MEMORANDUM

Date: September 13, 2019

To: Alta Planning
David Foster, PLA

From: Hales Engineering

Subject: Salt Lake City 900 East Corridor Study – Existing Conditions

UT19-1518

This memorandum discusses the traffic analysis completed for the 900 East Corridor Study in Salt Lake City, Utah. This Corridor Study is for 900 East from 2700 South to Hollywood Avenue. Hales Engineering analyzed existing conditions related to vehicle speed, traffic volumes, safety, intersection level of service, and turn lane needs. These items are discussed in the following sections.

Data Collection

Weekday morning (7:00 to 9:00 a.m.) and evening (4:00 to 6:00 p.m.) peak period traffic counts were performed at the following intersections:

- 2100 South / 900 East
- Sugarmont Drive / 900 East
- Simpson Avenue / 900 East
- 2700 South / 900 East

The counts were performed on Thursday, August 8, 2019. The morning peak hour was determined to be between 8:00 and 9:00 a.m., and the evening peak hour was determined to be between 5:00 and 6:00 p.m. The evening peak hour volumes were approximately 65% higher than the morning peak hour volumes. Detailed turning movement count data are included in Appendix A. The morning and evening peak hour volumes are shown in Figure 1.

Daily traffic volume, speed, and classification data were collected over a 24-hour period using pneumatic tube counters at two locations on 900 East. These data were collected near Wilmington Avenue and near Stratford Avenue on Tuesday, August 20, 2019. A summary of the data collected by the tube counters is shown in Table 1. Detailed tube count data is provided in Appendix B.

Morning Peak Hour

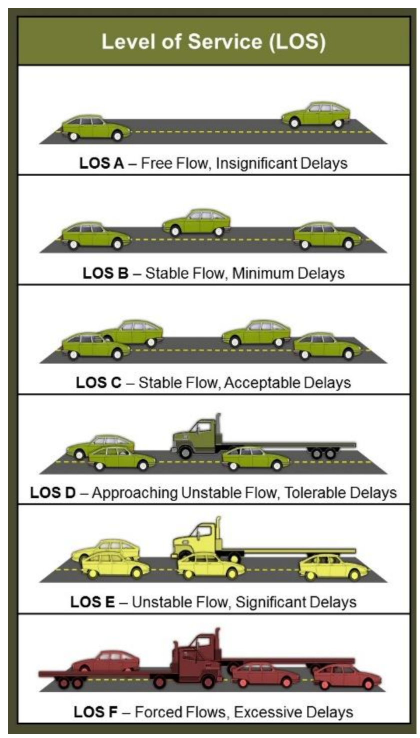
Evening Peak Hour

Figure 1: Existing (2019) peak hour turning movement volumes

Table 1: Tube Count Data – Tuesday, August 20, 2019

		Willington Avenue	Stratford Avenue
Speed	Posted Speed Limit	30 mph	30 mph
	Average	24.0 mph	32.6 mph
	85th Percentile	29.4 mph	37.2 mph
Vehicle Classification: Percent Trucks	Daily	5.6%	5.2%
	AM Peak Hour	8.5%	6.3%
	PM Peak Hour	5.1%	4.7%
Volume	Daily	11,083 vpd	10,161 vpd

Level of Service Methodology



Level of service (LOS) is a term that describes the operating performance of an intersection or roadway. LOS is measured quantitatively and reported on a scale from A to F, with A representing the best performance and F the worst. The *Highway Capacity Manual* (HCM), 6th Edition, 2016 methodology was used in this study to remain consistent with "state-of-the-practice" professional standards.

For the purposes of this study, a minimum acceptable performance was set at LOS D. If levels of service E or F conditions exist, an explanation and/or mitigation measures will be presented.

Corridor Level of Service

Hales Engineering calculated the existing LOS for the corridor by section based on the existing average daily traffic (ADT) volumes and the HCM methodology. According to HCM, corridor LOS is based on a volume-to-capacity (v/c) ratio. The higher the ratio, the worse the LOS. When the v/c of a roadway is over 1.0, it is determined that the roadway operates at LOS F.

A two-lane roadway has a capacity of approximately 12,500 vehicles per day (vpd), and a three-lane roadway has a capacity of approximately 16,400 vpd. As shown in Table 2 and assuming a two-lane roadway on 900 East, it is anticipated that the north and south sections of 900 East would operate at LOS E and LOS D, respectively. This implies that a three-lane cross-section is needed north of Sugarmont Drive.

