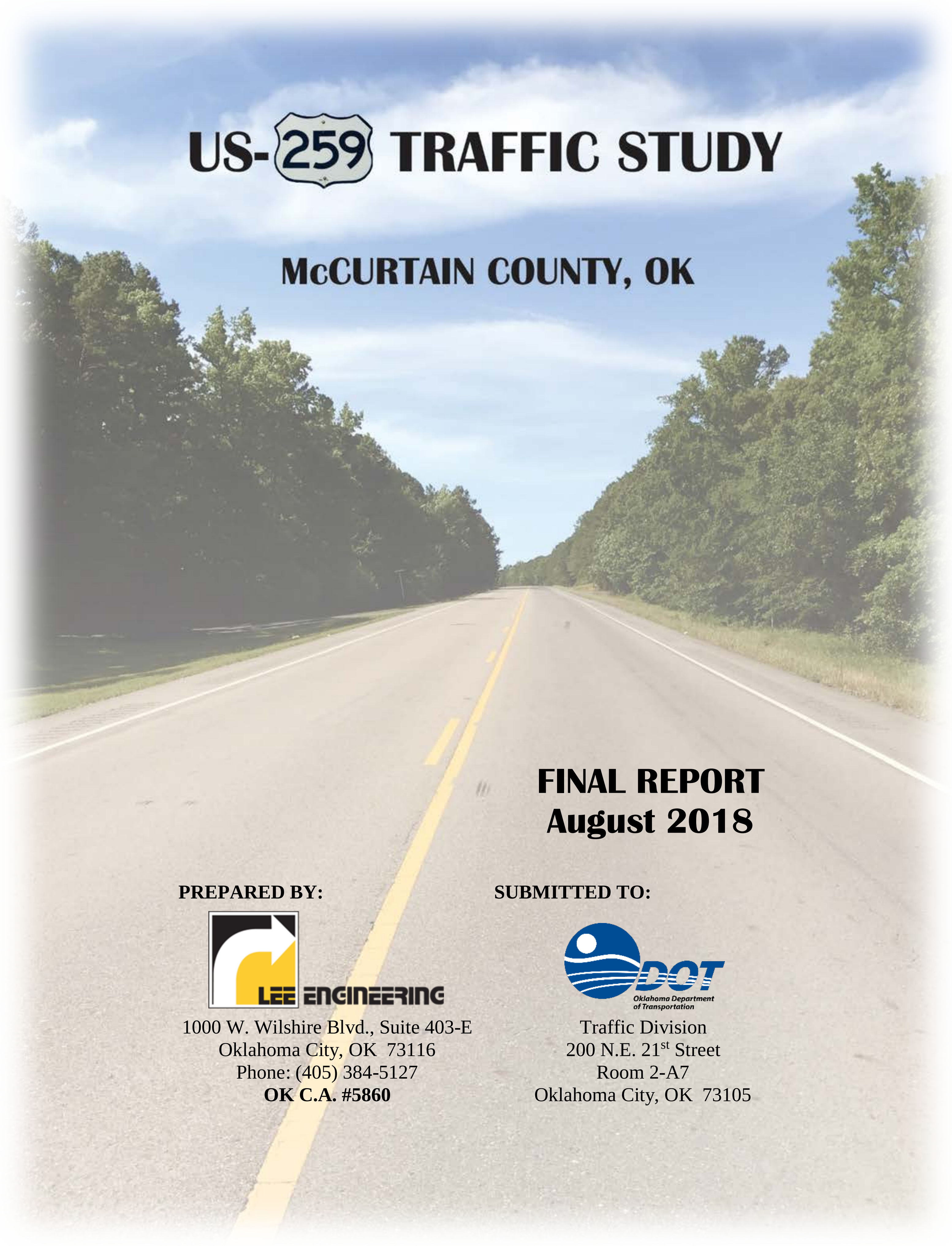

US-259 TRAFFIC STUDY

McCURTAIN COUNTY, OK

FINAL REPORT
August 2018

PREPARED BY:

LEE ENGINEERING

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SUBMITTED TO:

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Oklahoma Department of Transportation

Traffic Division
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Room 2-A7
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Oklahoma Department of Transportation

FINAL REPORT

US-259 Traffic Study

McCurtain County, Oklahoma

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Date: 8-9-2018

Submitted to:
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Chad Pendley, P.E.
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Date: ____________

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Division Two Engineer

Date: ____________

Comments:

EXECUTIVE SUMMARY

The US-259 study corridor begins $^{1}/_{8}$ mile south of Sherry Lane in Broken Bow, OK and extends north for approximately 13.5 miles to just north of Cedar Creek Trail (51810), in McCurtain County. Due to the recreational nature of this corridor with its proximity to Broken Bow Lake and Hochatown, travel patterns tend to be abnormal compared to commuter areas and are greatly impacted by seasonality and holiday weekends (e.g. Memorial Day weekend).

The purpose of this study is to analyze the performance of the study corridor and to identify future strategies to improve safety and traffic operations. Overall, traffic operations were observed to be satisfactory and level of service analysis indicates that capacity has not been exceeded along the corridor. And while the adjusted collision rates for the entire corridor are less than the reported statewide rates for similar roadways, the collision rate for the segment of US-259 through Hochatown is almost 20% higher than the statewide rate.

This report identifies both long-term and short-term safety recommendations for the study corridor which consider collision analysis, speed data, access management, sight distance requirements, etc. Long-term recommendations include installation of traffic signals (when warranted) and widening of intersection approaches to include dedicated turn lanes. These improvements would be more costly and time consuming than the short-term recommendations which can be implemented more quickly and for a lower cost since they often require less infrastructure. The following list of short-term improvements are recommended for immediate implementation:

1. Trim or remove foliage that impedes sight distance
2. Upgrade bridge barricades
3. Install curve warning signs
4. Remove objects within roadway clear zone
5. Install guardrails
6. Repaint stop bars at all intersections
7. Replace street name signs at all intersections
8. Install rumble strips parallel to edge lines at major intersections
9. Install advance street name signs at major intersections
10. Install centerline rumble strips along the entire corridor except at intersections and major commercial driveways
11. Restripe two of the passing zones to prohibit passing for a small section
12. Implement access modifications at high and medium priority locations
13. Relocate 55 mph posted speed limit sign north of Carson Creek Road (Juniper)
14. Increase speed enforcement along the corridor
15. Implement Variable Speed Limit (VSL) pilot project through Hochatown

The *Oklahoma Department of Transportation* (ODOT) has not initiated any projects to date that include variable speed limits (VSLs), although development of a VSL temporary work zone detail and specification is in progress. The segment of US-259 through Hochatown is a suitable location for a VSL pilot project. It is recommended that the limits of the project begin at Old Hochatown Road (Pinyon Road) and extend 1.5 miles north towards Carson Creek Road (Juniper). The VSL could be dependent on traffic volumes or speeds and would change in real time based on data received from traffic volume and speed detectors.

The list of short-term improvements is shown in **Figure ES-1** and is expected to improve safety throughout the entire study corridor.

