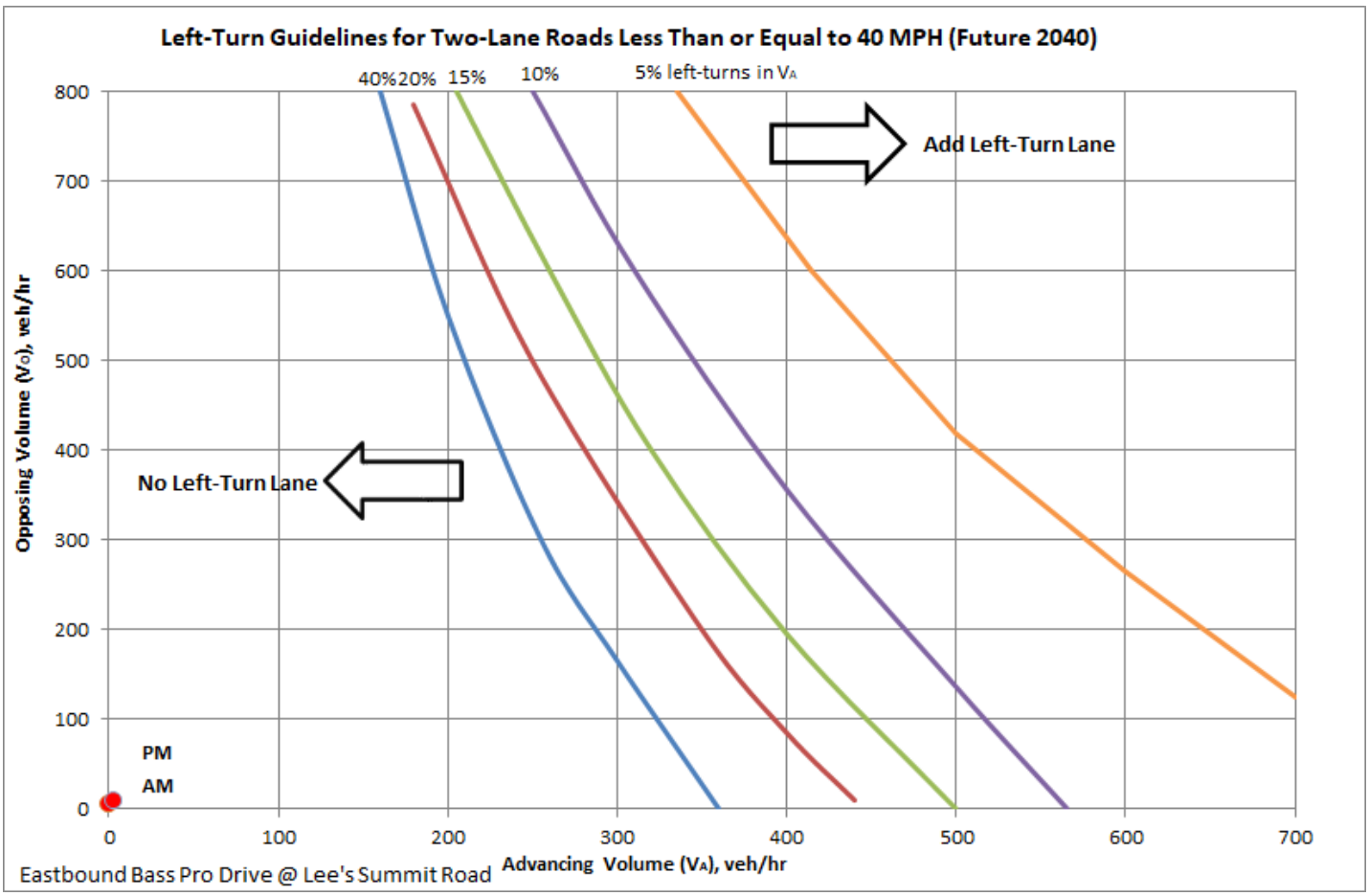
2040 PM Growth

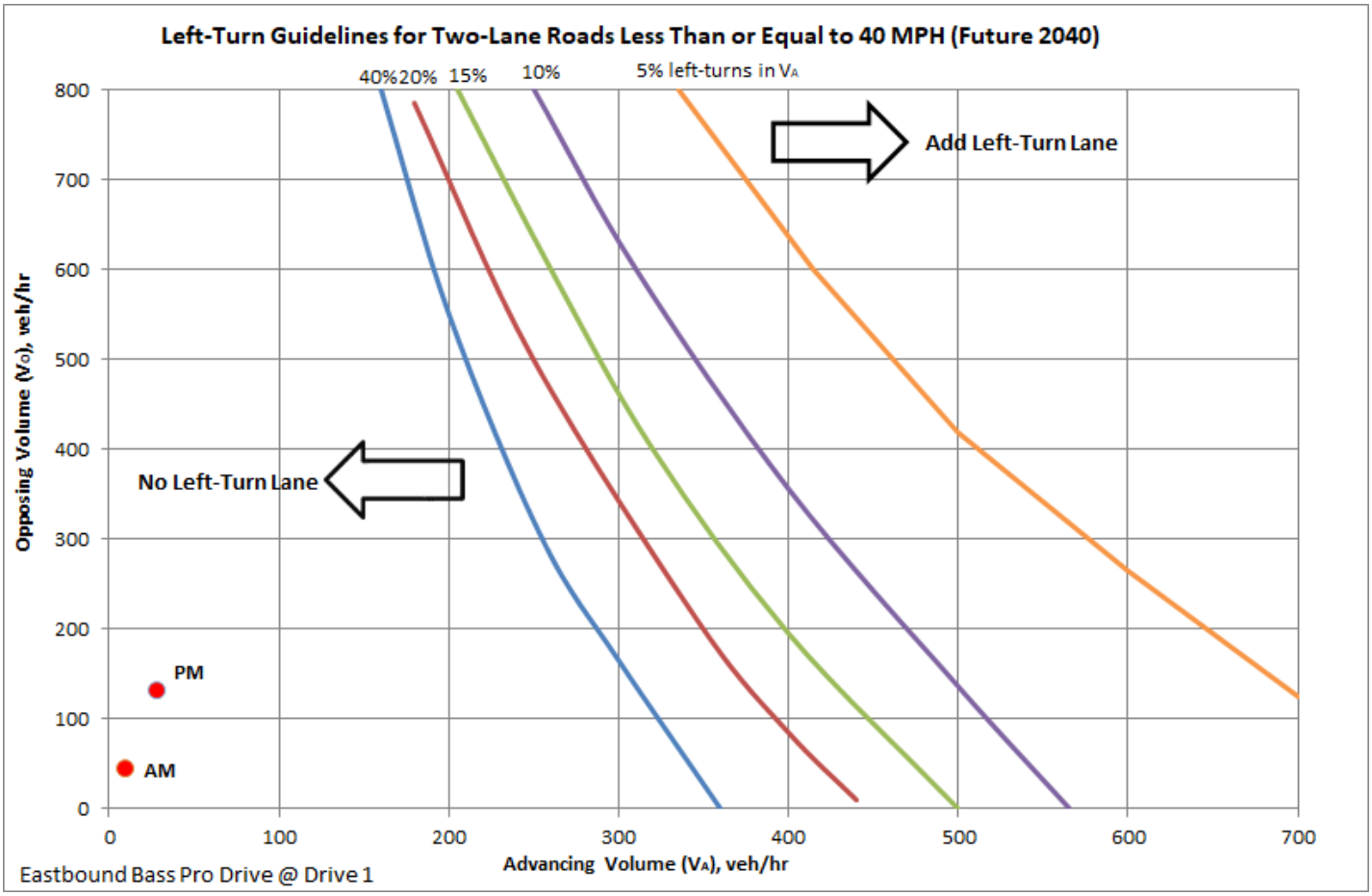
	0	345	0	
0	2% Annual Growth Volumes			0
0				0
0				0
	0	349	0	

