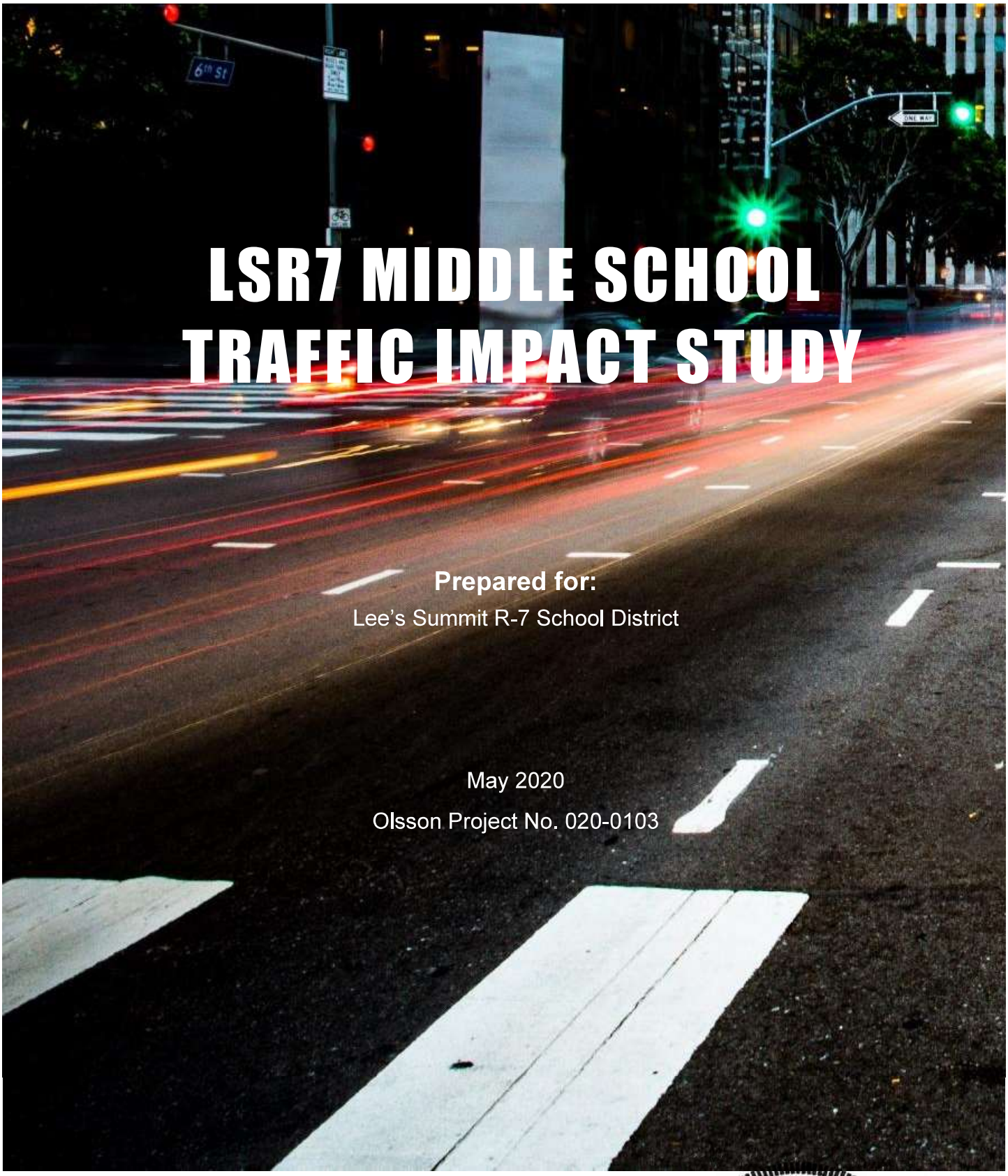

LSR7 MIDDLE SCHOOL TRAFFIC IMPACT STUDY

Prepared for:

Lee's Summit R-7 School District

May 2020

Olsson Project No. 020-0103

olsson

STATE OF MISSOURI
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1. INTRODUCTION

This report studies traffic impacts associated with a proposed middle school complex located south of Bailey Road and west of Ranson Road in Lee's Summit, Missouri.

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

- Ranson Road and US-50 Westbound Ramps
- Ranson Road and US-50 Eastbound Ramps
- Ranson Road and Oldham Parkway
- Ranson Road and Bailey Road
- Bailey Road and Century Drive / Hamblen Road East (referred to as Century Drive)
- Bailey Road and Hamblen Road West (referred to as Hamblen Road)
- Proposed Site Driveways

For this study, the following scenarios were analyzed for the AM (coincides with school arrival), Afternoon (coincides with school dismissal), and PM (includes commuters and after school functions) peak hour periods:

- Existing Conditions (Includes approved Culver's and Princeton senior living community)
- Existing Plus Proposed School Conditions
- Future Planned Development Conditions (includes future Bailey Farm residential development)

The approximate locations of the proposed school complex, approved developments, and future development are shown on **Figure 1**.

FIGURE 1

Vicinity Map

LSR7 Middle School
Lee's Summit, MO

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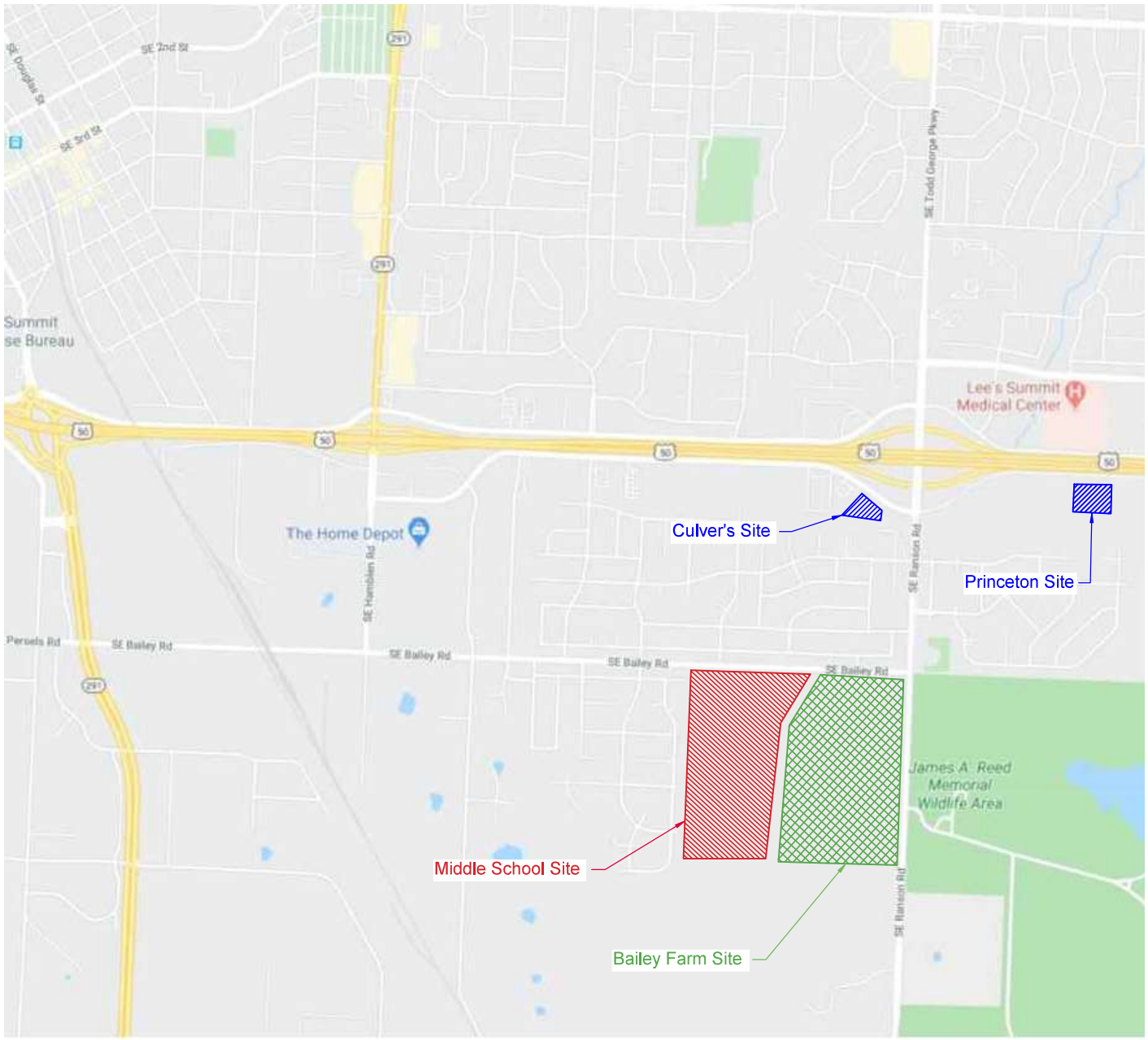


LEGEND

- Middle School Site Location
- Culver's & Princeton Site Locations (Approved)
- Bailey Farm Site Location (Future)

2. DATA COLLECTION

At the time of this report, local and regional travel patterns have been affected by the Covid-19 stay-at-home order, resulting in decreased traffic volumes when compared to typical conditions. To provide for analysis of more typical conditions, recent traffic counts collected prior to the stay-at-home order were utilized where possible. **Table 1** illustrates count data provided and utilized for the purposes of this study.

Table 1. Provided Traffic Count Data.

Intersection	Source	Date of Count	Peak Period Provided
Bailey Road and Hamblen Road	City	May 14th, 2019	AM and PM
Bailey Road and Century Drive	City	May 2nd, 2019	AM and PM
Bailey Road and Ranson Road	City	April 25th, 2017	AM and PM
Ranson Road and Oldham Parkway	Approved traffic impact study	October 24-25th, 2018	AM and PM

The approved traffic impact study provided by the City included traffic volumes for the intersection of Ranson Road and Oldham Parkway which reflect the impact of a proposed Culver's development and the proposed Princeton senior living community. This count was utilized for this study, thus the impact of these two approved developments are included in existing conditions analysis.

New counts were collected at the US-50 Interchange Ramps with Ranson Road on Tuesday, April 7th, 2020. Due to variance in data collection dates, volumes were increased/balanced as appropriate across the study intersections.

The City and approved traffic study counts did not include data for the Afternoon peak hour, expected to occur from 3:00-4:00 PM. To obtain this, City average daily traffic (ADT) data in the vicinity of the project area was reviewed to compare the Afternoon and PM peak hour periods. It was determined that the Afternoon peak hour has approximately 80% of the volume observed during the PM peak hour. At study intersections where data was obtained from City or approved study counts, the existing PM peak hour counts were reduced to obtain existing Afternoon turning movement volumes.

The approach to adjust volumes to address impacts of the Covid-19 stay-at-home orders and determination of afternoon peak hour volumes were coordinated with and approved by the City of Lee's Summit and MoDOT staff.

In general, the AM peak hour was observed to be from 7:15 AM – 8:15 AM. The afternoon peak hour is expected to occur from 3:00 PM – 4:00 PM. The PM peak hour was observed to be from 4:30 PM – 5:30 PM.

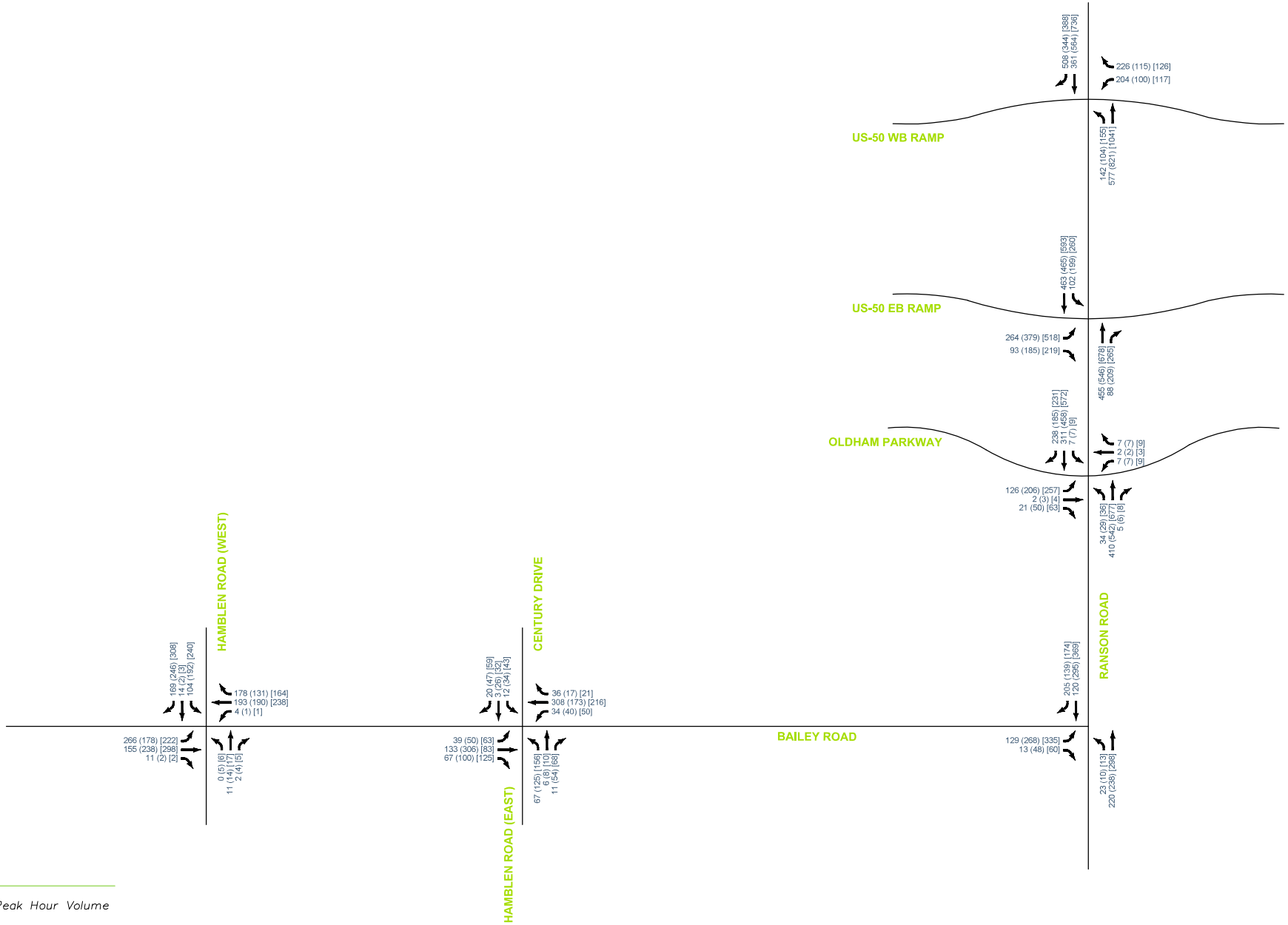
The existing peak hour volumes are illustrated in **Figure 1**. Turning movement count data, ADT data, and additional information regarding volume balancing is provided in **Appendix A**.

The data collection effort also included documentation of current roadway geometrics and obtaining existing and planned traffic signal timings. Existing signal timing information at the US-50 Interchange with Ranson Road was obtained from the Mid-America Regional Council's (MARC) Central Traffic Control System (TransSuite). Signal timings have not been developed at the planned signalized intersections but were approximated considering existing volumes, proximity and timings at adjacent intersections, and general guidance from City staff.

FIGURE 2

Existing
Peak Hour Volumes

LSR7 Middle School
Lee's Summit, MO



LEGEND

AM (Afternoon) [PM] *Total Peak Hour Volume*

3. EXISTING CONDITIONS

Existing traffic conditions were evaluated to identify any existing deficiencies and to provide a baseline for comparative purposes. At the request of the City, two approved development projects were included within the existing conditions. The proposed Princeton senior living project is located east of Ranson Road along Oldham Parkway. The proposed Culver's project is located west of Ranson Road along Oldham Parkway. Traffic volumes associated with both approved projects were obtained from the approved traffic impact study and are reflected in the turning movement data referenced for the intersection of Ranson Road and Oldham Parkway.

Based on direction from City and MoDOT staff, the following planned improvements were considered in-place under existing conditions analysis:

- Traffic signal at Ranson Road and Oldham Pkwy with 150-foot northbound left-turn lane
- Traffic signal at Bailey Road and Hamblen Road with 90-foot westbound left-turn lane

3.1. Network Characteristics

Six roadways within the study area were considered during analysis: US-50, Oldham Parkway, Ranson Road, Bailey Road, Century Drive, and Hamblen Road. Ranson Road is also designated as Route RA; for the purposes of this report the roadway will be referred to as Ranson Road.

US-50, Ranson Road, and Oldham Parkway are maintained by MoDOT. The functional classification for these roadways was acquired from the MoDOT Functional Classification System Map. The other three roadways are maintained by the City of Lee's Summit and were referenced from the City's *Thoroughfare Master Plan.* Current network characteristics are summarized in **Table 2**.

Table 2. Existing Network Summary.

Roadway	Functional Classification	Typical Section	Median Type	Posted Speed
US-50	Other Freeway and Expressway (MoDOT)	4-Lane	Divided	65 mph on mainline / 40 mph on exit ramps
Oldham Parkway	Local (MoDOT)	2-Lane	None	40 mph
Ranson Road	Minor Arterial / Major Collector* (MoDOT)	4-Lane / 2-Lane*	Divided / None*	40 mph / 45 mph*
Bailey Road	Minor Arterial (City)	2-Lane	None	35 mph
Century Drive / Hamblen Road East	Local / Minor Arterial** (City)	2-Lane	None	25 mph north / 40 mph south
Hamblen Road West	Minor Arterial (City)	2-Lane	None	35 mph north / 25 mph south

*Minor Arterial north of Bailey Road, Major Collector south of Bailey Road. 4-lane divided with 40 mph speed limit near interchange transitioning to 2-lane undivided with 45 mph speed limit south of Oldham Parkway.
**Local north of Bailey Road, Minor Arterial south of Bailey Road

The US-50 Ramps and Ranson Road intersections are signalized. Pedestrian accommodations including marked crosswalks and pedestrian pushbuttons and signal heads are provided at each intersection for north/south crossings. No pedestrian accommodations are present for crossing Ranson Road at either intersection.

The intersection of Oldham Parkway and Ranson Road is planned for signalization. Marked crosswalks are currently provided for north/south travel, and pedestrian pushbuttons and signal heads are assumed to be provided when the signal is installed. No pedestrian accommodations are currently present for crossing Ranson Road at the intersection.

The intersection of Bailey Road and Ranson Road is unsignalized with stop-control at the minor approach (eastbound). Sidewalk is present in the northwest corner. Pedestrian crossing accommodations are not provided at the intersection. An unsignalized pedestrian crossing is provided approximately 450 feet north of Bailey Road across Ranson Road.

The intersection of Bailey Road and Century Drive is unsignalized. Sidewalk is provided along the north side of Bailey Road in the vicinity of the intersection and terminates west of Century Drive. Sidewalks are not present along the south side of Bailey Road except for an unconnected section along a developed lot in the southwest corner. Marked crosswalks are not provided.

The intersection of Bailey Road and Hamblen Road is planned for signalization by the City. Sidewalk will be provided in the northeast corner, and a shared use-path will be provided in the southwest and southeast corners for east/west travel. Pedestrian accommodations including marked crosswalks, pedestrian pushbuttons and signal heads are proposed to be provided at the south and east legs with the signalization project.

The study roadways of Bailey Road and Ranson Road are included in *Exhibit 4 – Bicycle Transportation Plan* of the City's *Thoroughfare Master Plan 2015-2040 (TMP).* Along Bailey Road, on-street bicycle lanes are provided between Century Drive and Ranson Road and is designated as planned west of Century Lane. An off-street path is also designated as planned for this section. Along Ranson Road, an off-street path is provided north of Bailey Road and is designated as planned for south of Bailey Road.

The City of Lee's Summit has adopted an Unimproved Road Policy to provide design guidelines for development activity impacting roadways that are constructed to unimproved/interim standards. Based on *Exhibit 6 – Existing Unimproved and Interim Roadways and Network Gaps* of the *TMP*, Hamblen Road East (south leg of the intersection of Century Drive and Bailey Road) is currently constructed to interim standard. All other study roadways are pending permanent or are not identified as substandard. The proposed middle school is not located along Hamblen Road East and is not expected to generate trips from this section of roadway.

3.2. Existing Warrant Analysis

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.

For this study, based on the data available, the Peak Hour Signal Warrant (Warrant 3) was reviewed under existing conditions to determine if alternative control measures are warranted for the currently unsignalized intersections of Bailey Road with Century Drive and Bailey Road with Ranson Road.

Based on available data, the intersection of Bailey Road with Century Drive is on the threshold for meeting a signal warrant during the PM peak hour.

A traffic signal is currently warranted at intersection of Bailey Road with Ranson Road during the Afternoon and PM peak hours.

Capacity and queueing analysis were also reviewed (see **Section 3.3**) to determine if signalization is recommended. Signal warrant analysis sheets are provided in **Appendix B**.

Turn Lane Warrants

City of Lee's Summit Access Management Code (AMC) guidelines were reviewed for turn lanes at study intersections along Bailey Road. MoDOT's Access Management Guidelines, located in MoDOT Engineering Policy Guide (EPG) Section 940.9, were reviewed for turn lanes at study intersections along Ranson Road.

Left-turn Lanes: Based on the Lee's Summit AMC, left-turn lanes shall be provided on all approaches to intersections controlled by a signal. Left-turn lanes are provided at the planned signal of Hamblen Road and Bailey Road except for the northbound approach, which is a private drive with minimal northbound traffic.

Based on the Lee's Summit AMC, left-turn lanes shall be provided on all arterial streets at the intersection with another arterial and on non-residential connectors intersecting with minor arterial streets where the left-turn volume is at least 20 vehicles per hour (vph). Left-turn lanes are provided at these locations except in the eastbound, westbound, and southbound directions at Century Drive and Bailey Road and in the eastbound at Bailey Road and Ranson Road.

Per the AMC, the minimum length of a left-turn lane should be 250 feet plus taper on an arterial street intersecting another arterial street and 200 feet plus taper on an arterial street at other locations. The existing southbound left-turn lane (110 feet) and planned westbound left-turn (90 feet) at Hamblen Road and Bailey Road and the existing northbound left-turn lane (110 feet) at Century Drive and Bailey Road do not meet the standard turn bay lengths. Increasing these turn bays could be achieved but would result in existing driveways being located within the turn bay and/or taper.

The MoDOT left-turn lane warrant was reviewed at study intersections along Ranson Road for which no left-turn lane is provided. Based on the MoDOT guidelines provided in the *EPG*, no additional left-turn lanes are currently warranted.

Right-turn Lanes: Based on the Lee's Summit AMC, right-turn lanes shall be provided on minor arterial streets at all connections with a turning volume of at least 60 vph. Right-turn lanes are provided at these locations except in the westbound and southbound directions at Hamblen Road and Bailey Road, northbound direction at Century Drive and Bailey Road, and eastbound direction at Ranson Road and Bailey Road.

Per the AMC, the minimum length of a right-turn lane should be 200 feet plus taper on a minor arterial street intersecting another arterial street. The existing eastbound right-turn lane (100 feet) at Century Drive and Bailey Road is below City standard.

The MoDOT right-turn lane warrant was reviewed at study intersections along Ranson Road for which no right-turn lane is provided. Based on the MoDOT guidelines provided in the *EPG*, a southbound right-turn lane is warranted for all three time periods at Ranson Road and Bailey

Road. A northbound right-turn lane is also warranted at Ranson Road and the US-50 Eastbound Ramps for the Afternoon and PM peak hour periods.

Per MoDOT guidelines, a right-turn lane along a 40-mph roadway should have a minimum deceleration/storage of 90 feet plus 100-foot taper. The westbound right-turn lane at Ranson Road and the US-50 Westbound Ramps provides 70 feet of deceleration/storage with no taper.

A summary of existing locations that do not meet left or right-turn lane standards is provided below:

- Northbound left-turn lane at Hamblen Road and Bailey Road is not planned
- Southbound left-turn lane with reduced storage at Hamblen Road and Bailey Road
- Westbound left-turn lane with reduced storage at Hamblen Road and Bailey Road
- Eastbound, westbound, and southbound left-turn lanes at Century Drive and Bailey Road are not provided
- Northbound left-turn lane with reduced storage at Century Drive and Bailey Road
- Eastbound left or right-turn lane at Ranson Road and Bailey Road
- Westbound and southbound right-turn lanes at Hamblen Road and Bailey Road are not provided
- Northbound right-turn lane is not provided at Century Drive and Bailey Road
- Eastbound right-turn lane with reduced storage at Century Drive and Bailey Road
- Southbound right-turn lane at Ranson Road and Bailey Road is not provided
- Northbound right-turn lane at Ranson Road and the US-50 Eastbound Ramps is not provided
- Westbound right-turn lane with reduced storage at Ranson Road and the US-50 Westbound ramps

Capacity and queueing analysis were reviewed (see **Section 3.3**) to determine if additional left/right-turn lanes and/or increased storage length is recommended based on existing operations. Existing conditions lane configurations and traffic control for the study intersections are illustrated in **Figure 3**. Turn lane warrant worksheets are provided in **Appendix B**.

3.3. Existing Capacity Analysis

Capacity analysis was performed for the study intersections utilizing the existing lane configurations and traffic control, including the planned signalization and geometric improvements at the intersections of Bailey Road with Hamblen Road west and Ranson Road with Oldham Parkway. Analysis was conducted using Synchro, Version 11, based on the Highway Capacity Manual (HCM) delay methodologies. 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 3** shows the delays associated with each LOS grade for signalized and unsignalized intersections, respectively. Queuing analysis was also conducted using the 95th-percentile queue length. This represents the queue length that has a 5 percent probability of being exceeded during the peak hour period.

Table 3. 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)		

The City of Lee's Summit references a Level of Service Policy to provide guidelines for acceptable traffic operations on its roadways. According to the policy, an overall LOS C is desirable at signalized intersections, and a LOS D may be acceptable under extraordinary circumstances. Based on discussions with City staff, individual signalized movements with a LOS D or E are typically considered acceptable. A LOS C is desirable at unsignalized intersections, and lower levels of service may be acceptable depending on the situation. MoDOT typically accepts overall peak hour LOS D (or LOS E in certain instances) on urban roadways. LOS D or E is typically considered acceptable for signalized and unsignalized individual movements.

Results of the analysis indicate that the planned signalized study intersection of Hamblen Road and Bailey Road is expected to operate at an overall LOS C or better during the three peak hour periods, which is considered acceptable based on the City's LOS Policy. Individual movements are operating at a LOS C or better with acceptable queues with one exception: the westbound shared through/right movement 95th-percentile queue is expected to extend past the adjacent left-turn lane/taper during all three peak hour periods. During the afternoon and PM peak hours, the queue is expected to block the adjacent driveway and extend toward the intersection of Fleetway Drive. As discussed previously, extension of this turn bay would result in existing driveways being located within the turn lane or taper.

Results of the analysis indicate that the existing signalized study intersections at the US-50 interchange with Ranson Road and the planned signalized intersection at Ranson Road and

Oldham Parkway are expected to operate at an overall LOS D or better during the three peak hour periods, which is typically considered acceptable for MoDOT maintained intersections. Individual signalized movements are expected to operate at a LOS D or better with acceptable queues with the following exceptions:

Ranson Road and Oldham Parkway

- Afternoon and PM Peak Hours
    - The northbound through movement 95th-percentile queue (167 feet in the Afternoon, 215 feet in the PM) is expected to extend past the adjacent left-turn lane and taper.
    - The southbound through movement 95th-percentile queue (177 feet in the Afternoon, 481 feet in the PM) is expected to extend past the adjacent left-turn bay/taper (afternoon) and into the upstream interchange ramp terminal (PM). Queueing between closely spaced outer road signalized intersections is not uncommon during peak hour periods.

Ranson Road and US-50 Eastbound Ramps

- PM Peak Hour
    - The southbound left-turn movement is expected to operate at a LOS F with a 95th-percentile queue of 228 feet, which exceeds available storage (200 feet).
    - The northbound shared through/right turn movement 95th-percentile queue (285 feet) is expected to extend past the adjacent left-turn bay/taper and toward the upstream signal at Oldham Parkway.

Ranson Road and US-50 Westbound Ramps

- AM Peak Hour
    - The southbound right-turn movement is expected to operate with a LOS E with a 95th-percentile queue of 169 feet, which extends toward the outer road signal at Blue Parkway.
    - The westbound left-turn movement is expected to operate at a LOS F with a 95th-percentile queue of 204 feet, which blocks the adjacent right-turn lane/taper.
    - An additional westbound left-turn lane was considered to address existing poor operations but would introduce a potential weaving condition unless significant roadway modifications/widening occurs along Ranson Road
- Afternoon and PM Peak Hours
    - The westbound left-turn movement 95th-percentile queue (106 feet in the Afternoon, 123 feet in the PM) is expected to block the adjacent right-turn lane/taper.

- The southbound through movement 95th-percentile queue (270 feet in the Afternoon, 347 feet in the PM) is expected to extend into the upstream outer road signal at Blue Parkway.

As stated above, poor operations and extended queueing is expected for various movements during the studied peak hour periods at the US-50 Interchange. With diamond interchange configurations, queuing between closely spaced signalized intersections, including adjacent outer road signals, is not uncommon during peak hour periods as higher ramp and crossroad volumes are serviced. An additional westbound left-turn lane was considered to address existing poor operations but would introduce a potential weaving condition without significant roadway modifications/widening along Ranson Road. Modifications to signal timings could improve poor operations but were not considered for the purposes of this study due to the impact to coordinated non-study intersections located north of US-50. A more comprehensive review of the existing interchange/outer road design or signal re-timing (considering adjacent non-study coordinated intersections) may be needed for this location.

All movements at the unsignalized study intersections are expected to operate at LOS C or better with acceptable queues during the three peak hour periods with the following exceptions:

<u>Century Drive and Bailey Road</u>

- AM Peak Hour
  - The westbound shared left/through/right movement is expected to operate at a LOS D with a 95th-percentile queue of 188 feet, which extends past the upstream driveway.
- Afternoon Peak Hour
  - The eastbound shared left/through lane is expected to operate at a LOS E with a 95th-percentile queue of 223 feet, which blocks the adjacent right-turn lane/taper.
- PM Peak Hour
  - The eastbound shared left/through lane is expected to operate at a LOS F with a 95th-percentile queue of 540 feet, which blocks the adjacent right-turn lane and extends approximately halfway to the planned signal at Hamblen Road.
  - The westbound shared left/through/right movement is expected to operate at a LOS D with a 95th-percentile queue of 158 feet, which extends past the upstream driveway.

<u>Ranson Road and Bailey Road</u>

- Afternoon and PM Peak Hour

- The eastbound shared left/right movement is expected to operate at a LOS F. The 95th-percentile queue is approximately 290 feet during the afternoon and 725 feet during the PM peak hour.

The existing conditions capacity analysis summary is illustrated in **Figure 4**. Detailed results may be found in **Appendix B**.

Several existing turn lanes were noted to not meet City or State guidance as presented in **Section 3.2**. Capacity and queuing analysis were reviewed and found that some movements are expected to operate at an acceptable level of service with the current configuration. However, the following modifications are recommended based on existing turn lane warrants and existing poor operations:

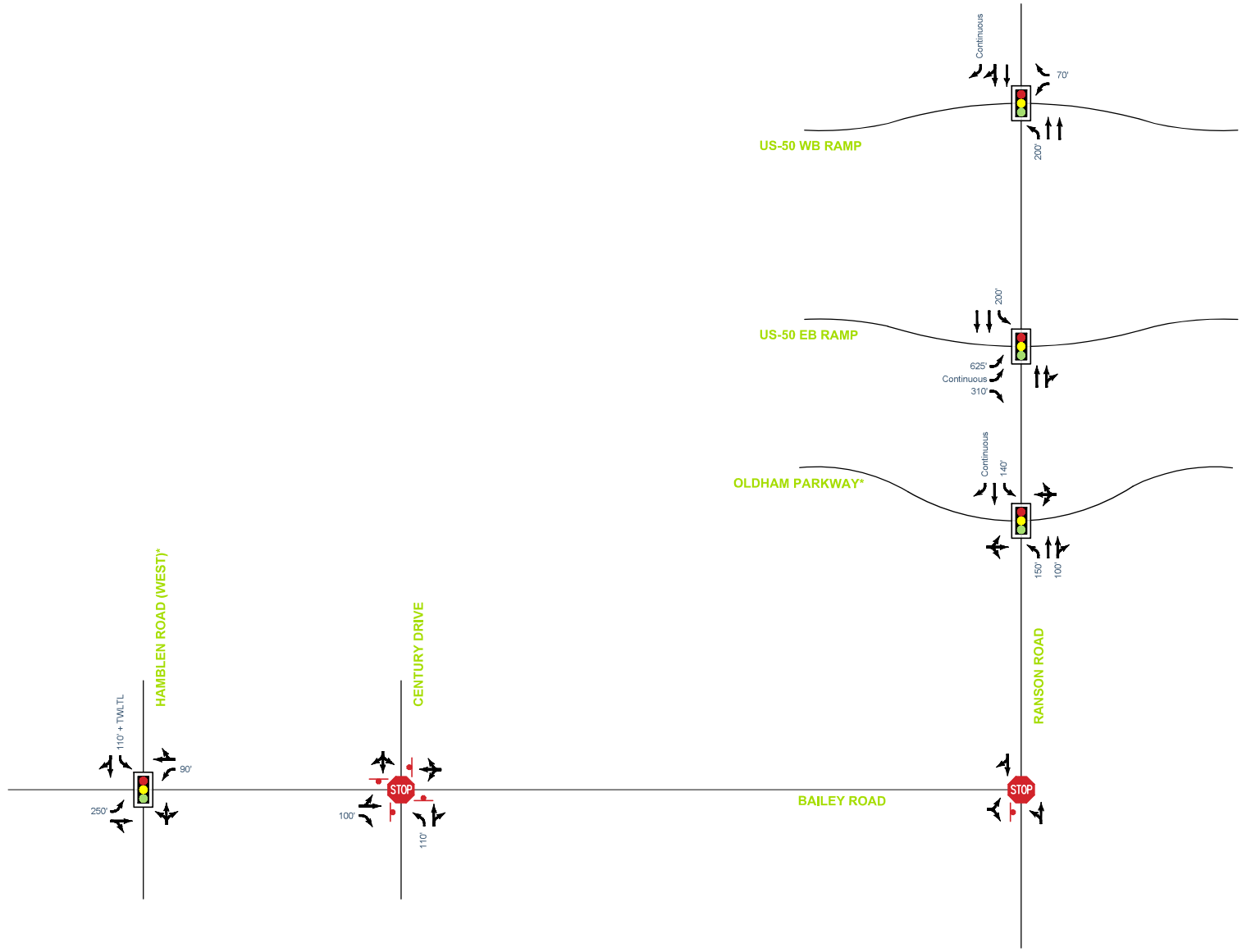
- *Provide alternate traffic control at Century Drive and Bailey Road. A traffic signal was considered for this report acknowledging the planned signal at Hamblen Road and the potential for coordination. A roundabout may be feasible at this intersection, but further investigation would be required to review available right-of-way and impact to adjacent existing development.*
- *Provide left-turn lanes at Century Drive and Bailey Road (storage length of 250 feet plus taper eastbound/westbound and 150 feet plus taper southbound).*
- *Provide a traffic signal at Ranson Road and Bailey Road.*
- *Provide right-turn lanes at Ranson Road and Bailey Road (storage length of 200 feet plus taper southbound and eastbound).*
- *Provide northbound right-turn lane at Ranson Road and the US-50 Eastbound Ramps (continuous to the upstream signal at Oldham Parkway with approximately 190 feet of storage and no taper).*

Due to the existing operational and turn lane deficiencies, capacity analysis was subsequently performed with the recommended improvements in place. This provides comparison with and without improvements under existing conditions. These lane configurations and traffic control are illustrated in **Figure 5**. The capacity analysis summary considering existing conditions with recommended improvements is illustrated in **Figure 6**. Detailed results are provided in **Appendix B**.