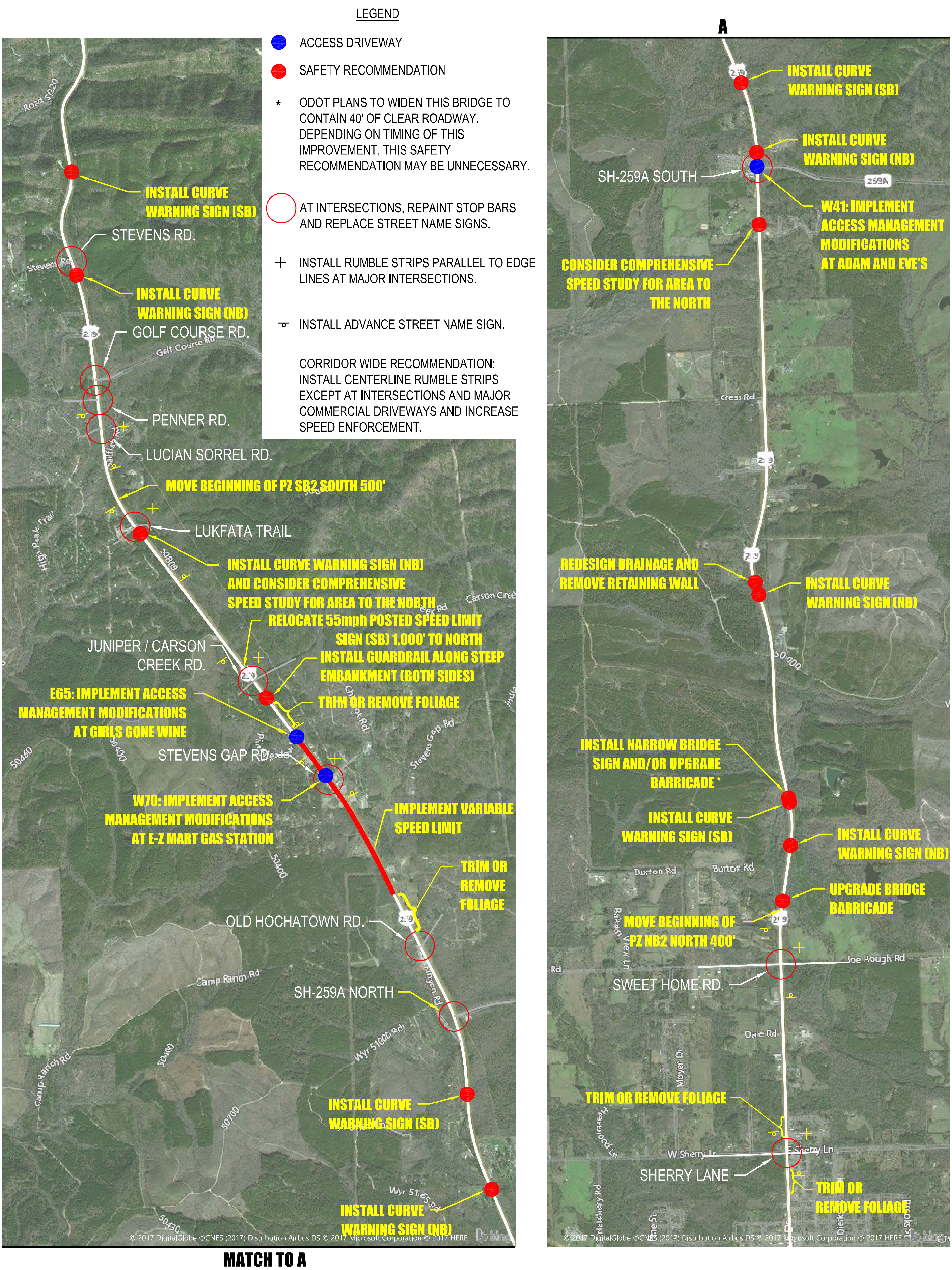

FIGURE ES-1

RECOMMENDED SHORT TERM IMPROVEMENTS

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0 .25 .5
SCALE: 1" = .5 MILES

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1.0 PURPOSE

U.S. Route 259 (US-259) is a highway that runs in the north-south direction for approximately 250 miles in Texas and Oklahoma. The southern terminus is near Nacogdoches, Texas and its northern terminus is approximately 15 miles south of Heavener, Oklahoma. US-259 winds through the Ouachita Mountains and on the west side of Broken Bow Lake near Broken Bow, Oklahoma. The focus of this traffic study is the US-259 corridor that begins $^{1}/_{8}$ mile south of Sherry Lane in Broken Bow and extends north for approximately 13.5 miles to just north of Cedar Creek Trail (51810). **Figure 1** shows the study limits of the US-259 corridor.

Due to the recreational nature of this corridor with its proximity to Broken Bow Lake and Hochatown, travel patterns tend to be abnormal compared to commuter areas and are greatly impacted by seasonality and holiday weekends (e.g. Memorial Day weekend). While intersections and roadway segments are not typically designed based on holiday travel patterns and traffic operations, it is important to be aware of them in corridors such as US-259 especially if they pose safety concerns.

The purpose of the US-259 Traffic Study is to analyze the performance of this corridor and to identify future strategies to improve safety and traffic operations. Various other aspects of this corridor were also evaluated including collisions, deceleration lanes, sight distance requirements, passing zones, access management strategies, etc. This report identifies recommendations to improve safety and traffic operations based on the analyses and field reconnaissance.

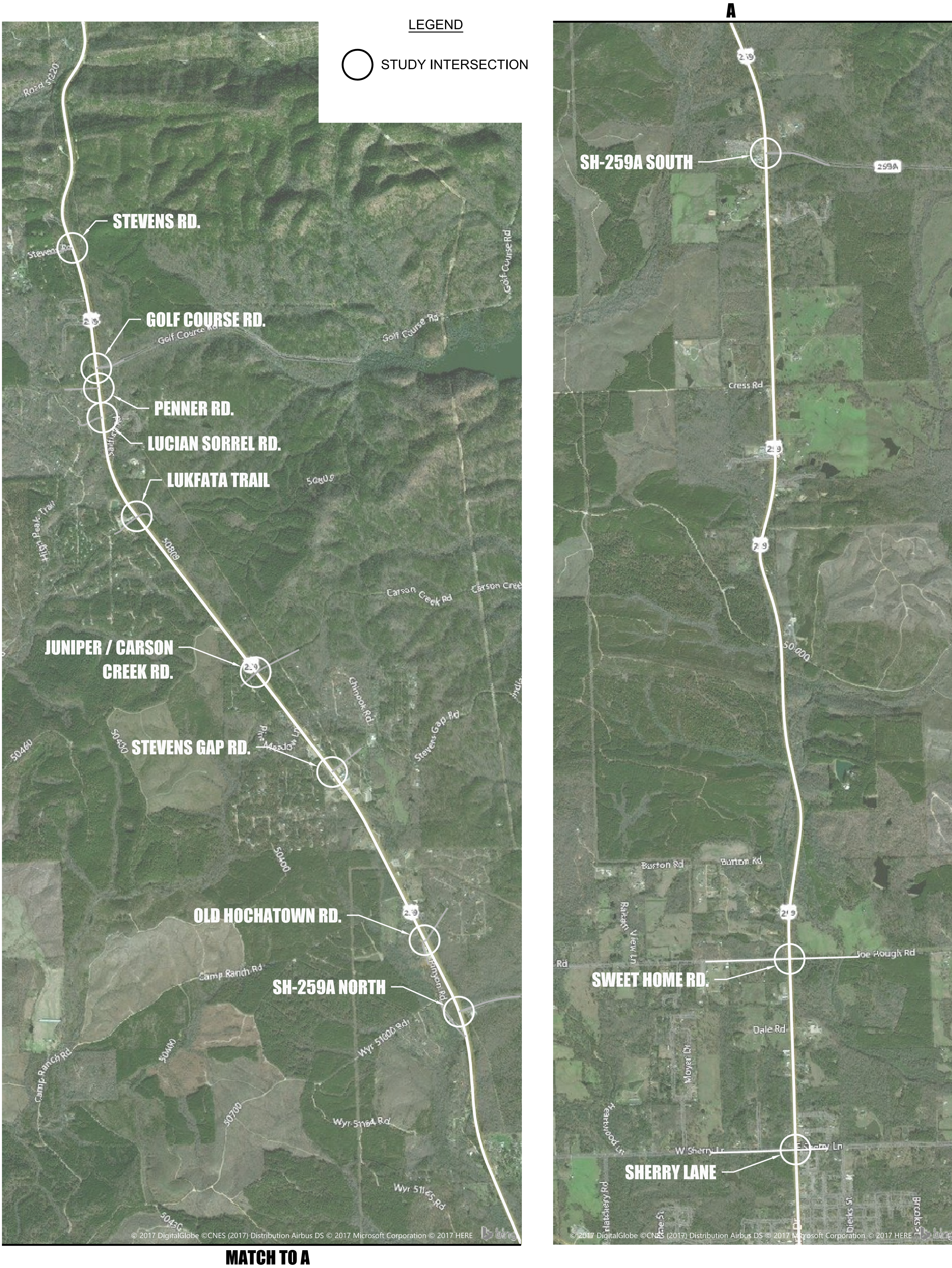

FIGURE 1

1000 W WILSHIRE BLVD.
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STUDY LIMITS OF
US-259 CORRIDOR

0 .25 .5
SCALE: 1" = .5 MILES

1.1 Oklahoma Strategic Highway Safety Plan

States are required by the *Federal Highway Administration* (FHWA) to have a *Strategic Highway Safety Plan* (SHSP) and Highway Safety Improvement Program funding is limited to projects that align with the SHSP. The *Oklahoma Department of Transportation* (ODOT) began developing the 2007 SHSP in 2006 in coordination with various federal and state agencies, counties and municipalities, and special interest groups. It laid the foundation for overall emphasis areas that encompassed engineering, education, enforcement, and emergency services. With the emergence of new and improved safety countermeasures, collision factors, technologies, and initiatives, the State wanted to adopt and utilize these innovative strategies to combat highway safety problems and began developing the 2nd edition of the SHSP in 2012. Some of the strategies identified in the most recent SHSP 2013-2014 may be applicable for implementation in this corridor.