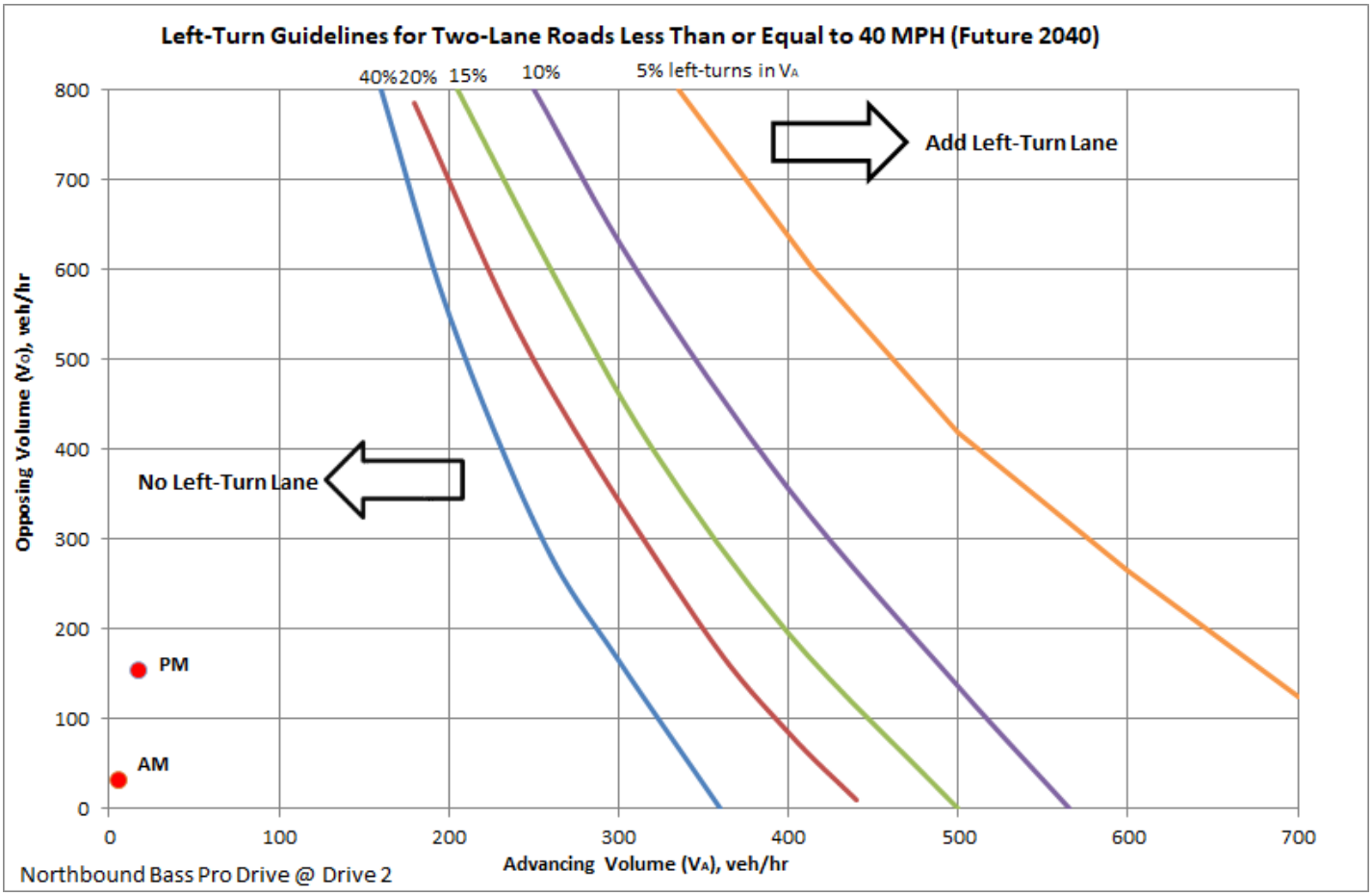
2 Turn Lane Warrants

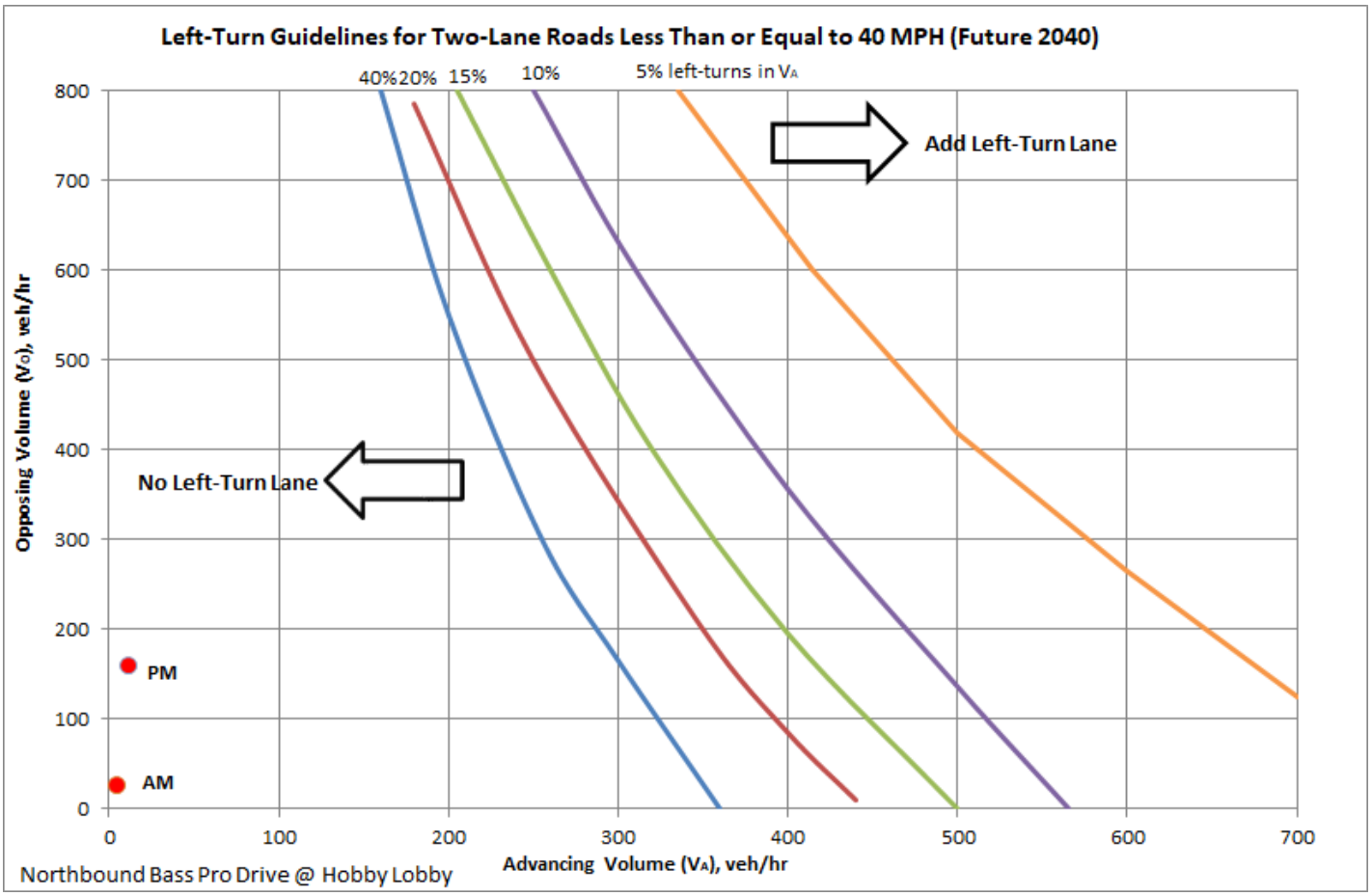

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Future 2040)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Eastbound Bass Pro Drive @ Lee's Summit Road

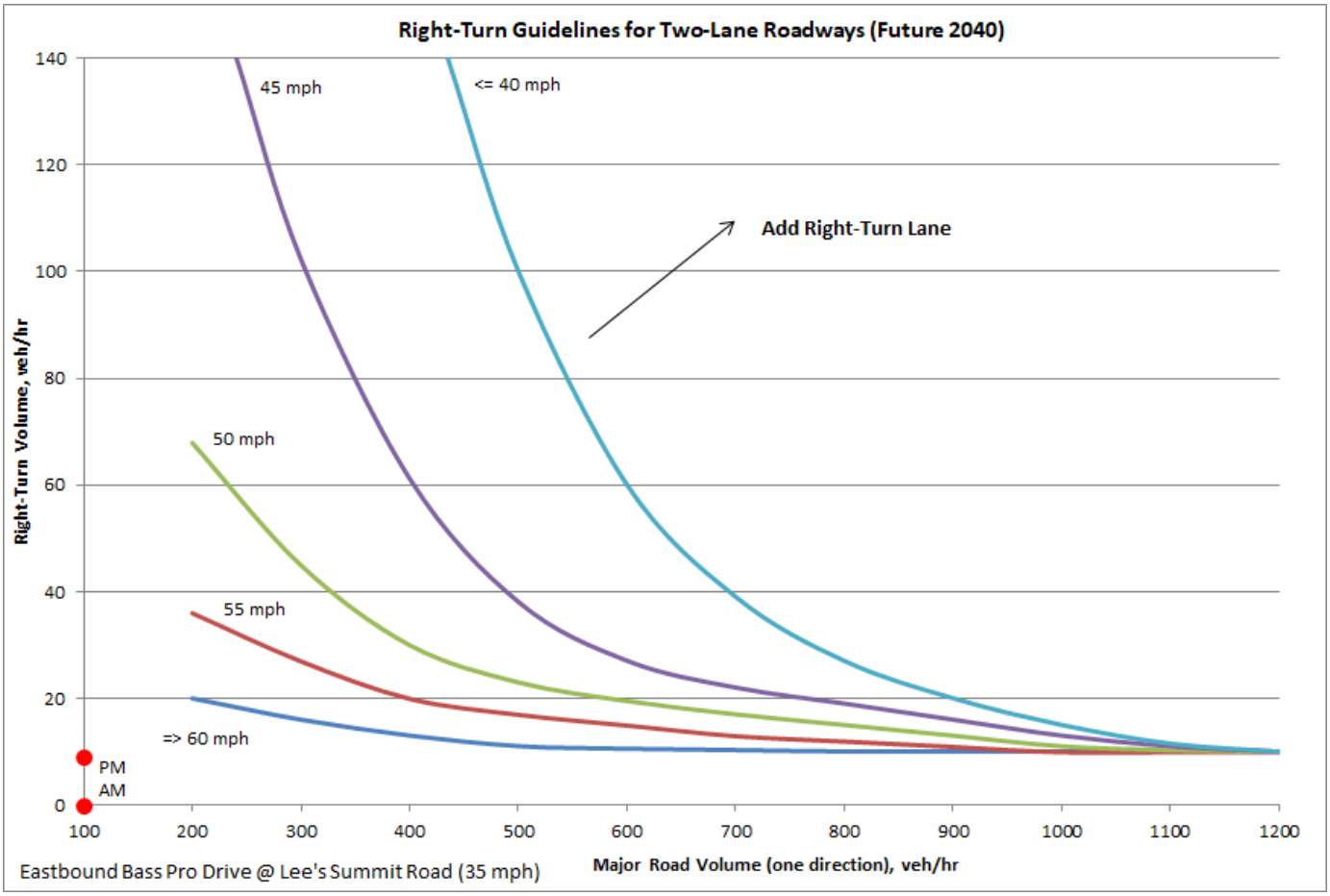

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Future 2040)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
AM
PM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Westbound Bass Pro Drive @ Lee's Summit Road

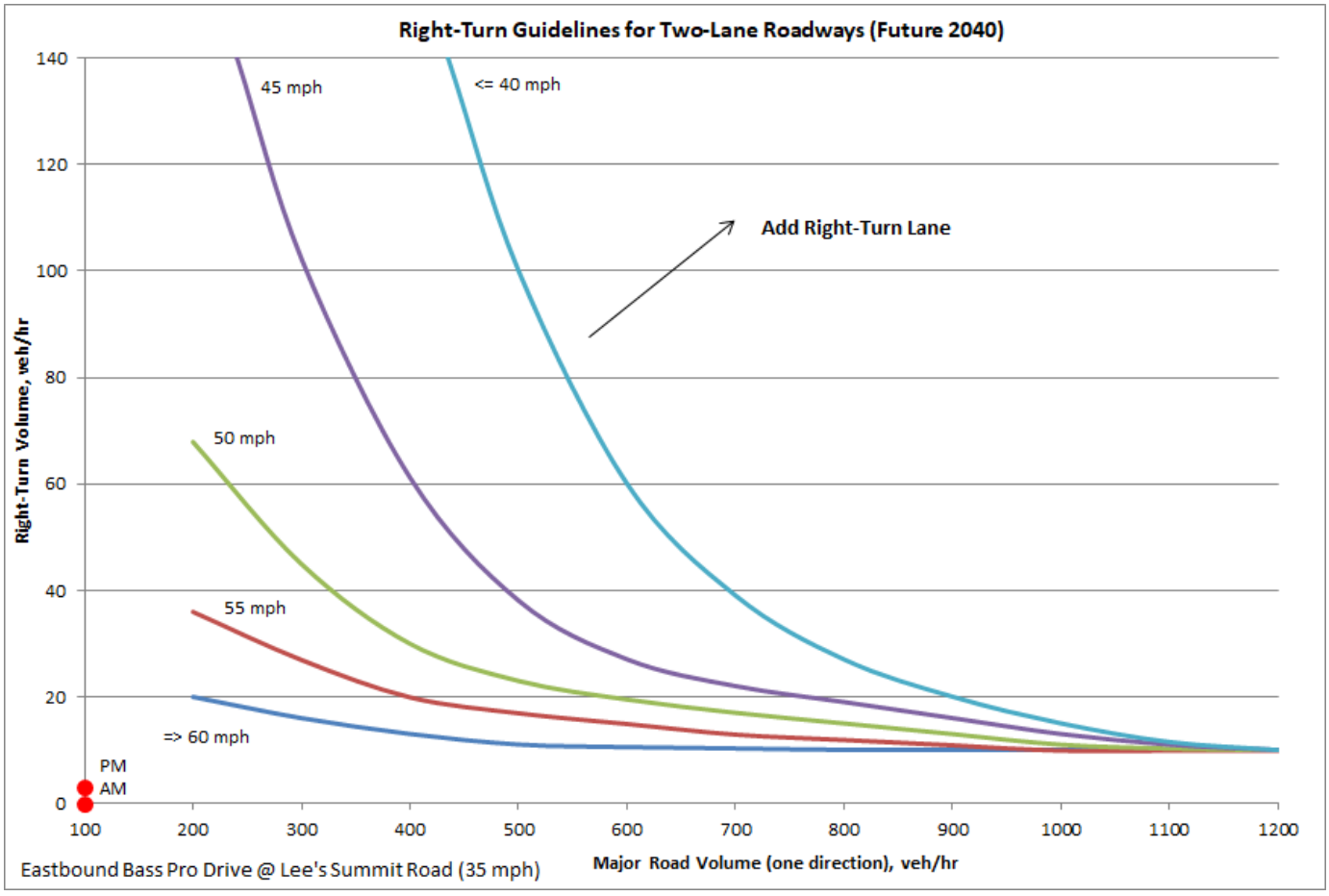

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Future 2040)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Eastbound Bass Pro Drive @ Lee's Summit Road