FIGURE 3

Existing
Lane Configuration and Traffic Control

LSR7 Middle School
Lee's Summit, MO



LEGEND

- XX' — *Lane Configuration & Storage Length*
- *Signalized Intersection*
- STOP — *Stop Controlled Intersection*
- *Stop Sign*
- TWLTL — *Two–Way Left–Turn Lane*

**Illustrates planned improvements including signal control and turn lane modifications.*

FIGURE 4

Existing
Capacity Analysis

LSR7 Middle School
Lee's Summit, MO

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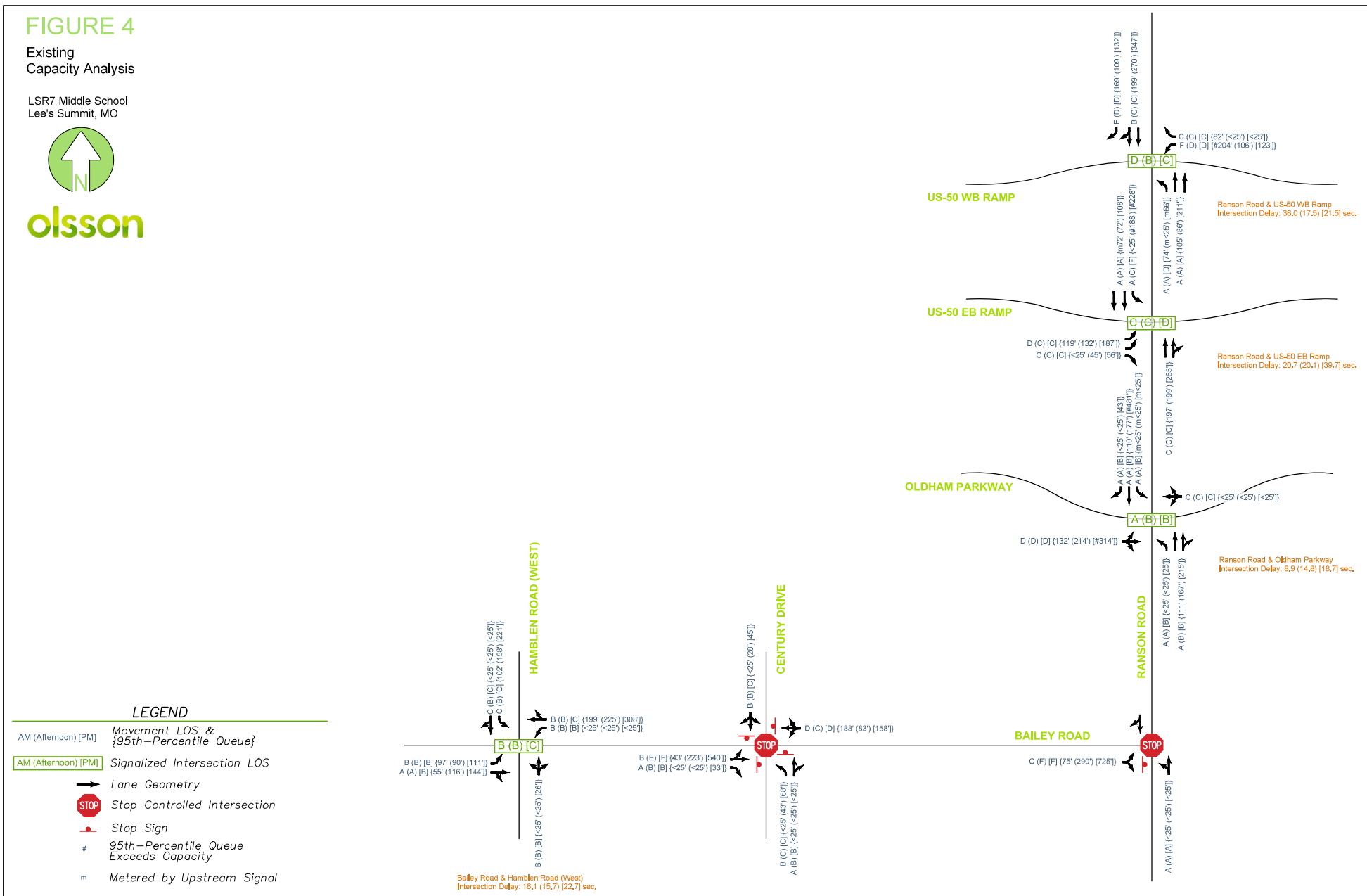
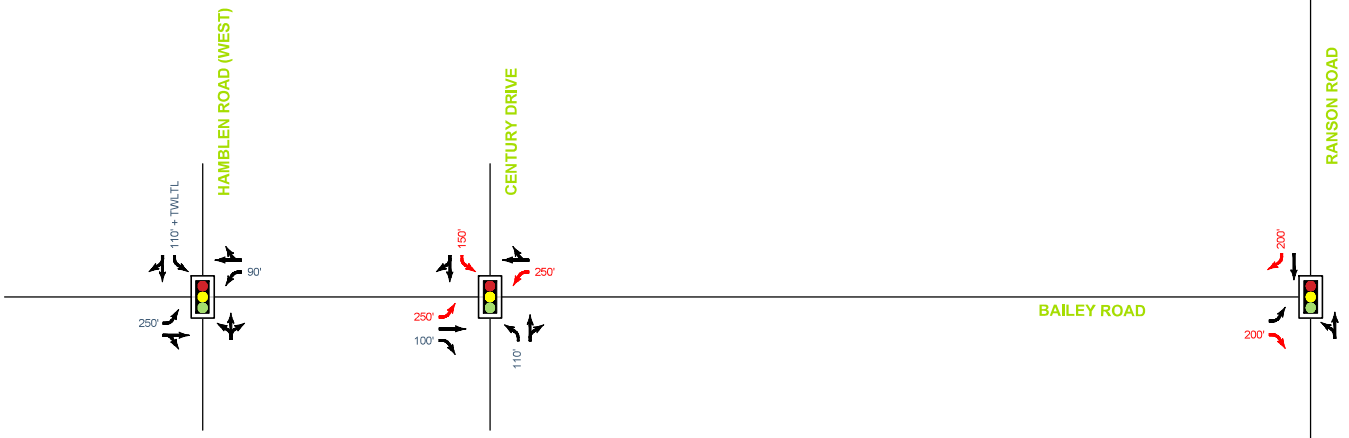


FIGURE 5

Existing
With Recommended Improvements
Lane Configuration and Traffic Control

LSR7 Middle School
Lee's Summit, MO



LEGEND

- XX' — Lane Configuration
- XX' — Proposed Lane Configuration & Storage Length
- Signalized Intersection
- Stop Controlled Intersection
- Stop Sign

FIGURE 6

Existing Conditions
with Recommended Improvements
Capacity Analysis

LSR7 Middle School
Lee's Summit, MO

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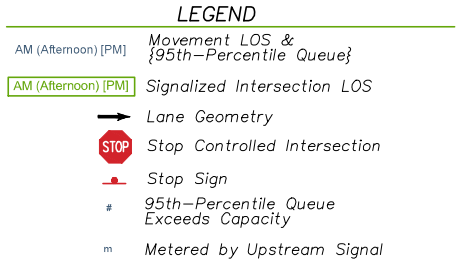
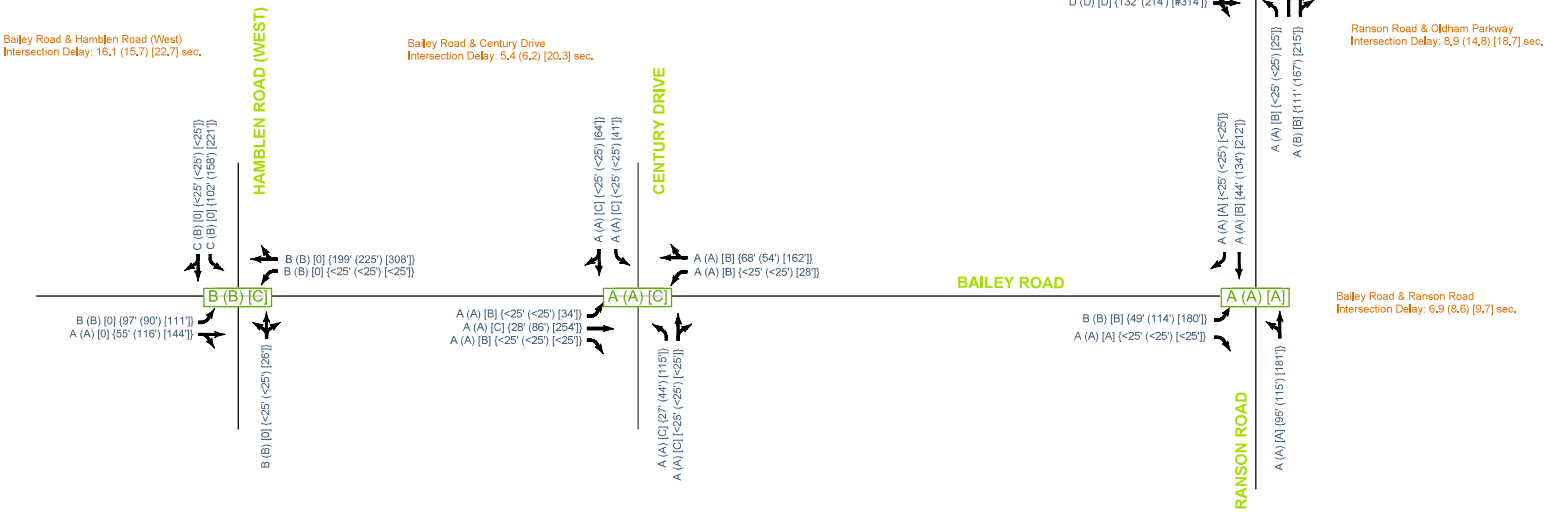




4. EXISTING PLUS PROPOSED SCHOOL CONDITIONS

The middle school is proposed south of Bailey Road, approximately 2,000 feet west of Ranson Road with an ultimate enrollment of 1,290 students. The proposed site plan is illustrated in **Figure 7**.

The site plan also illustrates four baseball/softball fields, which are expected to be primarily used by the nearby high school, located on the proposed campus north of the middle school. Trips associated with the ballfields are included in this scenario.

4.1. Trip Generation and Distribution

To determine the impact of potential site traffic, expected trips associated with the proposed school complex 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 use that most closely resembles the proposed school is Land Use Code 522 (Middle School/Junior High School).

There is not a clearly defined ITE land use for baseball/soccer fields of this type. Thus, trips were generated based on expected usage for a typical day, which considers athletes/staff arriving from the high school for practice during the afternoon peak and leaving to the high school during the PM peak hour. Information regarding field usage trips was provided by school staff.

Trip generation characteristics expected for the site are shown in **Table 4**. Detailed ITE and expected trip generation information is provided in **Appendix C.**

Table 4. Proposed School Complex Trip Generation.

Land Use	Size	Average Weekday	AM Peak Hour			Afternoon Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Middle School / Junior High School	1,290 Students	2,748	749	404	345	410	189	221	220	108	112
Baseball / Softball Fields	4 fields	60	-	-	-	30	30	-	30	-	30
Total		**2,808**	**749**	**404**	**345**	**440**	**219**	**221**	**250**	**108**	**142**

Trips were distributed through the network based on the anticipated school service area, discussions with City and MoDOT staff, and the surrounding roadway network and land uses. Directional trip distribution percentages expected for the site are illustrated in **Table 5.**

Table 5. Proposed School Trip Distribution.

Direction	To/From	
	Middle School	Ballfields
Bailey Road (West)	10%	-
Hamblen Road (North)	5%	100%
Todd George Parkway / Ranson Road (North)	15%	-
Ranson Road (South)	20%	-
US-50 (West)	5%	-
US-50 (East)	40%	-
Adjacent Homes (Internal or Walk)	5%	-
TOTAL	**100%**	**100%**

The expected trip distribution for the proposed school is shown in **Figure 8**. The resulting existing plus proposed school volumes are illustrated in **Figure 9**.

4.2. Access Characteristics

Access to the site is proposed via two full access drives located along Bailey Road. The western drive (Drive 1) aligns with Country Lane, and the eastern drive (Drive 2) is proposed approximately 615 feet east of Drive 1. During school arrival and dismissal, Drive 1 is expected to service primarily school bus traffic, with Drive 2 serving as the main access point for student pickup/drop.

South of Bailey Road along the west side of Drive 1, three existing residential streets are proposed to be extended to connect with Drive 1 – 13th Street and Cape Drive. These connections are internal to the site and are expected to be used by the adjacent homes.

Access Spacing

Access is proposed along the City maintained roadway of Bailey Road, thus Section 15 (Connection Spacing) of the City's AMC was reviewed. Per the AMC, connections shall have a minimum spacing of 400 feet along a minor arterial, such as Bailey Road, and be located outside any intersection influence area and turn lanes. Per the AMC, the upstream intersection influence area along a 35-mph road is 370 feet (270 feet if limiting conditions), and the downstream influence area is 250 feet.

Drive 1 aligns with Country Lane and will be located with approximately 960-foot spacing from the nearest access point to the west (Cape Drive) and 615-foot spacing from the nearest access

to the east (Drive 2), both of which meet AMC spacing standards. The proposed alignment with Country Lane is recommended as it is currently shown.

Drive 2 will be located with approximately 615-foot spacing from the nearest access point to the west (Drive 1) and 1,060-foot spacing from the nearest access to the east (Brownfield Drive), both of which meet AMC spacing standards.

Access Geometrics

City standards outlined in the AMC and Design & Construction Manual were reviewed for drive width and throat characteristics. Section 18.1.D (Driveway Width) of the AMC provides standards for commercial/industrial driveways and states they may be generally applied to non-commercial access points. The Design & Construction Manual provides standards for residential access, which is considered to be similar to the proposed school driveways. Considering the operations of a school drive, which is not typical of a commercial development, residential requirements were reviewed as a minimum standard with commercial requirements referenced for general guidelines.

Table 6. Access Characteristics

Proposed Access	Public Roadway Intersected	Access Type	Proposed Throat Length	Proposed Pavement Width	Median Divided
Drive 1	Bailey Road	Full Access	310 feet	24 feet	No
Drive 2	Bailey Road	Full Access	1,200 feet	22 feet	No

Referencing *Table 18-1* of the AMC, driveways servicing between 150 – 400 vph during the peak hour period should have a driveway width from back-of-curb between 42 feet (striped for 3-lanes) and 56 feet (striped for 4 lanes) for two-way access. Trip generation completed in **Section 4.1** of this report projects that Drive 1 will service 159 vehicles during the PM peak hour but less than 150 vph during other periods. Referencing Table LS-1 of the Design & Construction Manual, residential access should have lane widths between 10.5 – 12 feet, totaling a maximum of 24 feet for two-way access. Drive 1 has a proposed driveway width of 24 feet, which would satisfy residential criteria but is less than commercial requirements. The proposed width of Drive 1 is expected to be acceptable.

Referencing *Table 18-1* of the AMC, driveways servicing over 400 vph during the peak hour period should have a minimum driveway width from back-of-curb of 42 feet (striped for 3-lanes) for two-way access and a maximum width determined by a traffic study. Drive 2 is proposed with a pavement width of 22 feet and is expected to have 641 vph during the highest peak period. It is recommended to construct Drive 2 with a width of 42 feet (from back-of-curb) to

meet minimum AMC requirements. Drive 2 should be striped for one entering lane and two exiting lanes.

Throat length standards are based on projected peak hour volumes, per the City of Lee's Summit AMC. Referencing *Table 18-2* of the AMC, driveways servicing between 100 – 400 vph during the peak hour period shall have a minimum throat length of 125 feet adjacent to an arterial roadway. Drive 1 has a proposed driveway throat length of 310 feet, which meets City standards.

Referencing *Table 18-2* of the AMC, driveways servicing over 400 vph during the peak hour period shall have a minimum throat length of 150 feet adjacent to an arterial roadway. Drive 2 has a proposed driveway throat length of 1,200 feet, which meets City standards.

Additional Safety Considerations

As mentioned in **Section 3.1**, the section of Bailey Road adjacent to the proposed access points has pedestrian and bicycle facilities including sidewalk, on-street bicycle lanes, and a planned off-street path. It is recommended to coordinate potential pedestrian/bicycle needs with the City to ensure that the proposed access points accommodate the potential planned off-street path and crossing maneuvers, if necessary.

An existing crest curve is present approximately 250 feet west of Drive 1. Proposed driveways should meet minimum sight distance requirements.

Consideration should be given to imposing a reduced school zone speed limit during school arrival and drop off periods.

FIGURE 7

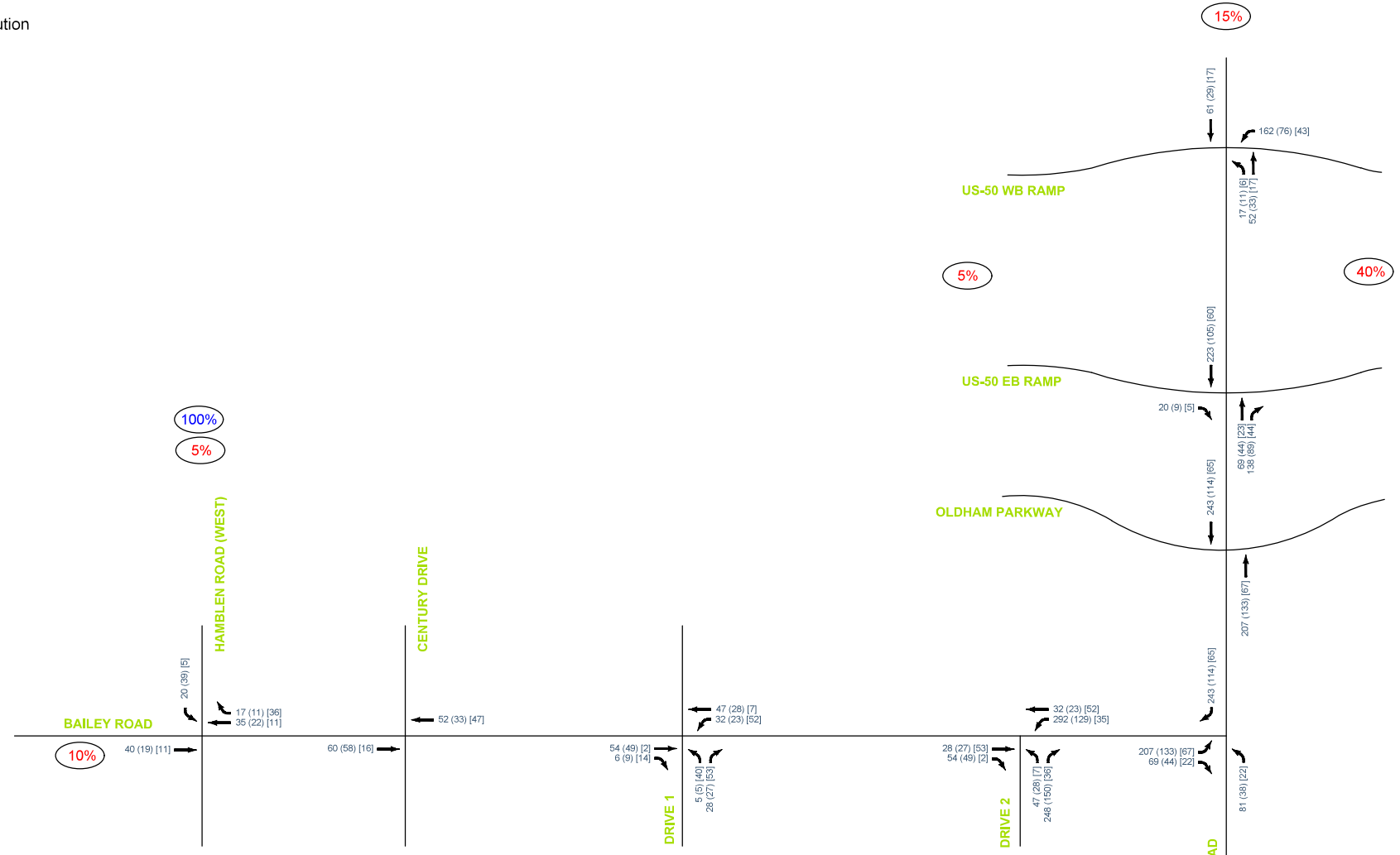
Site Plan

LSR7 Middle School
Lee's Summit, MO

FIGURE 8

Middle School Trip Distribution

LSR7 Middle School
Lee's Summit, MO



LEGEND

AM (Afternoon) [PM] *Trip Distribution*

School Location

XX% *School Trip Distribution Percentages*

XX% *Ballfields Trip Distribution Percentages*

5% Adjacent Homes (Internal Trips or Walk)

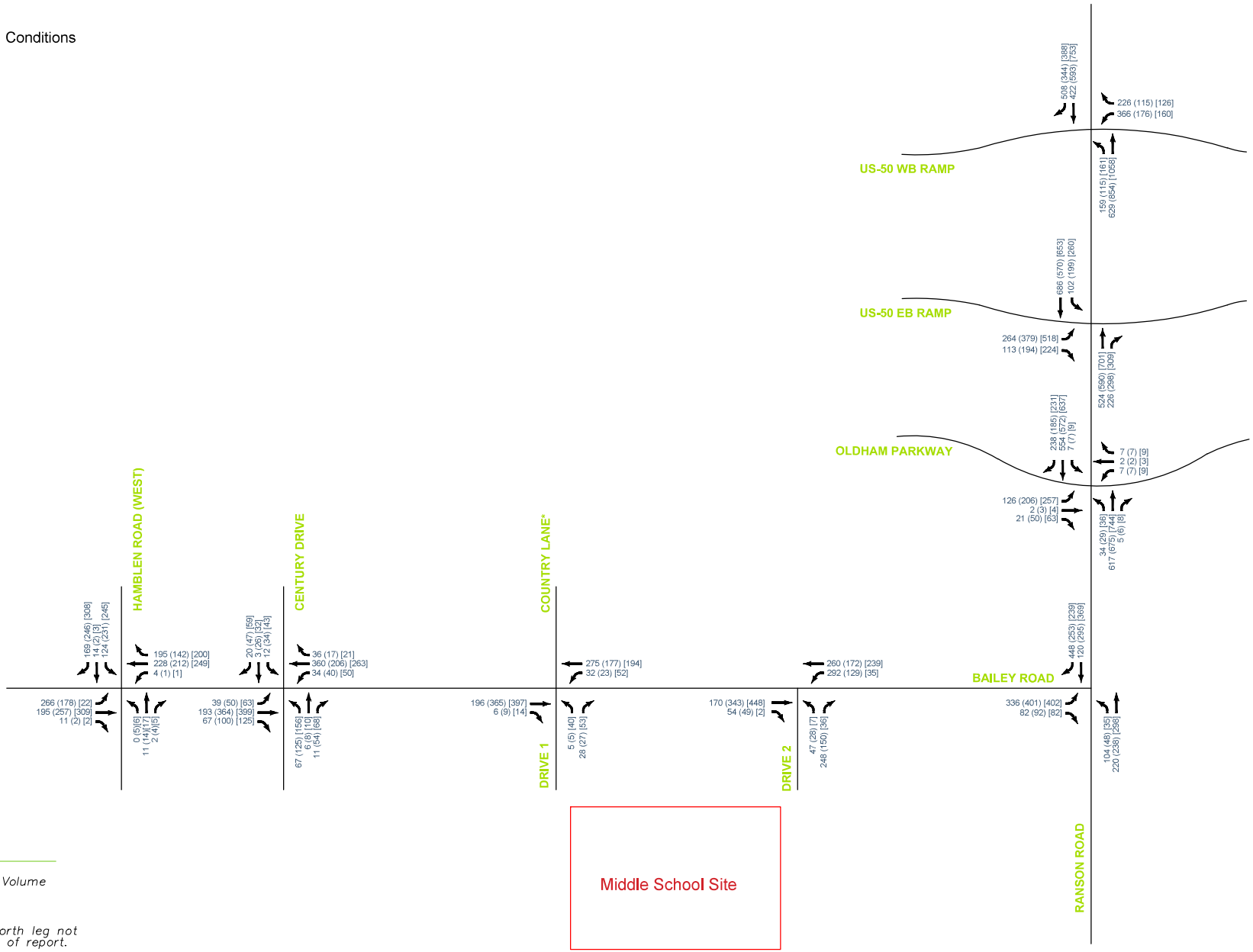
17 (11) [6]
20 (9) [5]

Middle School Site

FIGURE 9

Existing Plus Proposed School Conditions
Peak Hour Volumes

LSR7 Middle School
Lee's Summit, MO



LEGEND

AM (Afternoon) [PM] *Total Peak Hour Volume*

School Location

**Data to/from north leg not available at time of report.*

4.3. Existing Plus Proposed School Warrant Analysis

Warrant analysis was conducted using the same methodology described in **Section 3.2**.

Signal Warrants
Considering existing plus proposed school volumes, school traffic at the intersection of Bailey Road with Drive 1/Country Lane is not expected to meet the criteria for signalization during any peak hour period based on Warrant 3.

The intersection of Bailey Road and Drive 2 is on the threshold for warranting a signal based on expected AM peak hour volumes. However, a significant portion of the minor street volumes (approximately 85% during the AM peak hour) are expected to turn right with minimal conflict with eastbound mainline traffic. Thus, signalization is not recommended at this time.

The intersections of Ranson Road with Bailey Road and Century Drive with Bailey Road were on the threshold or met criteria for signalization under existing conditions and have poor operations with stop-control. As discussed in **Section 3.3**, traffic signals are recommended under existing conditions and were subsequently included under existing plus proposed school conditions.

Signal warrant analysis sheets are provided in **Appendix C**.

Turn Lane Warrants
As discussed in **Section 3.2**, the following turn lane deficiencies were noted in existing conditions.

- Northbound left-turn lane at Hamblen Road and Bailey Road is not planned
- Southbound left-turn lane with reduced storage at Hamblen Road and Bailey Road
- Westbound left-turn lane with reduced storage at Hamblen Road and Bailey Road
- Eastbound, westbound, and southbound left-turn lanes at Century Drive and Bailey Road are not provided (*recommended under existing conditions*)
- Northbound left-turn lane with reduced storage at Century Drive and Bailey Road
- Eastbound left or right-turn lane at Ranson Road and Bailey Road (*right-turn lane recommended under existing conditions*)
- Westbound and southbound right-turn lanes at Hamblen Road and Bailey Road are not provided
- Northbound right-turn lane is not provided at Century Drive and Bailey Road
- Eastbound right-turn lane with reduced storage at Century Drive and Bailey Road
- Southbound right-turn lane at Ranson Road and Bailey Road is not provided (*recommended under existing conditions*)

- Northbound right-turn lane at Ranson Road and the US-50 Eastbound Ramps is not provided (*recommended under existing conditions*)

Left-turn Lanes: Based on the Lee's Summit AMC, left-turn lanes shall be provided on all arterial streets at the intersection with any local street/driveway where the turning volume is at least 20 vph. A left-turn lane is also warranted when a non-residential connector intersects a minor arterial where the turning volume is at least 20 vph. Per the AMC, westbound and northbound left-turn lanes are warranted at both proposed school driveways. It should be noted that, while these driveways are technically "non-residential", they are located in and serve a largely residential population. Based on this and a review of operations (see **Section 4.4**), westbound left-turn lanes with 200 feet of storage plus taper are recommended at Drive 1/Country Lane, and at Drive 2, and a northbound left-turn lane with 150 feet of storage plus taper is recommended at Drive 2. A northbound left-turn is not expected to be required due to acceptable operations.

Based on the MoDOT guidelines provided in the *EPG*, a northbound left-turn lane is expected to be warranted at Ranson Road and Bailey Road during all three peak hours. It is recommended to provide a northbound left-turn lane with 200 feet of storage plus taper at this location.

Right-turn Lanes: Based on City and MoDOT criteria, no right-turn lanes in addition to what was previously described are expected to be warranted under existing plus proposed school conditions.

Capacity and queueing analysis were also reviewed (see **Section 4.4**) to determine if additional turn lanes and/or storage length is recommended based on expected operations. Turn lane warrant worksheets are provided in **Appendix C**. Existing plus proposed school conditions lane configurations and traffic control for the study network are illustrated in **Figure 10**.

4.4. Existing Plus Proposed School Capacity Analysis

Capacity analysis was performed under existing plus proposed school conditions using the methodologies described in **Section 3.3**. The peak hour factors observed under existing conditions were utilized for this scenario except for movements which are expected to experience a notable increase in traffic. At these locations, the peak hour factors were conservatively adjusted considering the Synchro suggested values and expected traffic conditions after development. Signal timings from the previous analysis scenario were maintained.

Results of the analysis indicate that the signalized study intersections of Hamblen Road with Bailey Road and Century Drive with Bailey Road are expected to operate at an overall LOS C or better overall during the three peak hour periods, which is considered acceptable based on the

City's LOS Policy. Movements that are expected to have a reduction in operations (to LOS D or worse) or have significantly more queueing compared to existing conditions include:

Hamblen Road and Bailey Road

- AM Peak Hour
    - The southbound shared through/right movement is expected to operate at a LOS D with minimal queueing. Similar delay would be expected if a southbound right-turn lane were installed. These operations are expected to be acceptable as they are limited to one peak hour.
- AM, Afternoon, and PM Peak Hour
    - The southbound left-turn movement is expected to operate at a LOS D with similar queueing as existing conditions. These operations are expected to be acceptable as the movement is nominally higher than the upper LOS C threshold and queues are not expected to have a significant impact to adjacent traffic lanes.

Century Drive and Bailey Road

- AM Peak Hour
    - The northbound through/right and southbound lanes are expected to operate at a LOS D with minimal queueing. These operations are expected to be acceptable as the movement is nominally higher than the upper LOS C threshold, approaching traffic is minimal, and queues are not expected to have a significant impact to adjacent traffic lanes.
- AM, Afternoon, and PM Peak Hour
    - The northbound left-turn movement is expected to operate at a LOS D with similar queueing as existing conditions. These operations are expected to be acceptable as the movement is nominally higher than the upper LOS C threshold and queues are not expected to have a significant impact to adjacent traffic lanes.

Results of the analysis indicate that the signalized study intersections along Ranson Road are expected to operate at an overall LOS C or better overall during the three peak hour periods, which is typically considered acceptable by MoDOT, with one exception. The intersection of Ranson Road with the US-50 Westbound Ramps is expected to operate with a LOS E overall (57 seconds of delay) during the AM peak hour. This is marginally higher than the LOS D threshold and limited to one peak hour period. No individual signalized movement that was considered acceptable under the previous scenario is expected to operate below a LOS D. Individual signalized movements that are expected to have significantly more queueing compared to existing conditions include:

Ranson Road and US-50 Westbound Ramps

- AM Peak Hour
    - The westbound left-turn is expected to continue operating at a LOS F with a 95th-percentile queue of 482 feet.

All movements at the unsignalized study intersections are operating at LOS C or better with acceptable queues with the one exception. The northbound left-turn movement at Drive 2 is expected to operate at a LOS E during the AM peak hour with a 95th-percentile queue of less than two vehicles. This is expected to be limited to the AM peak hour period during school arrivals and queues are not expected to have a significant impact to adjacent traffic lanes, thus is considered acceptable for proposed conditions.

Several existing turn lane deficiencies were noted in **Section 3.2**. Capacity and queuing analysis were reviewed for each movement considering school conditions. After review of the analysis, it was determined that the proposed school is not expected to have a significant impact to operations for the majority of the listed movements. Identified existing turn lane deficiencies (and expected operations) that are expected to encounter increased volumes due to the proposed school are further detailed below:

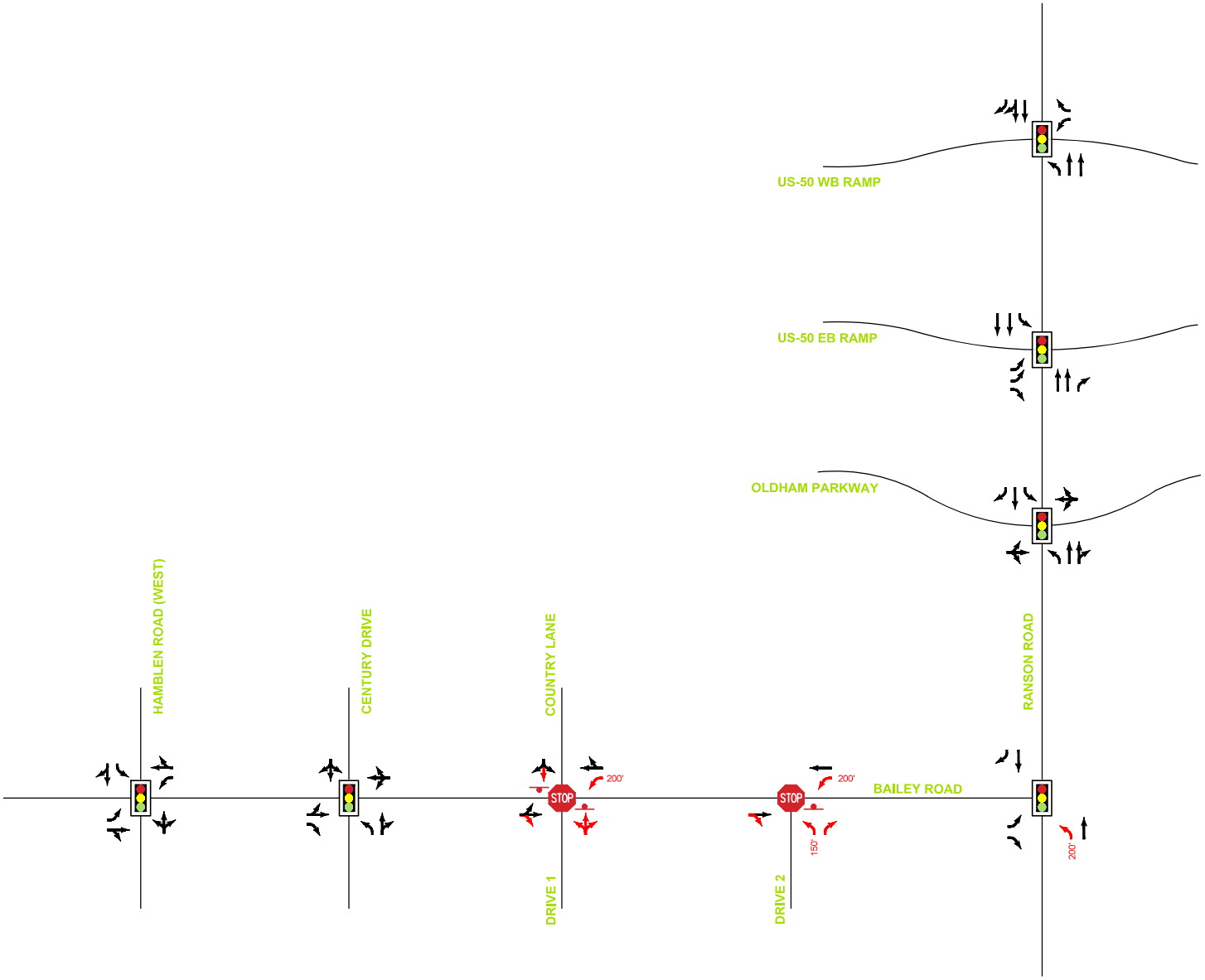
- Southbound left-turn lane with reduced storage at Hamblen Road and Bailey Road
    - Movement is expected to operate at an acceptable level of service (LOS D). The longest expected 95th-percentile queue (229 feet) would be contained within the provided TWLTL.
- Westbound right-turn lane at Hamblen Road and Bailey Road is not provided
    - Movement is expected to operate at an acceptable level of service (LOS B or better). The longest expected 95th-percentile queue (338 feet) would extend to the edge of Fleetway Drive and is minimally impacted by the proposed school.

The existing plus proposed school conditions capacity analysis summary is illustrated in **Figure 11**. Detailed results may be found in **Appendix C**.

FIGURE 10

Existing Plus Proposed School
Lane Configuration and Traffic Control

LSR7 Middle School
Lee's Summit, MO



LEGEND

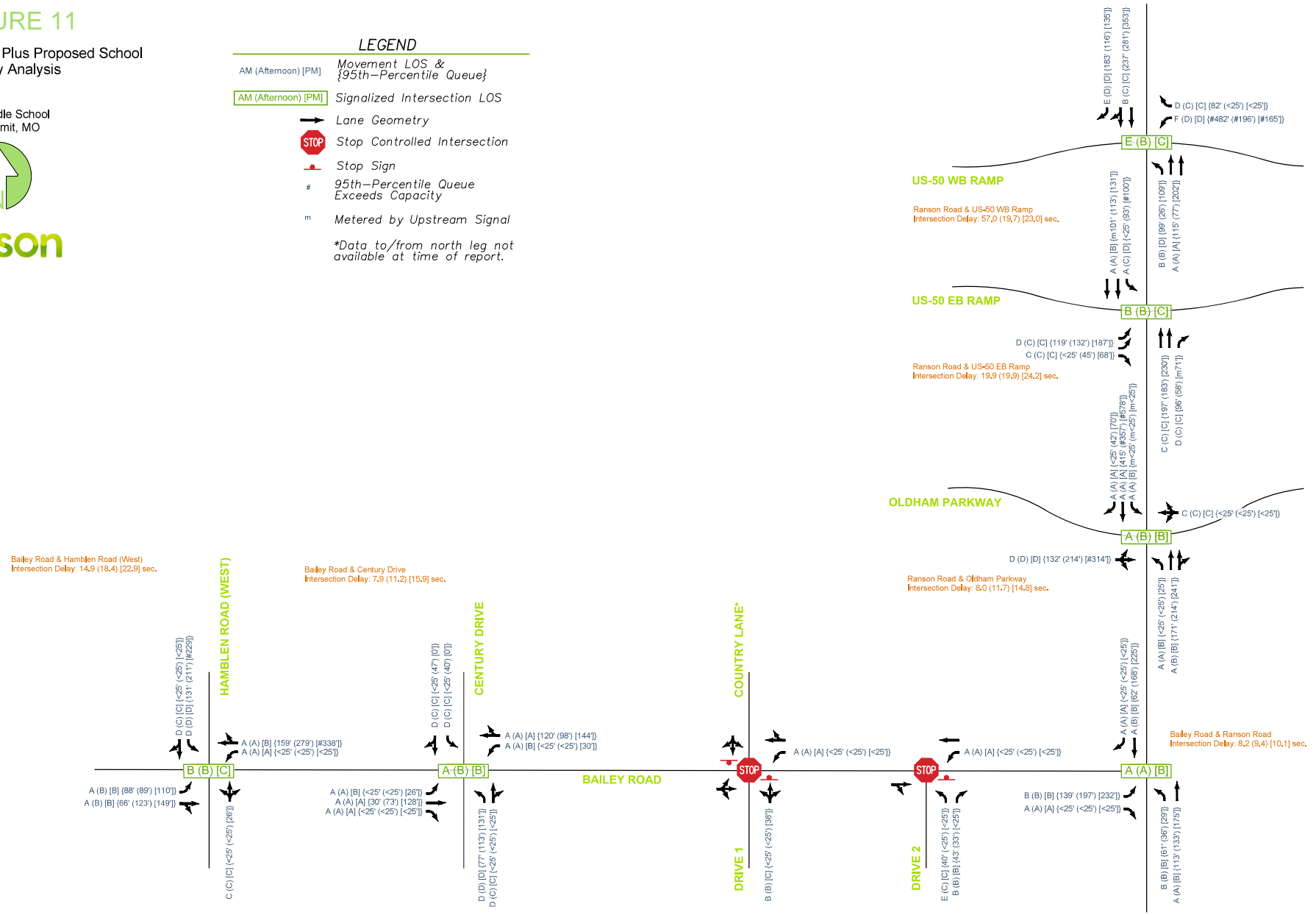
- Lane Configuration
- XX' Proposed Lane Configuration & Storage Length
- Signalized Intersection
- STOP Stop Controlled Intersection
- Stop Sign

FIGURE 11

Existing Plus Proposed School Capacity Analysis

LSR7 Middle School
Lee's Summit, MO

olsson



5. FUTURE PLANNED DEVELOPMENT CONDITIONS

A future residential housing development (referred to as “Bailey Farm”) is expected east of the proposed school. At the time of this report, the site plan for this development was not finalized but is expected to include approximately 300 single-family homes. The site is assumed to utilize two driveways – one located along Bailey Road between Drive 2 and Ranson Road and one located along Ranson Road south of Bailey Road. Additional cross access may be provided to the Cape Drive extension located south of the proposed middle school.