1.1.1 SHSP Vision Statement

The SHSP's vision statement is to "Provide and promote the safest roadway transportation system for all travelers – zero deaths, zero injuries."

1.1.2 SHSP Mission Statement

The mission statement of the SHSP is to "Develop, implement, and evaluate a data-driven, multidisciplinary process to maximize road safety through widespread collaboration, integrating Engineering, Enforcement, Education, and Emergency Services (The "4E" approach)."

1.1.3 SHSP Emphasis Areas

The areas emphasized for improvements through the SHSP include:

1. Unsafe Driver Behavior (addressing impaired, aggressive, and fatigued/distracted driving, and occupant protection);
2. Intersection Crashes;
3. Crashes involving Young Drivers; and
4. Lane Departure Crashes.

This report fulfills the objectives of the SHSP by evaluating the safety of the US-259 study corridor with consideration to numerous aspects; both data-driven analyses as well as qualitative assessments that rely on engineering judgement. The safety recommendations identified in this report are intended to address unsafe driver behaviors through speed enforcement and installation of rumble strips, intersection collisions through improvement to sight distance obstacles and pavement markings, and lane departure collisions through improved signage and installation of rumble strips and guardrails.

2.0 CORRIDOR CONTEXT

2.1 Facility Type

Throughout the study corridor, US-259 is designated as an "Other Principal Arterial" according to ODOT's *Rural Functional Classification* (RFC). Features of the study corridor include:

- Two-lane roadway without left- or right-turn lanes
- Shoulder widths vary between 5-8 feet
- Speed limits vary from 45 to 65 miles per hour (mph)
- Roadside features include trees, ditches, embankments, bridges, utility poles, traffic signs, and business signs
- Passing zones are present in approximately 30% of the study corridor
- Numerous intersecting residential and commercial driveways as well as county roads and trails

US-259 near Carson Creek Road (NB)

US-259 north of Stevens Road (NB)

US-259 near Stevens Gap Road (SB)

2.2 Users

The US-259 corridor serves commuters, weekend recreational users, and heavy truck traffic (logging operations). During the average weekday, traffic is fairly evenly split with commuters traveling in both directions in the morning and afternoon peak periods. Heavy truck (3 or more axles) traffic is slightly higher in the northbound direction for the morning period and conversely is much higher in the southbound direction in the afternoon. Field reconnaissance and intersection turning movement counts indicate heavy trucks typically travel northbound and southbound throughout the entire corridor, however trucks are also present on local roadways such as Sherry Lane west of US-259, Sweet Home Road, and Lukfata Trail. The peak hours based on recent intersection turning movement counts are approximately 11:00 AM-12:00 PM and 3:15 PM-4:15 PM.

During the 2017 Memorial Day weekend (holiday Friday and Saturday travel conditions), approximately 60% more vehicles traveled northbound south of Stevens Gap Road than on an average weekday. North of Stevens Gap Road, the daily and peak hour traffic volumes were evenly split between the northbound and southbound directions. Heavy truck traffic was more than 50% less than average weekday conditions. The peak hours based on recent intersection turning movement counts were approximately 11:00 AM-12:00 PM and 3:30 PM-4:30 PM on a holiday Friday and holiday Saturday.

2.3 Mobility

In McCurtain County, US-259 connects Idabel to Smithville and travels through Broken Bow and Hochatown. It connects to SH-259A which is a 10-mile loop to Broken Bow Lake and Beavers Bend Resort Park. Though mostly rural in nature, the US-259 study corridor includes a significant number of driveways and access roads that link residential units and businesses directly to US-259. While the location of businesses is sporadic throughout most of the corridor, there are concentrations of businesses near Sherry Lane, Sweet Home Road, near the intersection with SH-259A (S), and within and near Hochatown whose economy is based on tourism. The businesses near Hochatown consist of restaurants, gift shops, gas stations, wineries/breweries, luxury cabins, and other entertainment/convenience based businesses and the area is continuing to grow rapidly.

The Annual Average Daily Traffic (AADT) south of SH-259A (S) was reported by ODOT to be 4,200 in 2016. ODOT does not maintain a permanent traffic recorder along the study corridor, therefore this AADT is likely based on data collected over a 2-day midweek period during an off-peak month. The 2017 average daily traffic (ADT) of 7,400 used in this report was collected over a 14-day period during a peak month. The difference between these volumes is indicative of the seasonal variability along this corridor. ODOT's seasonal factors are used to adjust short-term counts for seasonal and day of the week variability

The posted speed limit along the US-259 study corridor varies between 45 and 65 mph. Speed data, as well as field reconnaissance, indicate these speeds are appropriate for much of the corridor except for some segments that include a significant number of driveways and access roads. Throughout Hochatown, the posted speed limit is 55 mph and the speed data collected for the area south of Hochatown showed that there was a decrease in vehicle speeds during periods of peak traffic volumes. Speed limits are established to reflect the reasonable speed of most drivers on a roadway and are set based on speed data collected on weekdays during off peak periods under favorable weather conditions. Speed limits are not set based on peak periods which represent a small fraction of total traffic conditions.

While the US-259 study corridor does not feature passing lanes which provide opportunities for motorists to overtake slower vehicles without entering opposing lanes of traffic, passing zones are permitted for approximately 30% of its length. All passing maneuvers in these passing zones are accomplished by entering an opposing vehicle lane, overtaking the slower moving vehicle, and then returning to the right lane. To safely accomplish this maneuver, sufficient sight distance is needed to ensure the left lane is clear of opposing traffic. Limitations to sight distance such as horizontal curves, crest vertical curves, or other obstructions may limit sight distance and reduce safe passing opportunities.

3.0 CORRIDOR COLLISION HISTORY

The US-259 study corridor, extending from approximately milepost 0.75 to 14.63, had 126 reported collisions in the five-year study period between 2011 and 2015. **Figure 2** maps out the general location and severity of each reported collision. **Figure 3** charts the number of collisions by location within the study area. The collision data obtained from ODOT is provided in the Appendix.

3.1 Collision Analysis

Out of the total 126 collisions reported, 2 collisions included at least one fatality (3 total fatalities), 50 collisions included at least one injury or possible injury (89 persons), and 74 collisions resulted in property damage only. **Figure 4** depicts the number of injuries and injury collisions that occurred at each location within the study area. One of the fatalities occurred approximately 1.3 miles north of Sweet Home Road (Joe Hough Road) and consisted of a single vehicle rollover accident that was attributed to a sleepy driver. The other fatality occurred approximately 1.5 miles north of SH-259A (S) and involved 3 vehicles in a head-on collision of which unsafe speed was a contributing factor. It was also identified as intersection related and the location is near access point E43, a county road.

As seen in the following figures, the locations with the highest number of reported collisions are in the segments of US-259 between Sherry Lane and SH-259A (N). The segments between Old Hochatown Road (Pinyon Road) and Carson Creek Road (Juniper) also had higher numbers of collisions. The intersections at Sherry Lane, Sweet Home Road (Joe Hough Road), and Lukfata Trail at US-259 had the highest number of reported intersection-related collisions. The locations with the highest number of reported collisions that included an injury or possible injury are also in the segments of US-259 between Sherry Lane and SH-259A (N) and between Old Hochatown Road (Pinyon Road) and Carson Creek Road (Juniper). The Lukfata Trail intersection also ranked high in the number of injury collisions.

The types of collisions occurring within the entire study area are categorized and summarized in **Figure 5**. Nearly $^{1}/_{3}$ of collisions occurred with a fixed object such as a tree, utility pole, guardrail, or embankment, and unsafe vehicle speeds were a contributing factor in almost 40% of these. There was also a large number of rear-end collisions (25%) and angle turning collisions (19%) in which unsafe speeds, improper turns, vehicles following too closely and failure to yield were contributing factors.