Table 2: Corridor LOS

900 East Section	2019 ADT	2-Lane Capacity	2-Lane V / C	LOS
North of Sugarmont Dr.	11,100 vpd	12,500 vpd	0.89	E
South of Sugarmont Dr.	10,200 vpd		0.82	D

Hales Engineering also looked at future volume projections from the Wasatch Front Regional Council (WFRC) travel demand model to estimate future cross-section needs. According to the model, it is anticipated that traffic volumes will increase by approximately 1,800 vpd and 900 vpd on the north and south sections, respectively, between 2019 and 2050. It is anticipated that the north section, if constructed as a three-lane cross section north of Sugarmont Drive, will operate at an acceptable LOS D, in year 2050. The south section may operate at LOS E at peak times by year 2050 in a two-lane configuration. However, it is anticipated that this will be an acceptable condition to encourage drivers to slow down through this area.

Intersection Level of Service

Hales Engineering completed a LOS analysis at the four main study intersections to determine how they currently operate. Using Synchro/SimTraffic software, which follow the HCM methodology, the peak hour LOS was computed for each study intersection. Multiple runs of SimTraffic were used to provide a statistical evaluation of the interaction between the intersections. Hales Engineering also calculated the 95th percentile queue lengths for each of the study intersections using SimTraffic. The detailed analysis reports are provided in Appendix C.

As shown in Table 3 and Table 4, all study intersections operate at acceptable levels of service except for the Simpson Avenue / 900 East intersection, which is anticipated to operate at LOS E in the eastbound direction during the evening peak hour. This is due to northbound queueing at the Sugarmont Drive / 900 East intersection. The significant 95th percentile queue lengths that were calculated are shown below:

<u>Intersection</u>	<u>Morning Peak Hour</u>	<u>Evening Peak Hour</u>
2100 South / 900 East	NB: 470 ft	NB: 380 ft, SB: 490 ft, EB: 440 ft
Sugarmont Drive / 900 East	NB: 250 ft	NB: 300 ft

Table 3: Existing (2019) Morning Peak Hour Level of Service

Intersection		Worst Approach			Overall Intersection	
Description	Control	Approach[1,3]	Aver. Delay (Sec/Veh)[1]	LOS[1]	Aver. Delay (Sec/Veh)[2]	LOS[2]
2100 South / 900 East	Signal	-	-	-	25.3	C
Sugarmont Drive / 900 East	Signal	-	-	-	8.4	A
Simpson Avenue / 900 East	EB Stop	EB	13.2	B	-	-
2700 South / 900 East	Signal	-	-	-	9.2	A

1. This represents the worst approach LOS and delay (seconds / vehicle) and is only reported for non-all-way stop unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle) and is reported for all-way stop and signal-controlled intersections.
3. SB = Southbound approach, etc.

Source: Hales Engineering, September 2019

Table 4: Existing (2019) Evening Peak Hour Level of Service

Intersection		Worst Approach			Overall Intersection	
Description	Control	Approach[1,3]	Aver. Delay (Sec/Veh)[1]	LOS[1]	Aver. Delay (Sec/Veh)[2]	LOS[2]
2100 South / 900 East	Signal	-	-	-	33.9	C
Sugarmont Drive / 900 East	Signal	-	-	-	17.4	B
Simpson Avenue / 900 East	EB Stop	EB	44.3	E	-	-
2700 South / 900 East	Signal	-	-	-	12.9	B

1. This represents the worst approach LOS and delay (seconds / vehicle) and is only reported for non-all-way stop unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle) and is reported for all-way stop and signal-controlled intersections.
3. SB = Southbound approach, etc.

Source: Hales Engineering, September 2019

Crash Analysis

Hales Engineering obtained the vehicle crash history along the corridor study area to summarize key statistics and crash characteristics. Crash data from January 1, 2010 to May 31, 2019 were summarized. As shown in Table 5, 108 crashes have been reported between 2700 South Hollywood Avenue on 900 East since 2010. No fatalities have been reported, and only a few serious injury crashes were reported.

Table 5: Crash Severity Summary

Severity	#
Fatal	0
Serious Injury	4
Minor Injury	25
Possible Injury	29
No Injury	50
Total	108

A summary of the crash manner of collision data is shown in Figure 2. As shown, many of the crashes were single vehicle crashes which implies that many crashes may have involved a vehicle hitting a pedestrian, bicyclist, or a fixed object. Several other types of crashes recorded were front to rear crashes, angle crashes, or crashes involving a parked vehicle.