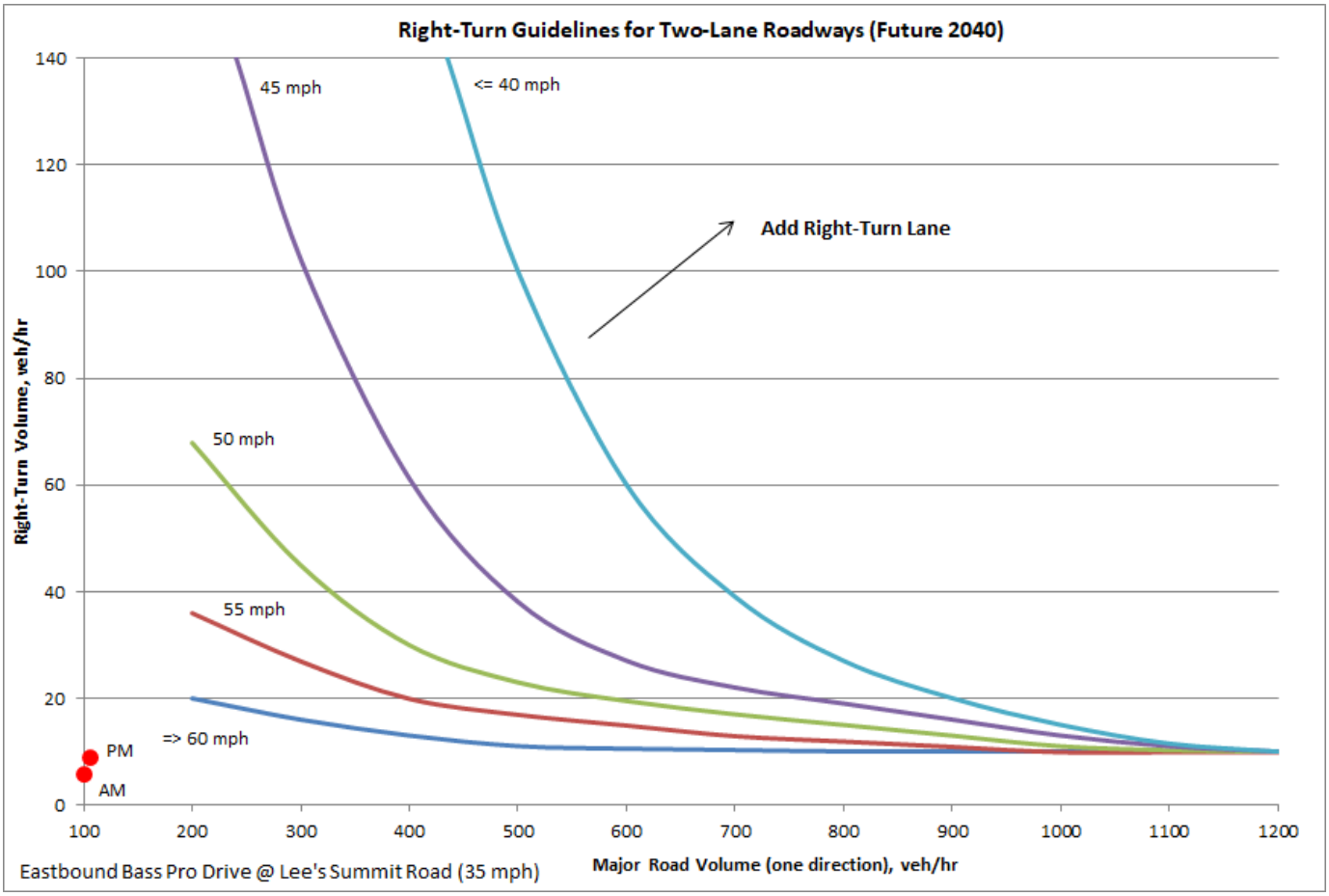

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Future 2040)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Eastbound Bass Pro Drive @ Drive 1

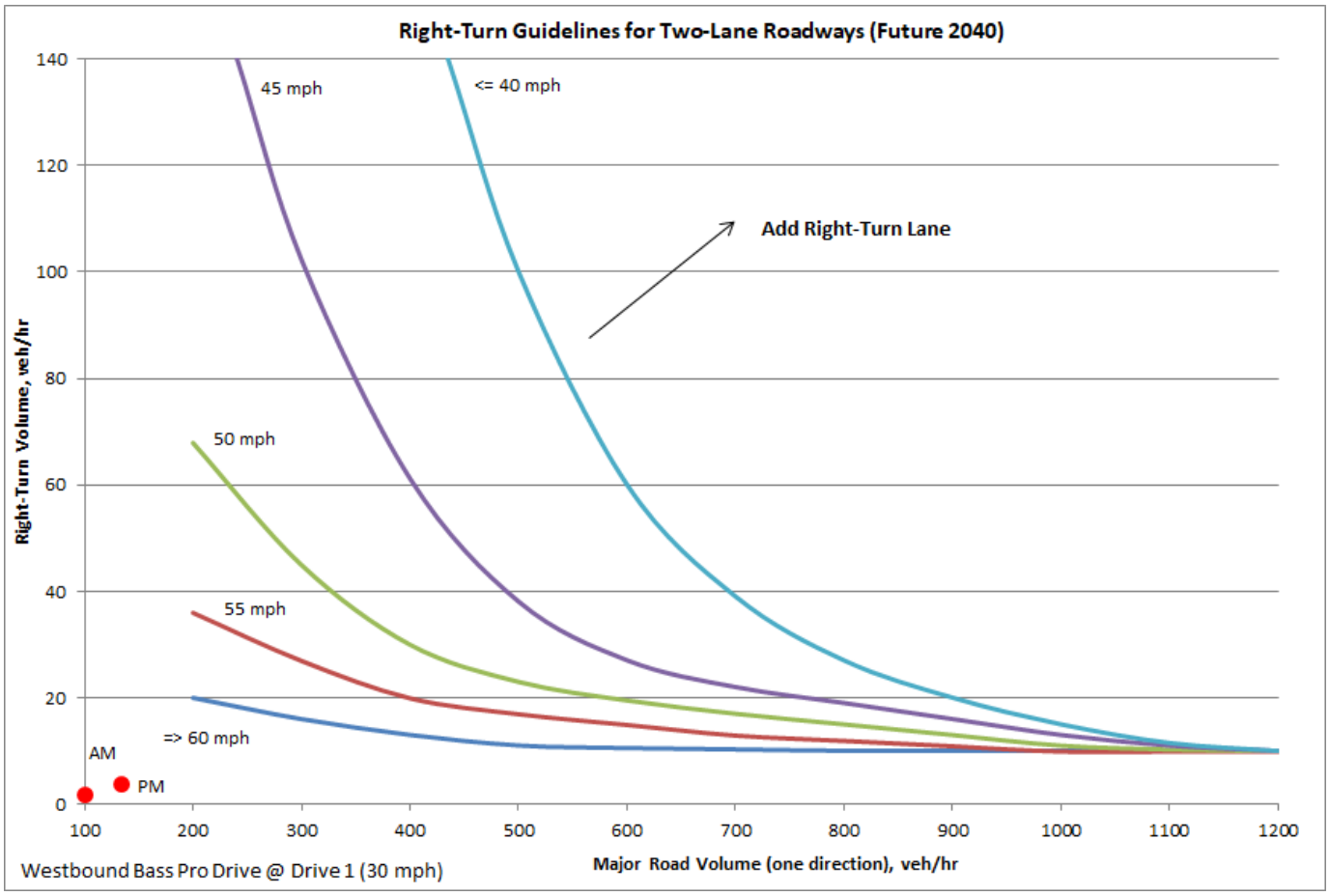

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Future 2040)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Northbound Bass Pro Drive @ Drive 2

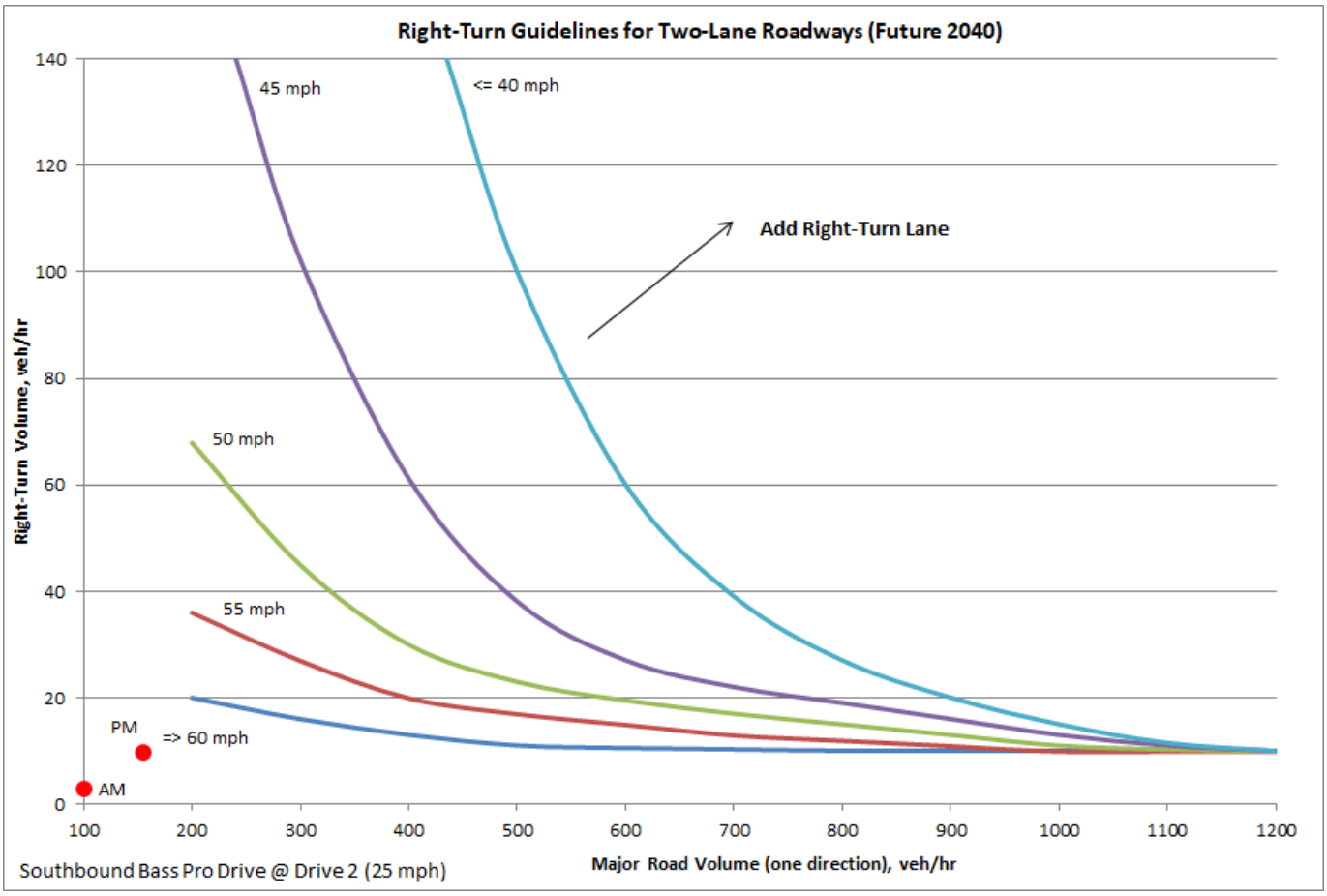

Left-Turn Guidelines for Two-Lane Roads Less Than or Equal to 40 MPH (Future 2040)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
AM
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Northbound Bass Pro Drive @ Hobby Lobby

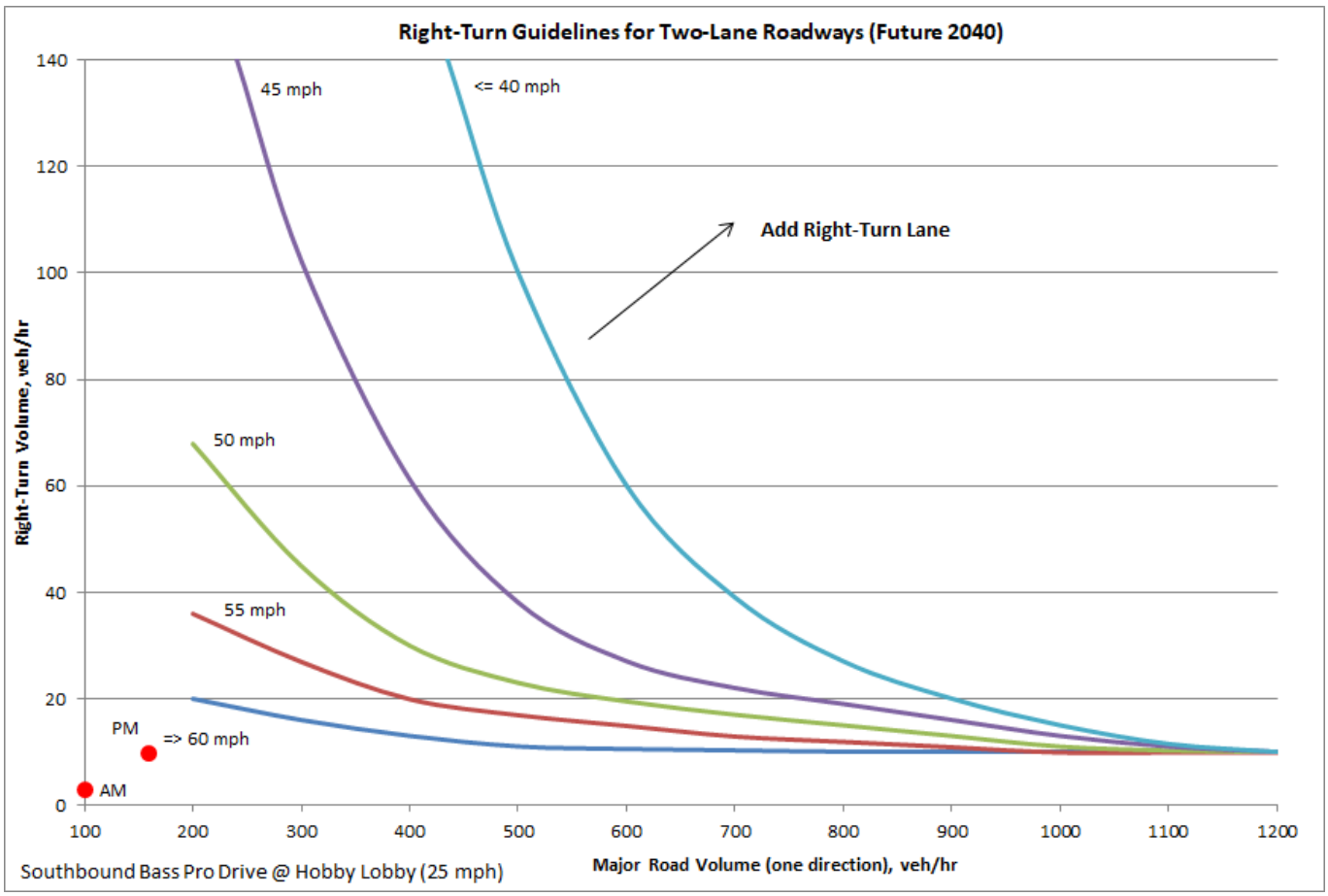

Right-Turn Guidelines for Two-Lane Roadways (Future 2040)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
PM
AM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Eastbound Bass Pro Drive @ Lee's Summit Road (35 mph)