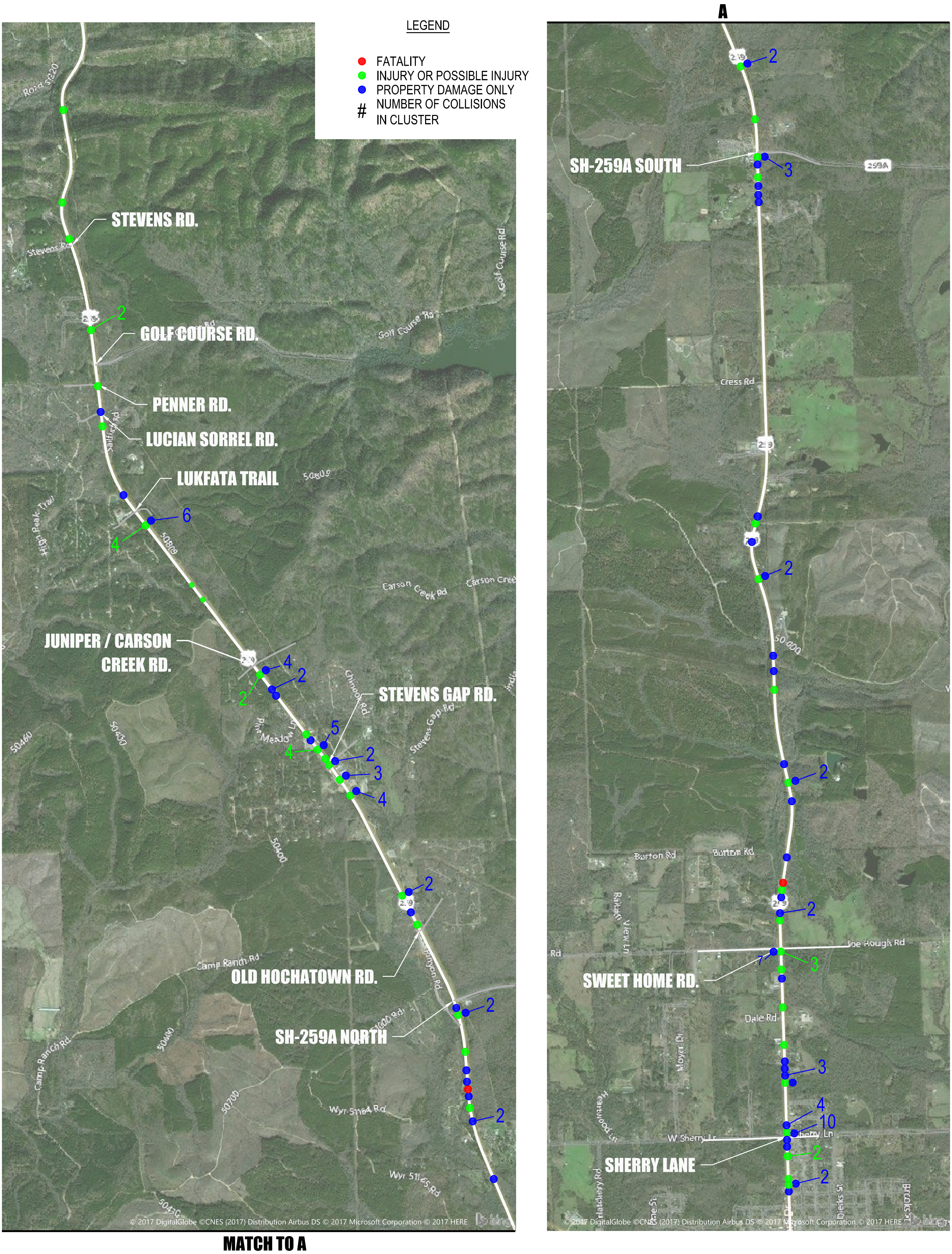

FIGURE 2

MAP OF REPORTED COLLISIONS
(2011 - 2015)