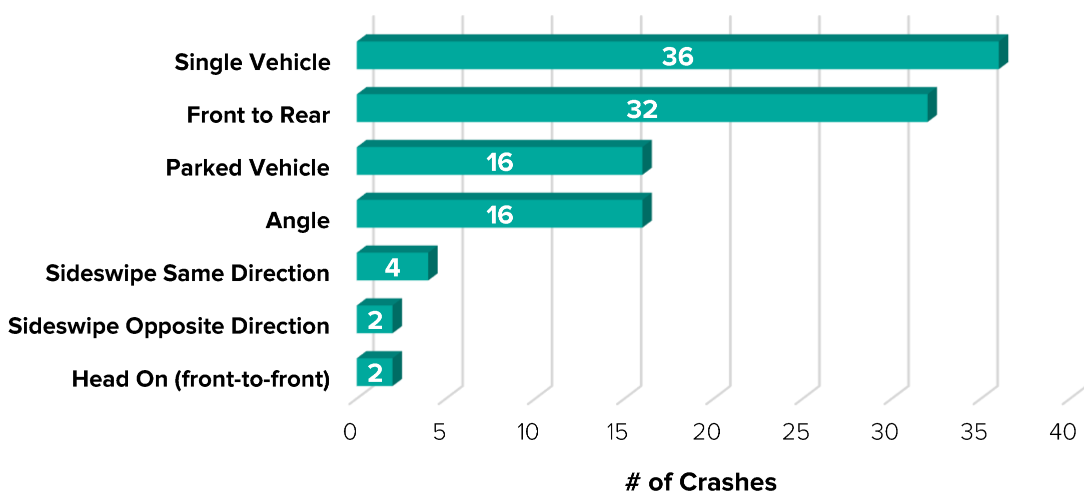


Figure 2: Crash manner of collision

A summary of key crash factors is shown in Figure 3. As shown, the most prominent crash factor along the corridor is older drivers. 21 crashes involved either a pedestrian or a bicyclist.

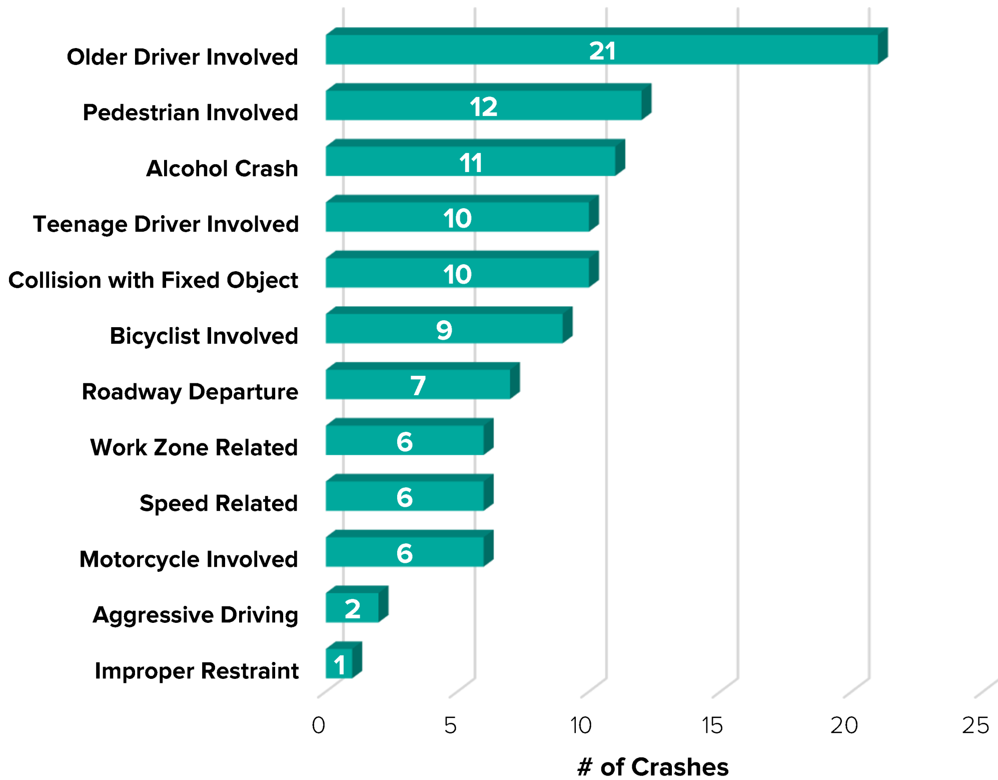


Figure 3: Crash factors

The following are other key observations from the crash data:

- Seven of the 12 crashes involving pedestrians occurred at or near the 2100 South / 900 East intersection, including one serious injury crash. Two of these crashes involved a northbound right-turn vehicle.
- Two of the nine crashes involving bicyclists occurred at or near the Commonwealth Avenue / 900 East intersection. Three other bike crashes occurred between 2100 South and Redondo Avenue, including a serious injury crash at the Redondo Avenue / Hollywood Avenue intersection.
- Nine of the 16 crashes involving parked vehicles occurred between Ashton Avenue and Sugarmont Drive.
- 82 of the 108 crashes occurred north of the I-80 underpass.