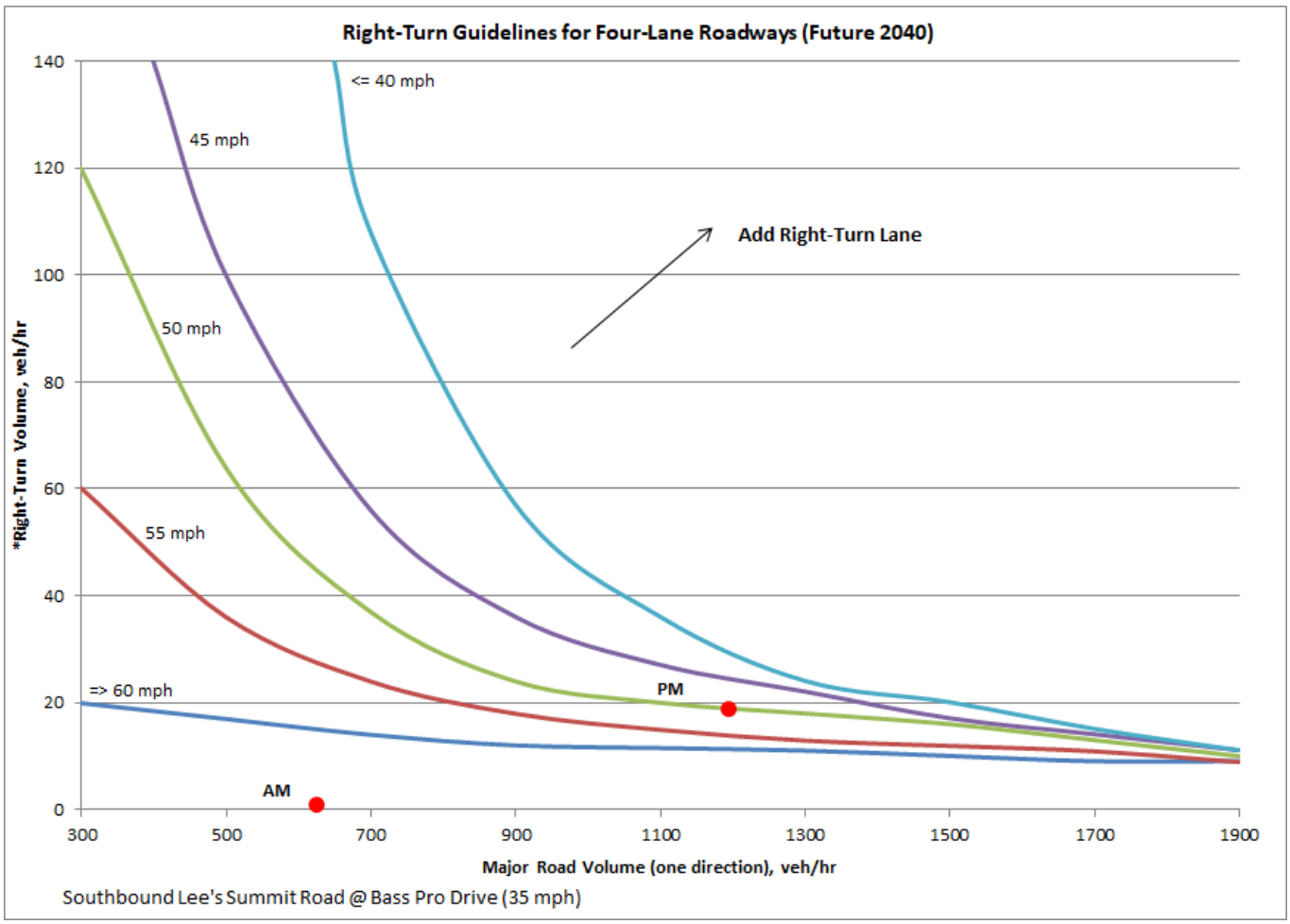

Right-Turn Guidelines for Two-Lane Roadways (Future 2040)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
PM
AM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Eastbound Bass Pro Drive @ Lee's Summit Road (35 mph)

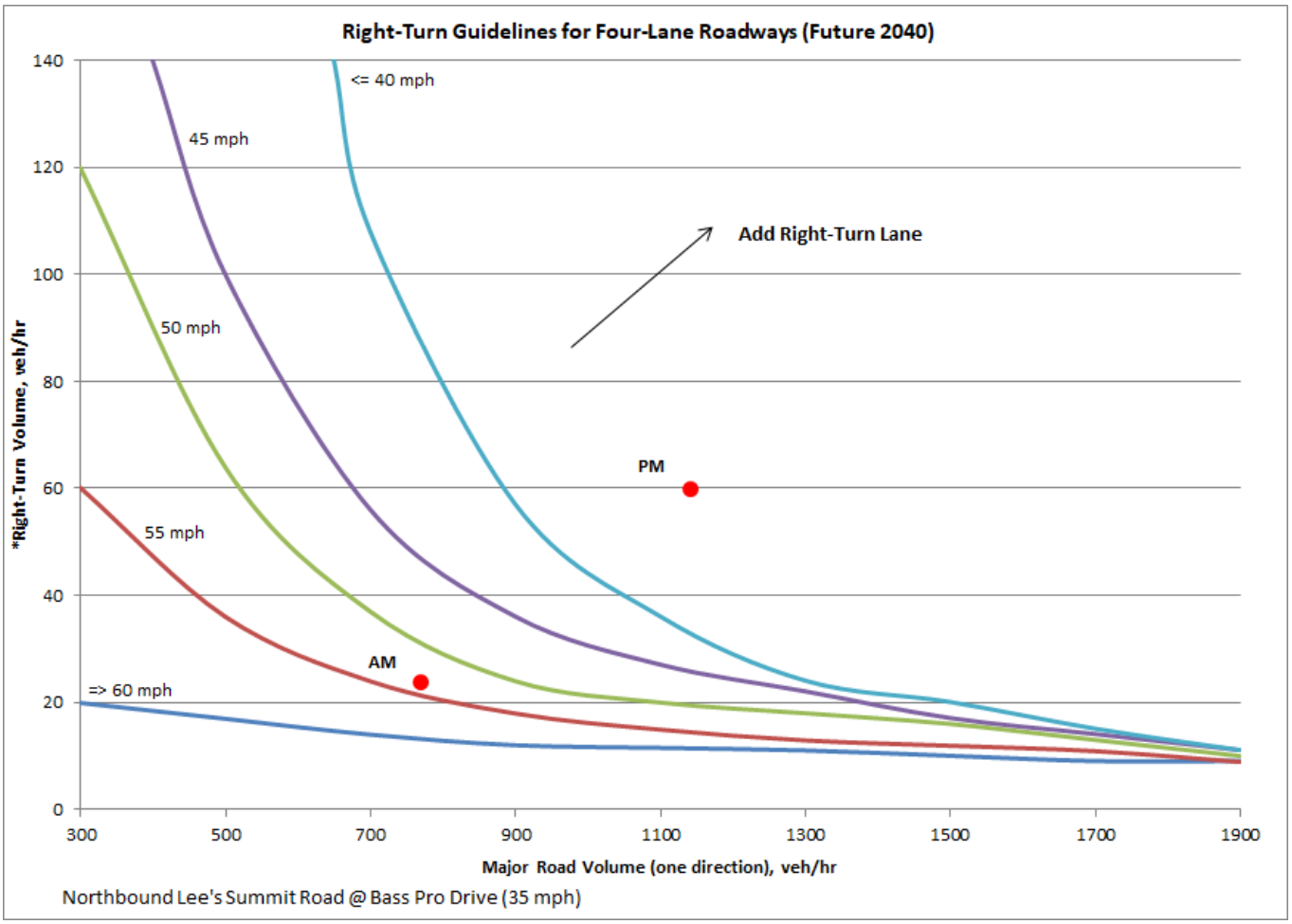

Right-Turn Guidelines for Two-Lane Roadways (Future 2040)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
PM
AM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Eastbound Bass Pro Drive @ Lee's Summit Road (35 mph)

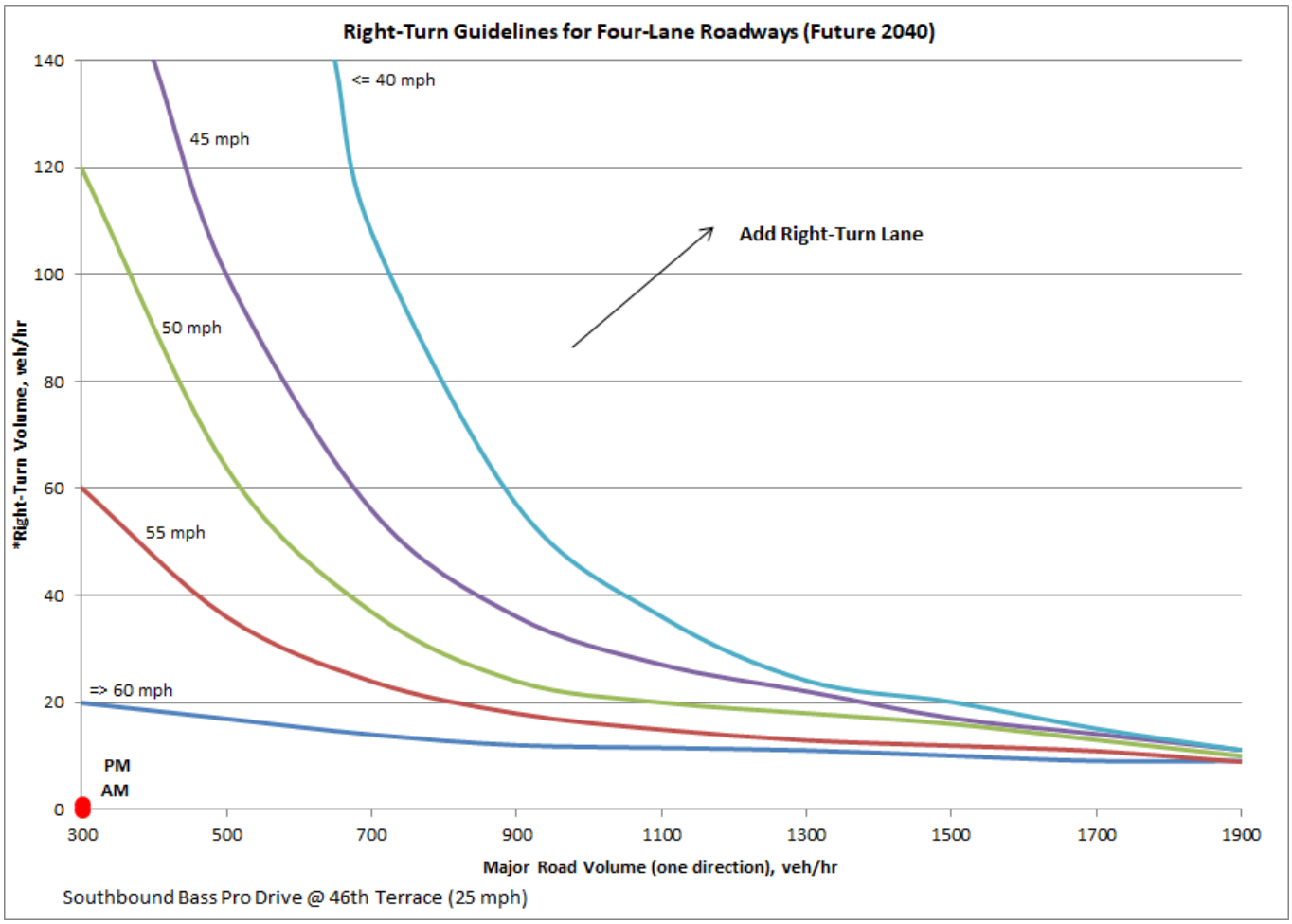

Right-Turn Guidelines for Two-Lane Roadways (Future 2040)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
AM
PM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
Westbound Bass Pro Drive @ Drive 1 (30 mph)