The timeline of the Bailey Farm development was unknown at the time of this report but is expected to occur after the school is in place. This analysis condition was reviewed to determine if the future Bailey Farm development is expected to have a significant impact on the study intersections. Specific access considerations, warrant and capacity analysis was not reviewed for the assumed Bailey Farm development driveways. Additional background growth, other than Bailey Farm trips, was not considered for this scenario.

5.1. Trip Generation and Distribution

To determine the impact of potential Bailey Farm traffic, expected trips associated with the proposed development were generated and applied to the study network using similar methodology described in **Section 4.1**. The land use that most closely resembles the proposed school is Land Use Code 210 (Single Family Detached Housing).

Trip generation characteristics expected for the site are shown in **Table 7**. Detailed ITE and expected trip generation information are provided in **Appendix D.**

Table 7. Proposed Bailey Farm Trip Generation.

Land Use	Size	Average Weekday	AM Peak Hour			Afternoon Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Single Family Detached Housing	300 Dwelling Units	2,748	749	404	345	410	189	221	220	108	112

Trips were distributed through the network based on the existing traffic volume gravity, discussions with City and MoDOT staff, and the surrounding roadway network and land uses. It is assumed that a portion of trips to the school may be generated from the Bailey Farm development if a connection to Cape Drive is provided, thereby reducing trips on Bailey Road. For the purposes of this study, those internal trips were assumed to be insignificant and/or already captured in the middle school trip distribution (which accounted for adjacent homes). Thus, adjustments to school trips were not made for this scenario.

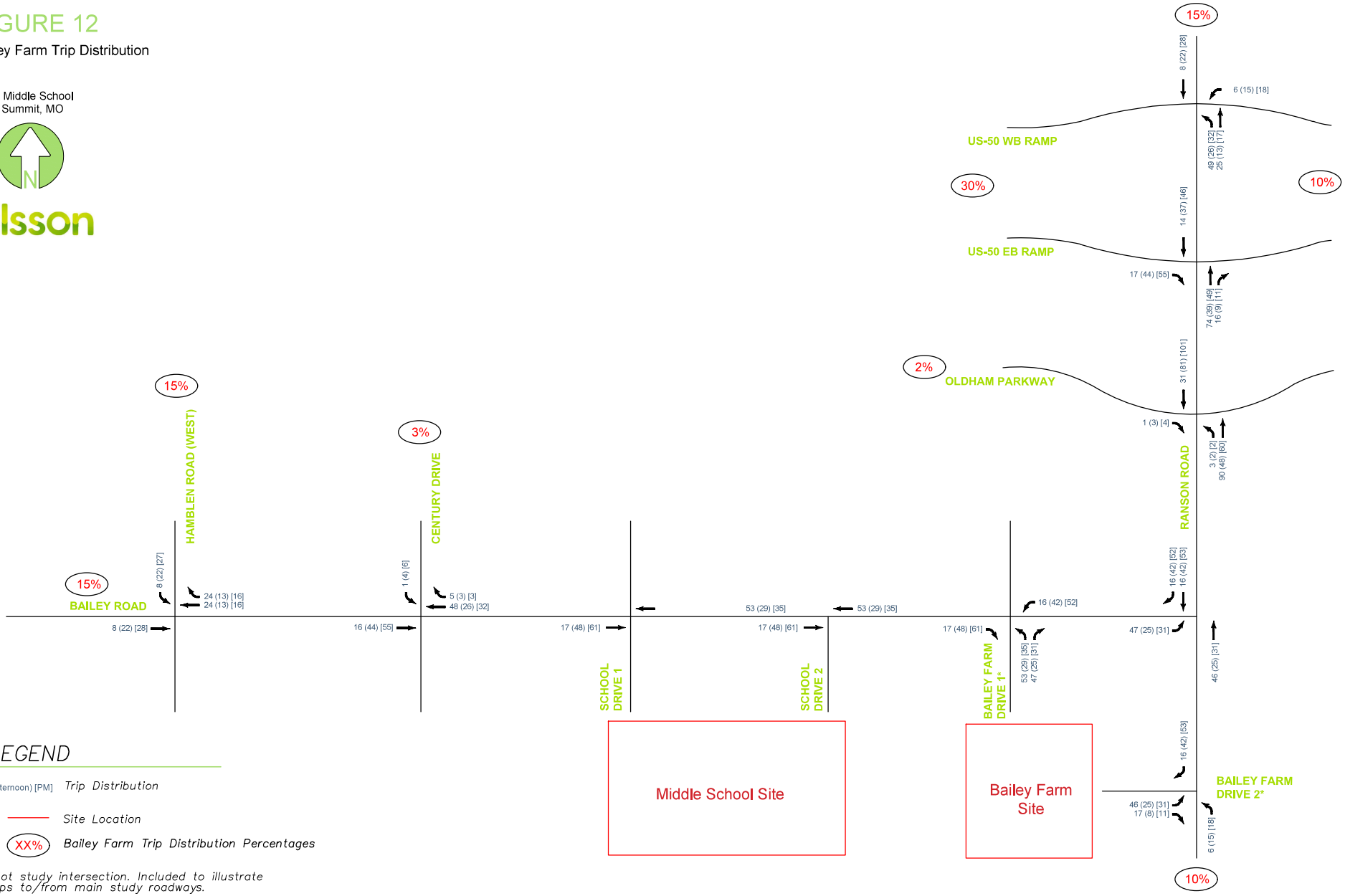
The expected trip distribution for the future Bailey Farm development is shown in **Figure 12**. The resulting future planned development volumes at the study intersections are illustrated in **Figure 13**.

FIGURE 12

Bailey Farm Trip Distribution

LSR7 Middle School
Lee's Summit, MO

olsson



LEGEND

AM (Afternoon) [PM] *Trip Distribution*

Site Location

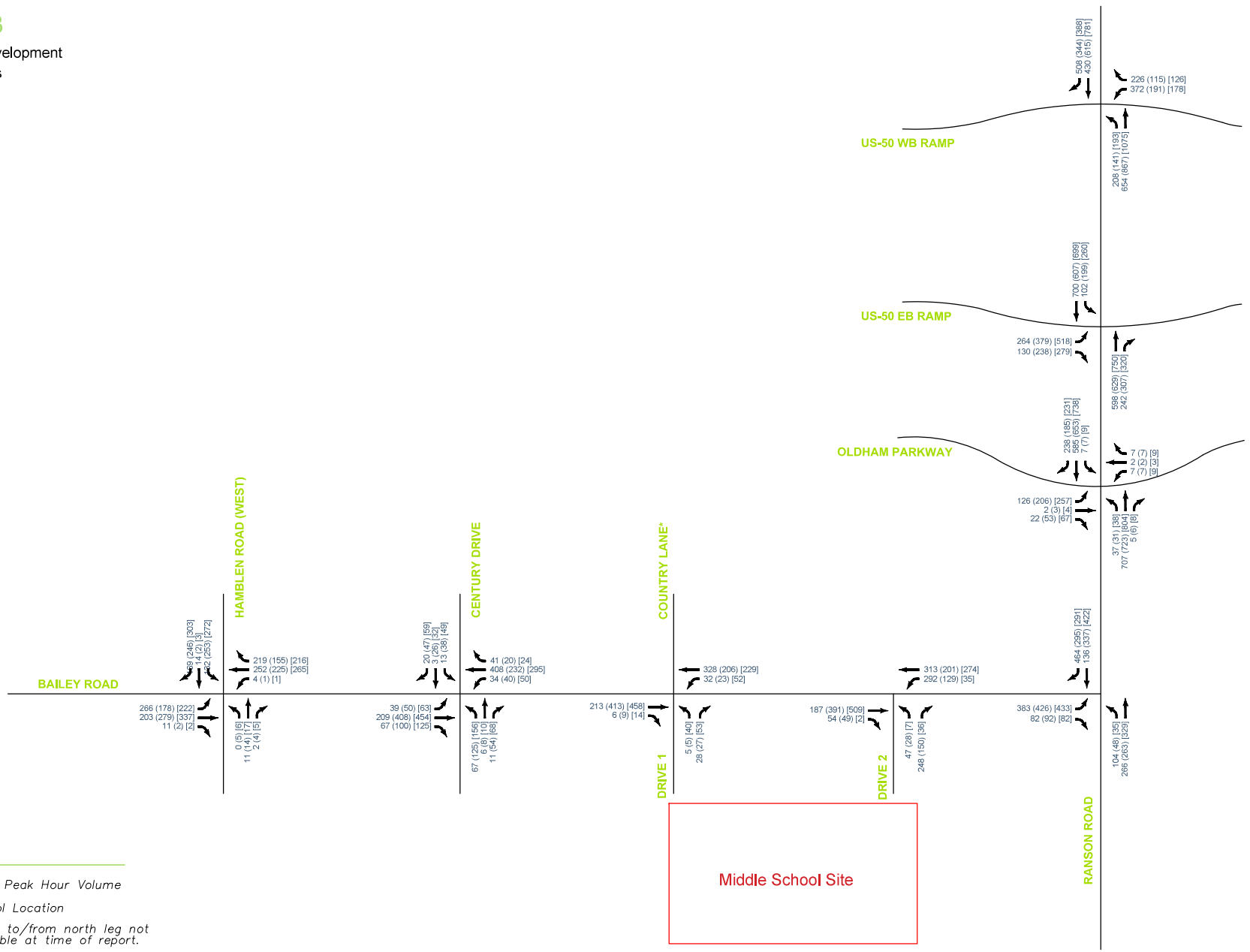
XX% *Bailey Farm Trip Distribution Percentages*

**Not study intersection. Included to illustrate trips to/from main study roadways.*

FIGURE 13

Future Planned Development
Peak Hour Volumes

LSR7 Middle School
Lee's Summit, MO



LEGEND

AM (Afternoon) [PM] Total Peak Hour Volume

School Location

*Data to/from north leg not available at time of report.

5.2. Future Planned Development Warrant Analysis

Warrant analysis was conducted at existing study intersections and proposed school driveways using the same methodology described in **Section 3.2**.

Signal Warrants
Considering future planned development volumes, the intersection of Bailey Road with Drive 1/Country Lane is not expected to meet the criteria for signalization during any peak hour period based on Warrant 3.

Similar to the previous scenario, the intersection of Bailey Road and Drive 2 continues to meet the signal warrant for an intersection with one lane approaches during the AM peak hour. However, as described in **Section 4.3**, a significant portion of the minor street volumes are expected to turn right with minimal conflict with eastbound mainline traffic. Thus, signalization is not recommended at this time.

Signal warrant analysis sheets is provided in **Appendix D**.

Turn Lane Warrants
Considering future planned development volumes, no left or right-turn lanes are expected to be warranted in addition to what was discussed for the previous analysis scenarios.

Capacity and queueing analysis were also reviewed (see **Section 5.3**) to determine if additional turn lanes and/or storage length is recommended based on expected operations. Turn lane warrant worksheets are provided in **Appendix D**. Future planned development conditions lane configurations and traffic control for the study network are illustrated in **Figure 14**.

5.3. Future Planned Development Capacity Analysis

Capacity analysis was performed under future planned development conditions using the methodologies described in **Section 3.3**. The peak hour factors and signal timings utilized under the previous scenario were maintained.

Results of the capacity analysis indicate that signalized study intersections along Bailey Road are expected to operate at an overall LOS C or better, which is considered acceptable based on the City's LOS Policy. Individual movements are expected to operate at a LOS D or better during the three peak hour periods except the southbound left-turn movement at Bailey Road and Hamblen Road, which is expected to operate at a LOS E during the PM peak hour. The expected 95th-percentile queue of 283 feet would be contained within the upstream TWLTL but not extend to the nearest upstream intersection at Fleetway Drive.

Intersections along Ranson Road are expected to operate at a LOS C or better except for Ranson Road and the US-50 Westbound ramps, which is expected to continue operating at a

LOS E during the AM peak hour as described under **Section 4.4**. In general, similar operations are expected for individual movements when compared to the previous scenario with slightly increased delay and queueing.

In addition to an unknown construction timeline, analysis conducted for the purposes of this report is based on assumptions regarding access and proposed density of the Bailey Farms development. Additional improvements are not recommended at this time, but further analysis should be conducted when a final development plan is available.

All movements at the unsignalized study intersections are expected to operate at LOS C or better with acceptable queues with one exception. The northbound left-turn movement at Drive 2 is expected to operate at a LOS F during the AM peak hour and LOS D during the afternoon peak hour. In both cases, the 95th-percentile queue is expected to be less than two vehicles. This is expected to be limited to school peak periods and not have a significant effect on mainline traffic, thus is considered acceptable for proposed conditions.

The future planned development conditions capacity analysis summary is illustrated in **Figure 15**. Detailed results may be found in **Appendix D**.

FIGURE 14

Future Planned Development
Lane Configuration and Traffic Control

LSR7 Middle School
Lee's Summit, MO

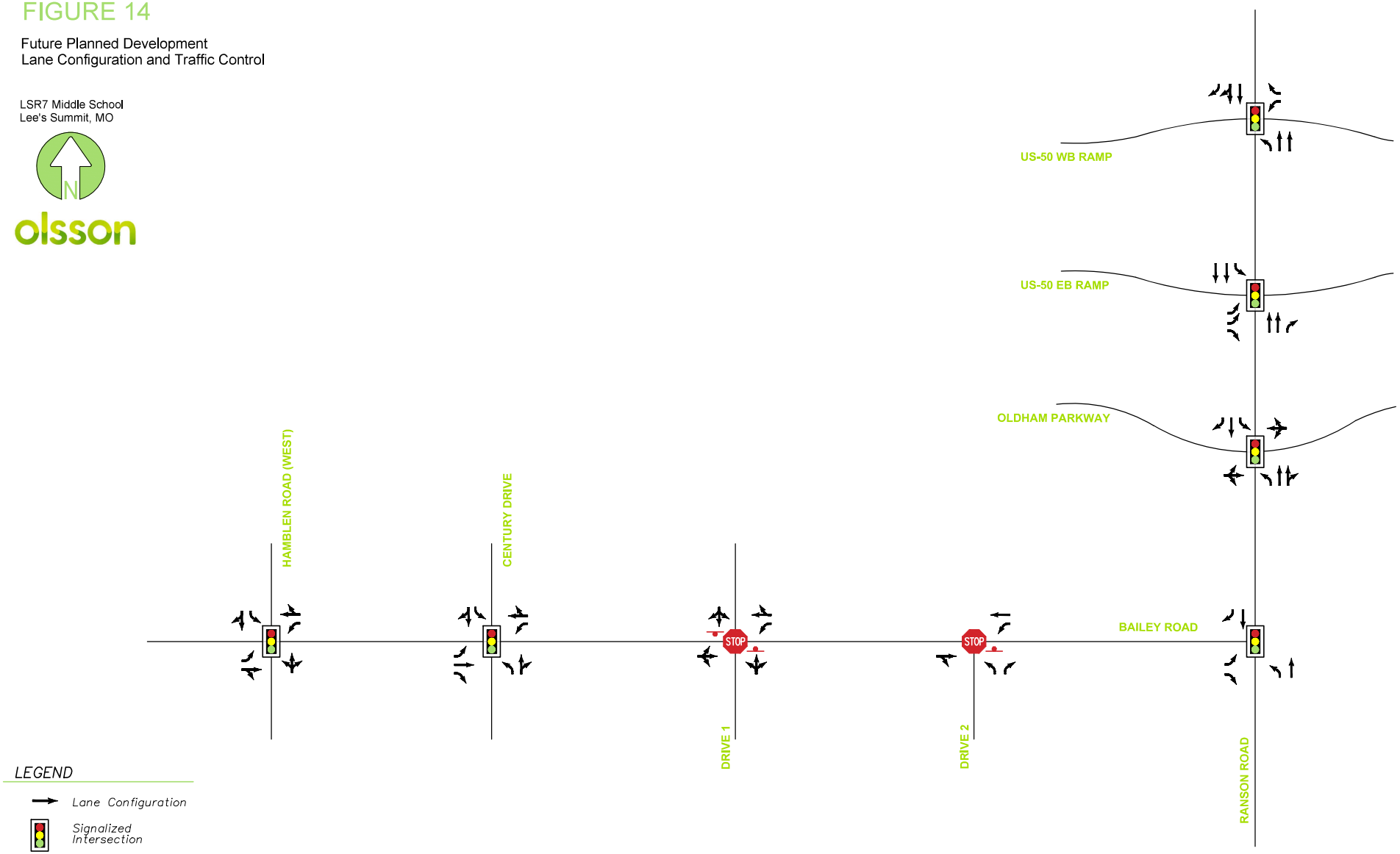
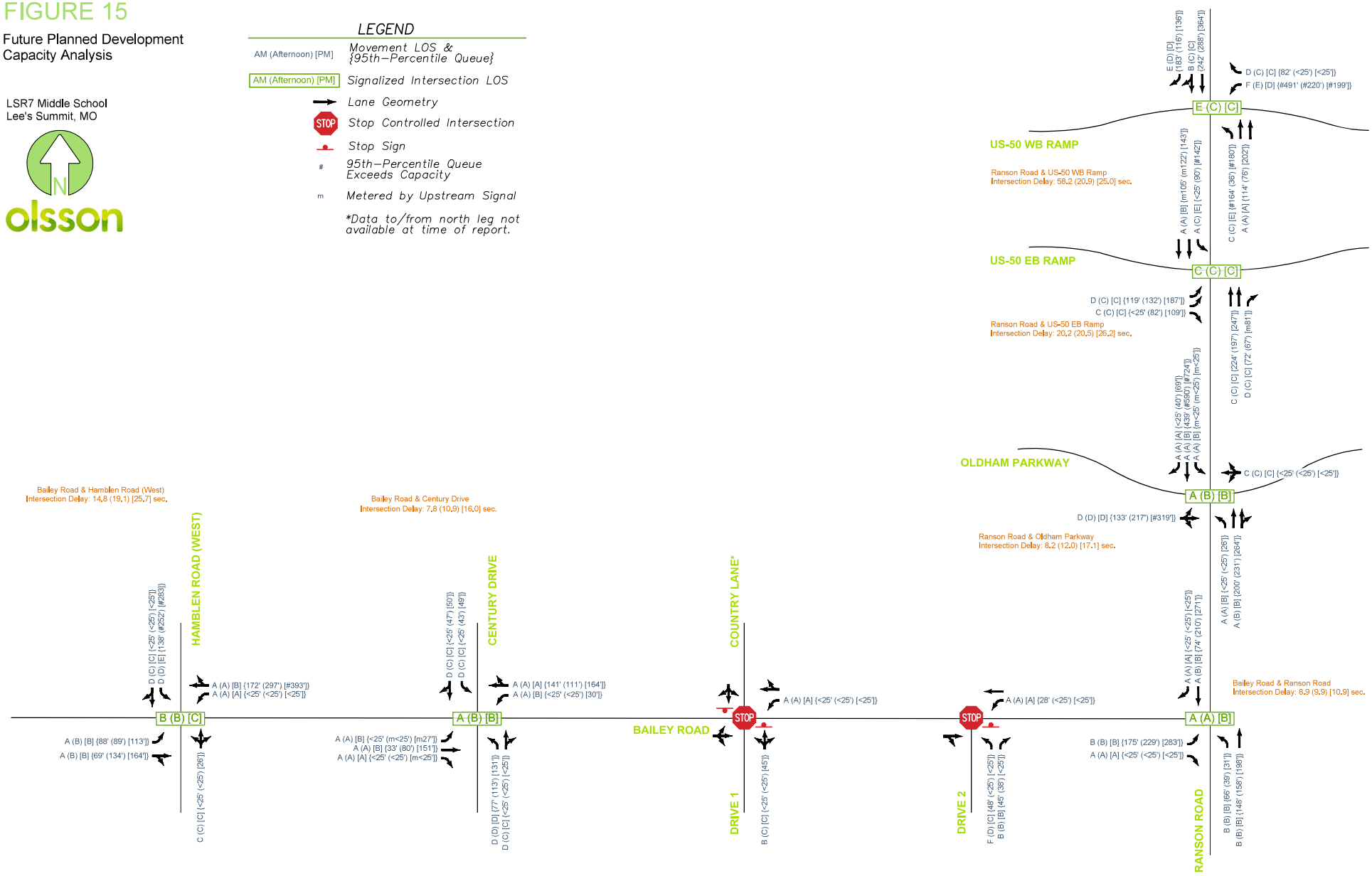


FIGURE 15

Future Planned Development
Capacity Analysis

LSR7 Middle School
Lee's Summit, MO

olsson



6. SUMMARY

The purpose of this study was to summarize traffic impacts regarding a proposed middle school located south of Bailey Road and west of Ranson Road in Lee's Summit, Missouri.

6.1. Conclusions

The general findings of note for the traffic impact study include:

1. In addition to the proposed school, the analysis scenarios considered approved (Culver's and Princeton senior living) and planned (Bailey Farm) developments in the surrounding area. Planned infrastructure improvements considered in this study included signal and turn lane installations at the intersections of Hamblen Road with Bailey Road and Ranson Road and Oldham Parkway.
2. Several signal and lane warrants are met under existing conditions. It was also noted that some existing turn lanes are provided with reduced storage. Existing intersection/turn lane warrant deficiencies that also have poor operations were addressed; recommendations to improve these existing conditions are listed in the next section.
3. Queueing in the north/south direction and at the westbound off-ramp was observed at the US-50 Interchange under existing conditions and is expected to continue under subsequent analysis conditions. With diamond interchange configurations, queuing between closely spaced signalized intersections, including adjacent outer road signals, is not uncommon during peak hour periods as higher ramp and crossroad volumes are serviced. An additional westbound left-turn lane was considered to address existing poor operations but would introduce a potential weaving condition without significant roadway modifications/widening along Ranson Road. A more comprehensive review of the existing interchange/outer road design or signal re-timing (considering adjacent non-study coordinated intersections) may be needed for this location.

6.2. Recommendations

Based on review and analysis of the study area, the following action items are recommended:

<u>Existing Conditions</u>

Ranson Road and Bailey Road

1. Install a traffic signal.
2. Install eastbound and southbound right-turn lanes with a storage length of 200 feet plus taper.

Ranson Road and US-50 Eastbound Ramps

3. Install a continuous northbound right-turn lane between the south ramp terminal and the intersection with Oldham Parkway (no taper)

Century Drive and Bailey Road:

4. Install a traffic signal with interconnect to allow for coordination with the planned signal approximately 0.25 mi to the west at Hamblen Road.
5. If a traffic signal is installed, install left-turn lanes with a storage length of 250 feet plus taper eastbound/westbound and 150 feet plus taper southbound resulting in left-turn lanes in all four approaches.

Existing Plus Development Conditions

Ranson Road and Bailey Road

1. Install a northbound left-turn lane with a storage of 200 feet plus taper.

Bailey Road and School Driveways

2. Coordinate potential pedestrian/bicycle needs with the City to ensure that the proposed access points accommodate the potential planned off-street path along Bailey Road and crossing maneuvers, if necessary.
3. Verify sight distance at both proposed driveways, especially considering the hill west of Drive 1.
4. Consider a school zone speed limit during school arrival/dismissal period.
5. Install a westbound left-turn lane at Drive 1 with a storage of 200 feet plus taper.
6. Install a westbound left-turn lane at Drive 2 with a storage of 200 feet plus taper.
7. Construct Drive 2 with a width of 42 feet (measured from back-of-curb) with one 14-foot entering lane and two 12-foot exiting lanes (150-foot storage plus taper) to meet City AMC requirements.

APPENDIX A

Data Collection

Count Data

Ranson Road (Route RA) @ US-50 EB ramp - TMC
Tue Apr 7, 2020
Full Length (7 AM-9 AM, 3 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761919, Location: 38.901279, -94.339856

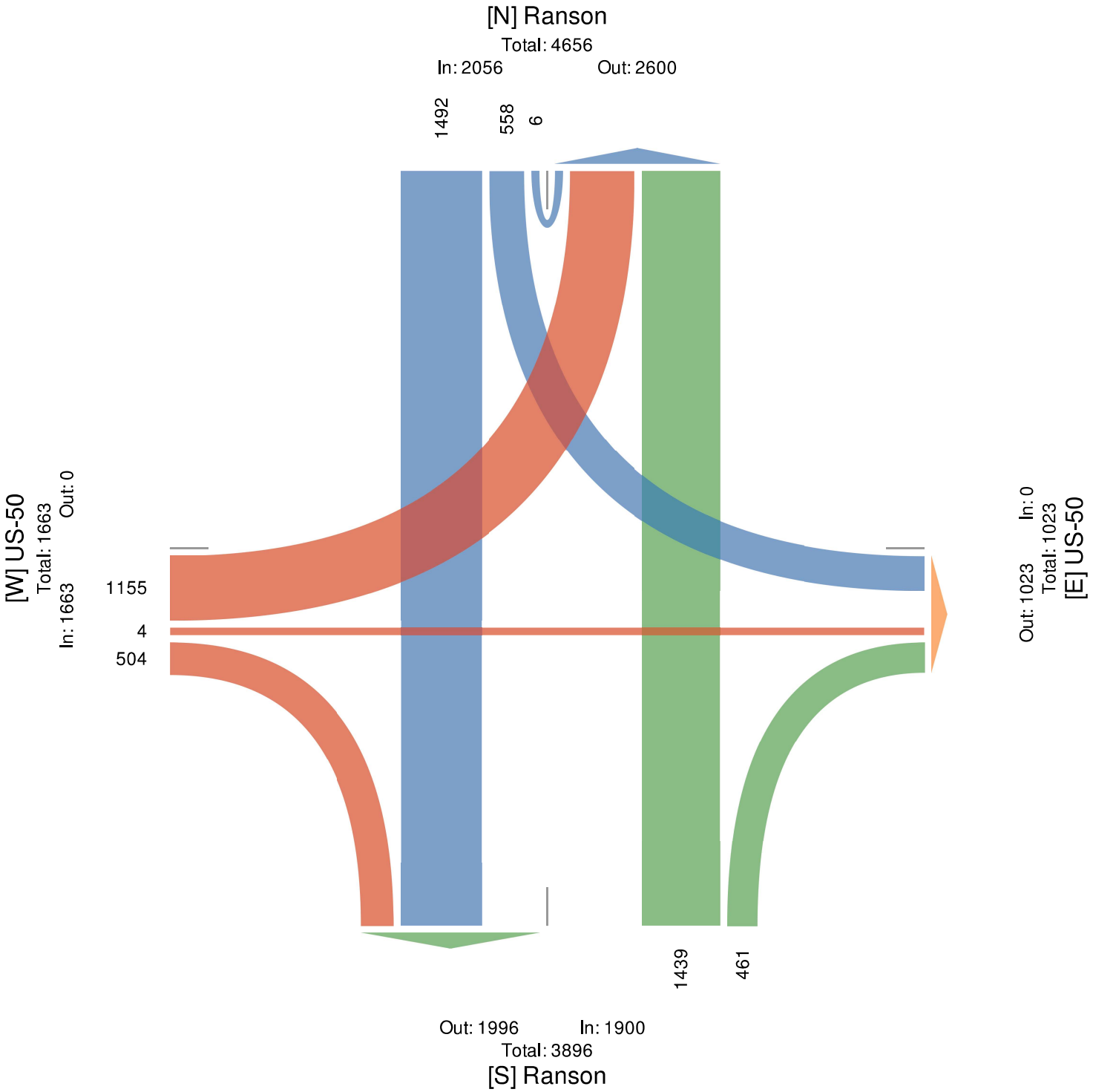
GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	US-50				Ranson				Ranson				
Direction	Eastbound				Northbound				Southbound				
Time	L	T	R	App	T	R	U	App	L	T	U	App	Int
2020-04-07 7:00AM	31	0	14	**45**	46	11	0	**57**	9	40	0	**49**	**151**
7:15AM	36	0	7	**43**	55	7	0	**62**	17	41	0	**58**	**163**
7:30AM	31	1	8	**40**	36	5	0	**41**	15	55	0	**70**	**151**
7:45AM	36	0	10	**46**	61	9	0	**70**	8	84	0	**92**	**208**
Hourly Total	134	1	39	**174**	198	32	0	**230**	49	220	0	**269**	**673**
8:00AM	38	0	18	**56**	44	13	0	**57**	12	51	0	**63**	**176**
8:15AM	27	0	14	**41**	41	8	0	**49**	16	58	0	**74**	**164**
8:30AM	19	0	12	**31**	35	15	0	**50**	14	51	0	**65**	**146**
8:45AM	42	0	11	**53**	54	7	0	**61**	8	55	1	**64**	**178**
Hourly Total	126	0	55	**181**	174	43	0	**217**	50	215	1	**266**	**664**
3:00PM	50	0	25	**75**	60	22	0	**82**	27	65	1	**93**	**250**
3:15PM	59	0	36	**95**	76	27	0	**103**	38	89	1	**128**	**326**
3:30PM	68	1	36	**105**	65	32	0	**97**	37	82	1	**120**	**322**
3:45PM	81	0	29	**110**	83	28	0	**111**	34	81	0	**115**	**336**
Hourly Total	258	1	126	**385**	284	109	0	**393**	136	317	3	**456**	**1234**
4:00PM	68	0	19	**87**	89	43	0	**132**	41	103	0	**144**	**363**
4:15PM	82	0	48	**130**	99	25	0	**124**	34	77	1	**112**	**366**
4:30PM	67	0	32	**99**	94	41	0	**135**	37	109	1	**147**	**381**
4:45PM	101	0	37	**138**	94	47	0	**141**	37	110	0	**147**	**426**
Hourly Total	318	0	136	**454**	376	156	0	**532**	149	399	2	**550**	**1536**
5:00PM	100	1	40	**141**	105	50	0	**155**	49	82	0	**131**	**427**
5:15PM	82	1	39	**122**	109	19	0	**128**	53	100	0	**153**	**403**
5:30PM	72	0	37	**109**	104	29	0	**133**	39	80	0	**119**	**361**
5:45PM	65	0	32	**97**	89	23	0	**112**	33	79	0	**112**	**321**
Hourly Total	319	2	148	**469**	407	121	0	**528**	174	341	0	**515**	**1512**
Total	1155	4	504	**1663**	1439	461	0	**1900**	558	1492	6	**2056**	**5619**
% Approach	69.5%	0.2%	30.3%	**-**	75.7%	24.3%	0%	**-**	27.1%	72.6%	0.3%	**-**	-
% Total	20.6%	0.1%	9.0%	**29.6%**	25.6%	8.2%	0%	**33.8%**	9.9%	26.6%	0.1%	**36.6%**	-
Lights	1126	4	490	**1620**	1415	438	0	**1853**	550	1456	6	**2012**	5485
% Lights	97.5%	100%	97.2%	**97.4%**	98.3%	95.0%	0%	**97.5%**	98.6%	97.6%	100%	**97.9%**	97.6%
Articulated Trucks	6	0	3	**9**	6	2	0	**8**	1	4	0	**5**	22
% Articulated Trucks	0.5%	0%	0.6%	**0.5%**	0.4%	0.4%	0%	**0.4%**	0.2%	0.3%	0%	**0.2%**	0.4%
Buses and Single-Unit Trucks	23	0	11	**34**	18	21	0	**39**	7	32	0	**39**	112
% Buses and Single-Unit Trucks	2.0%	0%	2.2%	**2.0%**	1.3%	4.6%	0%	**2.1%**	1.3%	2.1%	0%	**1.9%**	2.0%

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

Ranson Road (Route RA) @ US-50 EB ramp - TMC
Tue Apr 7, 2020
Full Length (7 AM-9 AM, 3 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761919, Location: 38.901279, -94.339856

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



Ranson Road (Route RA) @ US-50 EB ramp - TMC
Tue Apr 7, 2020
AM Peak (7:30 AM - 8:30 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761919, Location: 38.901279, -94.339856

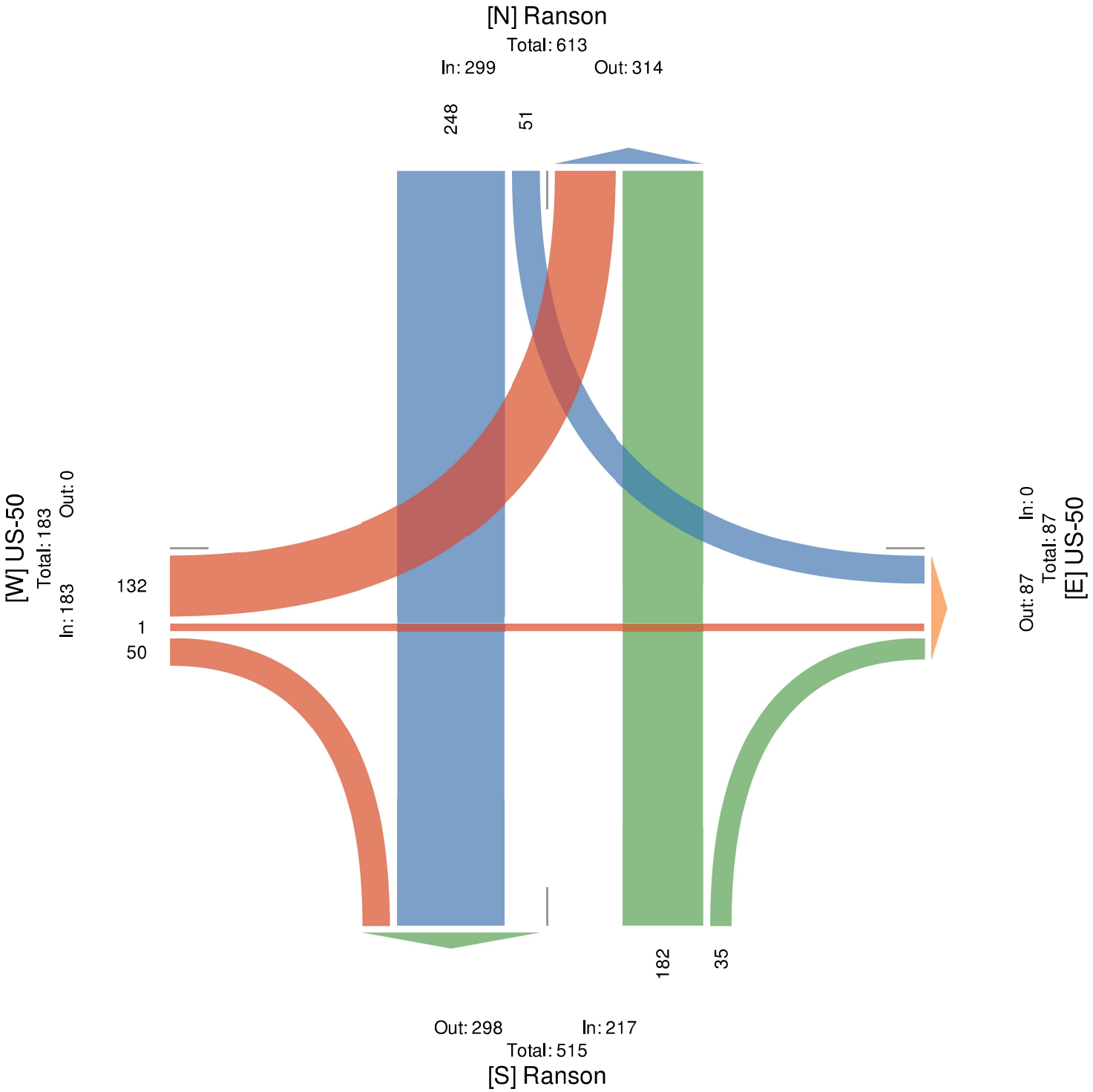
GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	US-50				Ranson				Ranson				
Direction	Eastbound				Northbound				Southbound				
Time	L	T	R	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2020-04-07 7:30AM	31	1	8	**40**	36	5	0	**41**	15	55	0	**70**	**151**
7:45AM	36	0	10	**46**	61	9	0	**70**	8	84	0	**92**	**208**
8:00AM	38	0	18	**56**	44	13	0	**57**	12	51	0	**63**	**176**
8:15AM	27	0	14	**41**	41	8	0	**49**	16	58	0	**74**	**164**
Total	132	1	50	**183**	182	35	0	**217**	51	248	0	**299**	**699**
% Approach	72.1%	0.5%	27.3%	-	83.9%	16.1%	0%	-	17.1%	82.9%	0%	-	-
% Total	18.9%	0.1%	7.2%	**26.2%**	26.0%	5.0%	0%	**31.0%**	7.3%	35.5%	0%	**42.8%**	-
PHF	0.868	0.250	0.694	**0.817**	0.746	0.673	-	**0.775**	0.797	0.738	-	**0.813**	0.840
Lights	124	1	47	**172**	177	34	0	**211**	48	241	0	**289**	672
% Lights	93.9%	100%	94.0%	**94.0%**	97.3%	97.1%	0%	**97.2%**	94.1%	97.2%	0%	**96.7%**	96.1%
Articulated Trucks	2	0	0	**2**	2	0	0	**2**	0	2	0	**2**	6
% Articulated Trucks	1.5%	0%	0%	**1.1%**	1.1%	0%	0%	**0.9%**	0%	0.8%	0%	**0.7%**	0.9%
Buses and Single-Unit Trucks	6	0	3	**9**	3	1	0	**4**	3	5	0	**8**	21
% Buses and Single-Unit Trucks	4.5%	0%	6.0%	**4.9%**	1.6%	2.9%	0%	**1.8%**	5.9%	2.0%	0%	**2.7%**	3.0%