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SCALE: 1" = .5 MILES

Figure 3: Reported Collisions by Location

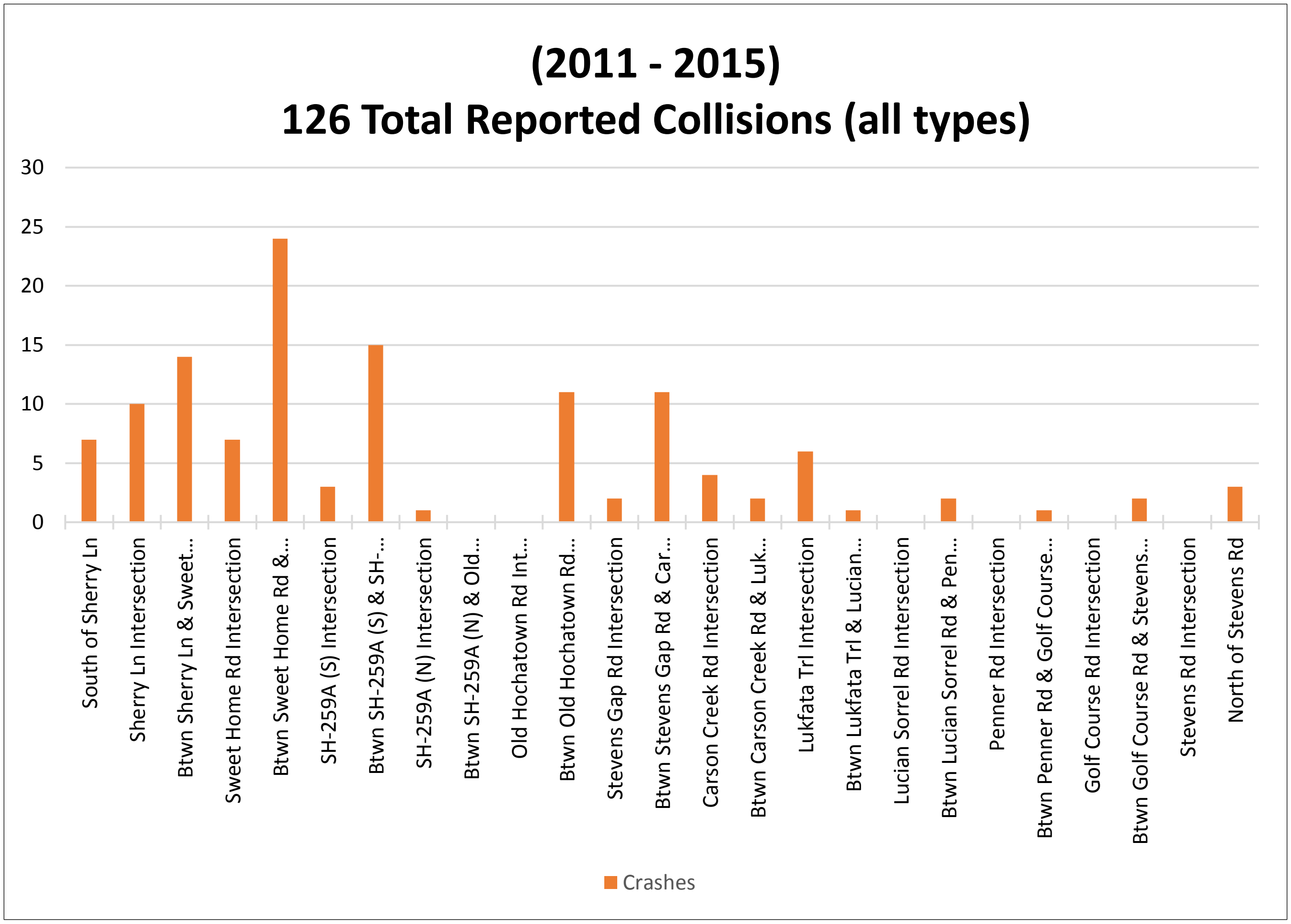


Figure 4: Reported Injuries by Location

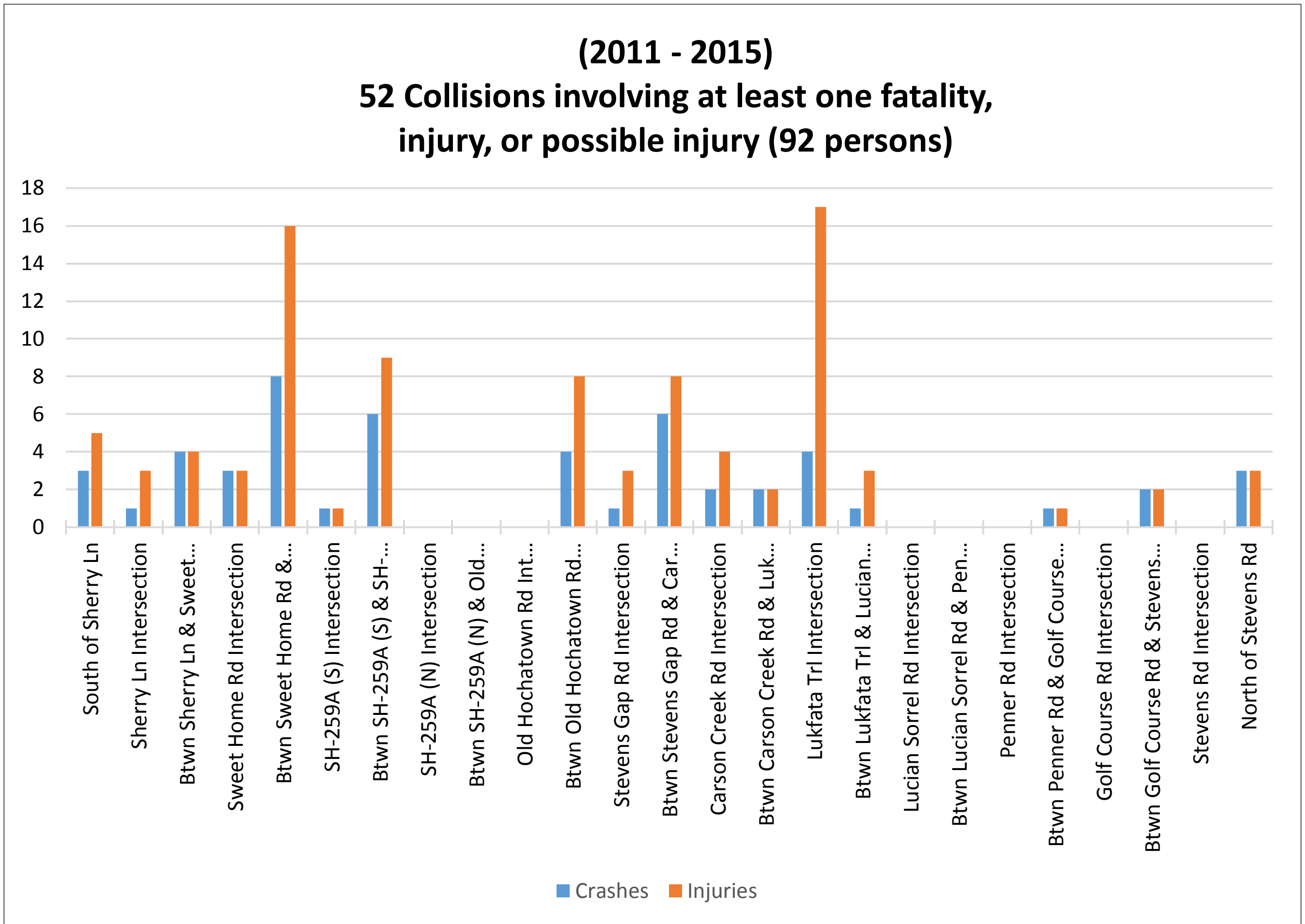
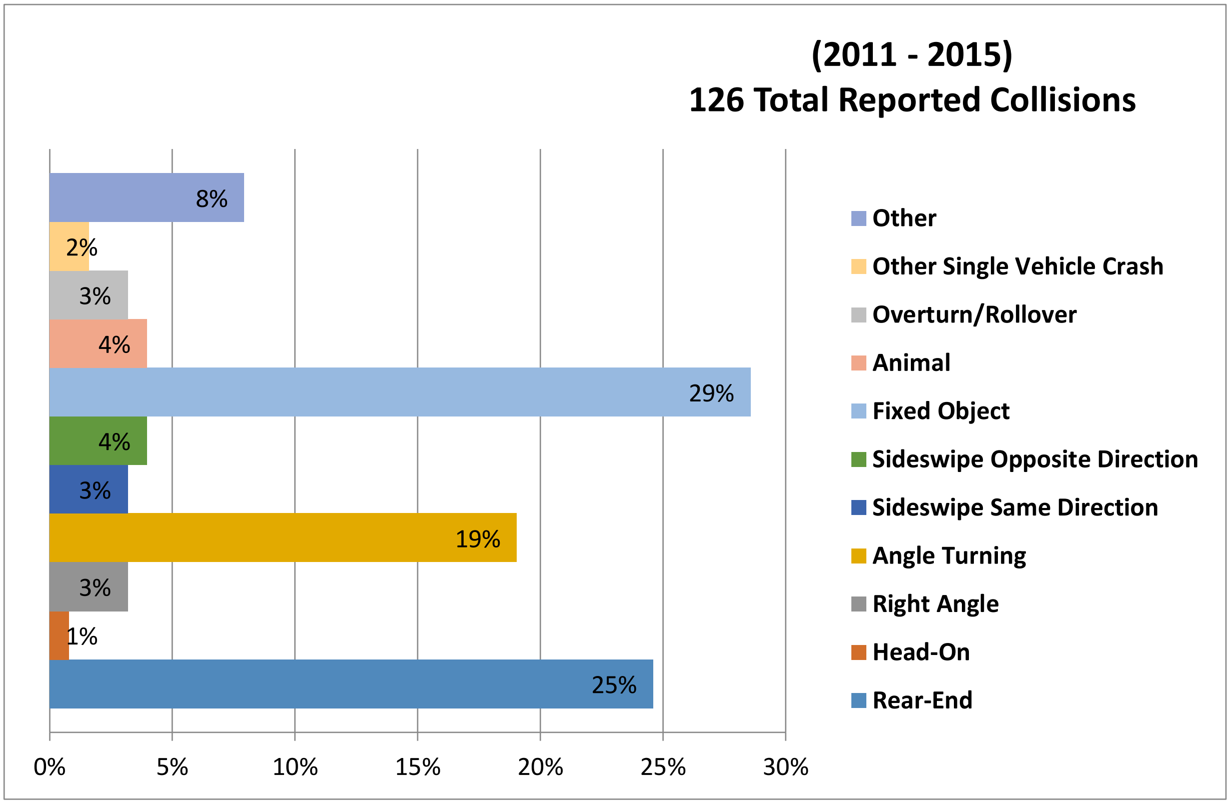


Figure 5: Type of Collisions



The collision data states that 216 vehicles were involved in the 126 total collisions along the corridor. The traffic count and collision data collected along the corridor shows that 8-12% of traffic is heavy trucks (3 or more axles) and approximately 7% of vehicles involved in a collision were heavy trucks. While this does not indicate that heavy trucks were involved in an excessively high number of collisions compared to their overall presence along the corridor, the field reconnaissance and speed data (discussed in greater detail in later sections of this report) suggest that the speeding of heavy trucks should be addressed through enforcement of the posted speed limits before it contributes to an increase in number and severity of collisions as the traffic volumes along this corridor increase.

Several variables contribute to the likelihood of a collision. These variables include roadway geometric design, lighting conditions, speed, driver awareness, pavement condition, signing and pavement marking presence and condition, weather conditions, and others. **Figure 6** and **7** show the number of collisions reported for various lighting and roadway conditions. As shown in this figure, over ¾ of collisions occur during the daylight hours and in dry weather conditions. **Figure 8** shows the causal type of all reported collisions and indicates that unsafe speed and driver inattention were the contributing factors in more than 40% of collisions.