Right-Turn Guidelines for Two-Lane Roadways (Future 2040)
140
120
100
80
60
40
20
0
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
PM
=> 60 mph
AM
Right-Turn Volume, veh/hr
100
200
300
400
500
600
700
800
900
1000
1100
1200
Major Road Volume (one direction), veh/hr
Southbound Bass Pro Drive @ Drive 2 (25 mph)


Right-Turn Guidelines for Two-Lane Roadways (Future 2040)
140
120
100
80
60
40
20
0
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
PM
=> 60 mph
AM
Right-Turn Volume, veh/hr
100
200
300
400
500
600
700
800
900
1000
1100
1200
Major Road Volume (one direction), veh/hr
Southbound Bass Pro Drive @ Hobby Lobby (25 mph)

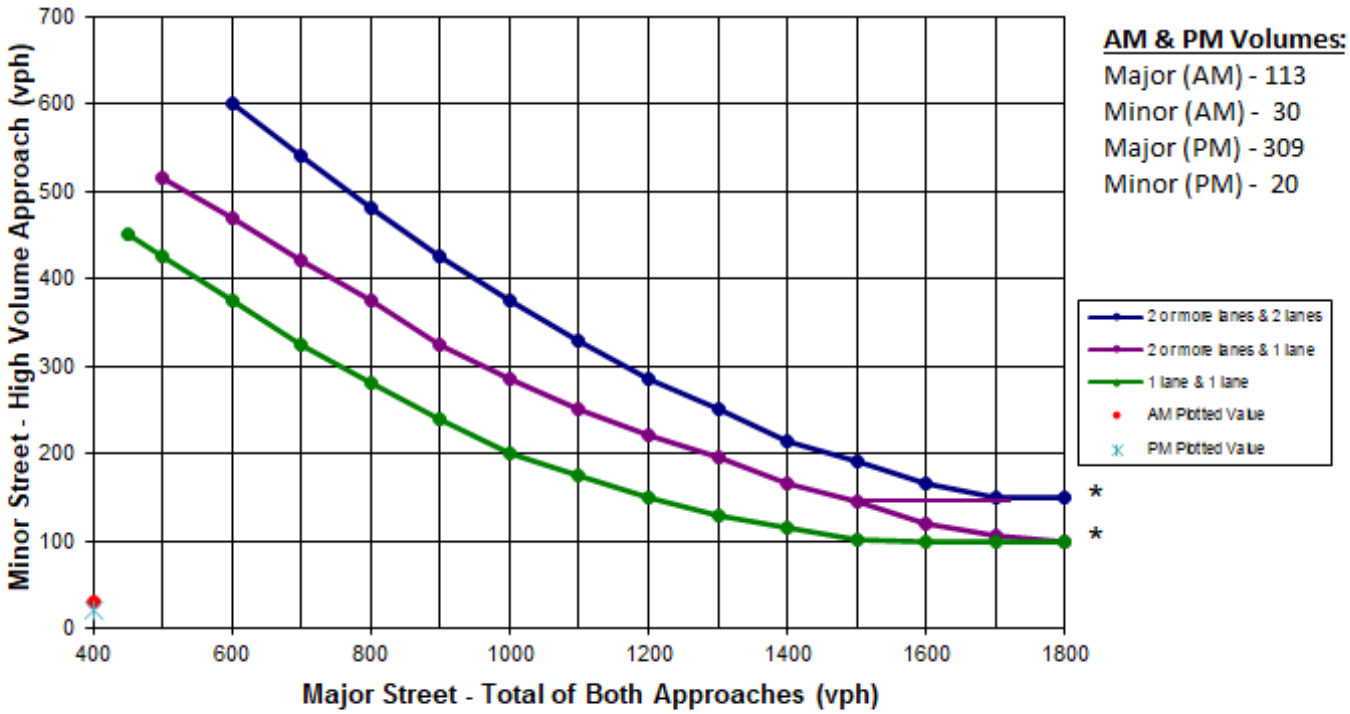

Right-Turn Guidelines for Four-Lane Roadways (Future 2040)
*Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
<= 40 mph
45 mph
50 mph
55 mph
=> 60 mph
Add Right-Turn Lane
PM
AM
140
120
100
80
60
40
20
0
300
500
700
900
1100
1300
1500
1700
1900
Southbound Lee's Summit Road @ Bass Pro Drive (35 mph)


Right-Turn Guidelines for Four-Lane Roadways (Future 2040)
*Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
<= 40 mph
45 mph
50 mph
55 mph
=> 60 mph
Add Right-Turn Lane
PM
AM
140
120
100
80
60
40
20
0
300
500
700
900
1100
1300
1500
1700
1900
Northbound Lee's Summit Road @ Bass Pro Drive (35 mph)


Right-Turn Guidelines for Four-Lane Roadways (Future 2040)
140
120
100
80
60
40
20
0
*Right-Turn Volume, veh/hr
<= 40 mph
45 mph
50 mph
55 mph
=> 60 mph
Add Right-Turn Lane
PM
AM
300
500
700
900
1100
1300
1500
1700
1900
Major Road Volume (one direction), veh/hr
Southbound Bass Pro Drive @ 46th Terrace (25 mph)

3 Signal Warrants

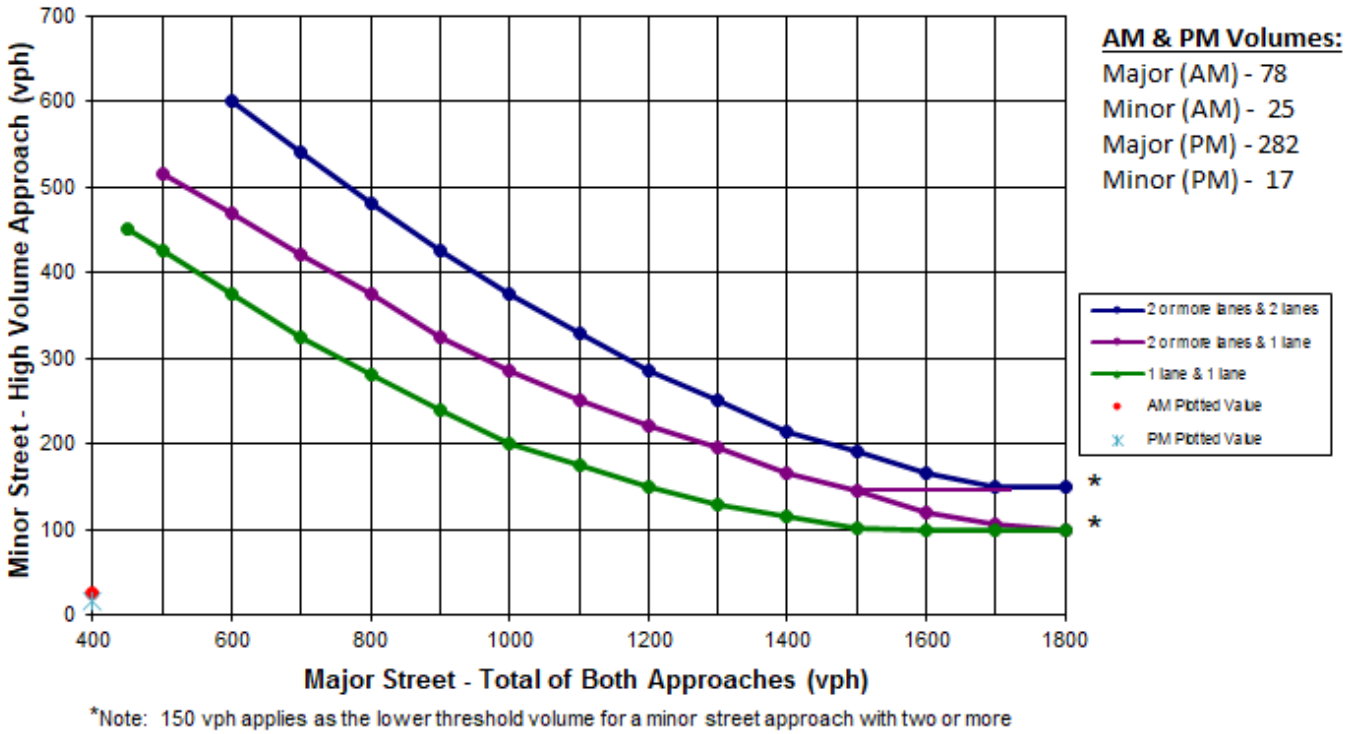
Peak Hour Volume Warrant (Future 2040)
Drive 1 & Bass Pro Drive



AM & PM Volumes:
Major (AM) - 113
Minor (AM) - 30
Major (PM) - 309
Minor (PM) - 20

*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

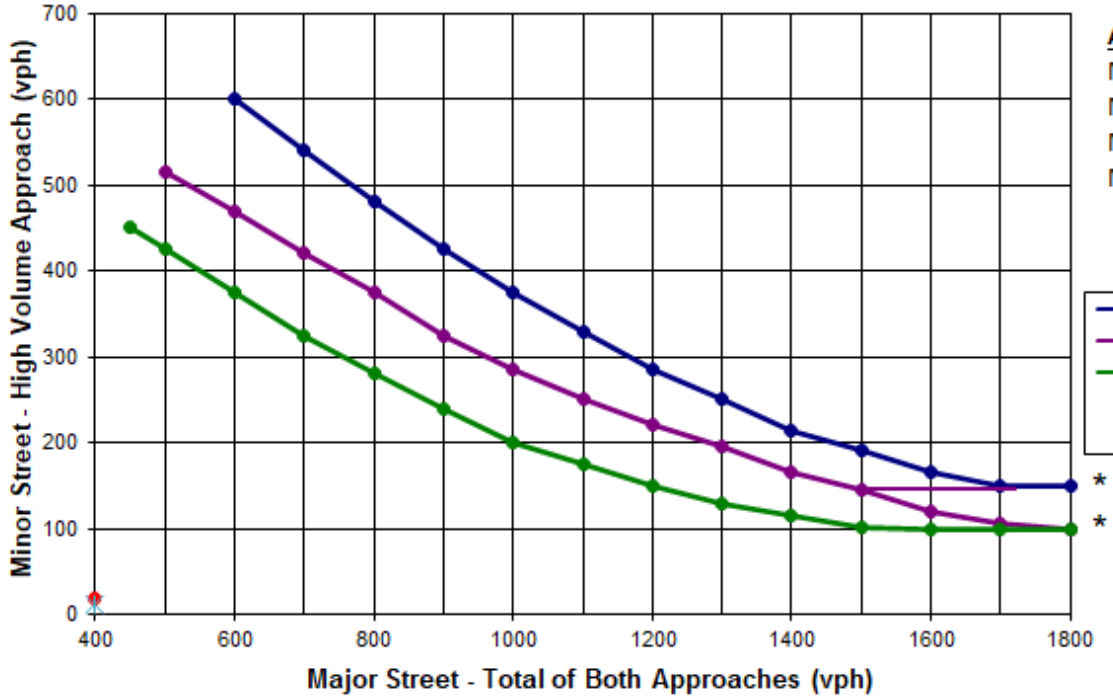
Peak Hour Volume Warrant (Future 2040)
Drive 2 & Bass Pro Drive



AM & PM Volumes:
Major (AM) - 78
Minor (AM) - 25
Major (PM) - 282
Minor (PM) - 17

*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

Peak Hour Volume Warrant (Future 2040)
Hobby Lobby Drive & Bass Pro Drive



AM & PM Volumes:

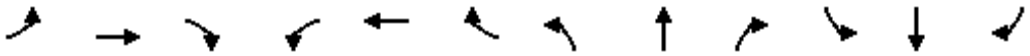
Major (AM) - 75
Minor (AM) - 19
Major (PM) - 275
Minor (PM) - 12