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

Ranson Road (Route RA) @ US-50 EB ramp - TMC
Tue Apr 7, 2020
AM Peak (7:30 AM - 8:30 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761919, Location: 38.901279, -94.339856

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



Ranson Road (Route RA) @ US-50 EB ramp - TMC
Tue Apr 7, 2020
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761919, Location: 38.901279, -94.339856

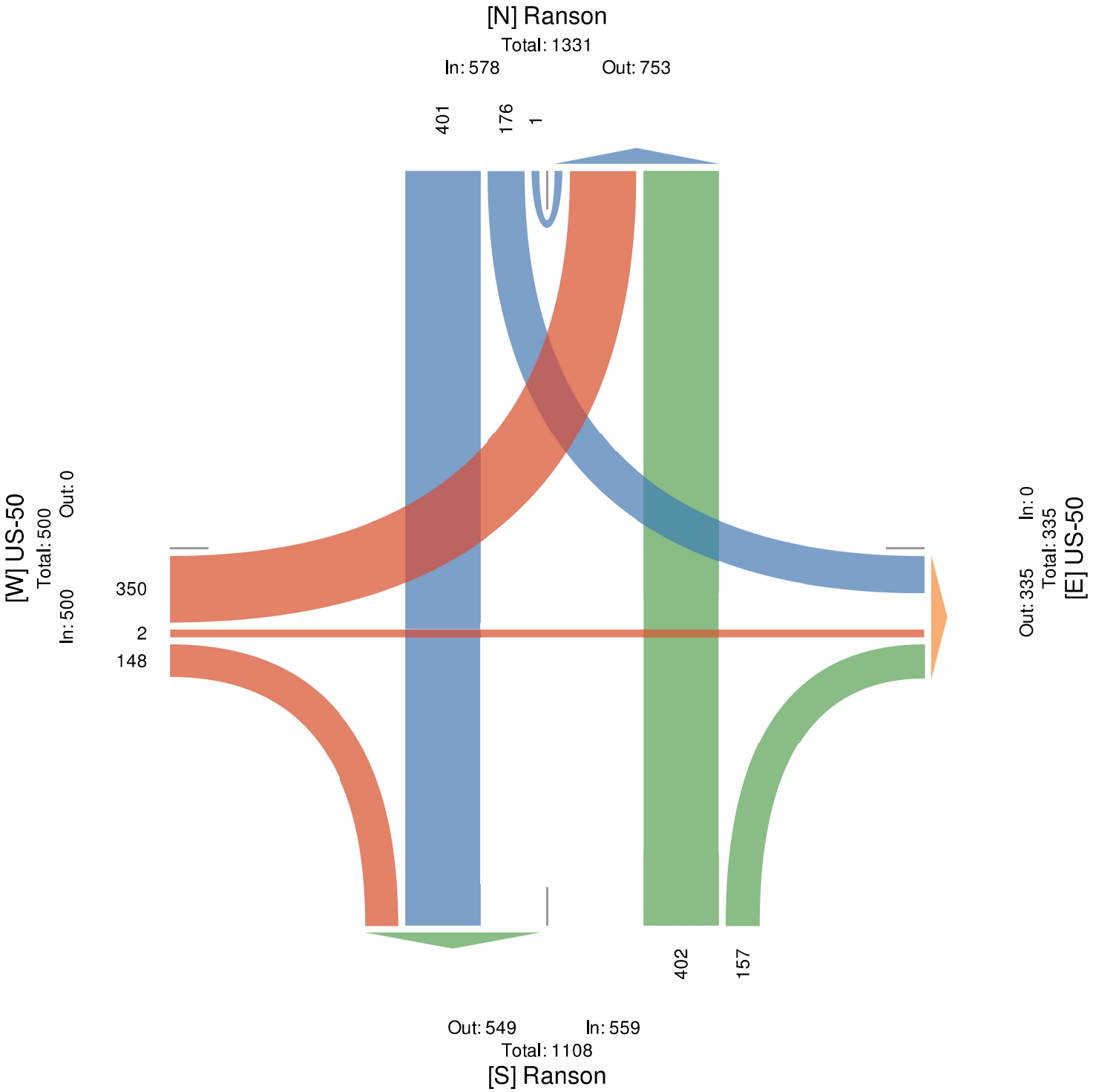
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	US-50				Ranson				Ranson				
Direction	Eastbound				Northbound				Southbound				
Time	L	T	R	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2020-04-07 4:30PM	67	0	32	**99**	94	41	0	**135**	37	109	1	**147**	**381**
4:45PM	101	0	37	**138**	94	47	0	**141**	37	110	0	**147**	**426**
5:00PM	100	1	40	**141**	105	50	0	**155**	49	82	0	**131**	**427**
5:15PM	82	1	39	**122**	109	19	0	**128**	53	100	0	**153**	**403**
Total	350	2	148	**500**	402	157	0	**559**	176	401	1	**578**	**1637**
% Approach	70.0%	0.4%	29.6%	-	71.9%	28.1%	0%	-	30.4%	69.4%	0.2%	-	-
% Total	21.4%	0.1%	9.0%	**30.5%**	24.6%	9.6%	0%	**34.1%**	10.8%	24.5%	0.1%	**35.3%**	-
PHF	0.866	0.500	0.925	**0.887**	0.922	0.785	-	**0.902**	0.830	0.911	0.250	**0.944**	0.958
Lights	347	2	146	**495**	398	151	0	**549**	176	393	1	**570**	1614
% Lights	99.1%	100%	98.6%	**99.0%**	99.0%	96.2%	0%	**98.2%**	100%	98.0%	100%	**98.6%**	98.6%
Articulated Trucks	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%
Buses and Single-Unit Trucks	3	0	2	**5**	4	6	0	**10**	0	8	0	**8**	23
% Buses and Single-Unit Trucks	0.9%	0%	1.4%	**1.0%**	1.0%	3.8%	0%	**1.8%**	0%	2.0%	0%	**1.4%**	1.4%

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

Ranson Road (Route RA) @ US-50 EB ramp - TMC
Tue Apr 7, 2020
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761919, Location: 38.901279, -94.339856

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



Ranson Road/Todd George Parkway @ US-50 WB R... - TMC
Tue Apr 7, 2020
Full Length (7 AM-9 AM, 3 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761917, Location: 38.903096, -94.339792

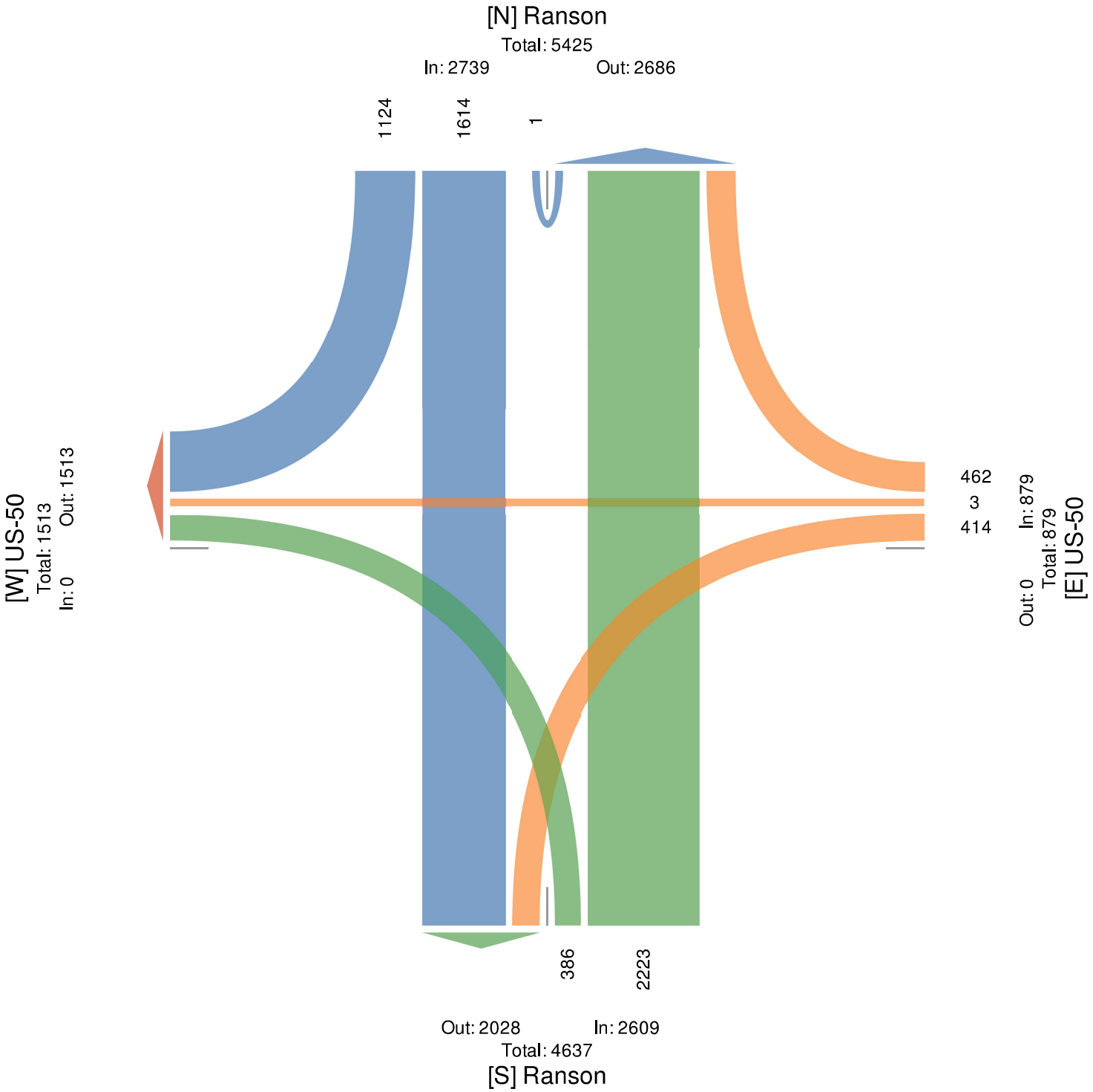
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	US-50				Ranson				Ranson				
Direction	Westbound				Northbound				Southbound				
Time	L	T	R	**App**	L	T	U	**App**	T	R	U	**App**	**Int**
2020-04-07 7:00AM	18	0	29	**47**	14	61	0	**75**	33	50	0	**83**	**205**
7:15AM	14	0	27	**41**	18	73	0	**91**	42	67	0	**109**	**241**
7:30AM	25	0	37	**62**	13	54	0	**67**	45	76	0	**121**	**250**
7:45AM	43	0	28	**71**	17	78	0	**95**	52	51	0	**103**	**269**
Hourly Total	100	0	121	**221**	62	266	0	**328**	172	244	0	**416**	**965**
8:00AM	21	0	21	**42**	17	63	0	**80**	42	60	0	**102**	**224**
8:15AM	22	0	14	**36**	17	52	0	**69**	52	47	0	**99**	**204**
8:30AM	24	0	22	**46**	9	46	0	**55**	40	52	0	**92**	**193**
8:45AM	19	0	19	**38**	15	79	0	**94**	42	41	0	**83**	**215**
Hourly Total	86	0	76	**162**	58	240	0	**298**	176	200	0	**376**	**836**
3:00PM	16	0	14	**30**	17	98	0	**115**	76	71	1	**148**	**293**
3:15PM	20	0	18	**38**	13	123	0	**136**	99	58	0	**157**	**331**
3:30PM	16	0	17	**33**	13	108	0	**121**	102	53	0	**155**	**309**
3:45PM	15	0	28	**43**	19	158	0	**177**	99	47	0	**146**	**366**
Hourly Total	67	0	77	**144**	62	487	0	**549**	376	229	1	**606**	**1299**
4:00PM	25	0	27	**52**	20	132	0	**152**	119	51	0	**170**	**374**
4:15PM	20	1	31	**52**	30	161	0	**191**	88	50	0	**138**	**381**
4:30PM	23	0	25	**48**	29	131	0	**160**	121	82	0	**203**	**411**
4:45PM	19	1	24	**44**	21	174	0	**195**	125	67	0	**192**	**431**
Hourly Total	87	2	107	**196**	100	598	0	**698**	453	250	0	**703**	**1597**
5:00PM	13	0	13	**26**	28	181	0	**209**	117	50	0	**167**	**402**
5:15PM	23	1	22	**46**	20	171	0	**191**	130	61	0	**191**	**428**
5:30PM	16	0	21	**37**	33	144	0	**177**	103	49	0	**152**	**366**
5:45PM	22	0	25	**47**	23	136	0	**159**	87	41	0	**128**	**334**
Hourly Total	74	1	81	**156**	104	632	0	**736**	437	201	0	**638**	**1530**
Total	414	3	462	**879**	386	2223	0	**2609**	1614	1124	1	**2739**	**6227**
% Approach	47.1%	0.3%	52.6%	**-**	14.8%	85.2%	0%	**-**	58.9%	41.0%	0%	**-**	-
% Total	6.6%	0%	7.4%	**14.1%**	6.2%	35.7%	0%	**41.9%**	25.9%	18.1%	0%	**44.0%**	-
Lights	388	3	457	**848**	374	2180	0	**2554**	1603	1106	1	**2710**	6112
% Lights	93.7%	100%	98.9%	**96.5%**	96.9%	98.1%	0%	**97.9%**	99.3%	98.4%	100%	**98.9%**	98.2%
Articulated Trucks	3	0	1	**4**	4	6	0	**10**	2	5	0	**7**	21
% Articulated Trucks	0.7%	0%	0.2%	**0.5%**	1.0%	0.3%	0%	**0.4%**	0.1%	0.4%	0%	**0.3%**	0.3%
Buses and Single-Unit Trucks	23	0	4	**27**	8	37	0	**45**	9	13	0	**22**	94
% Buses and Single-Unit Trucks	5.6%	0%	0.9%	**3.1%**	2.1%	1.7%	0%	**1.7%**	0.6%	1.2%	0%	**0.8%**	1.5%

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

Ranson Road/Todd George Parkway @ US-50 WB R... - TMC
Tue Apr 7, 2020
Full Length (7 AM-9 AM, 3 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761917, Location: 38.903096, -94.339792

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



Ranson Road/Todd George Parkway @ US-50 WB R... - TMC
Tue Apr 7, 2020
AM Peak (7:15 AM - 8:15 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761917, Location: 38.903096, -94.339792

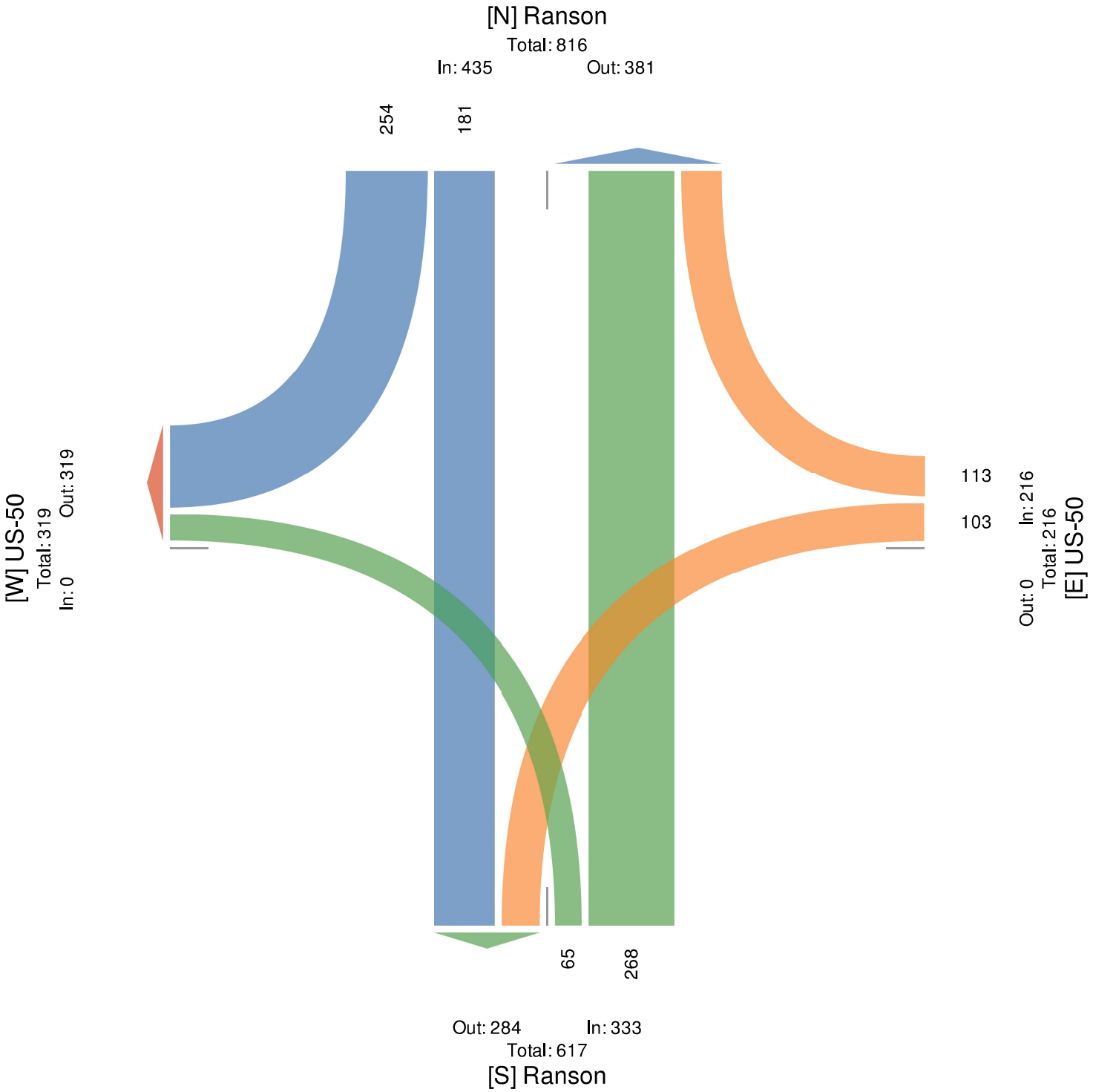
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	US-50 Westbound				Ranson Northbound				Ranson Southbound				
Time	L	T	R	**App**	L	T	U	**App**	T	R	U	**App**	**Int**
2020-04-07 7:15AM	14	0	27	**41**	18	73	0	**91**	42	67	0	**109**	**241**
7:30AM	25	0	37	**62**	13	54	0	**67**	45	76	0	**121**	**250**
7:45AM	43	0	28	**71**	17	78	0	**95**	52	51	0	**103**	**269**
8:00AM	21	0	21	**42**	17	63	0	**80**	42	60	0	**102**	**224**
Total	103	0	113	**216**	65	268	0	**333**	181	254	0	**435**	**984**
% Approach	47.7%	0%	52.3%	-	19.5%	80.5%	0%	-	41.6%	58.4%	0%	-	-
% Total	10.5%	0%	11.5%	**22.0%**	6.6%	27.2%	0%	**33.8%**	18.4%	25.8%	0%	**44.2%**	-
PHF	0.599	-	0.764	**0.761**	0.903	0.859	-	**0.876**	0.870	0.836	-	**0.899**	0.914
Lights	100	0	111	**211**	62	255	0	**317**	181	250	0	**431**	959
% Lights	97.1%	0%	98.2%	**97.7%**	95.4%	95.1%	0%	**95.2%**	100%	98.4%	0%	**99.1%**	97.5%
Articulated Trucks	1	0	0	**1**	2	3	0	**5**	0	1	0	**1**	7
% Articulated Trucks	1.0%	0%	0%	**0.5%**	3.1%	1.1%	0%	**1.5%**	0%	0.4%	0%	**0.2%**	0.7%
Buses and Single-Unit Trucks	2	0	2	**4**	1	10	0	**11**	0	3	0	**3**	18
% Buses and Single-Unit Trucks	1.9%	0%	1.8%	**1.9%**	1.5%	3.7%	0%	**3.3%**	0%	1.2%	0%	**0.7%**	1.8%

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

Ranson Road/Todd George Parkway @ US-50 WB R... - TMC
Tue Apr 7, 2020
AM Peak (7:15 AM - 8:15 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761917, Location: 38.903096, -94.339792

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



Ranson Road/Todd George Parkway @ US-50 WB R... - TMC
Tue Apr 7, 2020
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761917, Location: 38.903096, -94.339792

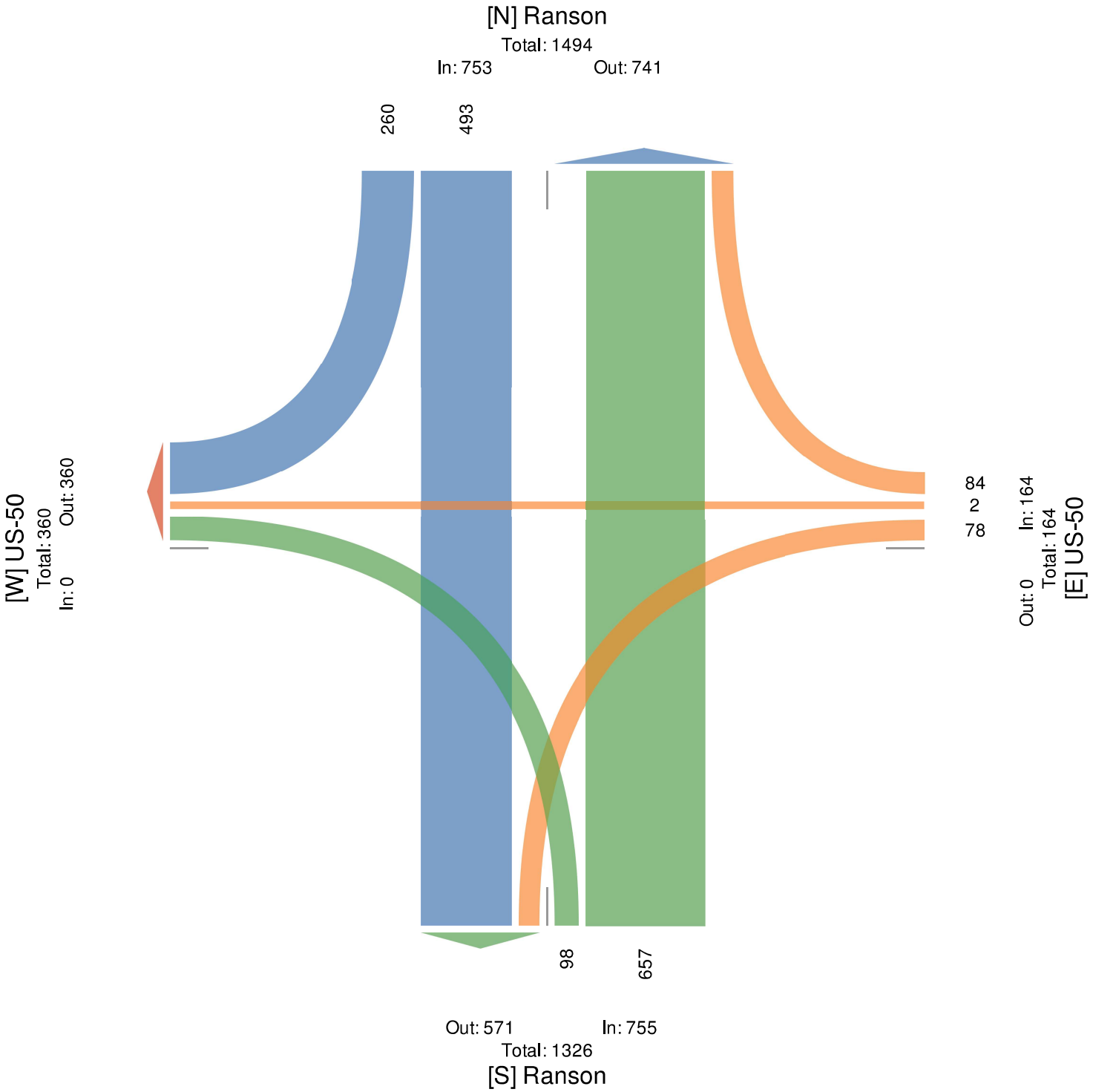
GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	US-50				Ranson				Ranson				
Direction	Westbound				Northbound				Southbound				
Time	L	T	R	**App**	L	T	U	**App**	T	R	U	**App**	**Int**
2020-04-07 4:30PM	23	0	25	**48**	29	131	0	**160**	121	82	0	**203**	**411**
4:45PM	19	1	24	**44**	21	174	0	**195**	125	67	0	**192**	**431**
5:00PM	13	0	13	**26**	28	181	0	**209**	117	50	0	**167**	**402**
5:15PM	23	1	22	**46**	20	171	0	**191**	130	61	0	**191**	**428**
Total	78	2	84	**164**	98	657	0	**755**	493	260	0	**753**	**1672**
% Approach	47.6%	1.2%	51.2%	-	13.0%	87.0%	0%	-	65.5%	34.5%	0%	-	-
% Total	4.7%	0.1%	5.0%	**9.8%**	5.9%	39.3%	0%	**45.2%**	29.5%	15.6%	0%	**45.0%**	-
PHF	0.848	0.500	0.840	**0.854**	0.845	0.907	-	**0.903**	0.948	0.793	-	**0.927**	0.970
Lights	71	2	83	**156**	96	651	0	**747**	491	256	0	**747**	1650
% Lights	91.0%	100%	98.8%	**95.1%**	98.0%	99.1%	0%	**98.9%**	99.6%	98.5%	0%	**99.2%**	98.7%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	1	2	0	**3**	3
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0.2%	0.8%	0%	**0.4%**	0.2%
Buses and Single-Unit Trucks	7	0	1	**8**	2	6	0	**8**	1	2	0	**3**	19
% Buses and Single-Unit Trucks	9.0%	0%	1.2%	**4.9%**	2.0%	0.9%	0%	**1.1%**	0.2%	0.8%	0%	**0.4%**	1.1%

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

Ranson Road/Todd George Parkway @ US-50 WB R... - TMC
Tue Apr 7, 2020
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 761917, Location: 38.903096, -94.339792

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



Your Company Name Here

This is your address
Your City, State, Zip Code
Your Tagline Here

Default Comments
Change These in The Preferences Window
Select File/Preference in the Main Scree
Then Click the Comments Tab

File Name : BaHa051419
Site Code : 00000000
Start Date : 5/14/2019

Groups Printed- Unshifted

	SE Hamblen Road From North					SE Bailey Road From East					Private Drive From South					SE Bailey Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	27	10	16	0	53	37	52	5	0	94	0	0	0	0	0	1	20	29	0	50	197
07:15 AM	43	9	20	0	72	43	60	2	0	105	0	2	0	0	2	7	45	68	0	120	299
07:30 AM	38	2	31	1	72	48	49	0	0	97	0	0	0	0	0	2	46	62	0	110	279
07:45 AM	45	2	30	0	77	37	42	1	0	80	2	3	0	0	5	1	37	80	0	118	280
Total	153	23	97	1	274	165	203	8	0	376	2	5	0	0	7	11	148	239	0	398	1055
08:00 AM	43	1	23	0	67	35	27	1	0	63	0	6	0	0	6	1	27	56	0	84	220
08:15 AM	45	0	22	0	67	44	30	1	0	75	1	0	0	0	1	1	28	52	0	81	224
*** BREAK ***																					
Total	88	1	45	0	134	79	57	2	0	138	1	6	0	0	7	2	55	108	0	165	444
*** BREAK ***																					
04:30 PM	76	2	58	2	138	39	58	0	0	97	1	4	2	0	7	1	54	61	0	116	358
04:45 PM	78	1	45	0	124	32	59	1	0	92	2	7	1	0	10	0	71	50	0	121	347
Total	154	3	103	2	262	71	117	1	0	189	3	11	3	0	17	1	125	111	0	237	705
05:00 PM	65	0	48	0	113	33	42	0	0	75	1	1	0	0	2	1	67	49	0	117	307
05:15 PM	89	0	52	1	142	44	55	0	0	99	1	5	3	0	9	0	60	62	0	122	372
05:30 PM	66	0	46	1	113	43	55	0	1	99	1	0	1	1	3	0	54	69	1	124	339
05:45 PM	45	1	45	0	91	47	51	1	0	99	2	1	0	0	3	2	42	58	0	102	295
Total	265	1	191	2	459	167	203	1	1	372	5	7	4	1	17	3	223	238	1	465	1313
Grand Total	660	28	436	5	1129	482	580	12	1	1075	11	29	7	1	48	17	551	696	1	1265	3517
Apprch %	58.5	2.5	38.6	0.4		44.8	54	1.1	0.1		22.9	60.4	14.6	2.1		1.3	43.6	55	0.1		
Total %	18.8	0.8	12.4	0.1	32.1	13.7	16.5	0.3	0	30.6	0.3	0.8	0.2	0	1.4	0.5	15.7	19.8	0	36	

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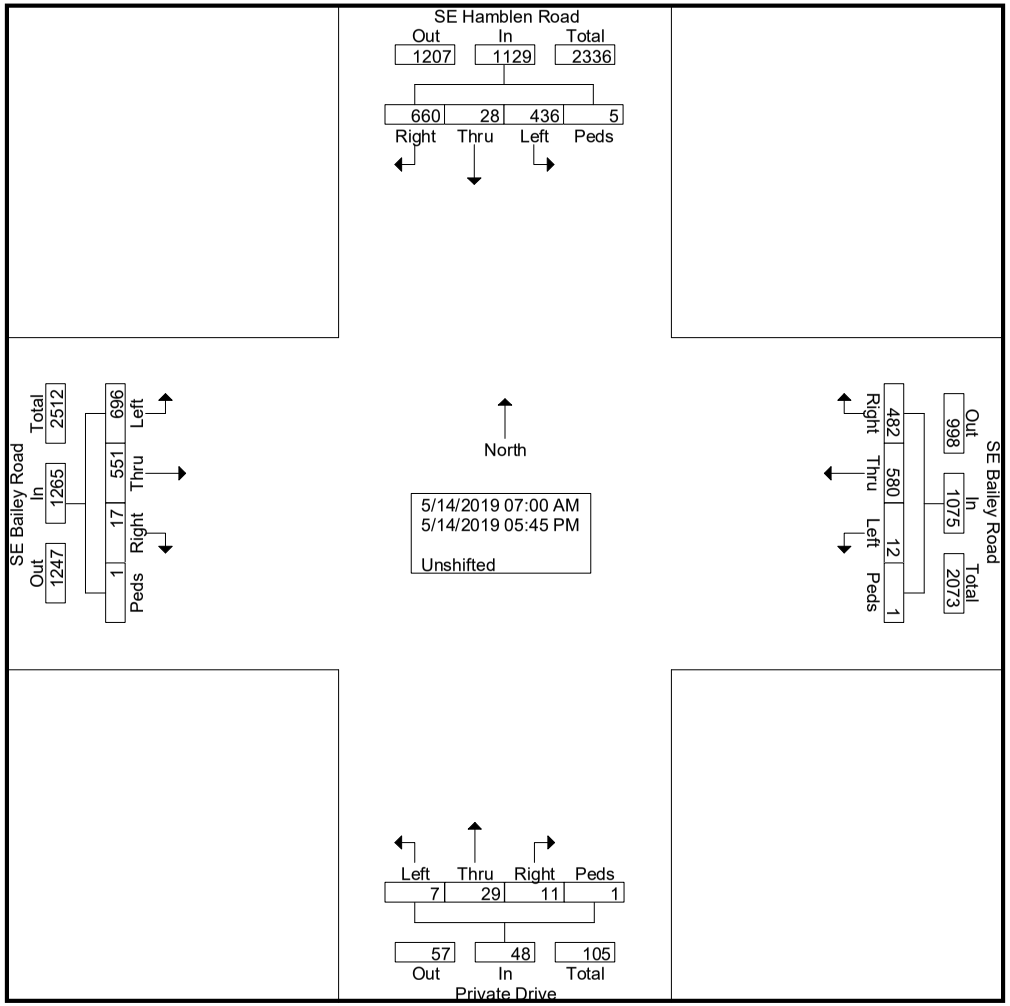
File Name : BaHa051419
Site Code : 00000000
Start Date : 5/14/2019
Page No : 2



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File Name : BaHa051419
Site Code : 00000000
Start Date : 5/14/2019
Page No : 3

	SE Hamblen Road From North					SE Bailey Road From East					Private Drive From South					SE Bailey Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	43	**9**	20	0	72	43	**60**	**2**	0	**105**	0	2	0	0	2	**7**	45	68	0	**120**	**299**
07:30 AM	38	2	**31**	**1**	72	**48**	49	0	0	97	0	0	0	0	0	2	**46**	62	0	110	279
07:45 AM	**45**	2	30	0	**77**	37	42	1	0	80	**2**	3	0	0	5	1	37	**80**	0	118	280
08:00 AM	43	1	23	0	67	35	27	1	0	63	0	**6**	0	0	**6**	1	27	56	0	84	220
Total Volume	169	14	104	1	288	163	178	4	0	345	2	11	0	0	13	11	155	266	0	432	1078
% App. Total	58.7	4.9	36.1	0.3		47.2	51.6	1.2	0		15.4	84.6	0	0		2.5	35.9	61.6	0		
PHF	.939	.389	.839	.250	.935	.849	.742	.500	.000	.821	.250	.458	.000	.000	.542	.393	.842	.831	.000	.900	.901

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File Name : BaHa051419
Site Code : 00000000
Start Date : 5/14/2019
Page No : 4

	SE Hamblen Road From North					SE Bailey Road From East					Private Drive From South					SE Bailey Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	76	**2**	**58**	**2**	138	39	58	0	0	97	1	4	2	0	7	**1**	54	61	0	116	358
04:45 PM	78	1	45	0	124	32	**59**	**1**	0	92	**2**	**7**	1	0	**10**	0	**71**	50	0	121	347
05:00 PM	65	0	48	0	113	33	42	0	0	75	1	1	0	0	2	1	67	49	0	117	307
05:15 PM	**89**	0	52	1	**142**	**44**	55	0	0	**99**	1	5	**3**	0	9	0	60	**62**	0	**122**	**372**
Total Volume	308	3	203	3	517	148	214	1	0	363	5	17	6	0	28	2	252	222	0	476	1384
% App. Total	59.6	0.6	39.3	0.6		40.8	59	0.3	0		17.9	60.7	21.4	0		0.4	52.9	46.6	0		
PHF	.865	.375	.875	.375	.910	.841	.907	.250	.000	.917	.625	.607	.500	.000	.700	.500	.887	.895	.000	.975	.930

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File Name : BaCe050219
Site Code : 00000000
Start Date : 5/2/2019