Figure 6: Percentage of Collisions by Lighting Conditions

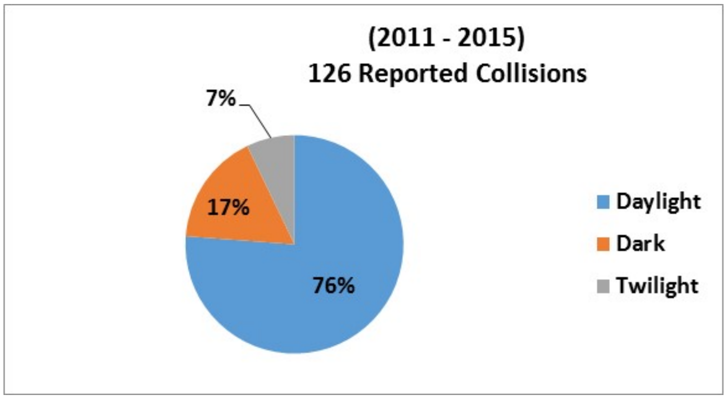


Figure 7: Percentage of Collisions by Roadway Conditions

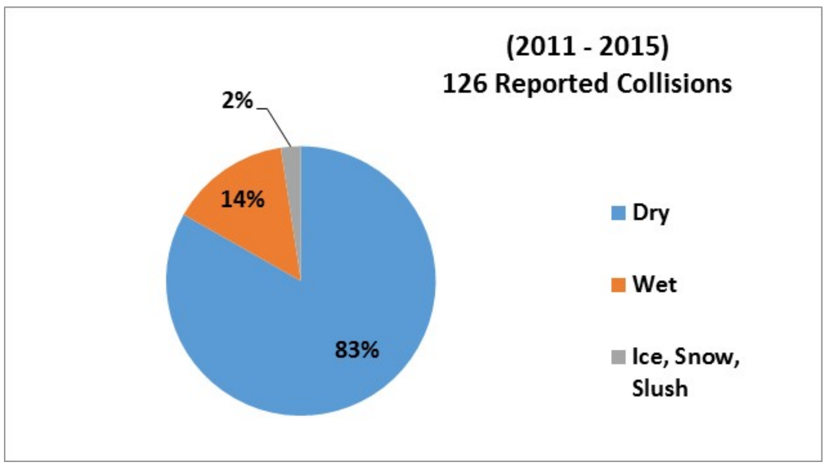
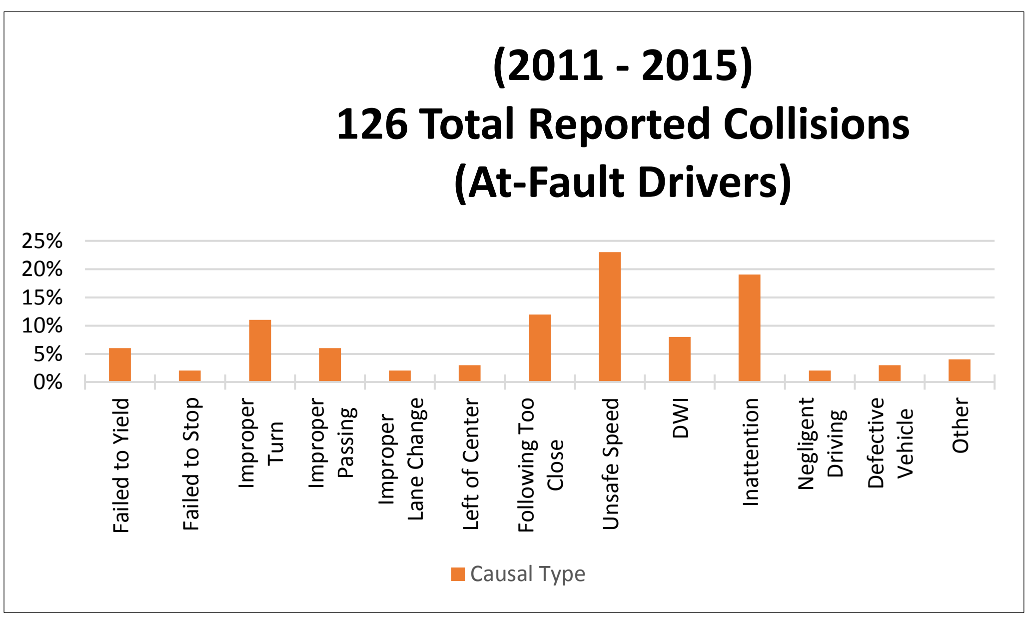


Figure 8: Percentage of Collisions by Causal Type



3.1.1 Collision Rates

The collision data obtained from ODOT includes collision rate analysis which compares the rates calculated for the study corridor against the statewide rates computed based on similar roadways. In this case, the ODOT collision report classifies US-259 as a two-lane undivided rural roadway without access control. While this classification is appropriate for some segments of US-259, the segments near Sherry Lane and those through Hochatown could be considered more like a transitioning or urban segment. The collision rates reported by ODOT are also based on the AADT value of approximately 4,100 which is low considering the seasonal variability of the corridor. Utilizing the collected ADT of 7,400 yields different collision rates as shown in **Table 1**.

Table 1: Collision Rate Analysis (2011-2015)

Road Characteristics	Statewide Collision Rates (Source: ODOT)	US-259 Study Corridor (Source: ODOT)	US-259 Study Corridor	US-259 thru Hochatown
Total Collisions	--	126	126	23
Fatal Collisions	--	2	2	0
Avg. Daily Traffic	--	4,107	7,400	7,400
Segment Length (miles)	--	13.88	13.88	1.50
Overall Collision[1]:	95.72	121.05	67.18	113.48
Fatal Collision[1]:	2.79	1.92	1.07	0.00

1 Collisions per 100 million vehicle miles

The adjusted collision rates for the entire corridor are less than the reported statewide rates for similar roadways; however, since the collision data indicated a higher number of collisions through Hochatown (in comparison to other locations along the corridor) and the field reconnaissance identified potential safety concerns in this area, collision rates were also calculated for the 1.5-mile segment of US-259 from Hochatown Road to south of Carson Creek Road (Juniper). The collision rate for this segment is almost 20% higher than the statewide rate.

3.1.2 General Safety Recommendations

Due to the types and number of collisions within the US-259 study corridor, safety improvements are recommended. As the corridor continues to develop with additional retail, commercial, and recreational land uses, traffic volumes and the number of driveways/access roads are expected to increase which increase the likelihood of a collision. Possible safety improvements include:

- Install bridge signage and upgrade barricades or install compression barrier.
- Improve/install pavement markings including properly placed stop bars at the stop-controlled side streets.
- At the major unsignalized intersections, implement lane narrowing using rumble strips parallel to the edge lines.
- Install centerline rumble strips except at intersections and major commercial driveways.
- Remove all foliage that limits sight distance.
- Implement variable speed limits through Hochatown.
- Install curve warning signs and advisory speed plaques, as necessary.
- Improve/install street name signs and install advance street name signs.
- Install guardrails.
- Remove fixed objects from the clear zone.
- Consider access control or restricting certain turns from driveways in close proximity to an intersection. High crash modification factors (CMFs) for all types of collisions can be realized by eliminating or restricting driveway access within the functional area of intersections.
- Improve/install roadway and intersection lighting.
- Apply high-friction surface treatments through major intersections and sharp curves.

Centerline and edge line rumble strips

Variable speed limit sign

Advance street name signs

Curve warning sign

Intersection lighting

Figure 9 identifies recommended safety improvements and the specific locations where they would be applicable along the study corridor.