*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

4 Capacity Analysis

Lane Group	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	26	10	4	107	4	4	68
v/c Ratio	0.07	0.01	0.00	0.11	0.01	0.01	0.07
Control Delay	25.4	0.0	7.0	25.4	0.0	24.5	25.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.4	0.0	7.0	25.4	0.0	24.5	25.0
Queue Length 50th (ft)	11	0	1	24	0	2	15
Queue Length 95th (ft)	31	0	1	28	0	6	27
Internal Link Dist (ft)		126		607			77
Turn Bay Length (ft)			100			150	
Base Capacity (vph)	376	1061	824	943	502	472	943
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.01	0.00	0.11	0.01	0.01	0.07

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	23	0	6	1	63	2	2	53	0
Future Volume (vph)	0	0	0	23	0	6	1	63	2	2	53	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor				1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt				1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1770	1583		1770	3539	1583	1770	3539	
Flt Permitted				0.76	1.00		0.71	1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1410	1583		1323	3539	1583	1770	3539	
Peak-hour factor, PHF	1.00	1.00	1.00	0.88	1.00	0.62	0.25	0.59	0.50	0.50	0.78	1.00
Adj. Flow (vph)	0	0	0	26	0	10	4	107	4	4	68	0
RTOR Reduction (vph)	0	0	0	0	7	0	0	0	3	0	0	0
Lane Group Flow (vph)	0	0	0	26	3	0	4	107	1	4	68	0
Turn Type				Perm	NA		pm+pt	NA	Perm	Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2			
Actuated Green, G (s)				24.0	24.0		48.0	24.0	24.0	24.0	24.0	
Effective Green, g (s)				24.0	24.0		48.0	24.0	24.0	24.0	24.0	
Actuated g/C Ratio				0.27	0.27		0.53	0.27	0.27	0.27	0.27	
Clearance Time (s)				6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Grp Cap (vph)				376	422		824	943	422	472	943	
v/s Ratio Prot					0.00		0.00	c0.03		c0.00	0.02	
v/s Ratio Perm				c0.02			0.00		0.00			
v/c Ratio				0.07	0.01		0.00	0.11	0.00	0.01	0.07	
Uniform Delay, d1				24.7	24.2		9.8	25.0	24.2	24.3	24.7	
Progression Factor				1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2				0.4	0.0		0.0	0.2	0.0	0.0	0.1	
Delay (s)				25.0	24.3		9.8	25.2	24.2	24.3	24.8	
Level of Service				C	C		A	C	C	C	C	
Approach Delay (s)		0.0			24.8			24.6			24.8	
Approach LOS		A			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.06		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	10	4	45	23	3
Future Vol, veh/h	9	10	4	45	23	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	11	4	49	25	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	84	14	28	0	-	0
Stage 1	27	-	-	-	-	-
Stage 2	57	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	913	1063	1585	-	-	-
Stage 1	992	-	-	-	-	-
Stage 2	965	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	910	1063	1585	-	-	-
Mov Cap-2 Maneuver	910	-	-	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	965	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	0.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1585	-	985	-	-
HCM Lane V/C Ratio	0.003	-	0.021	-	-
HCM Control Delay (s)	7.3	0	8.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	7.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	7	0	0	19
Future Vol, veh/h	0	0	7	0	0	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	8	0	0	21

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	17	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	16	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	1001	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	1007	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	996	1084
Mov Cap-2 Maneuver	-	-	-	-	996	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	1002	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.019	-	-	0.005	-
HCM Control Delay (s)	8.4	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	58	44	2	4	26
Future Vol, veh/h	9	58	44	2	4	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	63	48	2	4	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	50	0	-	0	132	49
Stage 1	-	-	-	-	49	-
Stage 2	-	-	-	-	83	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1557	-	-	-	862	1020
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	940	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1557	-	-	-	856	1020
Mov Cap-2 Maneuver	-	-	-	-	856	-
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	940	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1557	-	-	-	995
HCM Lane V/C Ratio	0.006	-	-	-	0.033
HCM Control Delay (s)	7.3	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	16	5	40	30	3
Future Vol, veh/h	9	16	5	40	30	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	17	5	43	33	3

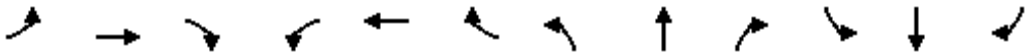
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	88	35	36	0	-	0
Stage 1	35	-	-	-	-	-
Stage 2	53	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	913	1038	1575	-	-	-
Stage 1	987	-	-	-	-	-
Stage 2	970	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	910	1038	1575	-	-	-
Mov Cap-2 Maneuver	861	-	-	-	-	-
Stage 1	984	-	-	-	-	-
Stage 2	970	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1575	-	861	1038	-	-
HCM Lane V/C Ratio	0.003	-	0.011	0.017	-	-
HCM Control Delay (s)	7.3	0	9.2	8.5	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0.1	-	-

Lane Group	WBT	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	15	90	970	60	591
v/c Ratio	0.08	0.30	0.38	0.12	0.18
Control Delay	27.2	8.3	5.4	1.8	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	27.2	8.3	5.4	1.8	1.0
Queue Length 50th (ft)	5	0	54	0	0
Queue Length 95th (ft)	22	9	141	12	48
Internal Link Dist (ft)	785		1425		1381
Turn Bay Length (ft)				265	
Base Capacity (vph)	703	378	2563	588	3345
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.02	0.24	0.38	0.10	0.18

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	15	0	52	0	745	24	48	575	1
Future Volume (vph)	0	0	0	15	0	52	0	745	24	48	575	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.2	5.7		5.5		5.7	5.7	
Lane Util. Factor					1.00	1.00		0.95		1.00	0.95	
Frt					1.00	0.85		0.99		1.00	1.00	
Flt Protected					0.95	1.00		1.00		0.95	1.00	
Satd. Flow (prot)					1770	1583		3518		1770	3536	
Flt Permitted					0.95	1.00		1.00		0.24	1.00	
Satd. Flow (perm)					1770	1583		3518		441	3536	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	0.58	1.00	0.80	0.61	0.80	0.98	0.25
Adj. Flow (vph)	0	0	0	15	0	90	0	931	39	60	587	4
RTOR Reduction (vph)	0	0	0	0	0	81	0	1	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	15	9	0	969	0	60	591	0
Turn Type				Split	NA	pm+ov	Prot	NA		pm+pt	NA	
Protected Phases	8	8		4	4	1	5	2		1	6	
Permitted Phases						4				6		
Actuated Green, G (s)					1.2	6.3		42.8		53.4	53.4	
Effective Green, g (s)					1.2	6.3		42.8		53.4	53.4	
Actuated g/C Ratio					0.02	0.09		0.64		0.80	0.80	
Clearance Time (s)					6.2	5.7		5.5		5.7	5.7	
Vehicle Extension (s)					3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)					31	149		2264		456	2839	
v/s Ratio Prot					c0.01	0.00		c0.28		0.01	c0.17	
v/s Ratio Perm						0.00				0.10		
v/c Ratio					0.48	0.06		0.43		0.13	0.21	
Uniform Delay, d1					32.3	27.4		5.8		2.1	1.5	
Progression Factor					1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2					11.4	0.2		0.6		0.1	0.2	
Delay (s)					43.8	27.6		6.4		2.2	1.7	
Level of Service					D	C		A		A	A	
Approach Delay (s)		0.0			29.9			6.4			1.8	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	66.5	Sum of lost time (s)	23.2
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

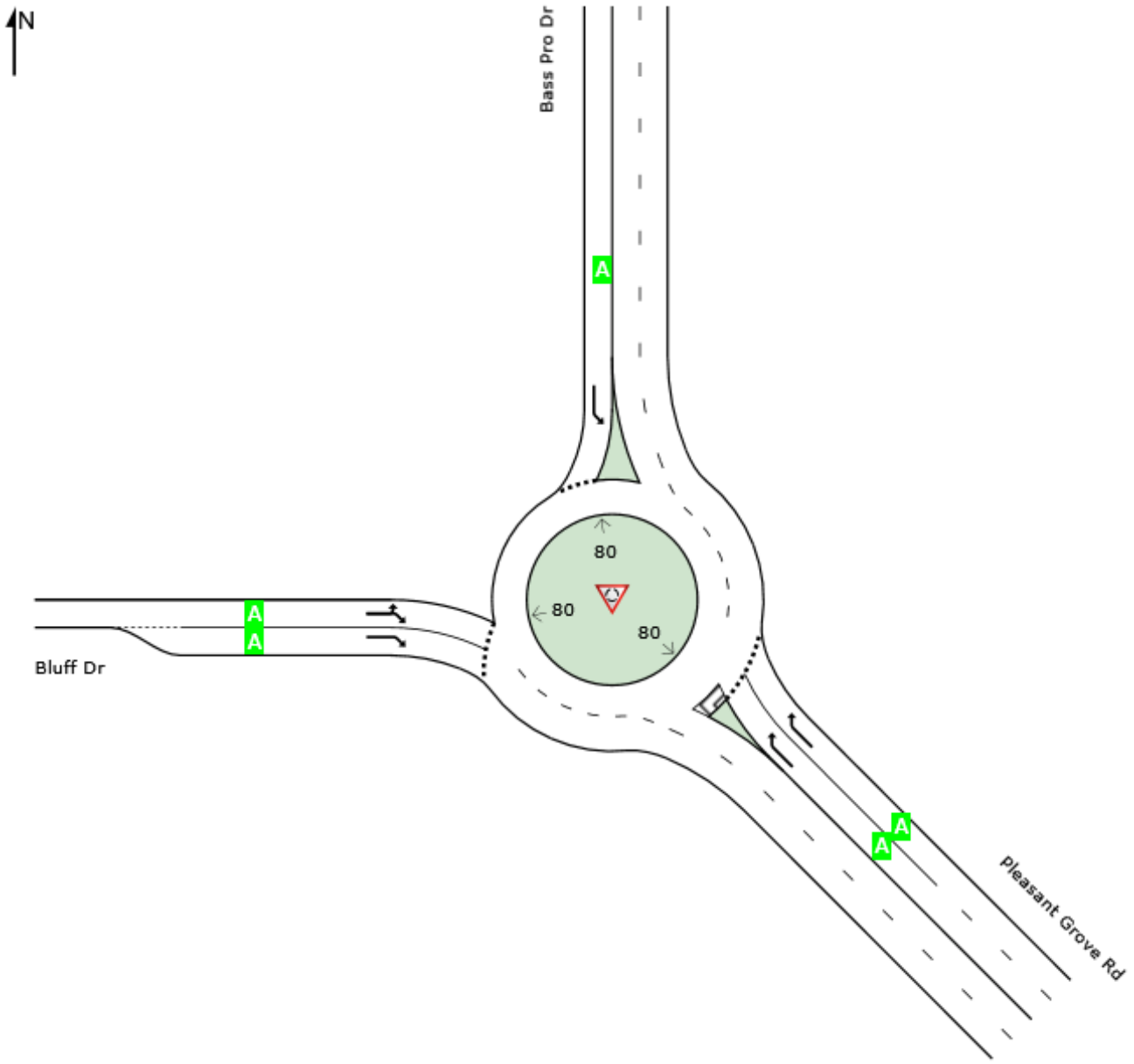
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [East Roundabout (Future AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [East Roundabout (Future AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
SouthEast: Pleasant Grove Rd													
Lane 1	57	2.0	1387	0.041	100	2.9	LOS A	0.2	4.1	Full	1600	0.0	0.0
Lane 2[d]	57	2.0	1387	0.041	100	2.9	LOS A	0.2	4.1	Full	1600	0.0	0.0
Approach	113	2.0		0.041		2.9	LOS A	0.2	4.1				
North: Bass Pro Dr													
Lane 1[d]	56	2.0	1353	0.042	100	3.0	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	56	2.0		0.042		3.0	LOS A	0.0	0.0				
West: Bluff Dr													
Lane 1	15	2.0	1321	0.011	100	2.8	LOS A	0.0	1.1	Full	1600	0.0	0.0
Lane 2[d]	15	2.0	1321	0.011	100	2.8	LOS A	0.0	1.1	Short	115	0.0	NA
Approach	29	2.0		0.011		2.8	LOS A	0.0	1.1				
Intersection	198	2.0		0.042		2.9	LOS A	0.2	4.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

SouthEast: Pleasant Grove Rd

Mov. From SE To Exit:	R1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	57	57	2.0	1387	0.041	100	NA	NA
Lane 2	57	57	2.0	1387	0.041	100	NA	NA
Approach	113	113	2.0		0.041			

North: Bass Pro Dr

Mov. From N To Exit:	L1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	56	56	2.0	1353	0.042	100	NA	NA