Groups Printed- Unshifted - Bank 1

	SE Century Drive From North					SE Bailey Road From East					SE Ranson Road From South					SE Bailey Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	7	1	3	0	11	11	103	4	0	118	3	1	20	0	24	12	18	9	0	39	192
07:15 AM	4	0	2	0	6	9	91	6	0	106	1	1	16	0	18	16	28	5	0	49	179
07:30 AM	6	0	5	0	11	6	57	10	0	73	3	1	18	0	22	17	36	10	0	63	169
07:45 AM	3	2	2	0	7	10	57	14	0	81	4	3	13	0	20	22	31	15	0	68	176
Total	20	3	12	0	35	36	308	34	0	378	11	6	67	0	84	67	113	39	0	219	716
08:00 AM	3	2	2	0	7	4	63	6	0	73	6	2	14	0	22	20	36	10	0	66	168
08:15 AM	7	2	2	0	11	5	45	7	0	57	4	1	19	0	24	13	27	11	0	51	143
*** BREAK ***																					
Total	10	4	4	0	18	9	108	13	0	130	10	3	33	0	46	33	63	21	0	117	311
*** BREAK ***																					
04:30 PM	16	8	13	0	37	7	55	20	0	82	15	1	24	0	40	48	76	17	0	141	300
04:45 PM	12	9	6	0	27	0	50	12	0	62	20	3	53	0	76	22	87	11	0	120	285
Total	28	17	19	0	64	7	105	32	0	144	35	4	77	0	116	70	163	28	0	261	585
05:00 PM	12	9	12	0	33	4	52	12	0	68	16	4	46	0	66	26	123	19	0	168	335
05:15 PM	19	6	12	0	37	10	59	6	1	76	17	2	33	0	52	29	97	16	1	143	308
05:30 PM	11	0	5	0	16	6	48	2	0	56	11	1	35	0	47	22	90	11	0	123	242
05:45 PM	16	5	14	0	35	10	47	2	0	59	8	0	32	0	40	25	112	13	0	150	284
Total	58	20	43	0	121	30	206	22	1	259	52	7	146	0	205	102	422	59	1	584	1169
Grand Total	116	44	78	0	238	82	727	101	1	911	108	20	323	0	451	272	761	147	1	1181	2781
Apprch %	48.7	18.5	32.8	0		9	79.8	11.1	0.1		23.9	4.4	71.6	0		23	64.4	12.4	0.1		
Total %	4.2	1.6	2.8	0	8.6	2.9	26.1	3.6	0	32.8	3.9	0.7	11.6	0	16.2	9.8	27.4	5.3	0	42.5	
Unshifted	116	44	78	0	238	82	727	101	1	911	108	20	323	0	451	272	761	147	1	1181	2781
% Unshifted	100	100	100	0	100	100	100	100	100	100	100	100	100	0	100	100	100	100	100	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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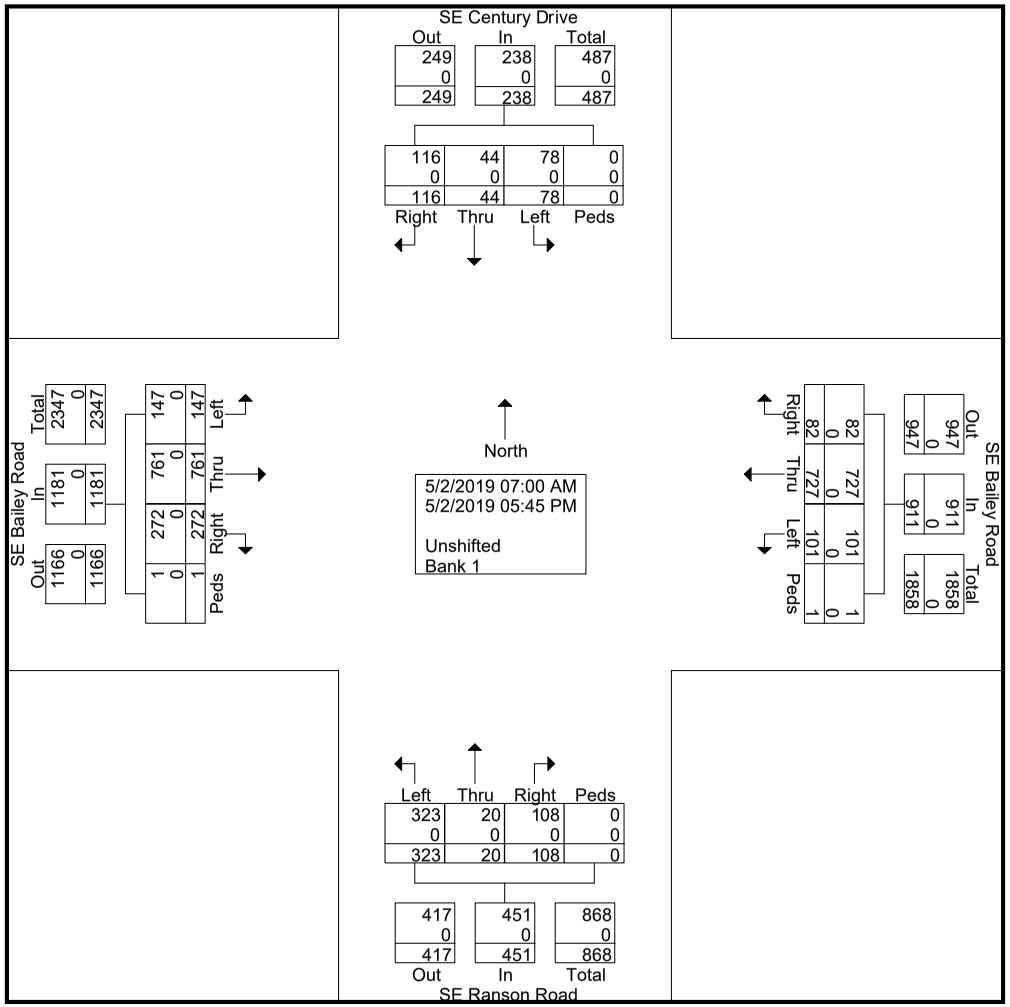
Start Date : 5/2/2019



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File Name : BaCe050219
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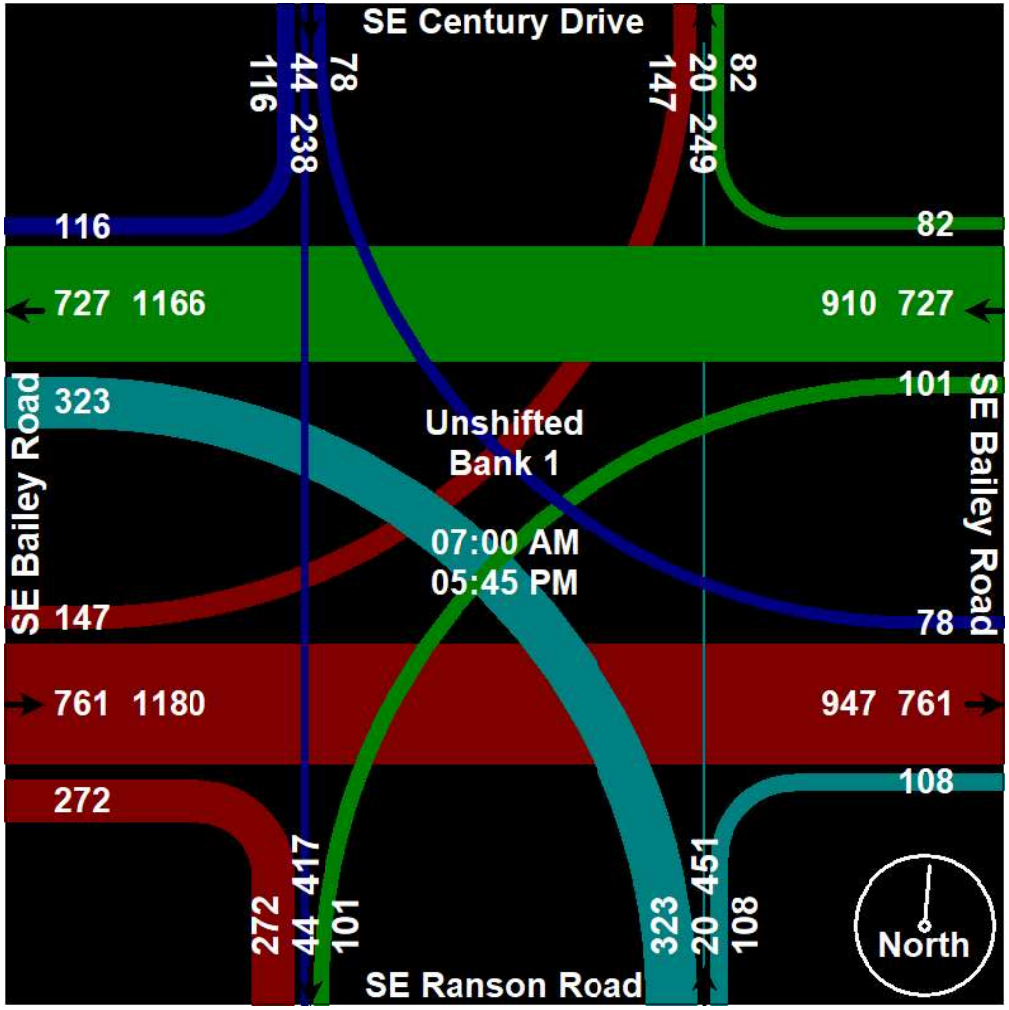

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Default Comments
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Select File/Preference in the Main Scree
Then Click the Comments Tab

File Name : BaCe050219
Site Code : 00000000
Start Date : 5/2/2019

	SE Century Drive From North					SE Bailey Road From East					SE Ranson Road From South					SE Bailey Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	**7**	1	3	0	**11**	**11**	**103**	4	0	**118**	3	1	**20**	0	**24**	12	18	9	0	39	**192**
07:15 AM	4	0	2	0	6	9	91	6	0	106	1	1	16	0	18	16	28	5	0	49	179
07:30 AM	6	0	**5**	0	11	6	57	10	0	73	3	1	18	0	22	17	**36**	10	0	63	169
07:45 AM	3	**2**	2	0	7	10	57	**14**	0	81	**4**	**3**	13	0	20	**22**	31	**15**	0	**68**	176
Total Volume	20	3	12	0	35	36	308	34	0	378	11	6	67	0	84	67	113	39	0	219	716
% App. Total	57.1	8.6	34.3	0		9.5	81.5	9	0		13.1	7.1	79.8	0		30.6	51.6	17.8	0		
PHF	.714	.375	.600	.000	.795	.818	.748	.607	.000	.801	.688	.500	.838	.000	.875	.761	.785	.650	.000	.805	.932

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Default Comments
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Then Click the Comments Tab

File Name : BaCe050219
Site Code : 00000000
Start Date : 5/2/2019

	SE Century Drive From North					SE Bailey Road From East					SE Ranson Road From South					SE Bailey Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	16	8	**13**	0	**37**	7	55	**20**	0	**82**	15	1	24	0	40	**48**	76	17	0	141	300
04:45 PM	12	**9**	6	0	27	0	50	12	0	62	**20**	3	**53**	0	**76**	22	87	11	0	120	285
05:00 PM	12	9	12	0	33	4	52	12	0	68	16	**4**	46	0	66	26	**123**	**19**	0	**168**	**335**
05:15 PM	**19**	6	12	0	37	**10**	**59**	6	**1**	76	17	2	33	0	52	29	97	16	**1**	143	308
Total Volume	59	32	43	0	134	21	216	50	1	288	68	10	156	0	234	125	383	63	1	572	1228
% App. Total	44	23.9	32.1	0		7.3	75	17.4	0.3		29.1	4.3	66.7	0		21.9	67	11	0.2		
PHF	.776	.889	.827	.000	.905	.525	.915	.625	.250	.878	.850	.625	.736	.000	.770	.651	.778	.829	.250	.851	.916

Start Date: 4/25/2017
Start Time: 7:00:00 AM
Site Code: 00000000
Comment 1: Default Comments
Comment 2: Change These in The Preferences Window
Comment 3: Select File/Preference in the Main Scree
Comment 4: Then Click the Comments Tab

	Ranson Road From North				From East				Ranson Road From South				Bailey Road From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
07:00 AM	41	22	0	0	0	0	0	0	0	38	7	0	4	0	16	0
07:15 AM	50	20	0	1	0	0	0	0	0	53	6	0	2	0	24	0
07:30 AM	38	40	0	0	0	0	0	0	0	57	3	0	3	0	49	0
07:45 AM	29	34	0	0	0	0	0	0	0	49	2	0	3	0	27	0
08:00 AM	18	10	0	0	0	0	0	0	0	44	4	0	4	0	19	0
08:15 AM	12	15	0	0	0	0	0	0	0	24	3	0	2	0	17	0
04:30 PM	30	49	0	0	0	0	0	0	0	51	9	0	9	0	52	0
04:45 PM	29	70	0	0	0	0	0	0	0	57	3	0	5	0	54	0
05:00 PM	36	80	0	0	0	0	0	0	0	64	2	0	13	0	79	0
05:15 PM	27	77	0	0	0	0	0	0	0	70	2	0	16	1	72	0
05:30 PM	29	69	0	0	0	0	0	0	0	55	5	0	9	0	46	0
05:45 PM	14	85	0	1	0	0	0	0	0	68	3	0	8	0	53	0

EXISTING PLUS PHASE 1 DEVELOPMENT CONDITIONS
LANE CONFIGURATIONS AND
PEAK HOUR TRAFFIC VOLUMES

Culver's
Traffic Impact Study
Lee's Summit, Missouri

December 2019

No Scale

Figure A-4

TranSystems

pw:\\hq-pwim01.a-e.transystcorp.com:transystcorp-pw1\Documents\Projects_2019\KC101 - Kansas City\P101190329 - Culver's Traffic Impact Study\310.00 - Traffic\Lane Configurations and Volume.dgn

Approximation of Existing School Dismissal Peak Hour Counts

Procedure:
Use ADT data to determine approximately how much less traffic occurs during the school dismissal peak hour (approx 3-4pm) compared to the actual PM peak hour.
This factor will be applied to the existing PM TMC to approximate existing school dismissal peak hour TMC.

Count Location	Count Date	Bidirectional Total		Percentage of PM Peak	**Average Percentage of PM Peak**	***Rounded Value***
		School Dismissal Peak (3-4pm)	PM Peak (either 4-5 pm or 5-6pm)			
Bailey Rd W/O Hamblen (west)	5/18/2017	747	919	81%	**79%**	***80%***
Bailey Rd E/O Hamblen (east)	7/24/2019	505	602	84%		
Bailey Rd E/O Cape Dr	8/13/2019	287	370	78%		
Ranson Rd S/O Bailey Rd	7/23/2019	288	390	74%		

Existing Volumes for Lee's Summit Middle School Traffic Study

Data Sources Utilized:

- Turning Movement Counts – AM and PM Peak Hours
    - Bailey Rd & Hamblen Rd West: May 2019 by City
    - Bailey Rd & Hamblen Rd East: May 2019 by City
    - Bailey Rd & Ranson Rd: April 2017 by City
    - Oldham Pkwy & Ranson Rd: October 2018 from approved traffic study. Includes trips associated with new Culver's and Princeton developments.
    - US-50 EB Ramp & Ranson Rd: April 2020
    - US-50 EB Ramp & Ranson Rd: April 2020
- ADT Counts
    - Along Bailey Rd, West of Hamblen Rd West: May 2017
    - Along Bailey Rd, East of Hamblen Rd East: July 2019
    - Along Bailey Rd, East of Cape Dr: August 2019
    - Along Ranson Rd, South of Baily Rd: July 2019

School Dismissal Peak Hour Determination:

- Counts at US-50 interchange contained existing turning movement counts associated with the assumed school dismissal peak hour (3-4pm).
- Obtained TMC for remaining intersections by applying an adjustment/reduction factor to the PM peak hour counts.
    - Reviewed ADTs; compared the 3-4pm hour volumes to PM peak hour volumes; obtained an adjustment/reduction factor of 0.80.
- Apply reduction factor to PM peak hour counts at necessary locations to obtain existing 3-4pm background turning movements.

Balancing Volumes Across Intersections:

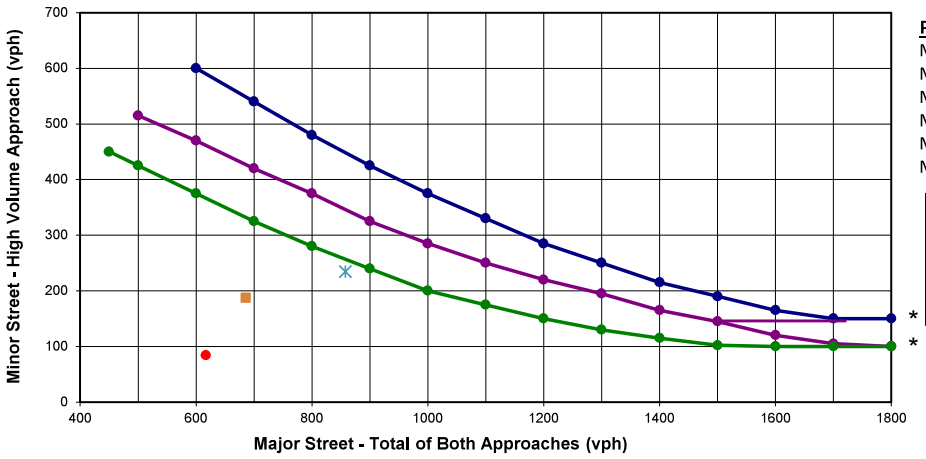
- Due to differing data collection dates, volume imbalances were present
- Volumes along Bailey Rd were conservatively adjusted (increased at adjacent intersection) to better balance the volumes across study intersections. This also accounted for some growth associated with the 2017 data captured at Ranson & Bailey.
- Volumes at the 50 Highway Interchange were collected when the local stay-at-home order was in effect. Turning movements at the interchange were balanced (increased) with the adjacent intersection of Ranson & Oldham.

APPENDIX B

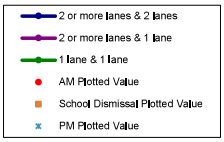
Existing Conditions

Signal Warrants

Peak Hour Volume Warrant (Existing Conditions)
Bailey Rd and Hamblen Rd (East)



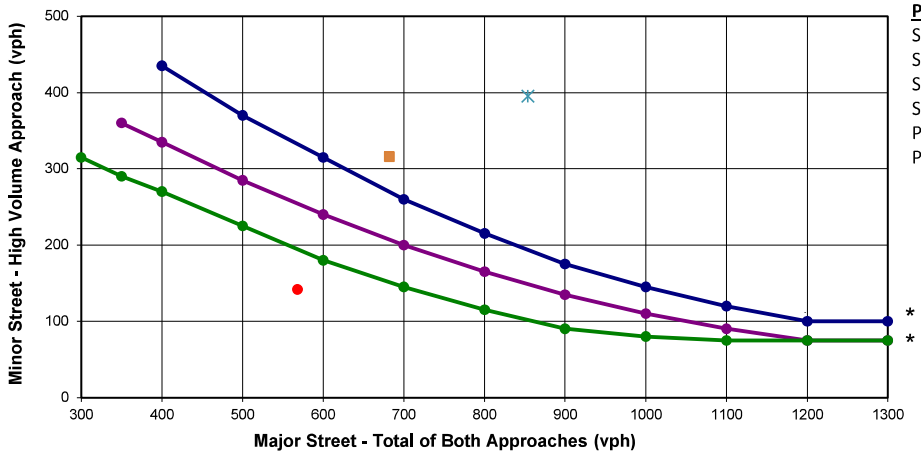
Peak Hour Volumes:
Major (AM) - 617
Minor (AM) - 84
Major (School Dis.) - 686
Minor (School Dis.) - 187
Major (PM) - 858
Minor (PM) - 234



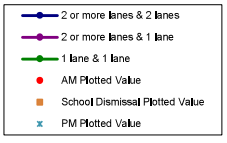
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

Peak Hour Volume Warrant (Existing)
Bailey Rd & Ranson Rd

(Community less than 10,000 population or above 40mph on major street)



Peak Hour Volumes:
School Arrival Major - 568
School Arrival Minor - 142
School Dismissal Major - 682
School Dismissal Minor - 316
PM Major - 854
PM Minor - 395



*Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph

Lane Warrants

Lee's Summit AMC Lane Warrants (Applied along Bailey Rd)

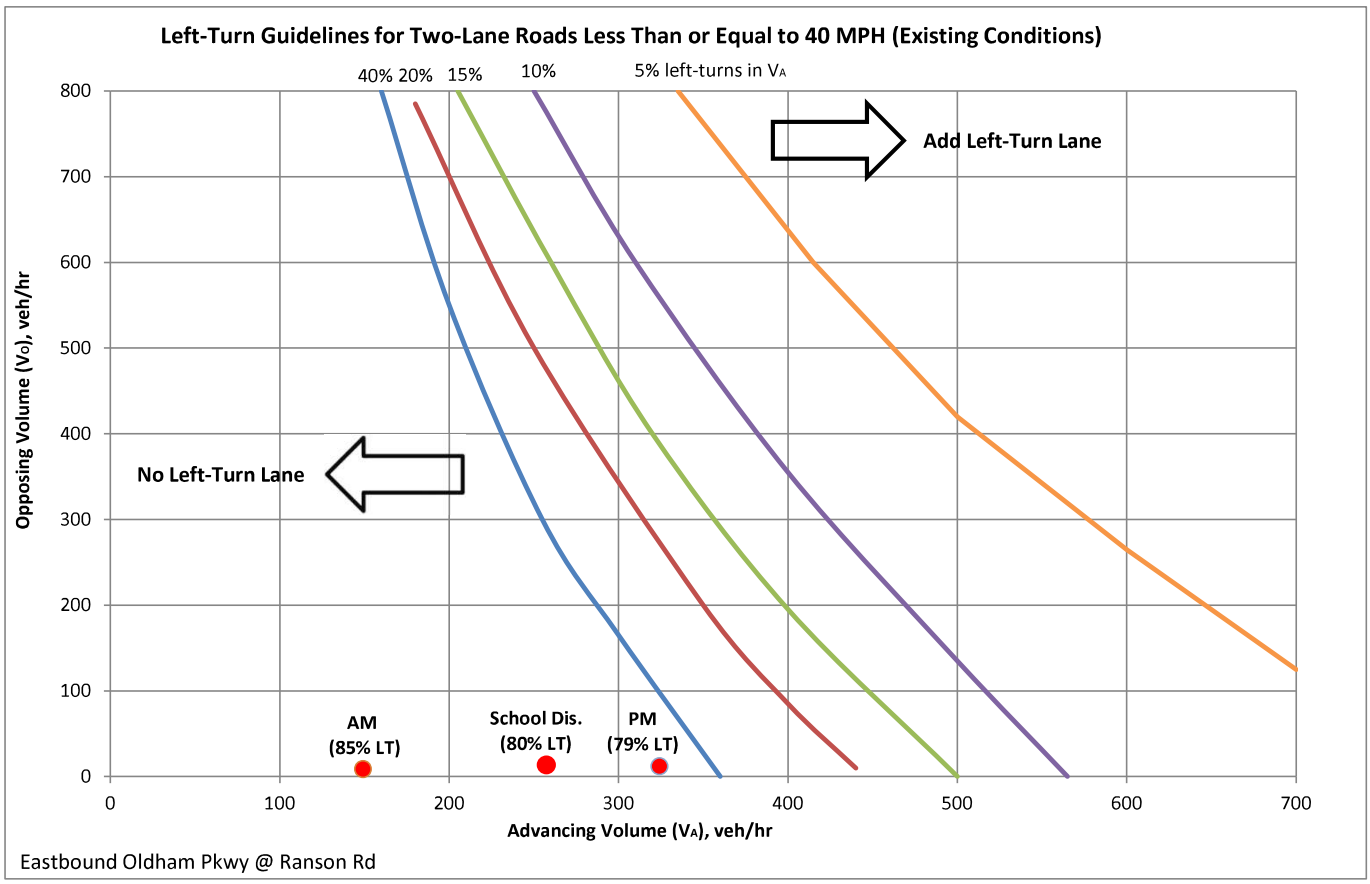
Existing Conditions

Left Turns

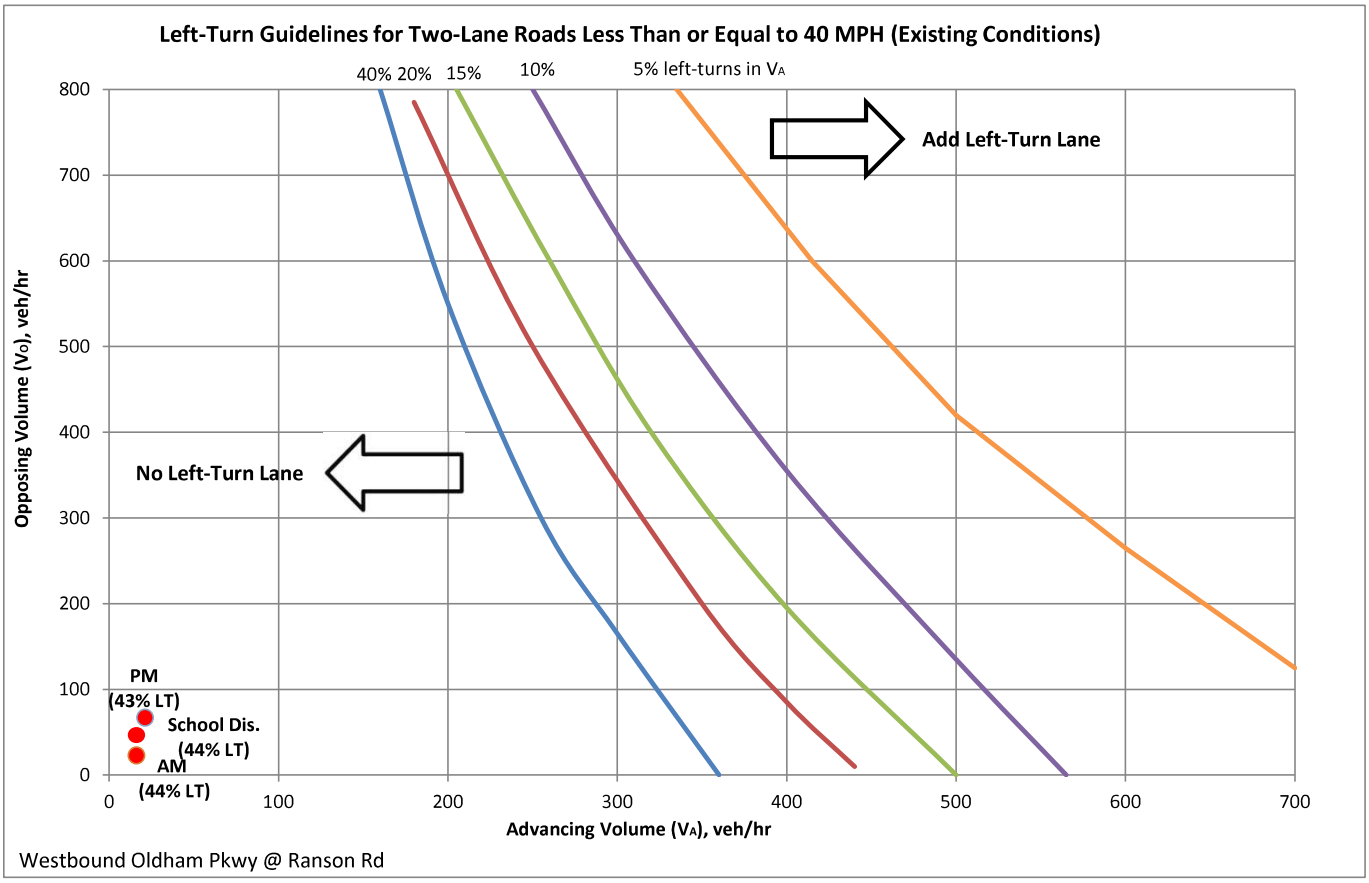
- Hamblen Rd (west) and Bailey Rd
  - EB, SB, WB existing or planned
  - NB warranted
    - AMC 16.1.A – planned traffic signal
- Hamblen Rd (east) / Century Dr and Bailey Rd
  - NB existing
  - EB, WB warranted
    - AMC 16.1.B – arterial intersecting with arterial
  - SB warranted
    - AMC 16.1.D – non-residential connector with minor arterial and >20 LT vph (met in Afternoon and PM)
- Ranson Rd & Bailey
  - LS Criterial only applied to EB approach. N/S approach MoDOT road.
  - EB warranted
    - AMC 16.1.B – arterial intersecting with arterial

Right Turns

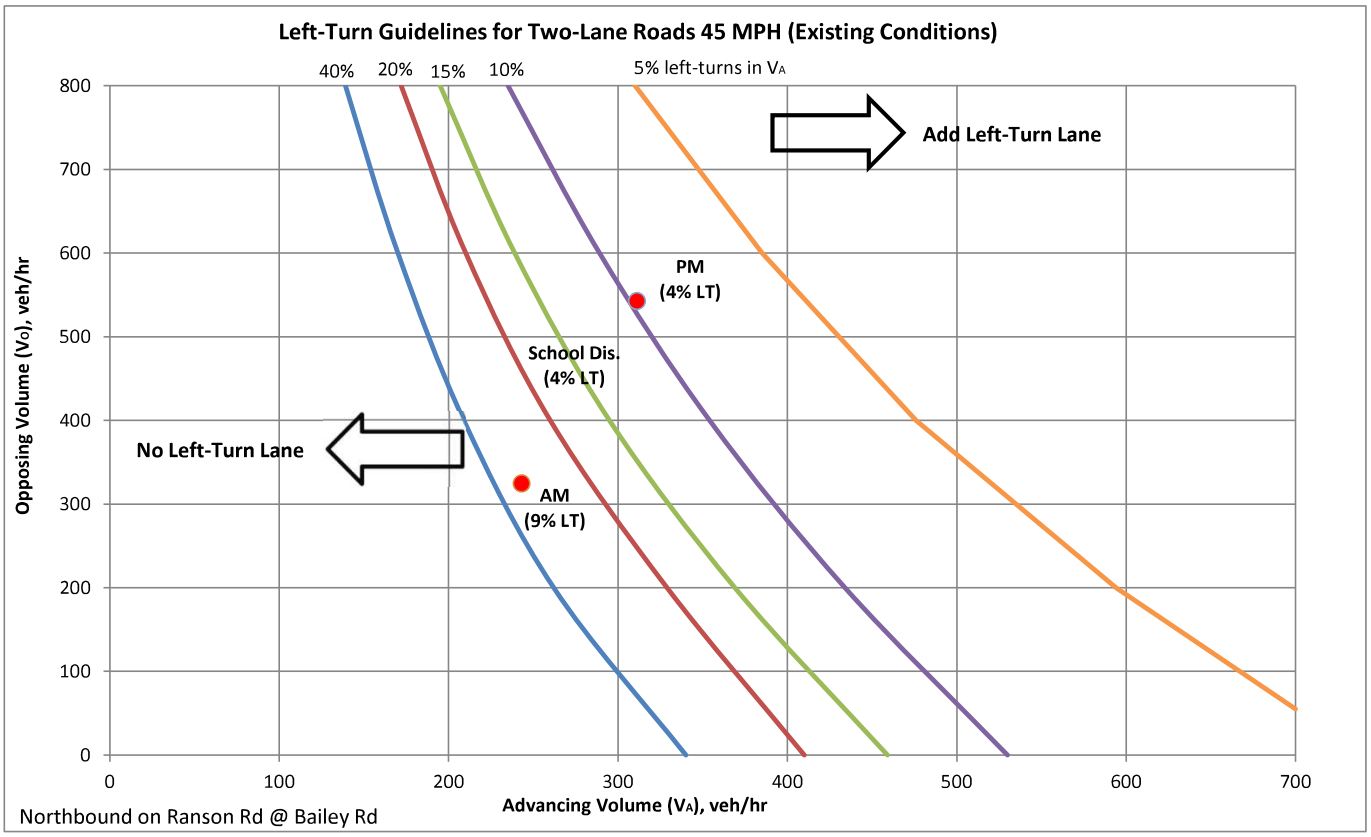
- Hamblen Rd (west) and Bailey Rd
  - WB, SB warranted
    - AMC 16.2.A – minor arterial with minor arterial and >60 RT vph (met AM, Afternoon, PM)
- Hamblen Rd (east) / Century Dr and Bailey Rd
  - EB existing
  - NB warranted
    - AMC 16.2.A – minor arterial with minor arterial and >60 RT vph (met PM)
- Ranson Rd & Bailey
  - LS Criterial only applied to EB approach. N/S approach MoDOT road.
  - EB warranted
    - AMC 16.2.A – minor arterial with minor arterial and >60 RT vph (met PM)