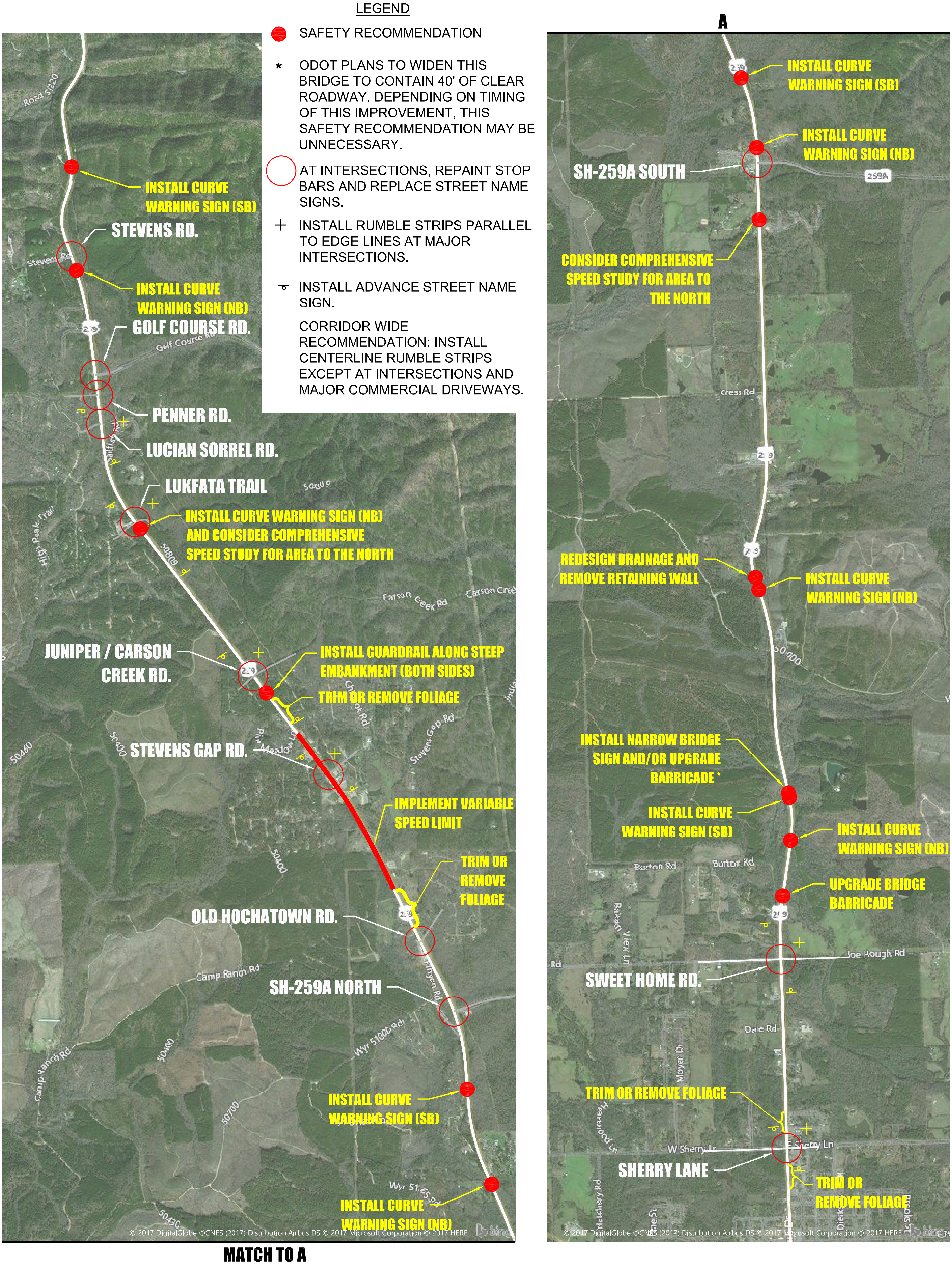


FIGURE 9

RECOMMENDED SAFETY IMPROVEMENTS

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0 .25 .5
SCALE: 1" = .5 MILES

4.0 CORRIDOR PERFORMANCE ANALYSIS

Twelve (12) intersections and four (4) roadway segments throughout the US-259 study corridor were evaluated for operational analysis. These locations were previously depicted in Figure 1 and were analyzed to determine their current and predicted operational capacity and levels of service. In addition, warrants for a traffic signal and left- and/or right-turn auxiliary lanes at intersections were evaluated. Other analysis includes sight distance measurements at intersections and driveways, access management opportunities and passing zones evaluation. Recommendations to improve safety and operations along the corridor are summarized at the end of this report.

4.1 Traffic Volumes

4.1.1 Existing Lane Configurations

The existing lane configurations and traffic control for the US-259 study corridor are provided in **Figure 10**. A description of the study area roadways depicted on ODOT's RFC map includes:

> **US-259 –** US-259 is a two-lane undivided rural highway through the study area with a posted speed limit that varies between 45 and 65 mph. It is identified as an "Other Principal Arterial" according to ODOT's RFC map.
>
> **Sherry Lane –** Sherry Lane is a two-lane undivided roadway through the study area with a posted speed limit of 25 mph east of US-259. There is no posted speed limit west of US-259. It is identified as a "Major Collector" west of US-259 according to ODOT's RFC map. Sherry Lane is the southern terminus of this study.
>
> **Sweet Home Road (Joe Hough Road) –** Sweet Home Road (Joe Hough Road) is a two-lane undivided rural roadway through the study area without a posted speed limit. It is identified as a "Minor Collector" west of US-259 according to ODOT's RFC map.
>
> **SH-259A –** SH-259A is a two-lane undivided rural roadway through the study area with a posted speed limit that varies. The posted speed limit at the intersections with US-259 are 45 and 55 mph. SH-259A connects with US-259 twice as it loops around to provide access to Broken Bow Lake. It is identified as a "Major Collector" according to ODOT's RFC map.
>
> **Minor Roadways –** Two-lane undivided rural roadways with speed limits of 25 mph not listed on ODOT's RFC map include all other study area roadways within the corridor.

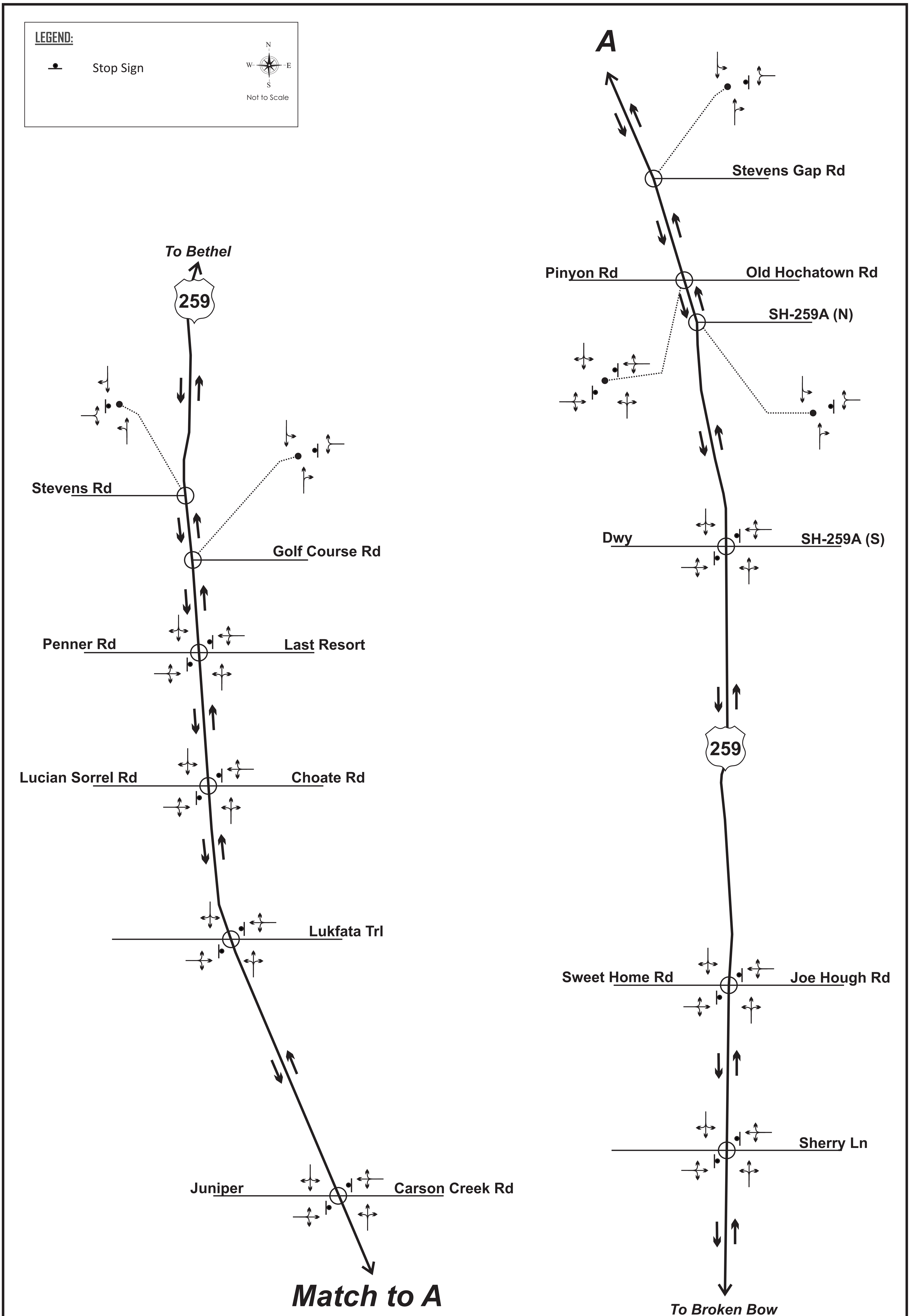

Figure 10

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EXISTING SYSTEM LANE CONFIGURATIONS

4.1.2 Existing Traffic Volumes

Existing daily traffic counts were collected over a 14-day period between May 18 and May 31, 2017 at four (4) locations. These counts include bi-directional volumes, vehicle classification, and speed data. Existing turning movement volumes were collected at twelve (12) intersections from 9:00 AM-6:00 PM on Wednesday, May 24, 2017, from 11:00 AM-8:00 PM on Friday, May 26, 2017, and from 10:00 AM-7:00 PM on Saturday, May 27, 2017. The raw traffic count data was adjusted in coordination with the ODOT Strategic Asset & Performance Management Division to reflect design daily/hourly volumes as well as balancing along the entire corridor. **Figures 11 through 13** show the adjusted Existing (2017) daily and peak hour volumes for the study corridor. The raw traffic count data is provided in the Appendix.