Recommendations

Hales Engineering made several recommendations for the 900 East corridor based on the data collection efforts, intersection LOS analysis, crash analysis, and a site visit conducted on Wednesday, August 21, 2019. The following are the recommended improvements by intersection:

- 2700 South / 900 East
  - Keep the existing lane configuration at this intersection as is, with left-turn lanes on all approaches and right-turn lanes on the southbound, eastbound, and westbound approaches.
- Parkway Avenue / 900 East
  - Provide north- and southbound left-turn pockets at the intersection.
- Ashton Avenue / 900 East
  - Provide a northbound left-turn pocket.
  - Install bulb-outs at the intersection on Ashton Avenue in order to slow down eastbound vehicles approaching the intersection.
  - Bulb-outs on 900 East at the current crosswalk (north of the intersection) could also be considered to provide a safer crossing for pedestrians.
- Simpson Avenue / 900 East
  - Based on the turning movement counts, a northbound left-turn lane is not needed.
  - Improve the sight triangle from the eastbound stop approach by clearing some of the greenery from the intersection corners.
  - Stripe separate left- and right-turn lanes at the eastbound approach to minimize delays during peak hours.
  - Remove the crosswalk on the north side of the intersection. Pedestrians should go to the Sugarmont Drive crosswalk to cross 900 East.
  - Install a raised median on 900 East between Simpson Avenue (north) and Sugarmont Drive to restrict left-turns from the business west of 900 East in order to reduce safety risks.
- Sugarmont Drive / 900 East
  - Change signal operations so that the no right-turn blank-out sign activates when pedestrians are crossing 900 East near the S-line track, not just when a train crosses 900 East.
  - Install a “Do Not Stop on Tracks” sign (MUTCD R8-8) in the northbound and southbound directions prior to the S-line tracks. It was observed during peak hours that vehicles stopped on the tracks at times.
- Elm Avenue / 900 East
  - Stripe the word “STOP” in front of the stop bar on the westbound approach to emphasize the intersection control.
  - Paint the curb red on the north side of Elm Avenue from the intersection to approximately 50 feet east of the intersection.

- Clear some of the greenery on the north side of Elm Avenue to provide a clear view of the stop sign for westbound vehicles.
- A larger stop sign could be considered on the westbound approach to further improve the visibility of the sign.

- Commonwealth Avenue & Smith's Access / 900 East
  - Install a crosswalk on the south side of the intersection crossing 900 East. This will provide safer crossing for both pedestrians and bicyclists.
- 2100 South / 900 East
  - Re-stripe the south leg of the intersection to have a 14.5' receiving lane, an 11' left-turn lane, an 11' through lane, and an 8' right-turn lane. The right-turn lane can continue to use the gutter pan for additional width.
  - Based on the high number of pedestrian crashes at this intersection, is the recommended that pedestrian visibility be improved at the intersection. Visibility is somewhat limited on the southwest and southeast corners of the intersection due to the proximity of buildings to the intersection. It is recommended that the crosswalks be painted or replaced with a colorful design, such as a brick pattern (see below example from Main Street in Salt Lake City)

- Hollywood Avenue / 900 East
  - Install Rectangular Rapid Flashing Beacons (RRFBs) at the crosswalk south of the intersection to increase driver awareness of pedestrians in the area. The RRFBs can be installed with solar power, if needed.
  - It is recommended that bulb-outs be installed at the crosswalk as well to improve pedestrian visibility and safety.
- Corridor
  - Except for the intersections indicated previously, left-turn pockets or a TWLTL are not generally needed south of Sugarmont Drive. Access density and traffic volumes increase north of Sugarmont Drive. Therefore, a TWLTL would be beneficial for traffic flow north of Sugarmont Drive.
    - The north end would also benefit from a TWLTL from a safety perspective, as most of the crashes in the corridor occurred in that section.
  - Remove on-street parking where possible to reduce conflicts involving parked vehicles. The preliminary concepts for the corridor propose removing the parking on the east side of the street.

APPENDIX A

Turning Movement Counts

APPENDIX B

Tube Count Data