Approach	56	56	2.0		0.042				
West: Bluff Dr									
Mov. From W To Exit:	L2 N	R1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	11	15	2.0	1321	0.011	100	NA	NA
Lane 2	-	15	15	2.0	1321	0.011	100	0.0	1
Approach	4	25	29	2.0		0.011			
	Total	%HV	Deg.Satn (v/c)						
Intersection	198	2.0		0.042					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Pleasant Grove Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

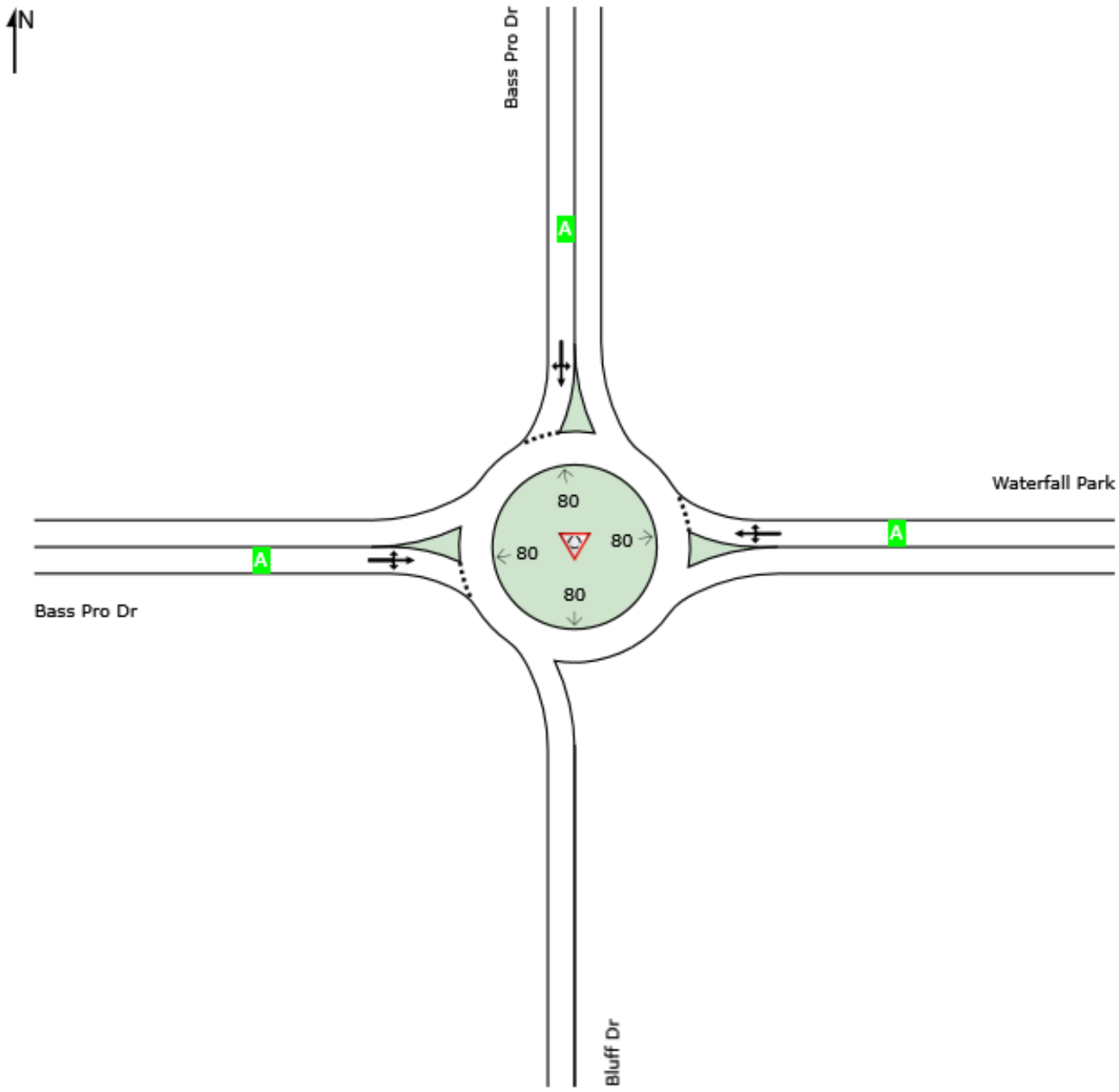
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [West Roundabout (Future AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	East	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [West Roundabout (Future AM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
East: Waterfall Park													
Lane 1[d]	30	2.0	1269	0.024	100	3.0	LOS A	0.1	2.5	Full	1600	0.0	0.0
Approach	30	2.0		0.024		3.0	LOS A	0.1	2.5				
North: Bass Pro Dr													
Lane 1[d]	81	2.0	1327	0.061	100	3.2	LOS A	0.3	6.8	Full	1600	0.0	0.0
Approach	81	2.0		0.061		3.2	LOS A	0.3	6.8				
West: Bass Pro Dr													
Lane 1[d]	96	2.0	1315	0.073	100	3.3	LOS A	0.3	8.2	Full	1600	0.0	0.0
Approach	96	2.0		0.073		3.3	LOS A	0.3	8.2				
Intersection	208	2.0		0.073		3.2	LOS A	0.3	8.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

East: Waterfall Park

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	14	12	30	2.0	1269	0.024	100	NA	NA
Approach	4	14	12	30	2.0		0.024			

North: Bass Pro Dr

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	4	58	81	2.0	1327	0.061	100	NA	NA
Approach	19	4	58	81	2.0		0.061			

West: Bass Pro Dr

Mov. From W	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	62	10	25	96	2.0	1315	0.073	100	NA	NA
Approach	62	10	25	96	2.0		0.073			

	Total	%HV	Deg.Satn (v/c)
Intersection	208	2.0	0.073

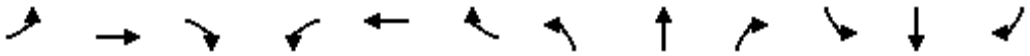
Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Bluff Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Waterfall Park Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	12	114	13	8	229	48	14	228
v/c Ratio	0.02	0.31	0.01	0.02	0.24	0.10	0.02	0.24
Control Delay	0.0	29.1	0.0	24.7	26.7	0.4	7.6	26.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.0	29.1	0.0	24.7	26.7	0.4	7.6	26.5
Queue Length 50th (ft)	0	52	0	3	53	0	3	53
Queue Length 95th (ft)	0	91	0	6	84	0	7	82
Internal Link Dist (ft)	137		126		607			77
Turn Bay Length (ft)				100			150	
Base Capacity (vph)	509	372	953	472	943	502	774	942
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.31	0.01	0.02	0.24	0.10	0.02	0.24

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	3	96	0	9	3	206	35	8	199	1
Future Volume (vph)	2	0	3	96	0	9	3	206	35	8	199	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt		0.91		1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1667		1770	1583		1770	3539	1583	1770	3530	
Flt Permitted		0.95		0.75	1.00		0.95	1.00	1.00	0.61	1.00	
Satd. Flow (perm)		1610		1397	1583		1770	3539	1583	1134	3530	
Peak-hour factor, PHF	0.50	1.00	0.38	0.84	1.00	0.67	0.38	0.90	0.73	0.58	0.89	0.25
Adj. Flow (vph)	4	0	8	114	0	13	8	229	48	14	224	4
RTOR Reduction (vph)	0	9	0	0	10	0	0	0	35	0	1	0
Lane Group Flow (vph)	0	3	0	114	3	0	8	229	13	14	227	0
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2	6		
Actuated Green, G (s)		24.0		24.0	24.0		24.0	24.0	24.0	48.0	24.0	
Effective Green, g (s)		24.0		24.0	24.0		24.0	24.0	24.0	48.0	24.0	
Actuated g/C Ratio		0.27		0.27	0.27		0.27	0.27	0.27	0.53	0.27	
Clearance Time (s)		6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Grp Cap (vph)		429		372	422		472	943	422	774	941	
v/s Ratio Prot					0.00		0.00	c0.06		c0.00	0.06	
v/s Ratio Perm		0.00		c0.08					0.01	0.00		
v/c Ratio		0.01		0.31	0.01		0.02	0.24	0.03	0.02	0.24	
Uniform Delay, d1		24.2		26.4	24.3		24.3	25.9	24.4	9.9	25.9	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.0		2.1	0.0		0.1	0.6	0.1	0.0	0.6	
Delay (s)		24.3		28.5	24.3		24.4	26.5	24.5	9.9	26.5	
Level of Service		C		C	C		C	C	C	A	C	
Approach Delay (s)		24.3			28.0			26.1			25.5	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	26.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	6	11	105	149	10
Future Vol, veh/h	6	6	11	105	149	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	7	12	114	162	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	306	87	173	0	-	0
Stage 1	168	-	-	-	-	-
Stage 2	138	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	674	955	1402	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	888	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	668	955	1402	-	-	-
Mov Cap-2 Maneuver	668	-	-	-	-	-
Stage 1	837	-	-	-	-	-
Stage 2	888	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.7	0.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1402	-	786	-	-
HCM Lane V/C Ratio	0.009	-	0.017	-	-
HCM Control Delay (s)	7.6	0	9.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	7.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	21	0	0	12
Future Vol, veh/h	0	0	21	0	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	23	0	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	47	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	46	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	963	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	950	1084
Mov Cap-2 Maneuver	-	-	-	-	950	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	962	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.012	-	-	0.014	-
HCM Control Delay (s)	8.4	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	28	148	129	4	3	17
Future Vol, veh/h	28	148	129	4	3	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	30	161	140	4	3	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	144	0	-	0	363	142
Stage 1	-	-	-	-	142	-
Stage 2	-	-	-	-	221	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1438	-	-	-	636	906
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	816	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1438	-	-	-	621	906
Mov Cap-2 Maneuver	-	-	-	-	621	-
Stage 1	-	-	-	-	865	-
Stage 2	-	-	-	-	816	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1438	-	-	-	848
HCM Lane V/C Ratio	0.021	-	-	-	0.026
HCM Control Delay (s)	7.6	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	11	17	110	145	10
Future Vol, veh/h	6	11	17	110	145	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	12	18	120	158	11

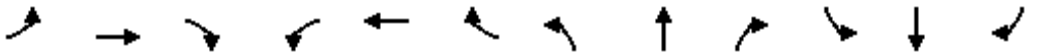
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	320	164	169	0	-	0
Stage 1	164	-	-	-	-	-
Stage 2	156	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	673	881	1409	-	-	-
Stage 1	865	-	-	-	-	-
Stage 2	872	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	664	881	1409	-	-	-
Mov Cap-2 Maneuver	696	-	-	-	-	-
Stage 1	853	-	-	-	-	-
Stage 2	872	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1409	-	696	881	-	-
HCM Lane V/C Ratio	0.013	-	0.009	0.014	-	-
HCM Control Delay (s)	7.6	0	10.2	9.1	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

Lane Group	EBT	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	30	53	141	22	1342	152	1164
v/c Ratio	0.11	0.27	0.33	0.13	0.68	0.48	0.45
Control Delay	0.8	37.6	5.6	37.7	17.2	15.0	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.8	37.6	5.6	37.7	17.2	15.0	11.0
Queue Length 50th (ft)	0	23	0	9	222	16	87
Queue Length 95th (ft)	0	62	21	23	387	67	343
Internal Link Dist (ft)	480	785			1425		1381
Turn Bay Length (ft)				110		265	
Base Capacity (vph)	455	600	454	239	1979	350	2586
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.09	0.31	0.09	0.68	0.43	0.45