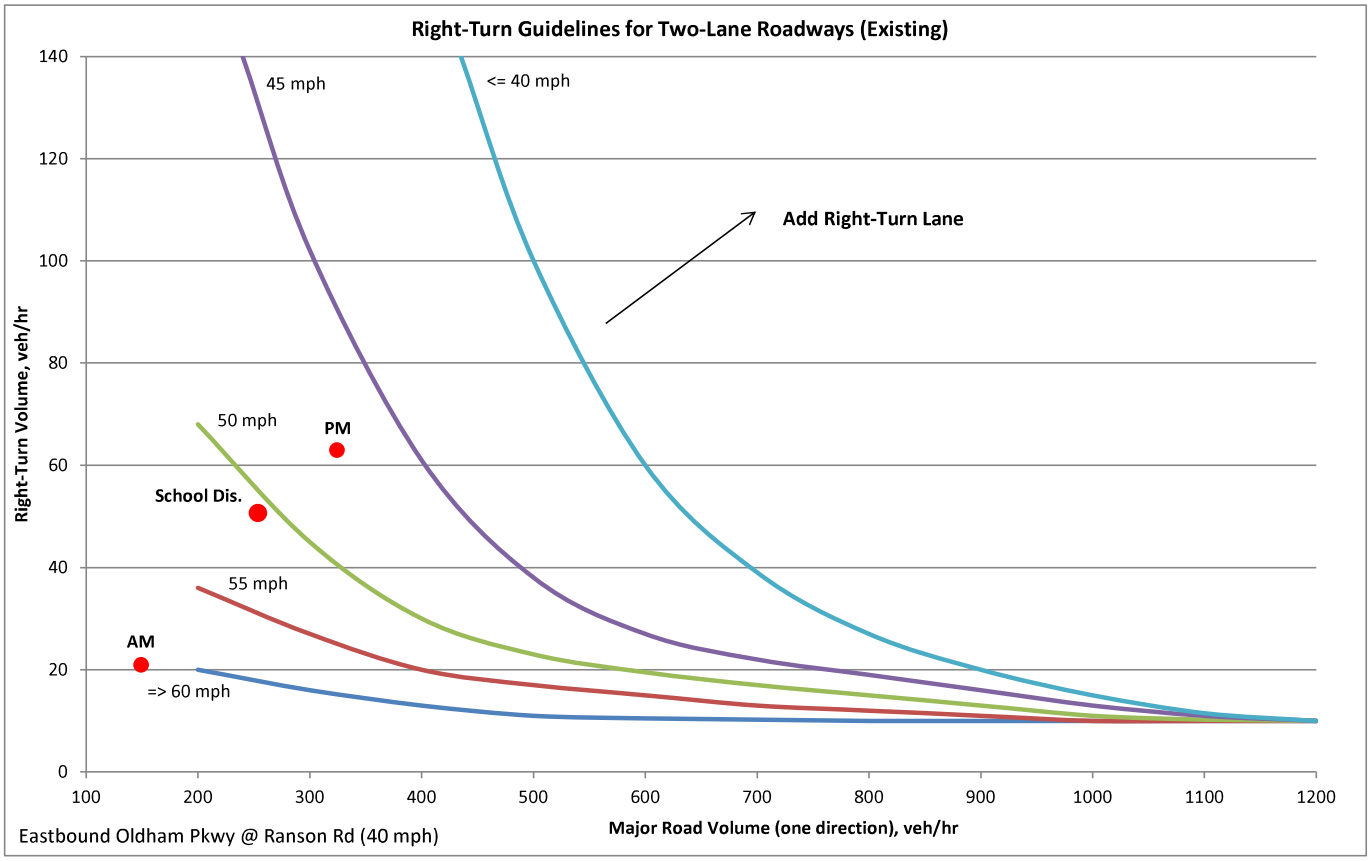


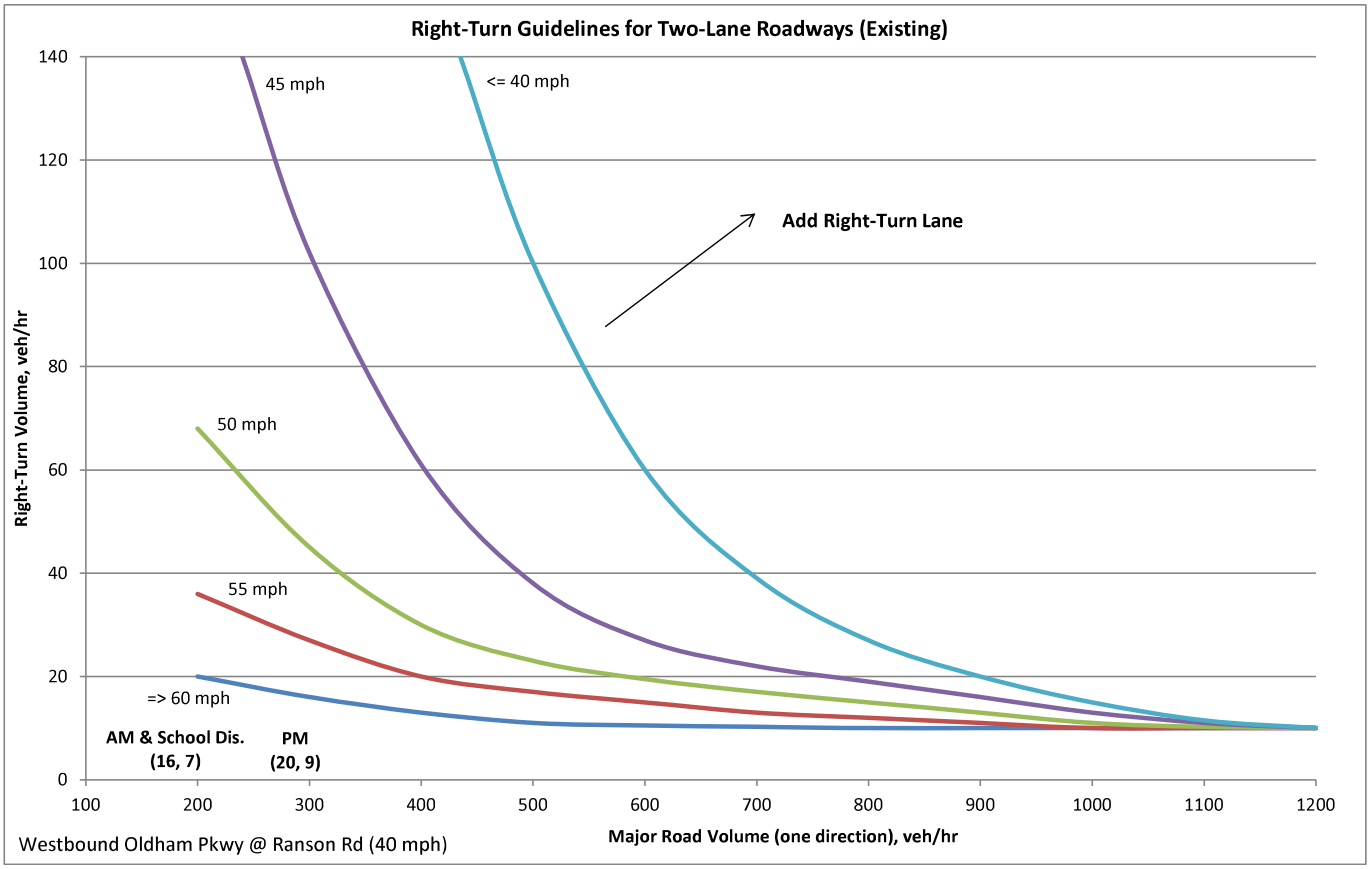
Eastbound Oldham Pkwy @ Ranson Rd

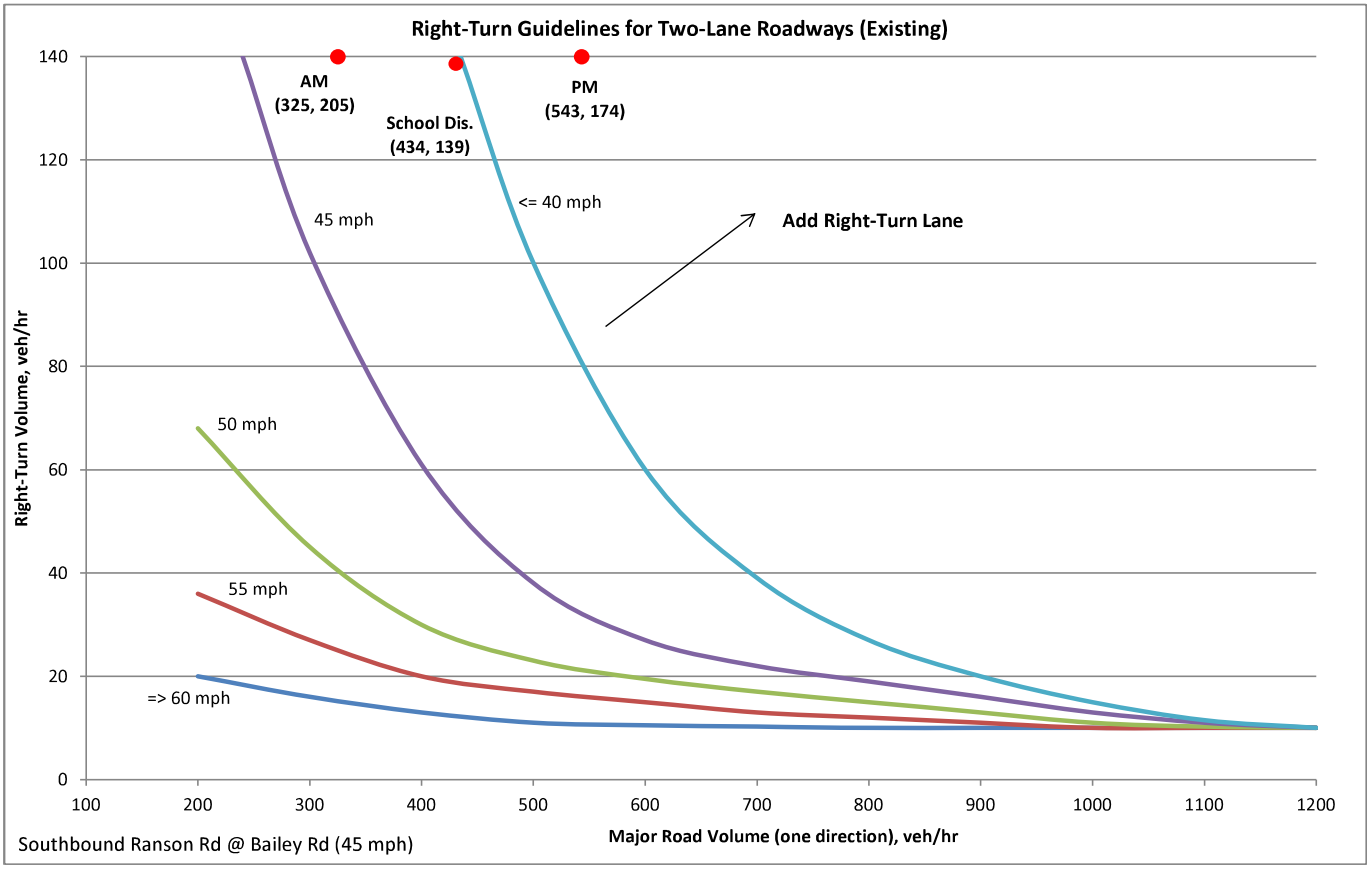


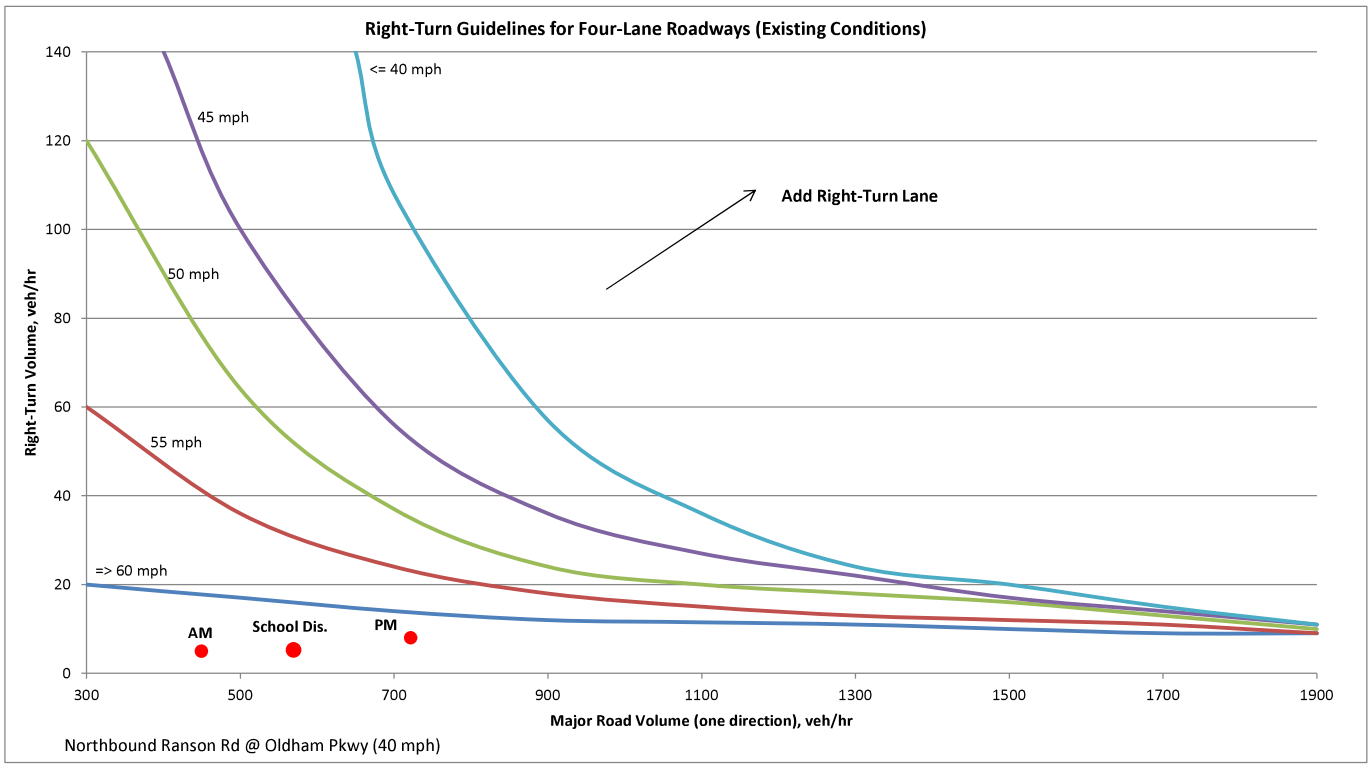
Westbound Oldham Pkwy @ Ranson Rd


Left-Turn Guidelines for Two-Lane Roads 45 MPH (Existing Conditions)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
(4% LT)
School Dis.
(4% LT)
AM
(9% LT)
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Northbound on Ranson Rd @ Bailey Rd

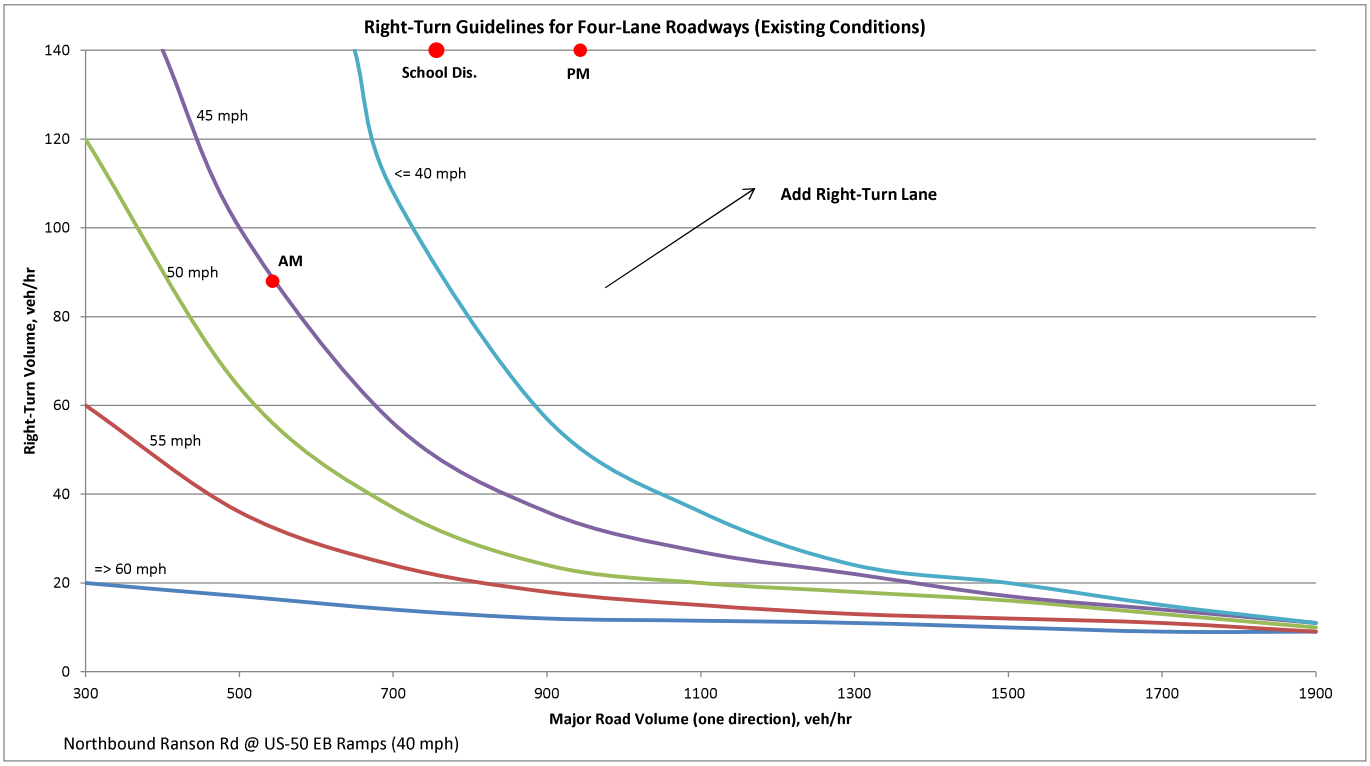

Right-Turn Guidelines for Two-Lane Roadways (Existing)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
PM
School Dis.
55 mph
AM
=> 60 mph
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
0
20
40
60
80
100
120
140
100
200
300
400
500
600
700
800
900
1000
1100
1200
Eastbound Oldham Pkwy @ Ranson Rd (40 mph)


Right-Turn Guidelines for Two-Lane Roadways (Existing)
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
AM & School Dis.
(16, 7)
PM
(20, 9)
Westbound Oldham Pkwy @ Ranson Rd (40 mph)


Right-Turn Guidelines for Two-Lane Roadways (Existing)
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
AM
(325, 205)
School Dis.
(434, 139)
PM
(543, 174)
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
Southbound Ranson Rd @ Bailey Rd (45 mph)



Northbound Ranson Rd @ Oldham Pkwy (40 mph)



Northbound Ranson Rd @ US-50 EB Ramps (40 mph)

Capacity Analysis

APPENDIX C

Existing Plus Proposed School Conditions

ITE Sheets

Land Use 522
Middle School/Junior High School

Description

A middle or junior high school serves students who have completed elementary school and have not yet entered high school. Both public and private middle schools/junior high schools are included in this land use. Elementary school (Land Use 520), high school (Land Use 530), private school (K-8) (Land Use 534), private school (K-12) (Land Use 536), and charter elementary school (Land Use 537) are related uses.

Additional Data

The percentage of students at the sites who were transported to school via bus varied considerably. Due to the varied transit and school bus usage at these sites, it is desirable that future studies include additional detail on the percentage of students who were bused to school and the percentage that were dropped off and picked up.

Because the ratio of floor space to student population varies widely among the schools surveyed, the number of students may be a more reliable independent variable on which to establish trip generation rates.

Time-of-day distribution data for this land use are presented in Appendix A. For the two 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 5:00 and 6:00 p.m., respectively.

The sites were surveyed in the 1990s, the 2000s, and the 2010s in California, Connecticut, Delaware, Florida, Minnesota, Nebraska, Oregon, Pennsylvania, and Tennessee.

Source Numbers

431, 444, 534, 536, 564, 579, 592, 611, 719, 867, 936, 940

Middle School/Junior High School
(522)

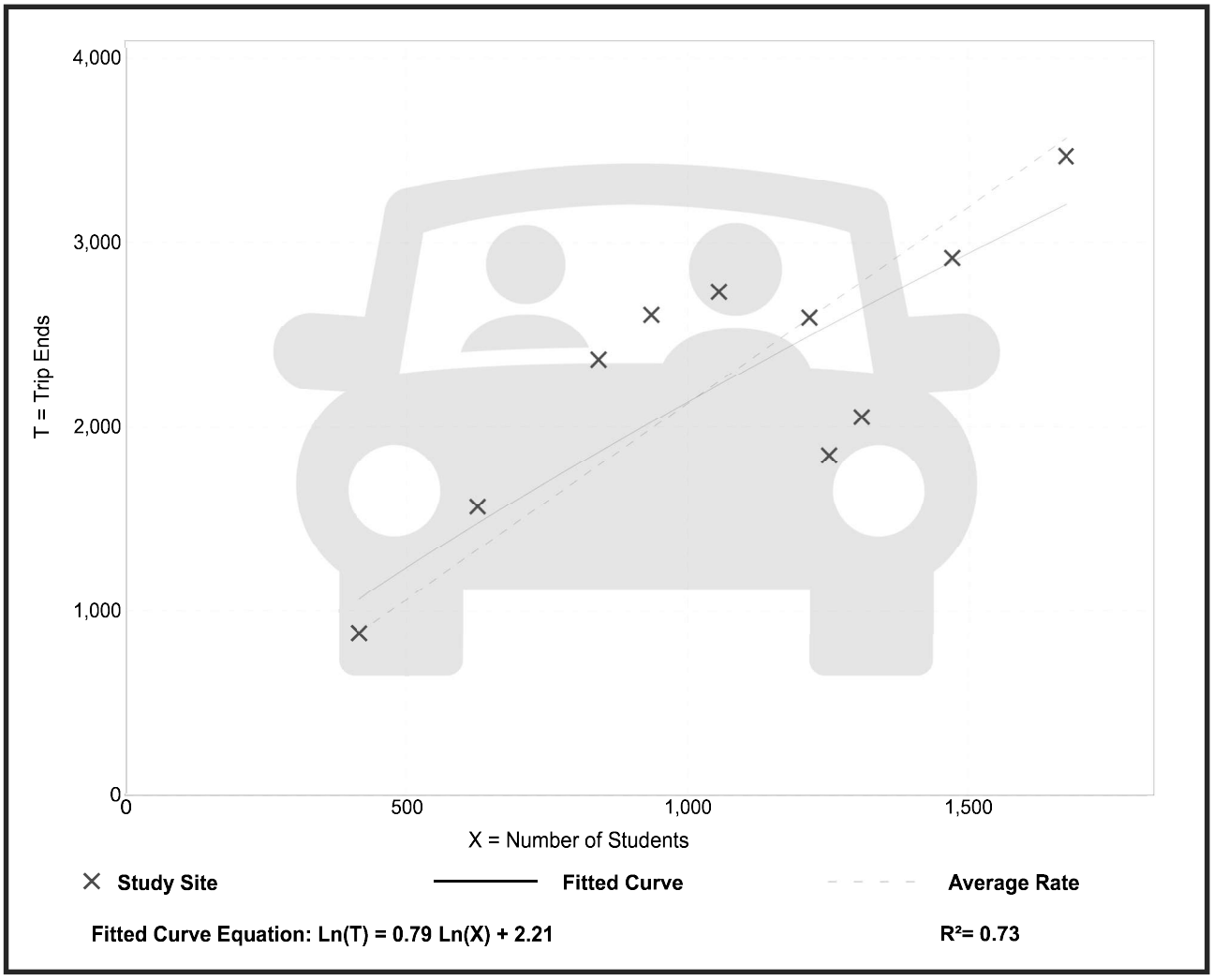
Vehicle Trip Ends vs: **Students**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 10
Avg. Num. of Students: 1079
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
2.13	1.48 - 2.81	0.46

Data Plot and Equation



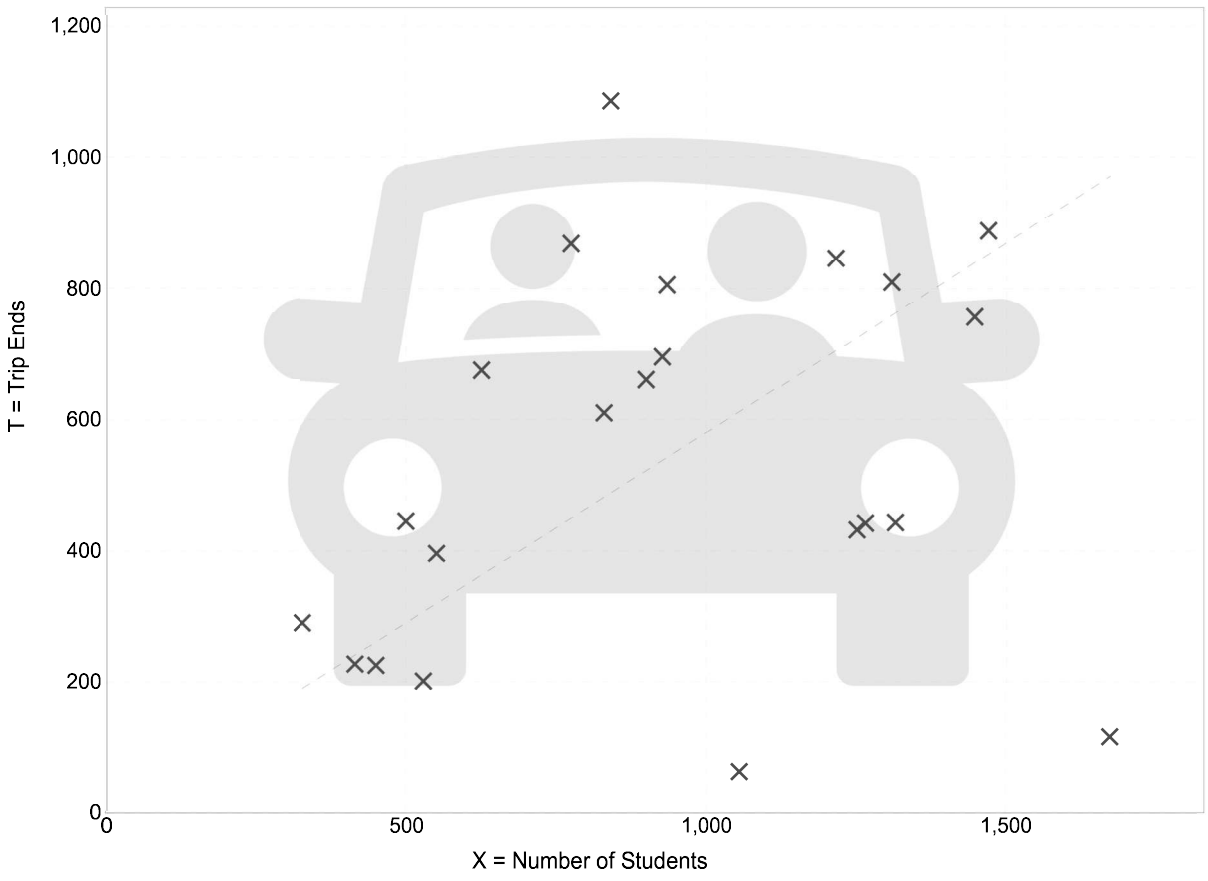
Middle School/Junior High School
(522)

Vehicle Trip Ends vs:	**Students**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	22
Avg. Num. of Students:	937
Directional Distribution:	54% entering, 46% exiting

Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.58	0.06 - 1.29	0.32

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= ****

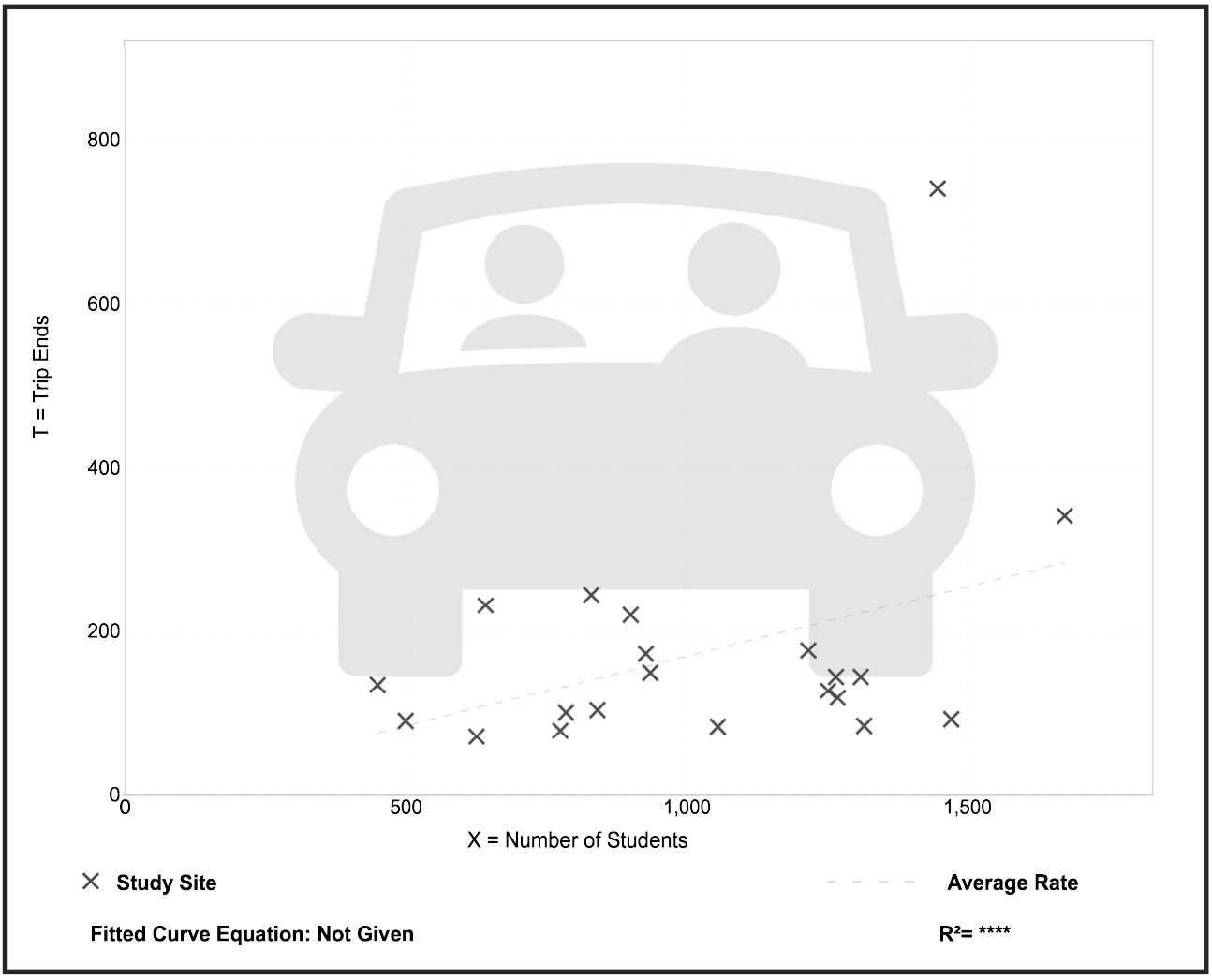
Middle School/Junior High School
(522)

Vehicle Trip Ends vs: **Students**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 21
Avg. Num. of Students: 1023
Directional Distribution: 49% entering, 51% exiting

Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.17	0.06 - 0.51	0.12

Data Plot and Equation



Middle School/Junior High School
(522)

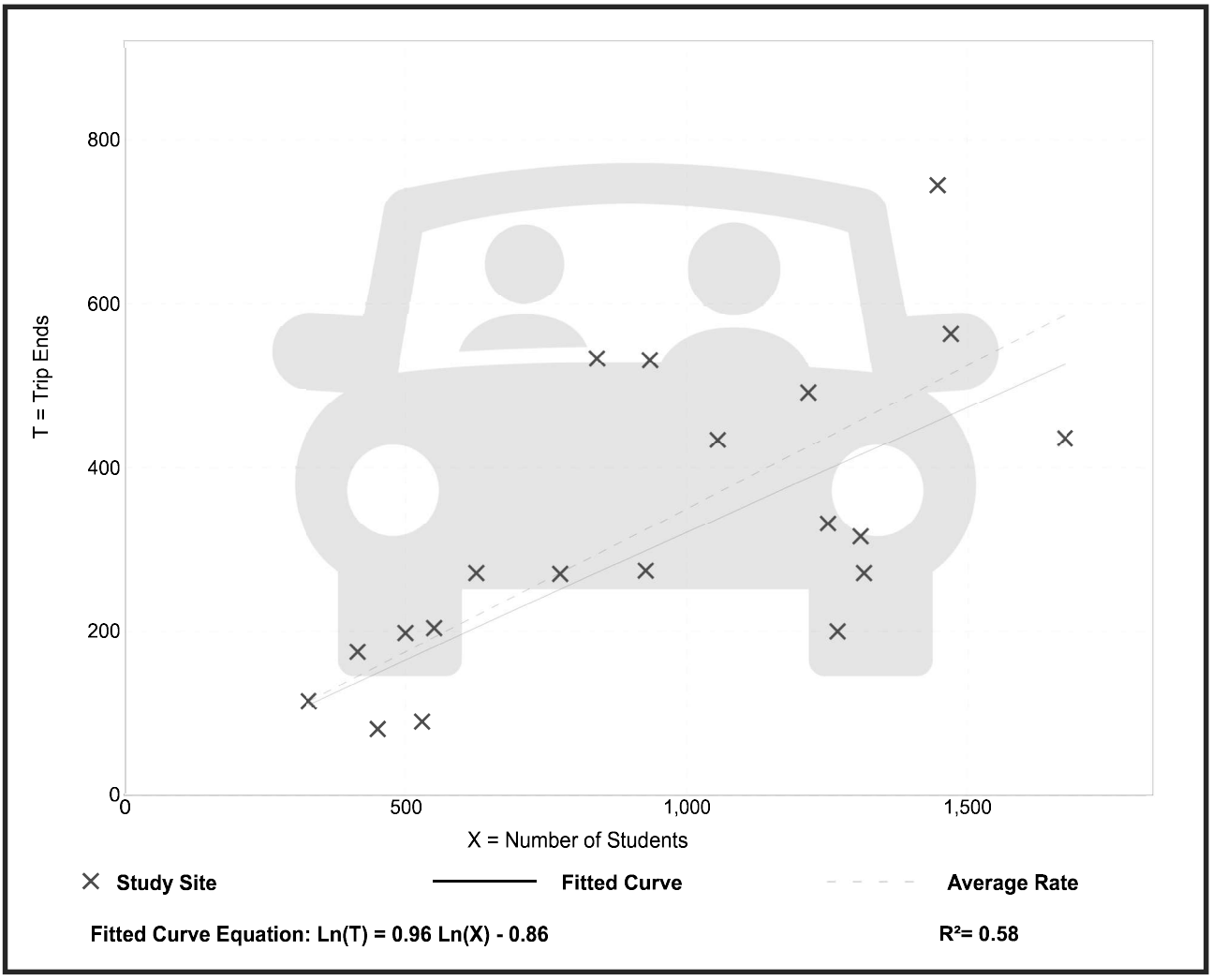
Vehicle Trip Ends vs: **Students**
On a: **Weekday,**
PM Peak Hour of Generator

Setting/Location: **General Urban/Suburban**
Number of Studies: 20
Avg. Num. of Students: 944
Directional Distribution: 46% entering, 54% exiting

Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.35	0.16 - 0.63	0.13

Data Plot and Equation



Trip Generation & Distribution

LS Middle School Trip Generation

Daily Trip Generation

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
522	Middle School/Junior High School	1,290	Students	Average	2,748	50%	50%	1,374	1,374
Total					**2,748**			**1,374**	**1,374**

AM Peak Hour Trip Generation (Peak Hour of Adjacent Street Traffic, 7-9 AM)

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
522	Middle School/Junior High School	1,290	Students	Average	749	54%	46%	404	345
Total					**749**			**404**	**345**

School Dismisal Peak Hour Trip Generation (PM Peak Hour of Generator)

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
522	Middle School/Junior High School	1,290	Students	Equation	410	46%	54%	189	221
Total					**410**			**189**	**221**

Note: PM Peak Hour of Generator is assumed to occur during the school dismissal time period.

PM Peak Hour Trip Generation (Peak Hour of Adjacent Street Traffic, 4-6 PM)

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
522	Middle School/Junior High School	1,290	Students	Average	220	49%	51%	108	112
Total					**220**			**108**	**112**

Baseball Field Trip Generation			
	Typical AM Peak	Typical School Dismissal	Typical PM Peak
Enter	0	30	0
Exit	0	0	30
Based on usage information provided by client			

Middle School	
Direction	Primary Trips (To/From)
Bailey Rd (West)	10%
Hamblen Rd (North)	5%
Todd George Pkwy (North)	15%
Ranson Rd (South)	20%
US-50 (West)	5%
US-50 (East)	40%
Adjacent Homes (Internal or Walk)	5%
Total	100%
Baseball Fields	
Direction	Primary Trips (To/From)
Hamblen Rd (North)	100%

- Community building - A 6th-8th setting can offer a greater sense of community and relationship building with staff, students and parents. The relationships are stronger the longer they are a part of the learning community
- Academics - A 6th-8th setting would necessitate a content specific certified teacher in each core subject area
- Academic/Behavioral Interventions - A 6th-8th setting provides a longer opportunity to address academic and behavioral gaps in a systemic way

A fourth 6th-8th grade middle school may mitigate the need for elementary schools in the northeast and southwest. A map illustrating a ***potential*** fourth middle school boundary (designated by the green section) is provided below:

Map 1.1 Sample Middle School Four Boundary

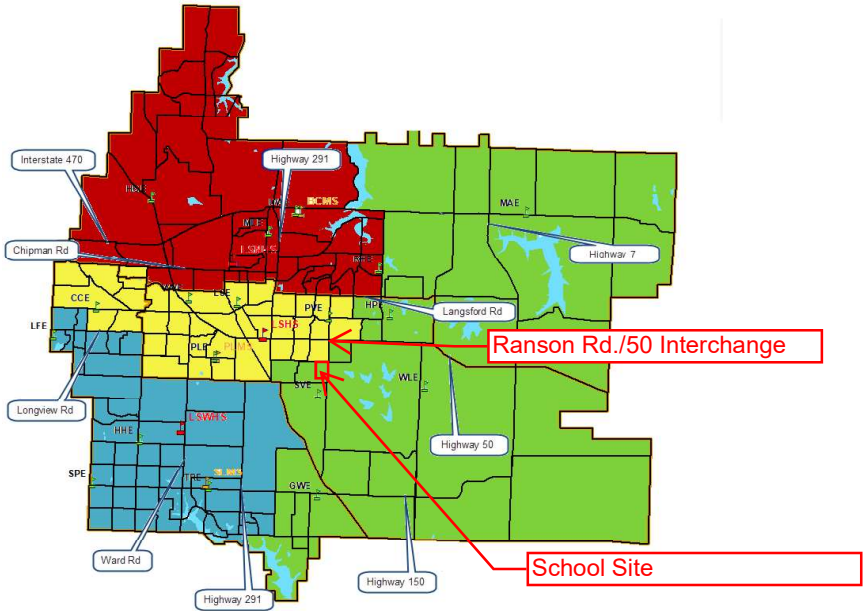


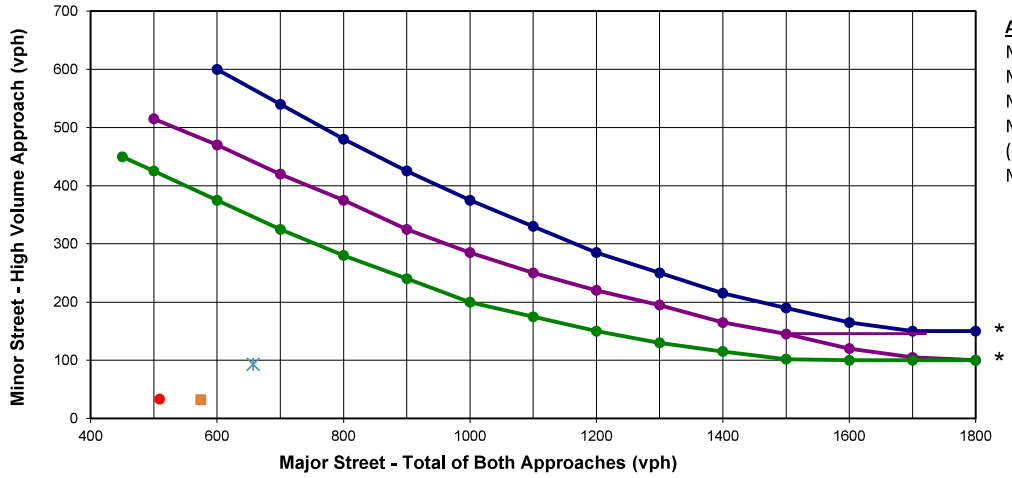
Table 1.1 Sample Middle School Four Capacity

School	85% Program Capacity	School of Residency Enrollment 9/26/18 **	2021-22	2022-23	2023-24	2028-29
PLMS	962	818	1167	1143	1094	1108
BCMS	1043	958	1118	1120	1143	1106
SLMS	1071	1090	1142	1126	1161	1211
NEW MS			1080	1033	1042	1290

Table 1.1 was not color coded because some of the existing middle schools will likely need additions if a fourth middle school is added. This approach would also create a split feeder system. In the example

Signal Warrants

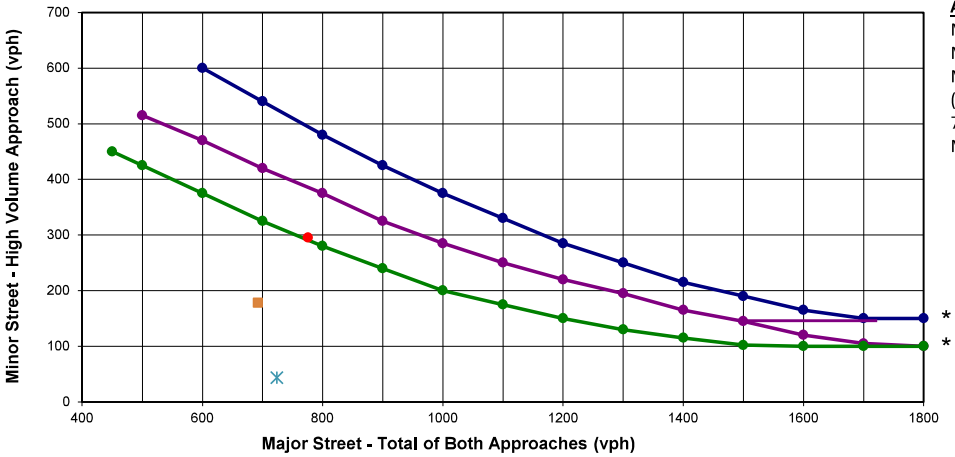
Peak Hour Volume Warrant (Existing + Development)
Bailey Rd and Drive 1



AM & PM Volumes:
Major (AM) - 509
Minor (AM) - 33
Major (School Dis.) - 574
Minor (School Dis.) -32 Major (PM) - 657
Minor (PM) - 93

*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 + Development)
Bailey Road & Drive 2



AM & PM Volumes:
Major (AM) - 776
Minor (AM) - 295
Major (School Dis.) - 693 Minor (School Dis.) - 178 Major (PM) - 724
Minor (PM) - 43

*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.