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	0	9	40	0	110	13	1067	60	120	1054	19
Future Volume (vph)	3	0	9	40	0	110	13	1067	60	120	1054	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8			6.2	5.7	5.5	5.5		5.7	5.7	
Lane Util. Factor		1.00			1.00	1.00	1.00	0.95		1.00	0.95	
Frt		0.92			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1678			1770	1583	1770	3511		1770	3525	
Flt Permitted		0.98			0.95	1.00	0.95	1.00		0.10	1.00	
Satd. Flow (perm)		1678			1770	1583	1770	3511		192	3525	
Peak-hour factor, PHF	0.25	1.00	0.50	0.75	1.00	0.78	0.60	0.84	0.83	0.79	0.93	0.61
Adj. Flow (vph)	12	0	18	53	0	141	22	1270	72	152	1133	31
RTOR Reduction (vph)	0	29	0	0	0	119	0	3	0	0	1	0
Lane Group Flow (vph)	0	1	0	0	53	22	22	1339	0	152	1163	0
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA		pm+pt	NA	
Protected Phases	8	8		4	4	1	5	2		1	6	
Permitted Phases						4				6		
Actuated Green, G (s)		2.0			4.8	13.0	2.6	44.9		58.6	50.5	
Effective Green, g (s)		2.0			4.8	13.0	2.6	44.9		58.6	50.5	
Actuated g/C Ratio		0.02			0.06	0.16	0.03	0.54		0.71	0.61	
Clearance Time (s)		5.8			6.2	5.7	5.5	5.5		5.7	5.7	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		40			102	247	55	1897		291	2142	
v/s Ratio Prot		c0.00			c0.03	0.01	0.01	c0.38		c0.05	c0.33	
v/s Ratio Perm						0.01				0.32		
v/c Ratio		0.02			0.52	0.09	0.40	0.71		0.52	0.54	
Uniform Delay, d1		39.6			38.0	30.0	39.5	14.2		10.2	9.5	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			4.4	0.2	4.7	2.2		1.7	1.0	
Delay (s)		39.8			42.4	30.1	44.2	16.4		11.9	10.5	
Level of Service		D			D	C	D	B		B	B	
Approach Delay (s)		39.8			33.5			16.9			10.7	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	83.1	Sum of lost time (s)	23.2
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

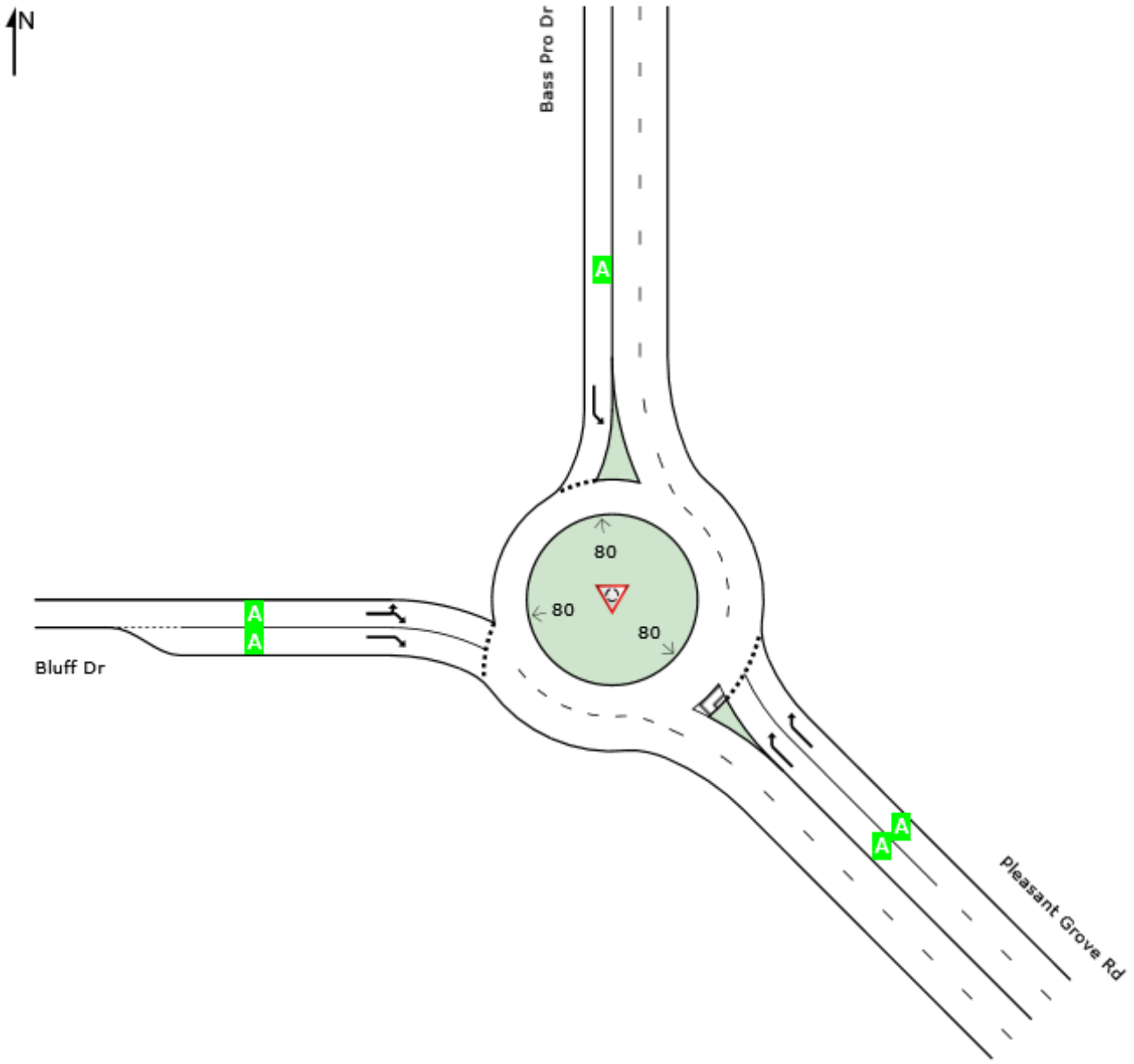
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [East Roundabout (Future PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	Southeast	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [East Roundabout (Future PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
SouthEast: Pleasant Grove Rd													
Lane 1	116	2.0	1387	0.084	100	3.3	LOS A	0.3	8.8	Full	1600	0.0	0.0
Lane 2[d]	116	2.0	1387	0.084	100	3.3	LOS A	0.3	8.8	Full	1600	0.0	0.0
Approach	233	2.0		0.084		3.3	LOS A	0.3	8.8				
North: Bass Pro Dr													
Lane 1[d]	197	2.0	1353	0.146	100	3.8	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	197	2.0		0.146		3.8	LOS A	0.0	0.0				
West: Bluff Dr													
Lane 1	35	2.0	1159	0.030	100	3.4	LOS A	0.1	2.9	Full	1600	0.0	0.0
Lane 2[d]	35	2.0	1159	0.030	100	3.4	LOS A	0.1	2.9	Short	115	0.0	NA
Approach	70	2.0		0.030		3.4	LOS A	0.1	2.9				
Intersection	501	2.0		0.146		3.5	LOS A	0.3	8.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

SouthEast: Pleasant Grove Rd

Mov. From SE To Exit:	R1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	116	116	2.0	1387	0.084	100	NA	NA
Lane 2	116	116	2.0	1387	0.084	100	NA	NA
Approach	233	233	2.0		0.084			

North: Bass Pro Dr

Mov. From N To Exit:	L1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	197	197	2.0	1353	0.146	100	NA	NA

Approach	197	197	2.0		0.146				
West: Bluff Dr									
Mov. From W To Exit:	L2 N	R1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	31	35	2.0	1159	0.030	100	NA	NA
Lane 2	-	35	35	2.0	1159	0.030	100	0.0	1
Approach	4	66	70	2.0		0.030			
	Total	%HV	Deg.Satn (v/c)						
Intersection	501	2.0		0.146					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Pleasant Grove Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

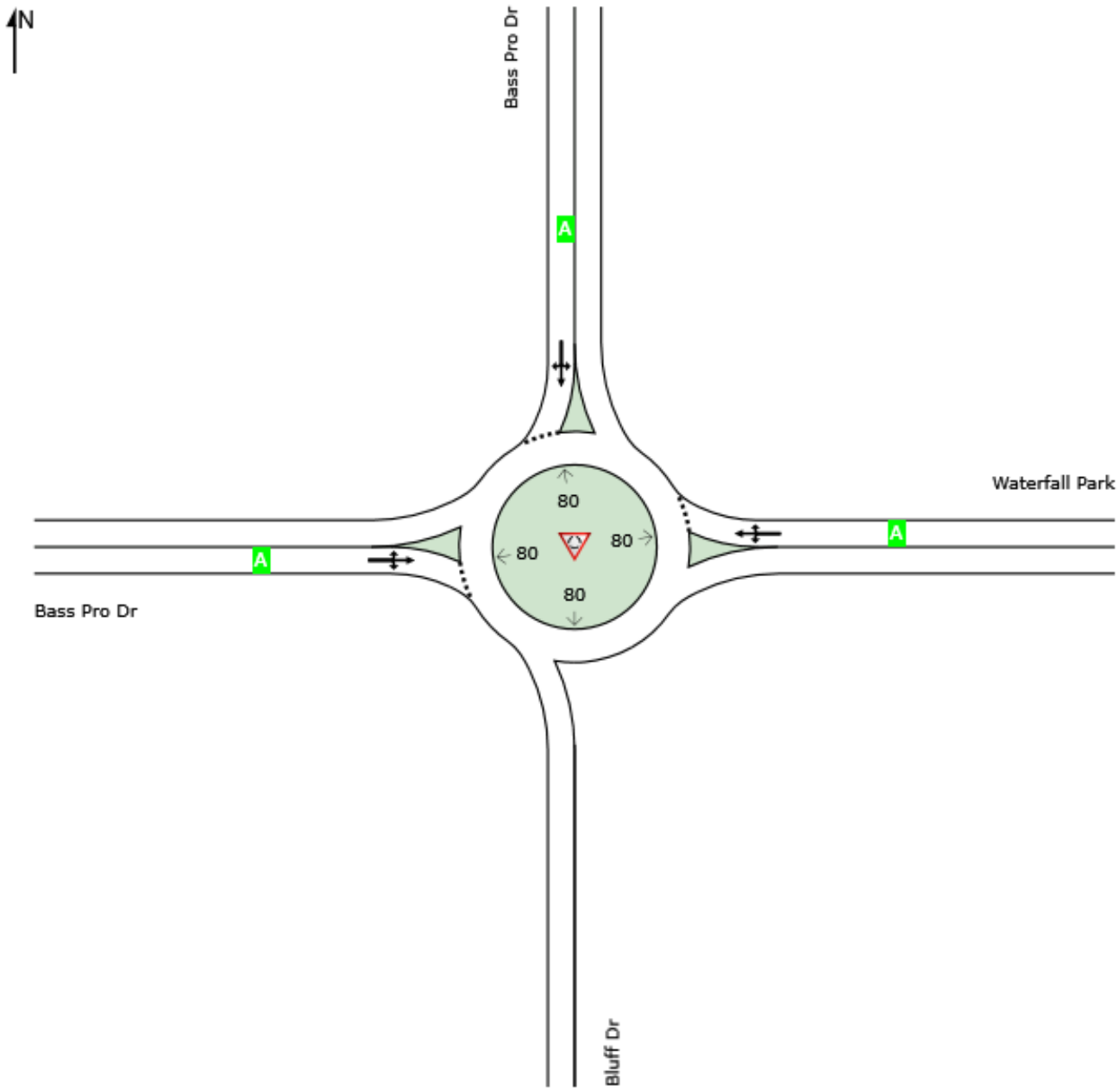
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 1 [West Roundabout (Future PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches			Intersection
	East	North	West	
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [West Roundabout (Future PM) (Site Folder: General)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
East: Waterfall Park													
Lane 1[d]	49	2.0	1175	0.042	100	3.4	LOS A	0.2	4.4	Full	1600	0.0	0.0
Approach	49	2.0		0.042		3.4	LOS A	0.2	4.4				
North: Bass Pro Dr													
Lane 1[d]	192	2.0	1309	0.146	100	4.0	LOS A	0.7	17.7	Full	1600	0.0	0.0
Approach	192	2.0		0.146		4.0	LOS A	0.7	17.7				
West: Bass Pro Dr													
Lane 1[d]	187	2.0	1266	0.148	100	4.1	LOS A	0.7	17.7	Full	1600	0.0	0.0
Approach	187	2.0		0.148		4.1	LOS A	0.7	17.7				
Intersection	428	2.0		0.148		3.9	LOS A	0.7	17.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

East: Waterfall Park

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	22	17	49	2.0	1175	0.042	100	NA	NA
Approach	10	22	17	49	2.0		0.042			

North: Bass Pro Dr

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	40	14	138	192	2.0	1309	0.146	100	NA	NA
Approach	40	14	138	192	2.0		0.146			

West: Bass Pro Dr

Mov. From W	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	135	31	21	187	2.0	1266	0.148	100	NA	NA
Approach	135	31	21	187	2.0		0.148			

	Total	%HV	Deg.Satn (v/c)
Intersection	428	2.0	0.148

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Bluff Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Waterfall Park Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Bass Pro Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										


STATE OF MISSOURI
SHANNON
L.
JEFFRIES
NUMBER
PE-2008000069
PROFESSIONAL ENGINEER
11.09.2020

THE FALLS RESIDENTIAL DEVELOPMENT

Independence, Missouri – 2020

November 2020

Olsson Project No. 020-2911