Lane Warrants

Lee's Summit AMC Lane Warrants (Applied along Bailey Rd)

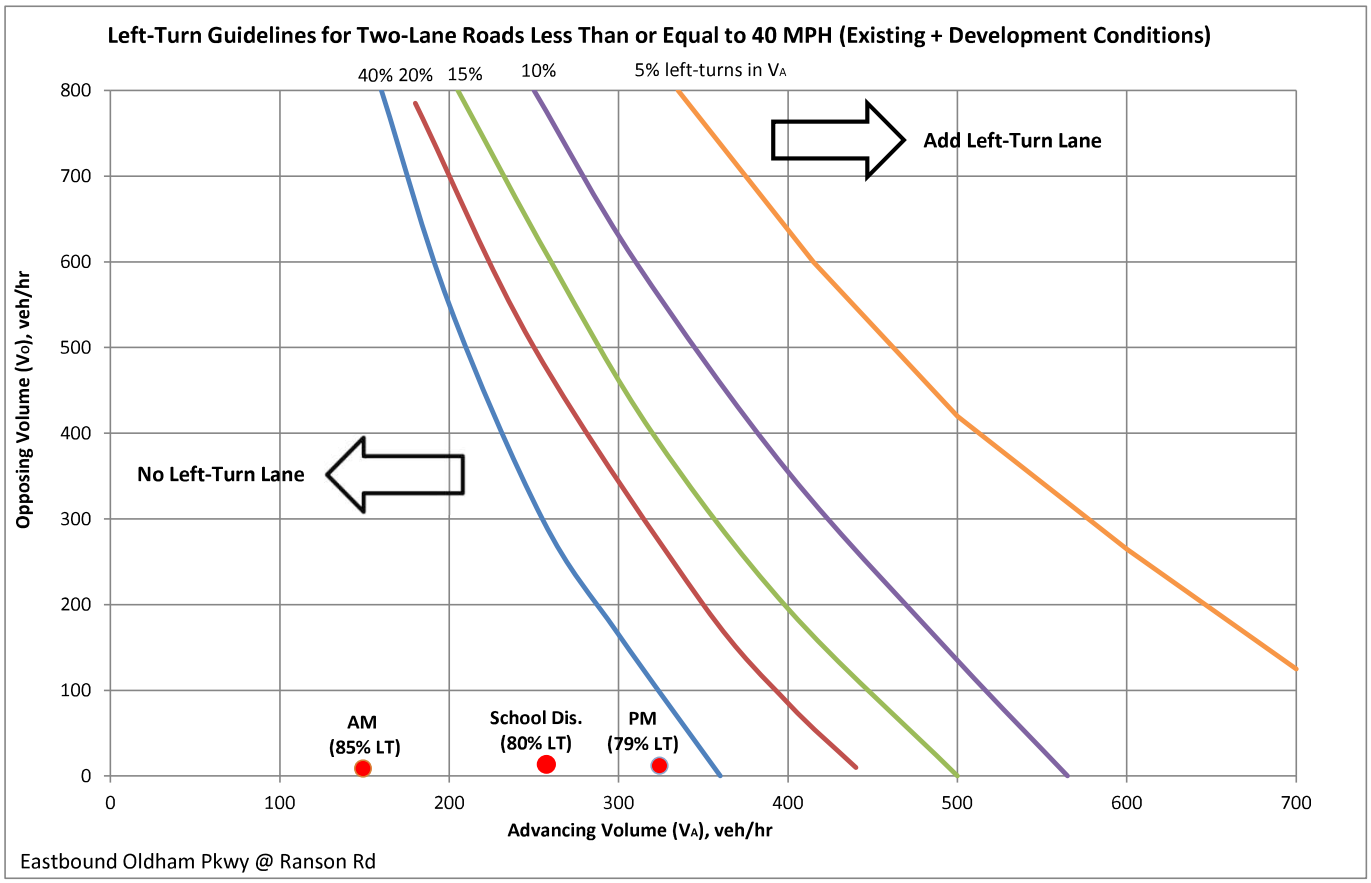
Existing + Development Conditions

Left Turns

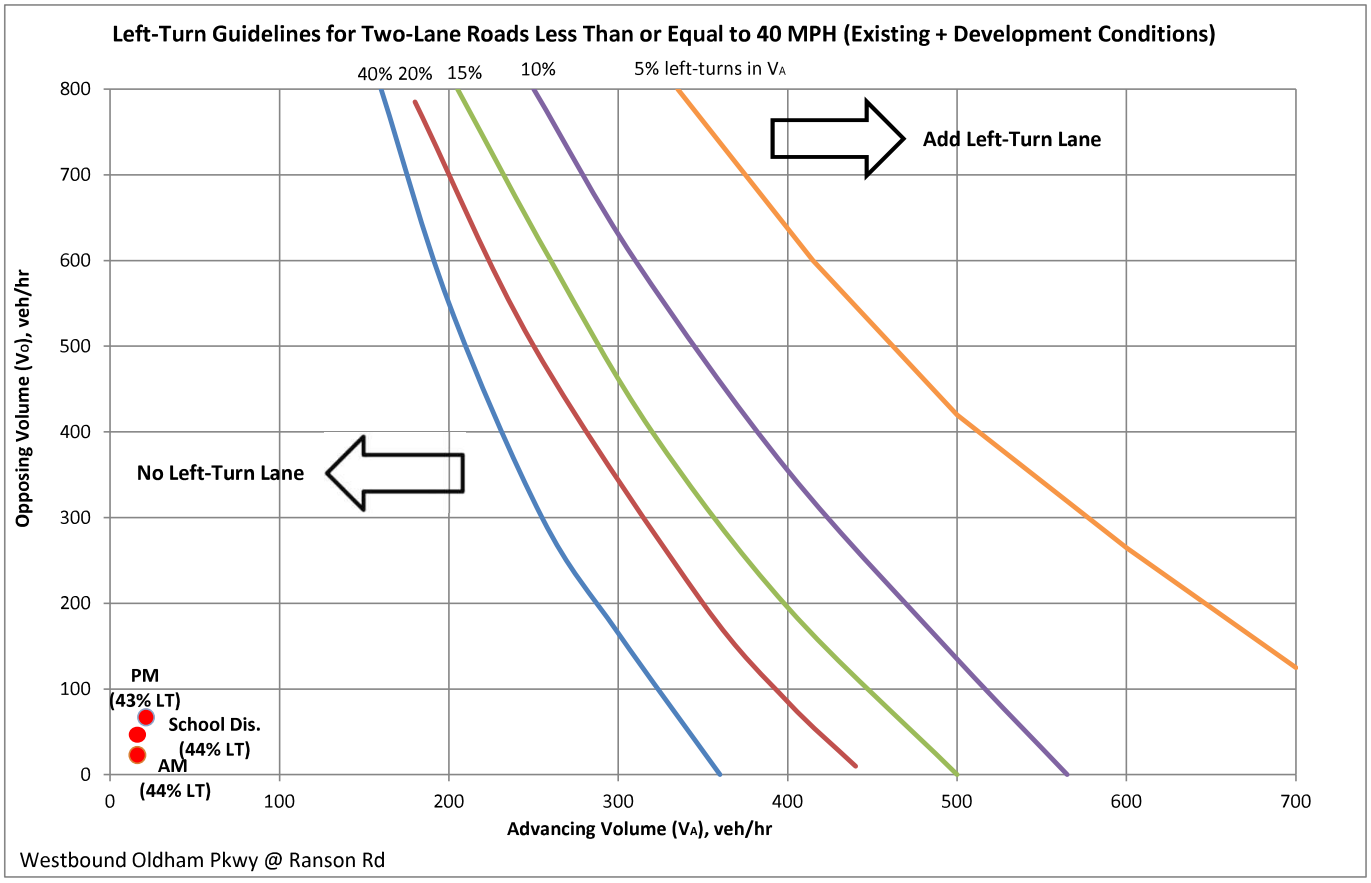
- Hamblen Rd (west) and Bailey Rd
  - EB, SB, WB existing or planned
  - NB warranted under existing
- Hamblen Rd (east) / Century Dr and Bailey Rd
  - NB existing
  - EB, WB, SB warranted under existing
- Ranson Rd & Bailey
  - LS Criterial only applied to EB approach. N/S approach MoDOT road.
  - EB warranted under existing
- School Drive 1 & Bailey
  - WB warranted
    - AMC 16.1.B – minor arterial intersection with driveway and >20 LT vph (met in all three time periods)
  - NB warranted
    - AMC 16.1.D – non-residential connector with minor arterial and >20 LT vph (met in PM)
- School Drive 2 & Bailey
  - WB warranted
    - AMC 16.1.B – minor arterial intersection with driveway and >20 LT vph (met in all three time periods)
  - NB warranted
    - AMC 16.1.D – non-residential connector with minor arterial and >20 LT vph (met in School Arrival and Dismissal)

Right Turns

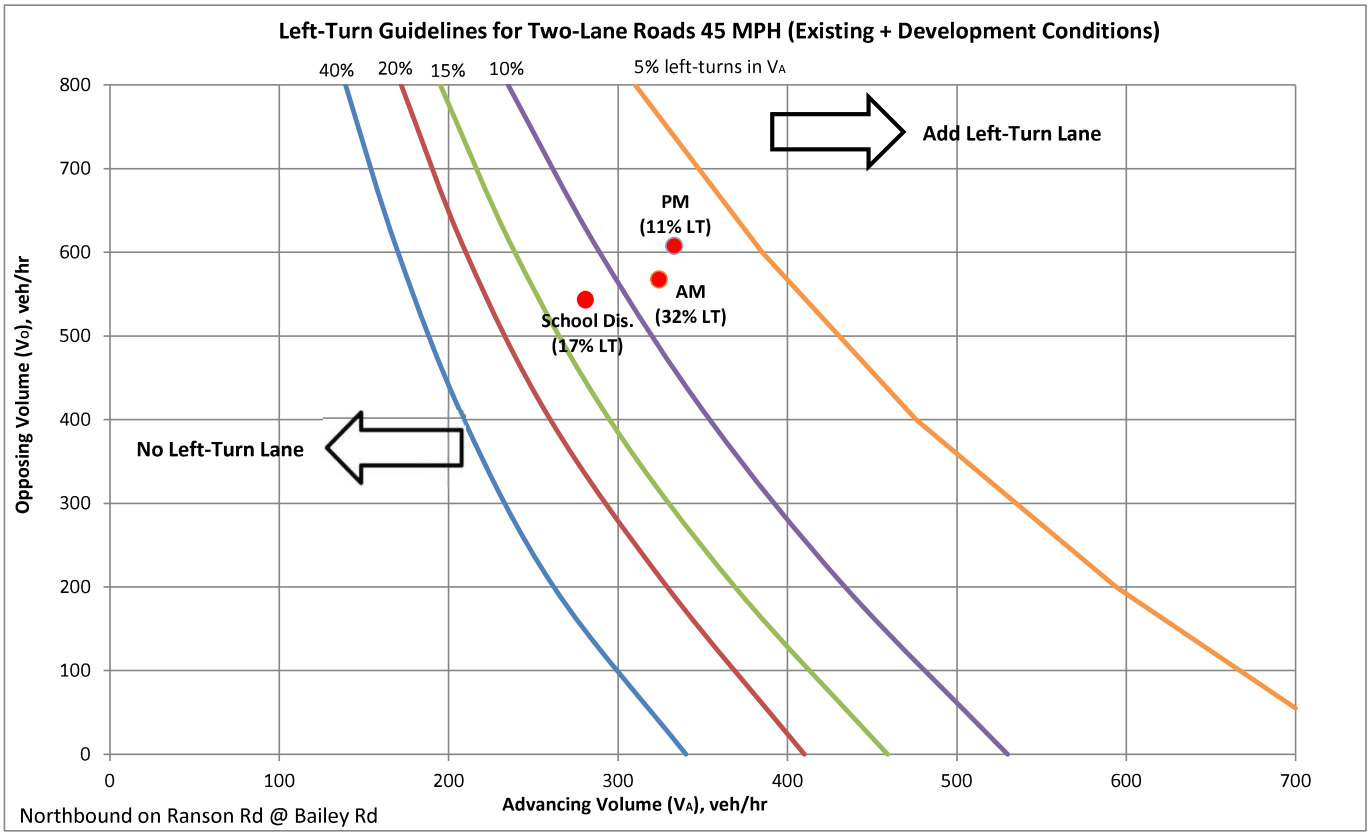
- Hamblen Rd (west) and Bailey Rd
  - WB, SB warranted under existing
- Hamblen Rd (east) / Century Dr and Bailey Rd
  - EB existing
  - NB warranted under existing
- Ranson Rd & Bailey
  - LS Criteria only applied to EB approach. N/S approach MoDOT road.
  - EB warranted under existing

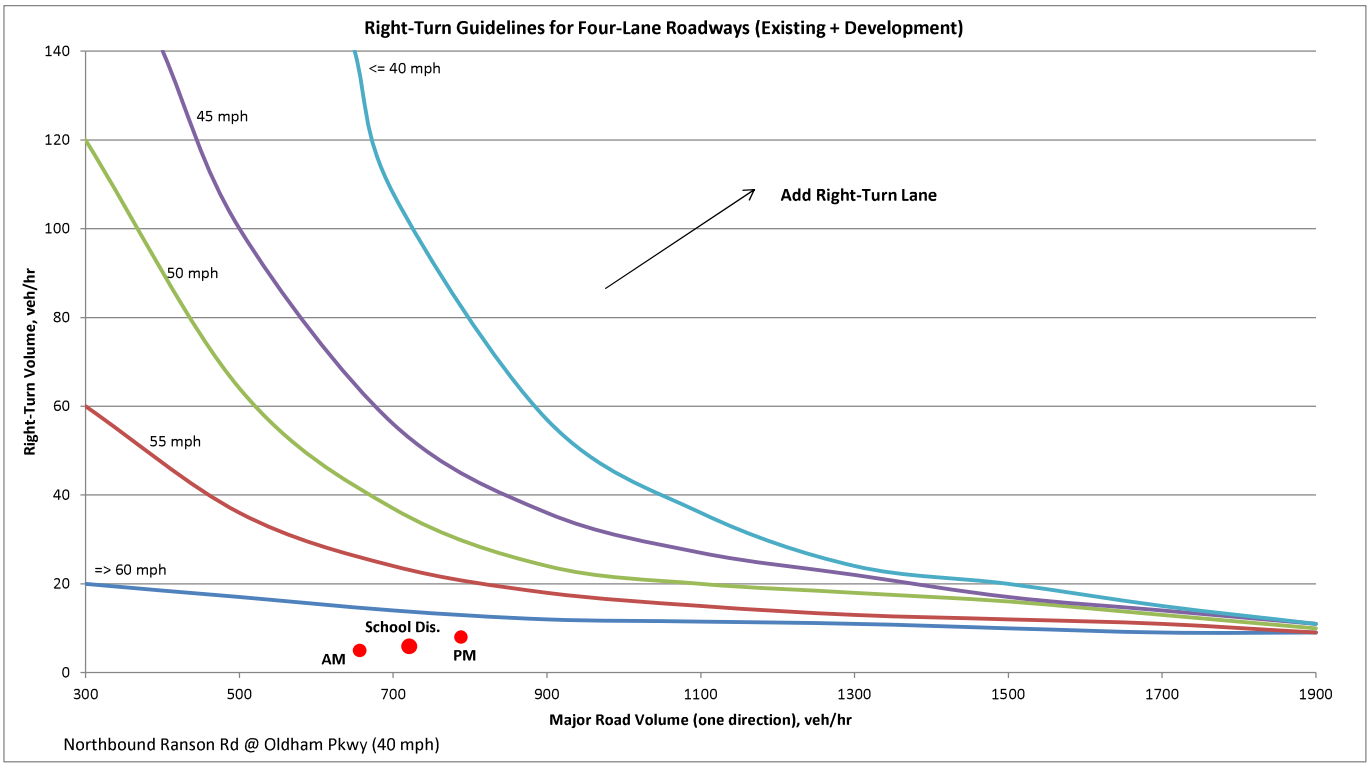


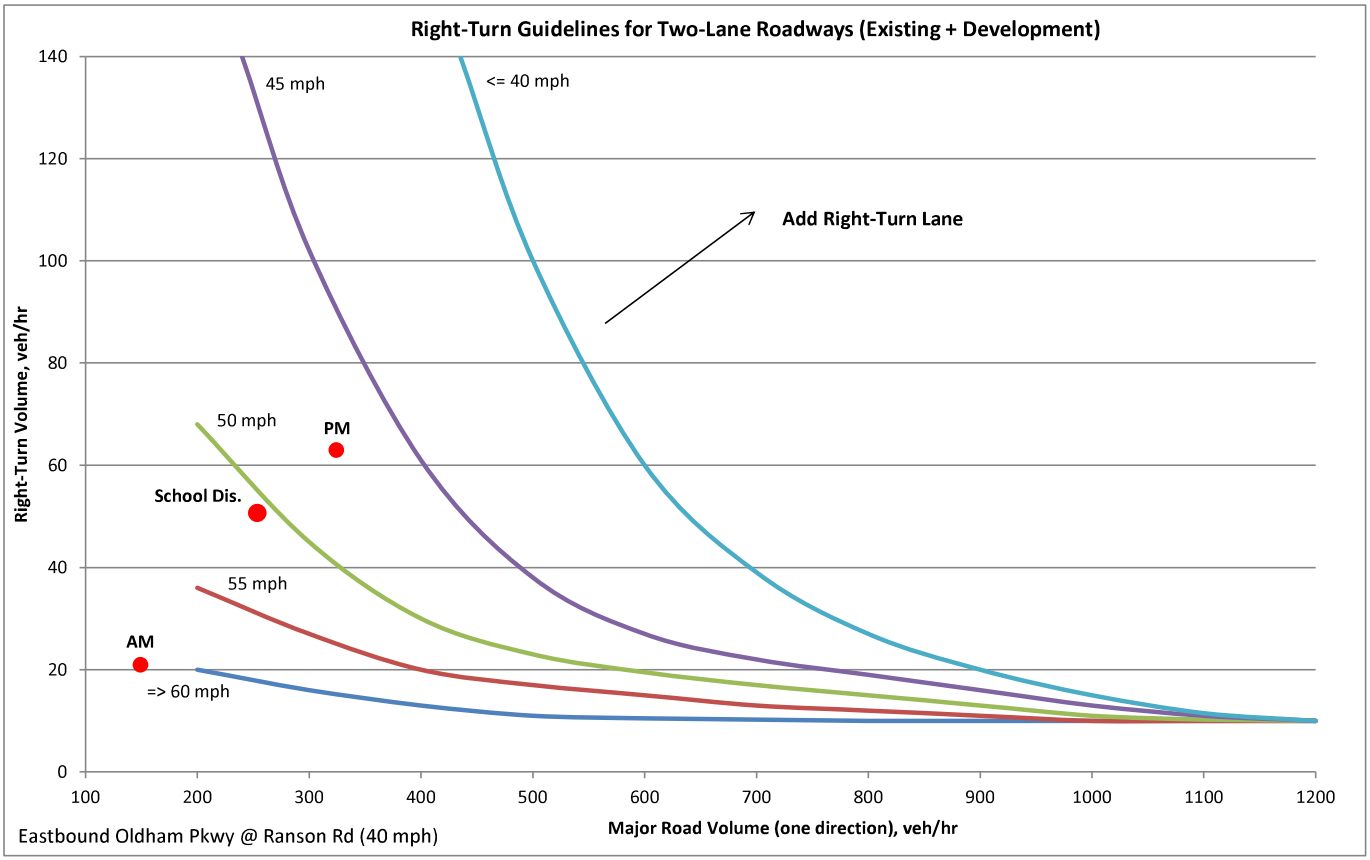
Eastbound Oldham Pkwy @ Ranson Rd

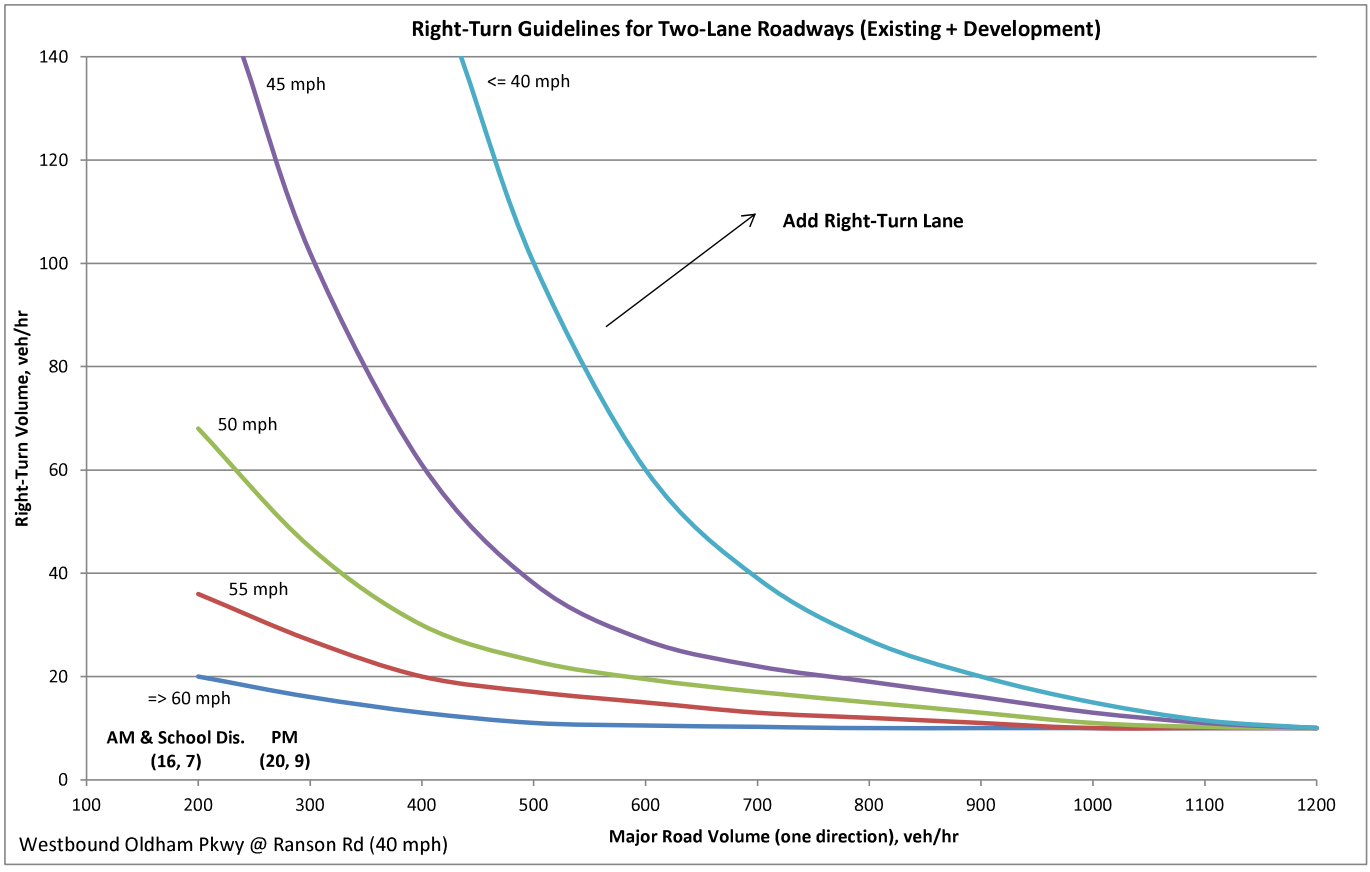


Westbound Oldham Pkwy @ Ranson Rd


Left-Turn Guidelines for Two-Lane Roads 45 MPH (Existing + Development Conditions)
40%
20%
15%
10%
5% left-turns in VA
Add Left-Turn Lane
No Left-Turn Lane
PM
(11% LT)
AM
(32% LT)
School Dis.
(17% LT)
Opposing Volume (VO), veh/hr
Advancing Volume (VA), veh/hr
0
100
200
300
400
500
600
700
800
Northbound on Ranson Rd @ Bailey Rd


Right-Turn Guidelines for Four-Lane Roadways (Existing + Development)
<= 40 mph
45 mph
50 mph
55 mph
=> 60 mph
Add Right-Turn Lane
School Dis.
AM
PM
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
0
20
40
60
80
100
120
140
300
500
700
900
1100
1300
1500
1700
1900
Northbound Ranson Rd @ Oldham Pkwy (40 mph)


Right-Turn Guidelines for Two-Lane Roadways (Existing + Development)
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
PM
School Dis.
55 mph
AM
=> 60 mph
0
20
40
60
80
100
120
140
100
200
300
400
500
600
700
800
900
1000
1100
1200
Eastbound Oldham Pkwy @ Ranson Rd (40 mph)


Right-Turn Guidelines for Two-Lane Roadways (Existing + Development)
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
AM & School Dis.
(16, 7)
PM
(20, 9)
0
20
40
60
80
100
120
140
100
200
300
400
500
600
700
800
900
1000
1100
1200
Westbound Oldham Pkwy @ Ranson Rd (40 mph)

Capacity Analysis

APPENDIX D

Future Planned Development Conditions

ITE Sheets

Land Use: 210
Single-Family Detached Housing

Description

Single-family detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision.

Additional Data

The number of vehicles and residents had a high correlation with average weekday vehicle trip ends. The use of these variables was limited, however, because the number of vehicles and residents was often difficult to obtain or predict. The number of dwelling units was generally used as the independent variable of choice because it was usually readily available, easy to project, and had a high correlation with average weekday vehicle trip ends.

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.

Single-family detached units had the highest trip generation rate per dwelling unit of all residential uses because they were the largest units in size and had more residents and more vehicles per unit than other residential land uses; they were generally located farther away from shopping centers, employment areas, and other trip attractors than other residential land uses; and they generally had fewer alternative modes of transportation available because they were typically not as concentrated as other residential land uses.

Time-of-day distribution data for this land use are presented in Appendix A. For the six 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 4:00 and 5:00 p.m., respectively. For the two sites with Saturday data, the overall highest vehicle volume was counted between 3:00 and 4:00 p.m. For the one site with Sunday data, the overall highest vehicle volume was counted between 10:15 and 11:15 a.m.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in California, Connecticut, Delaware, Illinois, Indiana, Maryland, Minnesota, Montana, New Jersey, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, and Virginia.

Source Numbers

100, 105, 114, 126, 157, 167, 177, 197, 207, 211, 217, 267, 275, 293, 300, 319, 320, 356, 357, 367, 384, 387, 407, 435, 522, 550, 552, 579, 598, 601, 603, 614, 637, 711, 716, 720, 728, 735, 868, 903, 925, 936

Single-Family Detached Housing
(210)

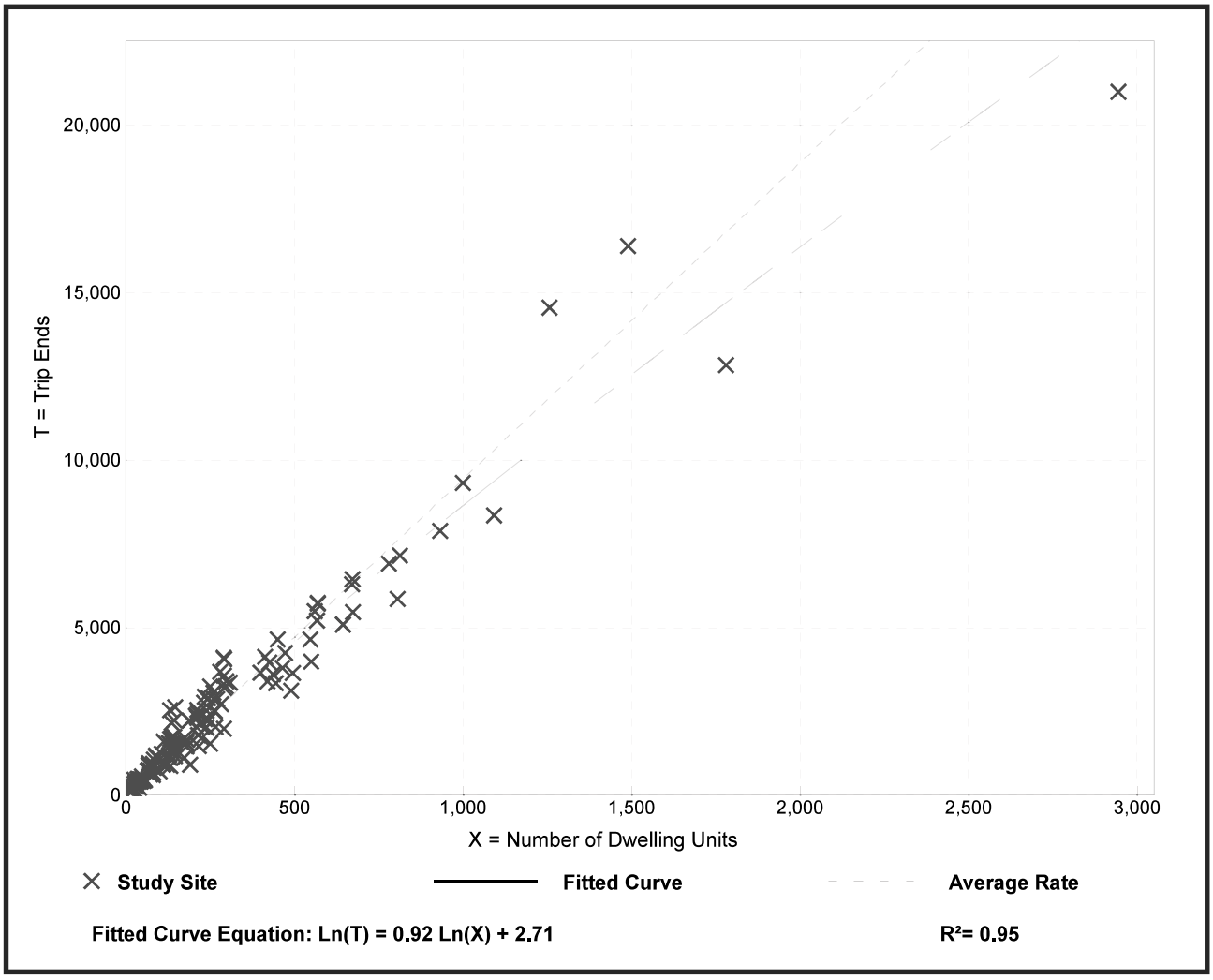
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



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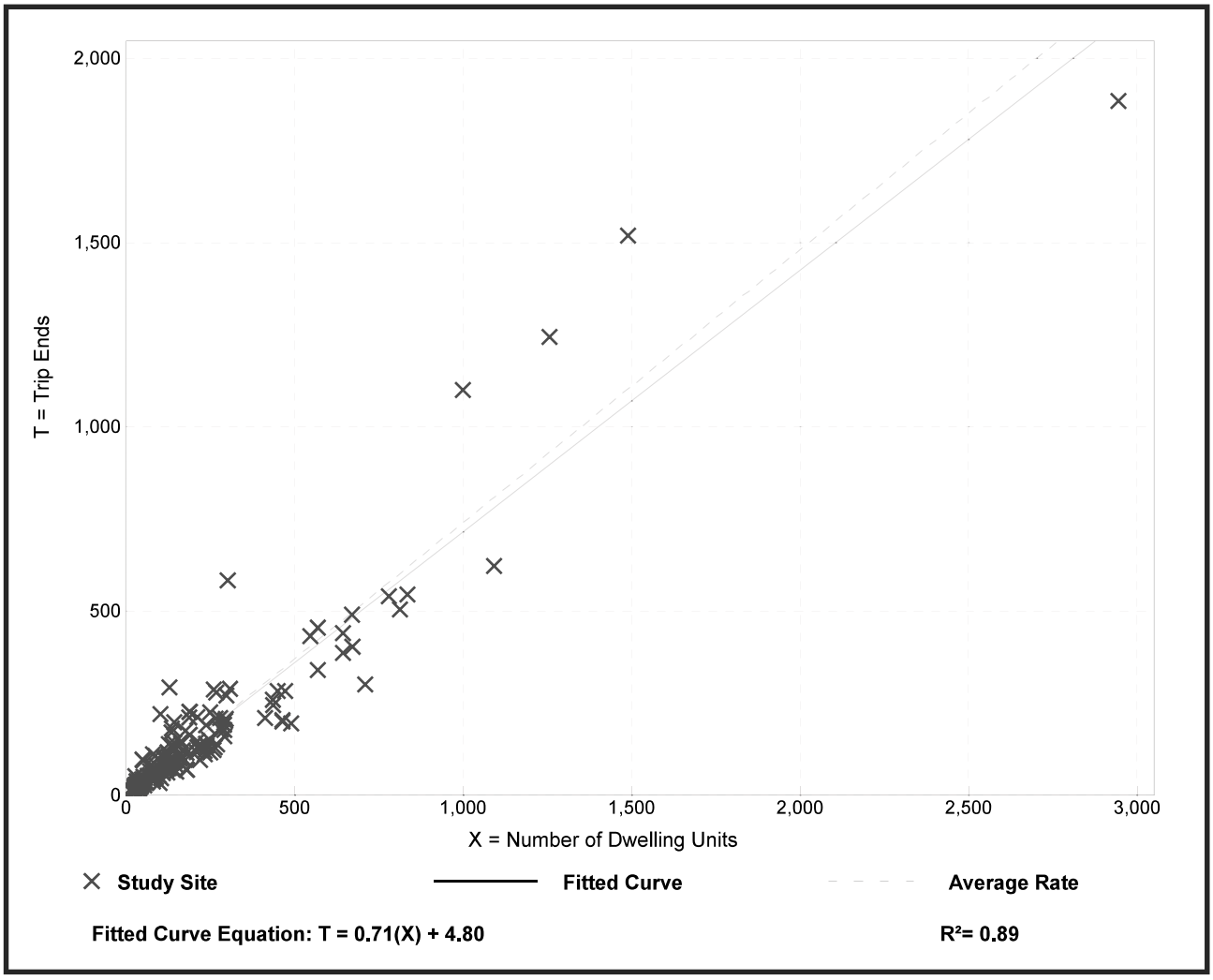
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 173
Avg. Num. of Dwelling Units: 219
Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



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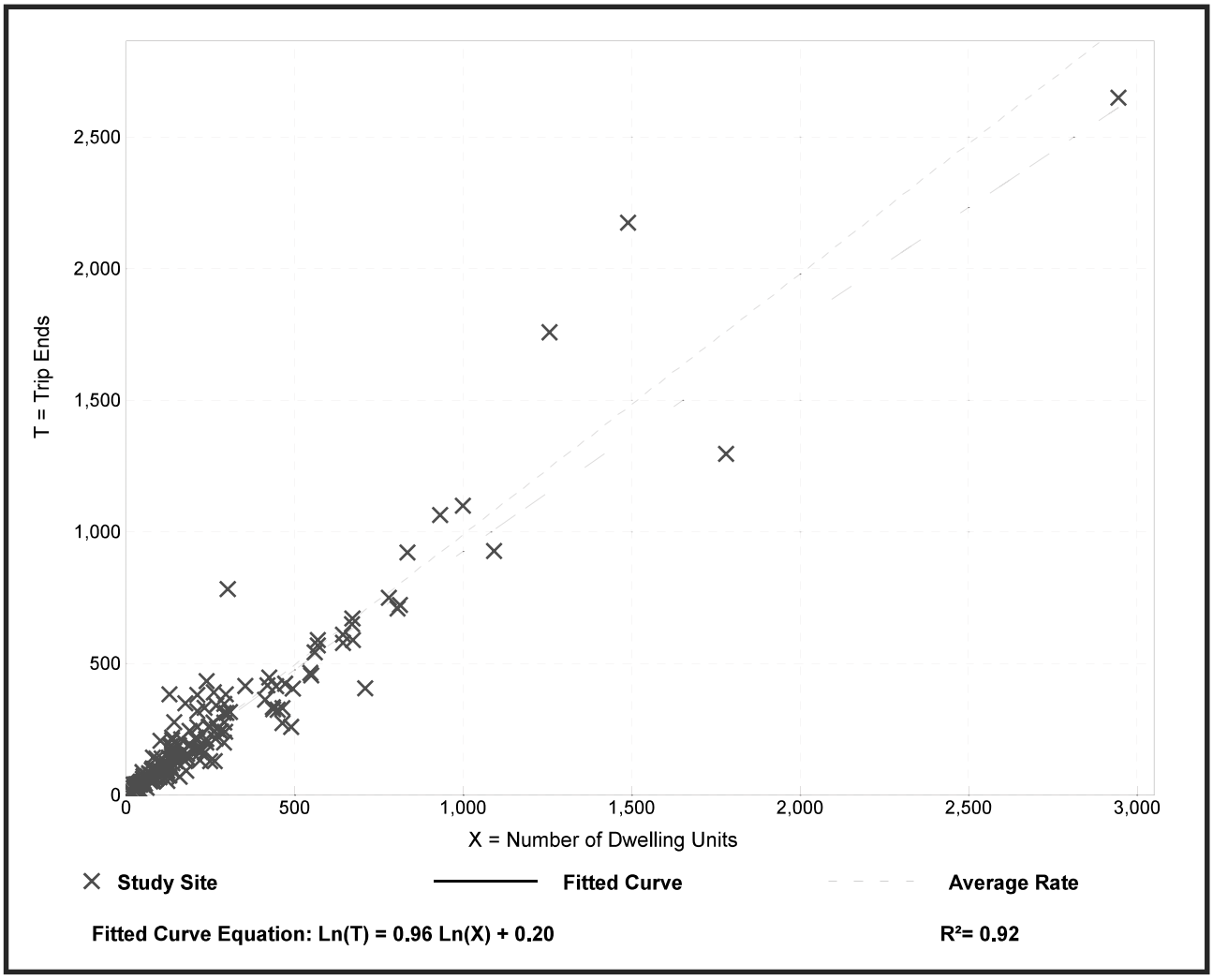
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 190
Avg. Num. of Dwelling Units: 242
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



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Land Use	210 Single-Family Detached Housing						220 Multifamily Housing (Low-Rise)							
Setting	General Urban/Suburban						General Urban/Suburban						Dense Multi-Use Urban	
Time Period	Weekday		Saturday		Sunday		Weekday		Saturday		Sunday		Weekday	
Trip Type	Vehicle		Vehicle		Vehicle		Vehicle		Vehicle		Vehicle		Vehicle	
# Data Sites	6		2		1		10		1		1		1	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
12:00	0.3	5.5	0.9	7.6	1.0	6.8	0.7	5.4	0.0	8.0	0.0	12.3	0.0	5.0
12:15	0.3	5.6	0.7	8.8	1.0	9.4	0.7	5.3	0.0	10.6	0.0	12.3	0.0	4.6
12:30	0.2	5.8	0.6	9.3	0.5	9.9	0.6	5.2	0.0	11.7	0.0	12.3	0.0	4.2
12:45	0.2	6.1	0.7	8.5	1.0	7.3	0.5	4.9	0.0	9.6	0.0	10.3	0.0	3.8
1:00	0.2	6.0	0.5	8.2	1.0	7.8	0.4				)	12.3	0.0	5.0
1:15	0.2	6.1	0.5	7.7	1.0	4.7	0.3				)	8.9	0.0	7.3
1:30	0.2	6.2	0.4	6.8	0.5	5.2	0.3				)	8.2	0.0	8.0
1:45	0.1	6.2	0.4	8.2	0.0	6.3	0.3				)	8.2	0.0	8.6
2:00	0.1	6.6	0.4	8.6	0.0	4.2	0.3	5.7	0.0	5.3	0.0	8.2	0.0	8.0
2:15	0.1	6.8	0.4	9.2	0.0	4.2	0.4	5.7	0.0	5.9	0.0	8.2	0.0	7.6
2:30	0.1	6.7	0.4	9.4	0.0	3.6	0.4	6.3	0.0	5.3	0.0	6.2	0.0	7.6
2:45	0.1	7.1	0.4	9.3	0.0	2.6	0.3	5.9	0.0	5.9	0.0	6.2	0.0	6.5
3:00	0.2	7.2	0.6	10.0	0.5	5.2	0.4	6.2	0.0	5.9	0.0	3.4	0.4	7.3
3:15	0.2	7.7	0.9	8.2	0.5	7.3	0.3	6.5	0.0	6.9	0.0	5.5	0.4	6.1
3:30	0.3	8.5	0.8	8.6	0.5	8.9	0.4				0.0	6.8	0.4	6.9
3:45	0.5	8.9	0.8	7.2	0.5	11.5	0.6				0.0	6.2	0.4	7.3
4:00	0.6	9.0	0.6	6.2	0.0	9.9	0.6				0.0	6.2	0.4	6.9
4:15	0.7	8.9	0.2	7.0	1.0	9.9	0.7	8.1	0.0	6.4	0.0	2.7	0.4	6.5
4:30	1.0	8.9	0.5	7.3	1.6	9.9	0.8	8.8	0.5	9.0	0.7	4.1	0.4	6.1
4:45	1.0	8.9	0.6	7.7	2.1	10.4	1.0	9.2	1.1	8.5	1.4	6.2	1.1	5.7
5:00	1.2	8.8	0.9	8.0	2.1	11.5	1.3	9.1	1.1	10.1	1.4	7.5	0.8	6.1
5:15	1.6	8.6	1.1	7.4	1.6	10.4	1.6	9.2	1.1	10.1	1.4	8.9	2.3	6.9
5:30	2.0	8.3	0.9	6.5	1.0	9.4	1.9	9.0	0.5	9.6	0.7	8.9	3.1	7.3
5:45	2.9	7.9	0.9	5.9	1.0	6.8	2.4	8.2	0.0	11.2	0.7	6.2	4.6	8.4
6:00	3.8	7.2	0.9	5.4	1.6	7.3	2.9	7.9	1.1	8.5	1.4	4.8	5.0	9.2
6:15	4.5	6.7	1.2	5.6	1.0	6.8	3.8	7.2	2.1	6.4	2.7	4.8	5.0	9.5
6:30	5.4	6.0	1.5	5.3	1.6	7.3	4.9	6.6	2.1	4.8	2.7	3.4	6.9	8.4
6:45	6.2	5.6	1.9	5.9	2.1	8.9	6.3	6.4	2.1	3.7	2.1	3.4	8.0	6.9
7:00	6.7	5.2	1.9	5.6	2.1	6.8	7.4	5.7	2.7	2.7	1.4	3.4	11.1	5.0
7:15	7.3	5.0	2.5	5.8	3.1	6.3	7.7	5.4	1.6	4.3	2.7	4.1	9.9	4.6
7:30	7.1	4.8	3.5	5.8	3.6	5.7	7.7	5.4	1.6	4.8	4.1	2.7	8.8	3.8
7:45	6.6	4.7	3.8	5.4	3.6	4.2	6.9	4.9	2.7	4.3	6.2	2.7	7.3	3.8
8:00	6.2	4.7	4.3	5.0	3.1	5.2	6.3	5.1	1.6	3.7	6.8	2.7	4.6	5.7
8:15	5.7	4.5	4.7	3.6	2.6	4.2	6.0	4.8	2.7	4.8	6.2	0.7	5.0	3.8
8:30	5.1	4.3	4.0	3.2	3.1	2.6	5.6	4.1	4.3	4.3	6.2	1.4	3.8	6.9
8:45	4.9	3.7	4.8	2.8	2.1	1.6	5.5	4.1	4.3	3.2	4.8	1.4	3.1	8.8
9:00	4.3	3.4	5.2	2.1	3.6	0.0	5.3	3.6	6.9	3.7	6.2	0.7	2.7	6.9
9:15	4.1	2.8	5.4	2.2	5.2	0.0	5.1	3.6	9.0	2.7	5.5	2.1	2.7	8.0
9:30	4.4	2.3	6.0	2.1	6.3	0.0	4.6	3.6	10.1	3.2	5.5	1.4	3.4	5.0
9:45	4.4	2.0	7.3	1.5	10.9	0.5	4.1	3.3	12.2	4.3	8.9	2.1	4.2	3.1
10:00	4.8	1.6	7.9	1.3	12.5	0.5	4.0	2.9	9.6	3.7	10.3	2.7	4.6	2.3
10:15	5.0	1.3	8.1	0.9	13.0	0.5	4.3	2.2	7.4	2.1	11.6	1.4	4.2	1.5
10:30	5.0	1.2	7.7	0.9	11.5	0.5	4.7	1.8	6.4	2.7	11.6	1.4	3.1	1.1
10:45	5.2	1.2	6.2	0.8	9.4	0.0	5.2	1.4	5.9	1.6	8.9	0.7	1.9	0.8
11:00	5.2	1.0	6.5	1.4	7.3	0.0	5.3	1.2	10.6	1.6	8.2	0.0	1.9	1.5
11:15	5.3	0.8	6.5	1.4	6.3	0.0	5.3	1.0	11.2	1.6	10.3	0.0	3.1	0.8
11:30	5.4	0.7	7.2	1.5	5.7	1.0	5.2	0.8	11.2	0.0	11.6	0.0	4.2	0.8
11:45	5.4	0.4	7.9	1.3	6.3	1.0	5.4	0.7	10.6	0.0	13.7	0.0	5.0	0.8

7.2% of daily trips occurred during 3-4pm. (7.2/9 = 80%). Thus 3-4pm is 80% of PM peak hour LU 210 trips.

4pm was peak hour. 9% of daily trips occured during PM peak.

Percent of Daily Traffic During the 60-Minute Period Beginning at Displayed Time

Trip Generation & Distribution

Bailey Farm Trip Generation

Daily Trip Generation

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
210	Single-Family Detached Homes	300	Dwelling Units	Equation	2,857	50%	50%	1,429	1,428
Total					**2,857**			**1,429**	**1,428**

AM Peak Hour Trip Generation (Peak Hour of Adjacent Street Traffic, 7-9 AM)

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
210	Single-Family Detached Homes	300	Dwelling Units	Equation	218	25%	75%	55	163
Total					**218**			**55**	**163**

School Dismisal Peak Hour Trip Generation (PM Peak Hour of Generator)

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
210	Single-Family Detached Homes	300	Dwelling Units	Equation	234	63%	37%	147	87
Total					**234**			**147**	**87**

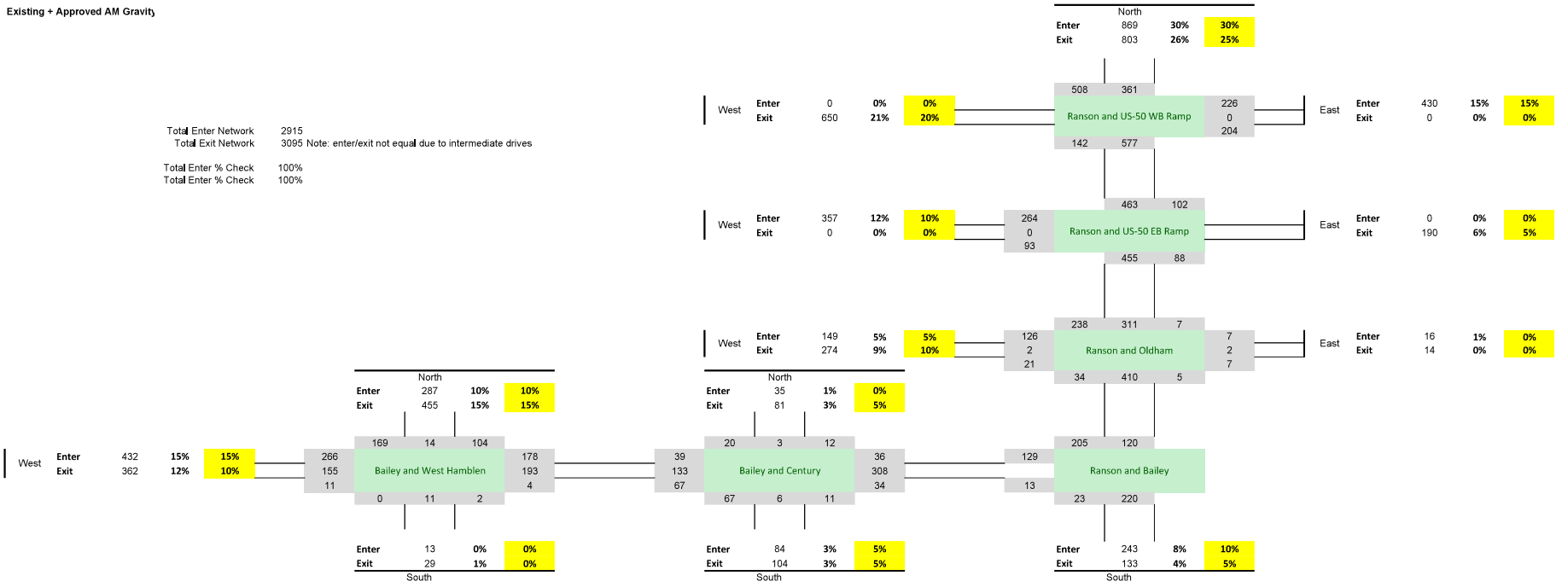
Note: Methods to generate trips during a school dismissal peak hour (3-4 PM) are not provided. Based on trime of day data provided in Appendix A of the Trip Generation Manual, trips during this time are expected to be approximately 80% of (or 20% less than) the PM peak hour.

PM Peak Hour Trip Generation (Peak Hour of Adjacent Street Traffic, 4-6 PM)

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
210	Single-Family Detached Homes	300	Dwelling Units	Equation	292	63%	37%	184	108
Total					**292**			**184**	**108**

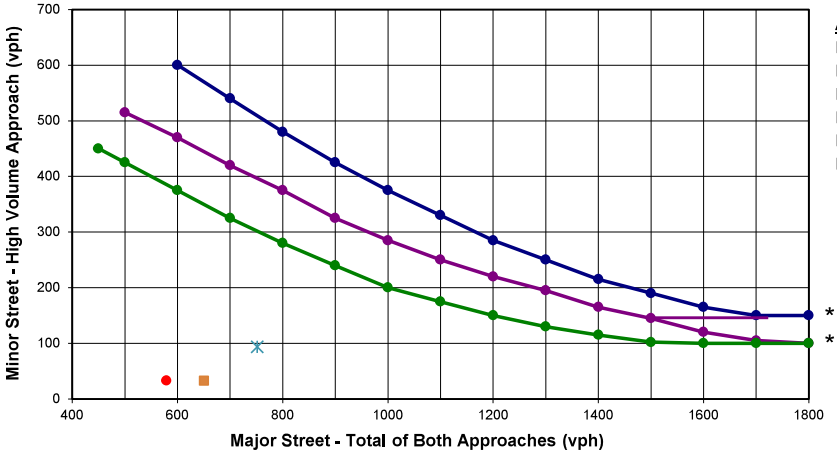
Bailey Farm Development	
Direction	Primary Trips (To/From)
Bailey Rd (West)	15%
Hamblen Rd (North)	15%
Century Dr (North)	3%
Todd George Pkwy (North)	15%
Ranson Rd (South)	10%
US-50 (East)	10%
US-50 (West)	30%
Oldham Pkwy (West)	2%
Total	100%

Existing Volume Gravity (Used in Part to Determine Bailey Farm Trip Distribution)



Signal Warrants

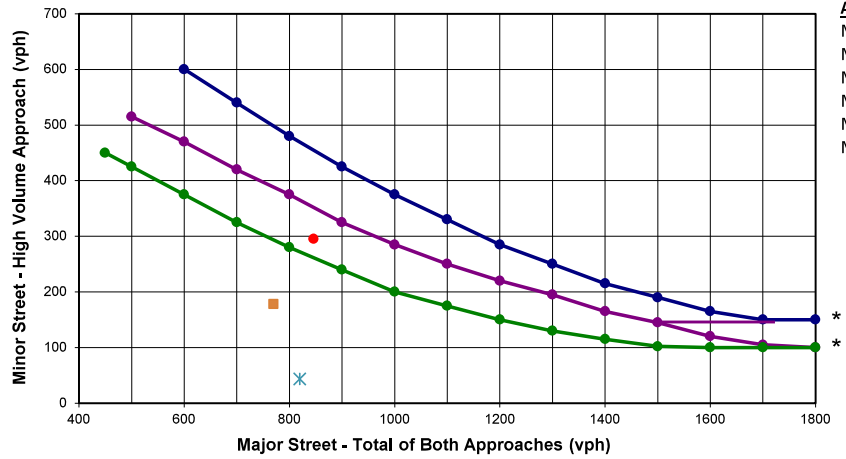
Peak Hour Volume Warrant (Future)
Bailey Rd and Drive 1



AM & PM Volumes:
Major (AM) - 579
Minor (AM) - 33
Major (School Dis.) - 651
Minor (School Dis.) - 32
Major (PM) - 752
Minor (PM) - 93

*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)
Bailey Road & Drive 2



AM & PM Volumes:
Major (AM) - 846
Minor (AM) - 295
Major (School Dis.) - 770
Minor (School Dis.) - 178
Major (PM) - 820
Minor (PM) - 43

*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.

Lane Warrants

Lee's Summit AMC Lane Warrants (Applied along Bailey Rd)

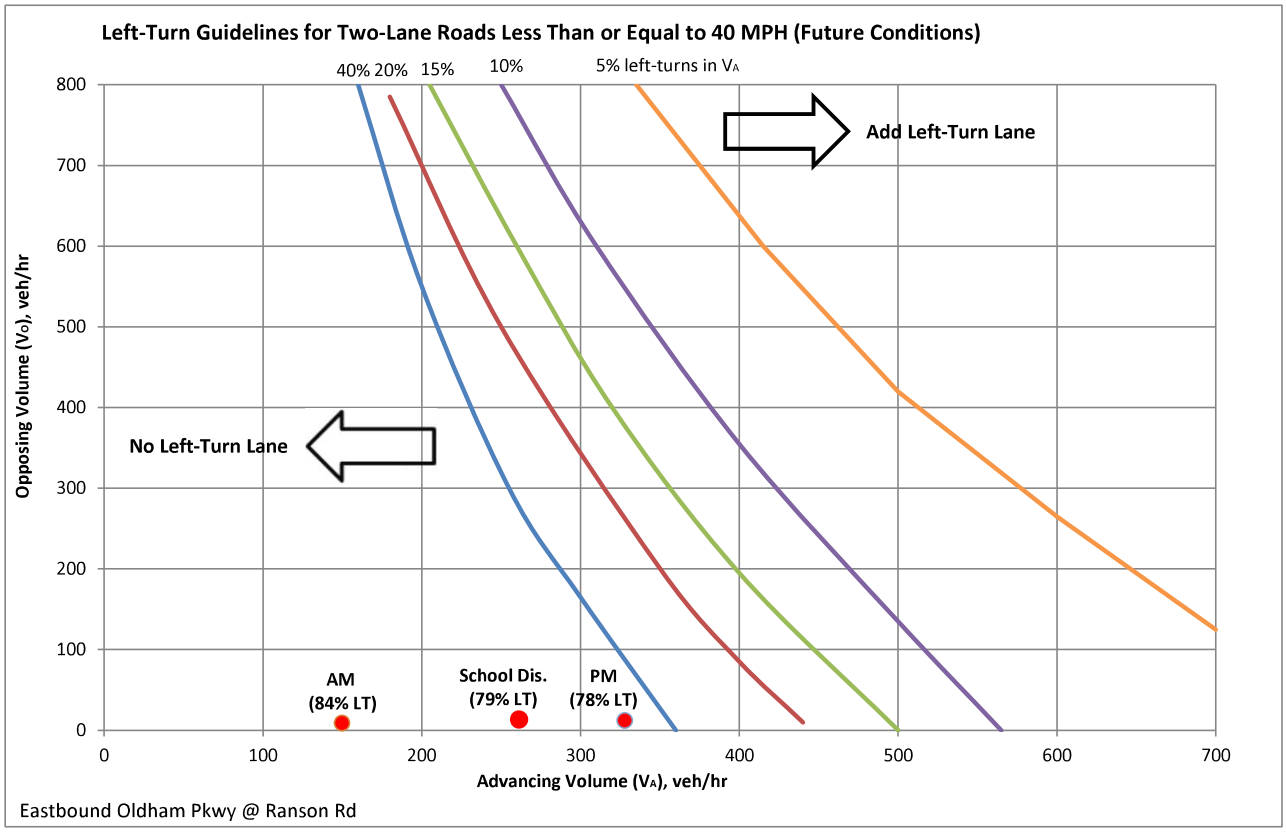
Future Conditions

Left Turns

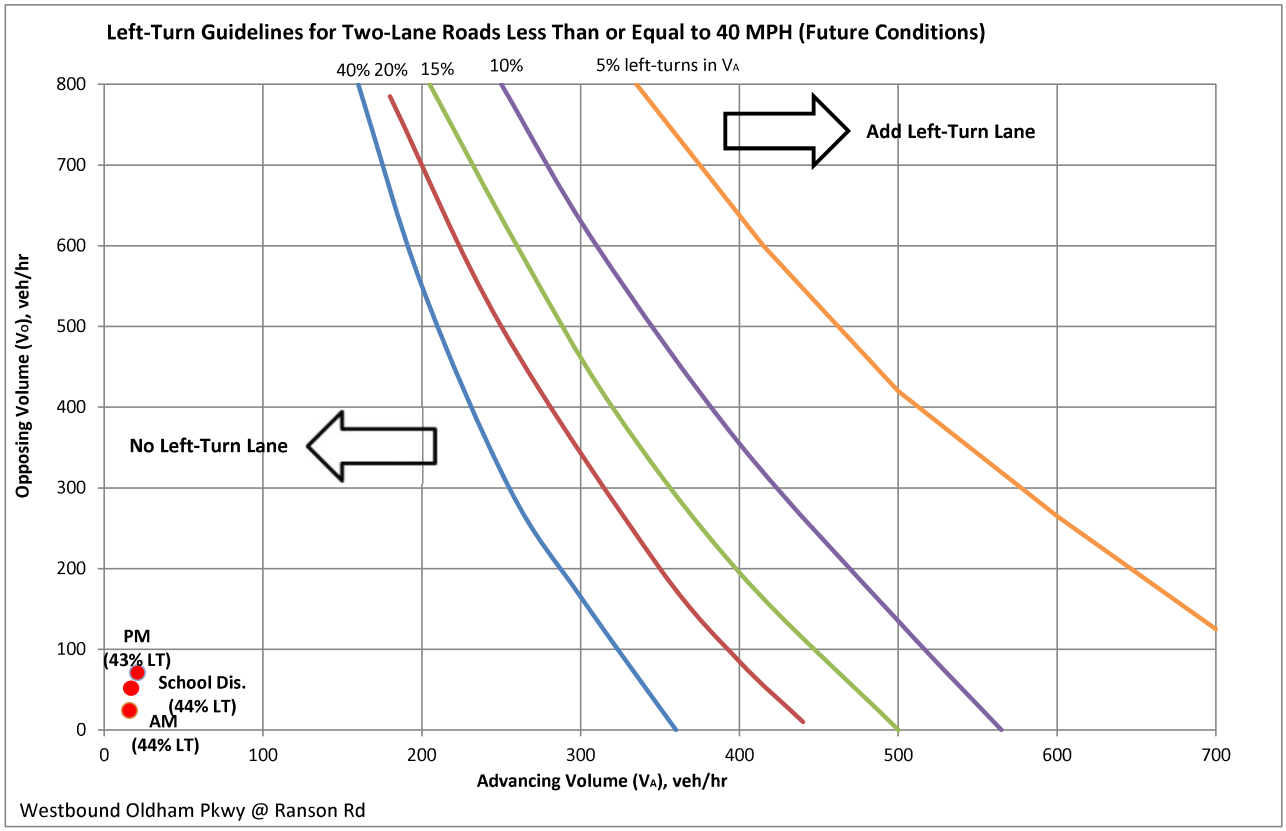
- Hamblen Rd (west) and Bailey Rd
  - EB, SB, WB existing or planned
  - NB warranted under existing
- Hamblen Rd (east) / Century Dr and Bailey Rd
  - NB existing
  - EB, WB, SB warranted under existing
- Ranson Rd & Bailey
  - LS Criterial only applied to EB approach. N/S approach MoDOT road.
  - EB warranted under existing
- School Drive 1 & Bailey
  - WB warranted under plus development
  - NB warranted under plus development
- School Drive 2 & Bailey
  - WB warranted under plus development
  - NB warranted under plus development

Right Turns

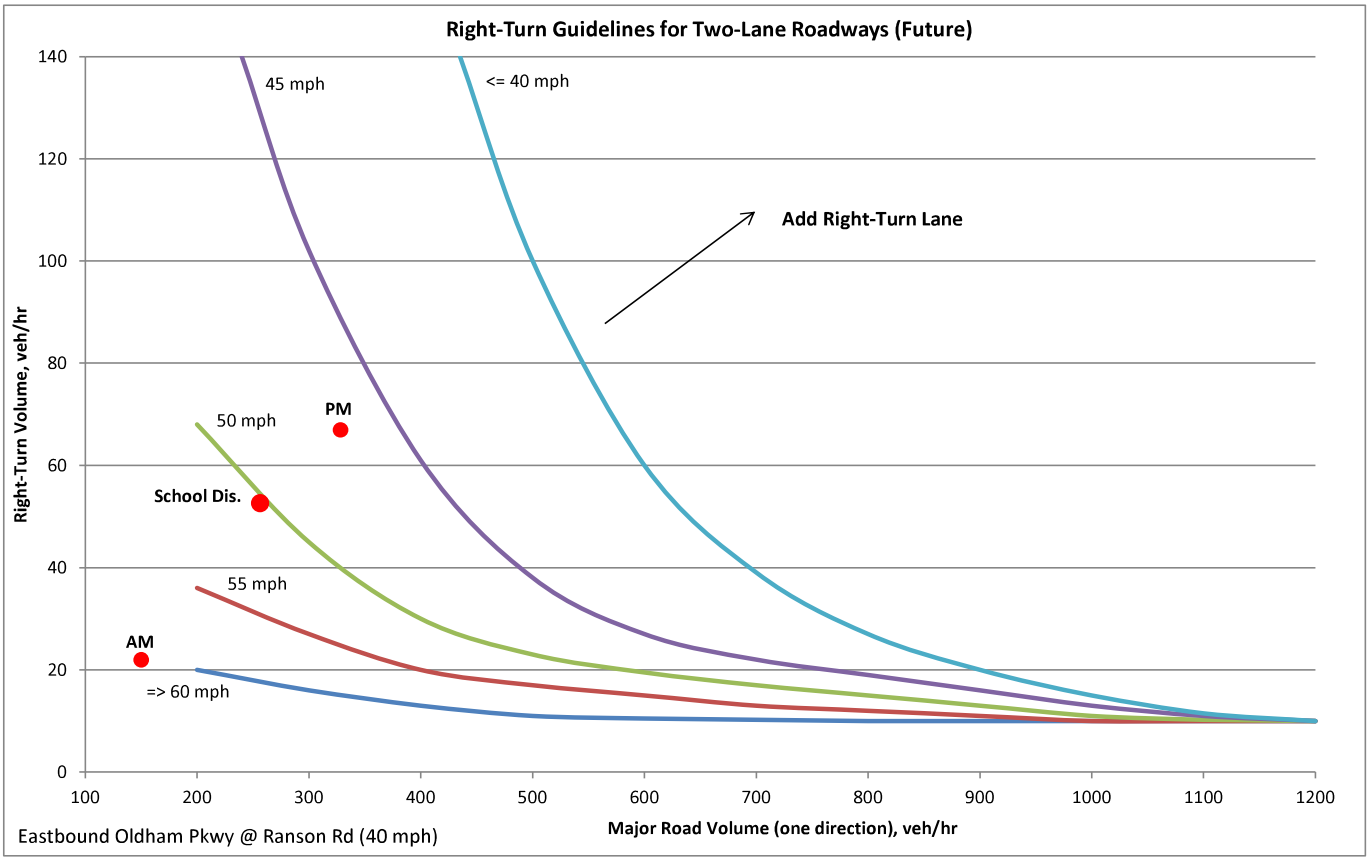
- Hamblen Rd (west) and Bailey Rd
  - WB, SB warranted under existing
- Hamblen Rd (east) / Century Dr and Bailey Rd
  - EB existing
  - NB warranted under existing
- Ranson Rd & Bailey
  - LS Criteria only applied to EB approach. N/S approach MoDOT road.
  - EB warranted under existing

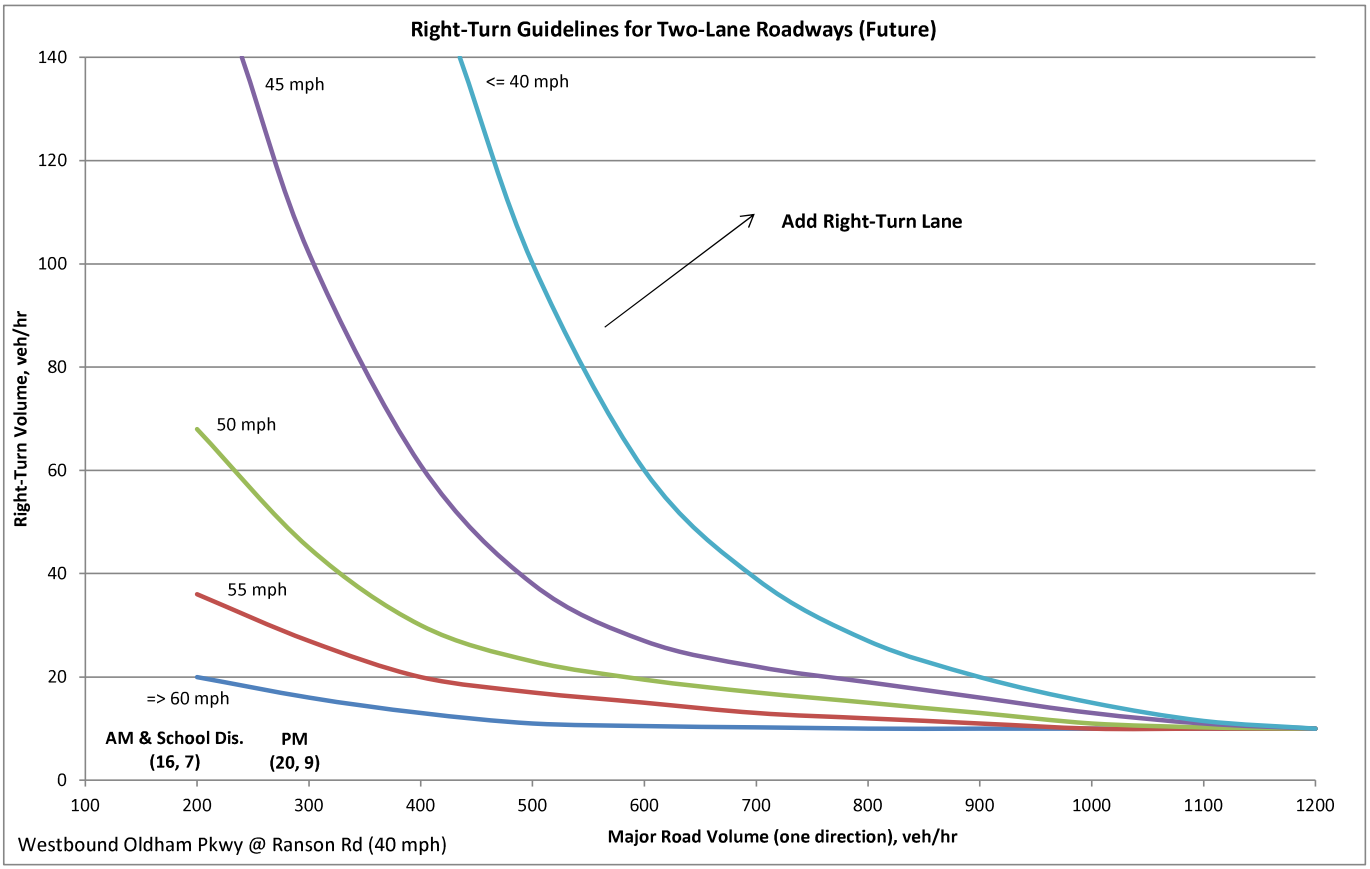


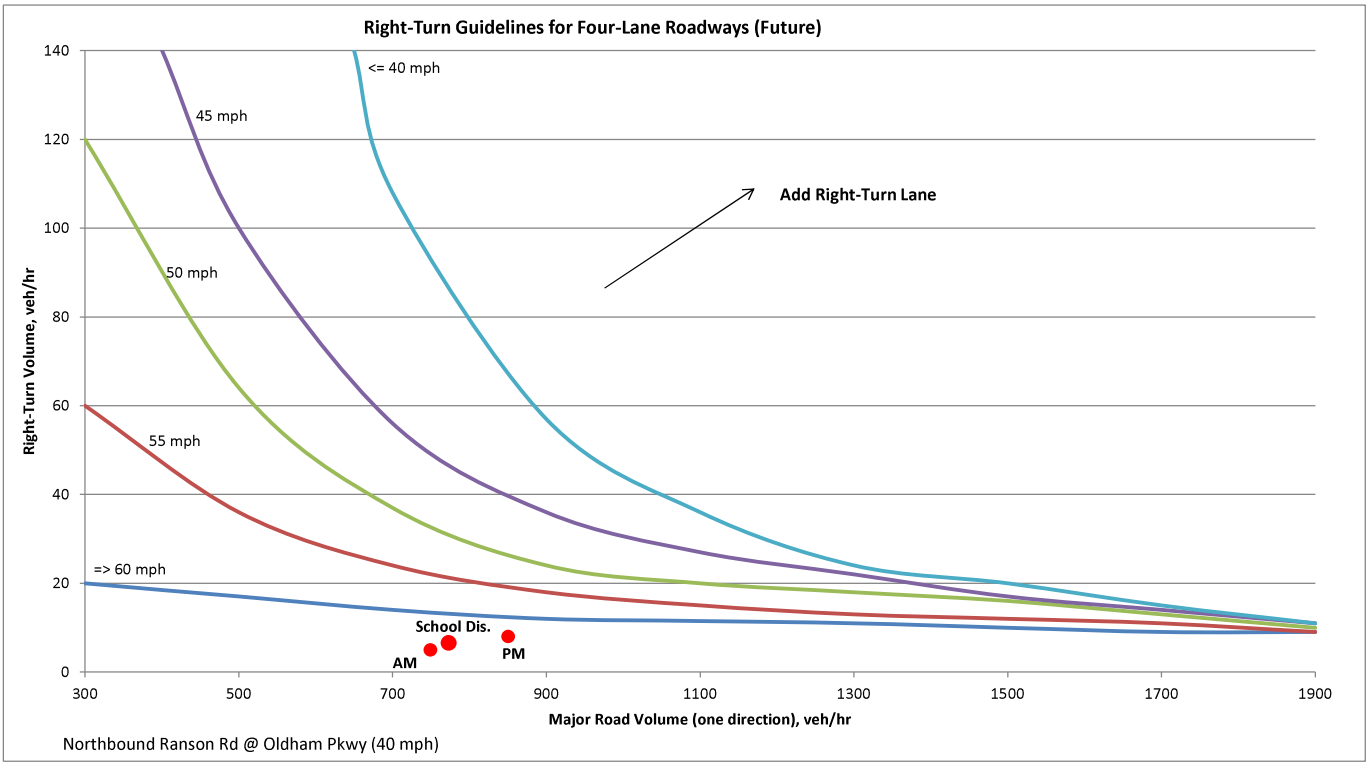
Eastbound Oldham Pkwy @ Ranson Rd



Westbound Oldham Pkwy @ Ranson Rd


Right-Turn Guidelines for Two-Lane Roadways (Future)
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
PM
School Dis.
55 mph
AM
=> 60 mph
Eastbound Oldham Pkwy @ Ranson Rd (40 mph)


Right-Turn Guidelines for Two-Lane Roadways (Future)
Right-Turn Volume, veh/hr
Major Road Volume (one direction), veh/hr
45 mph
<= 40 mph
Add Right-Turn Lane
50 mph
55 mph
=> 60 mph
AM & School Dis.
(16, 7)
PM
(20, 9)
Westbound Oldham Pkwy @ Ranson Rd (40 mph)


Right-Turn Guidelines for Four-Lane Roadways (Future)
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
School Dis.
AM
PM
140
120
100
80
60
40
20
0
300
500
700
900
1100
1300
1500
1700
1900
Northbound Ranson Rd @ Oldham Pkwy (40 mph)

Capacity Analysis


STATE OF MISSOURI
SHANNON
JEFFRIES
NUMBER
PE-2008000069
PROFESSIONAL ENGINEER
05.08.2020