4.1.3 Traffic Growth Projections

In order to provide meaningful recommendations that are relevant for future traffic conditions, traffic volumes were projected to a short-term Design Year (2022) and a long-term Horizon Year (2037). The short-term annual background growth rate over the next 5 years was estimated to be 4% based on known developments planned along the US-259 study corridor. There are numerous rental cabins, restaurants, and other service and entertainment commercial and retail land uses currently in various stages of planning and construction within the corridor. The long-term annual background growth rate beyond the next 5 years, was estimated to be 2%, conservatively. These growth rates were applied to all existing traffic volumes in order to forecast future traffic volumes. In addition to the background traffic growth based on annual rates, traffic volumes along US-259 and at the SH-259A (N) intersection were also increased to account for the additional trip generation stemming from a planned resort. Information and calculations related to this process are provided in the Appendix. Figures that show the estimated Design Year (2022) and Horizon Year (2037) traffic volumes are also provided in the Appendix.

New development at Penner Rd.

New development near SH-259A (S)

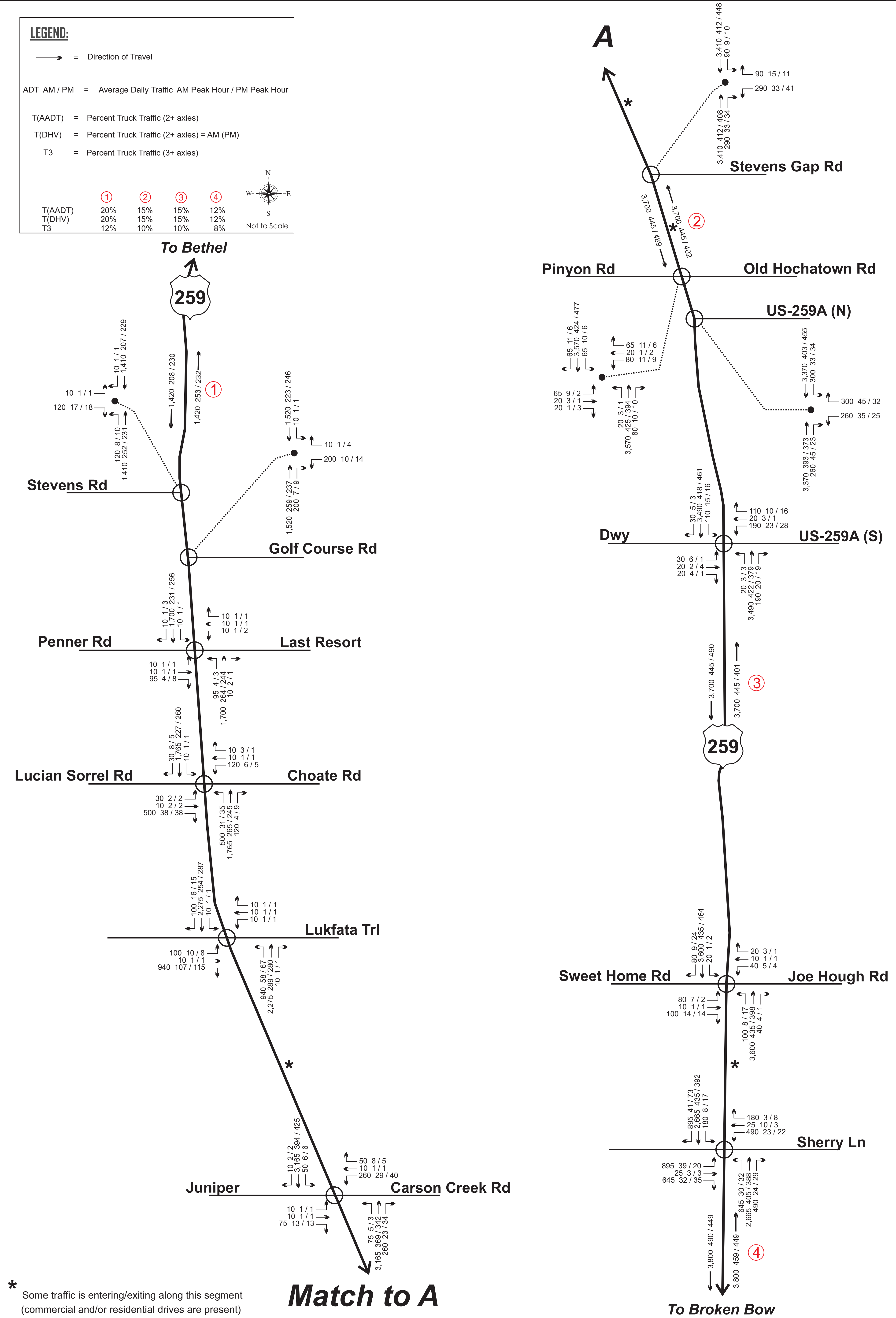

Figure 11

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BASE (2017) EXISTING SYSTEM AVERAGE WEEKDAY TRAFFIC

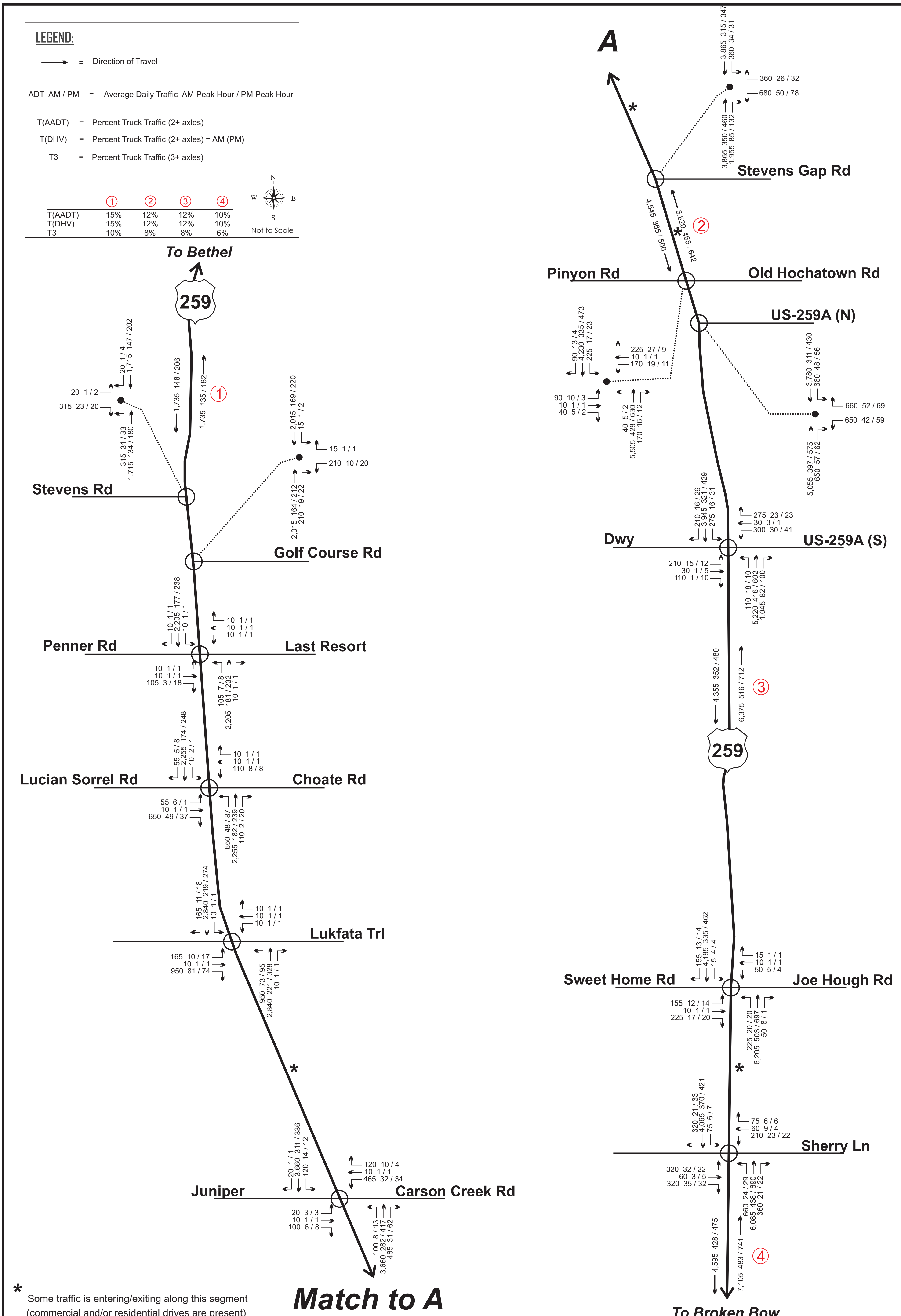

Figure 12

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BASE (2017) EXISTING SYSTEM HOLIDAY FRIDAY TRAFFIC

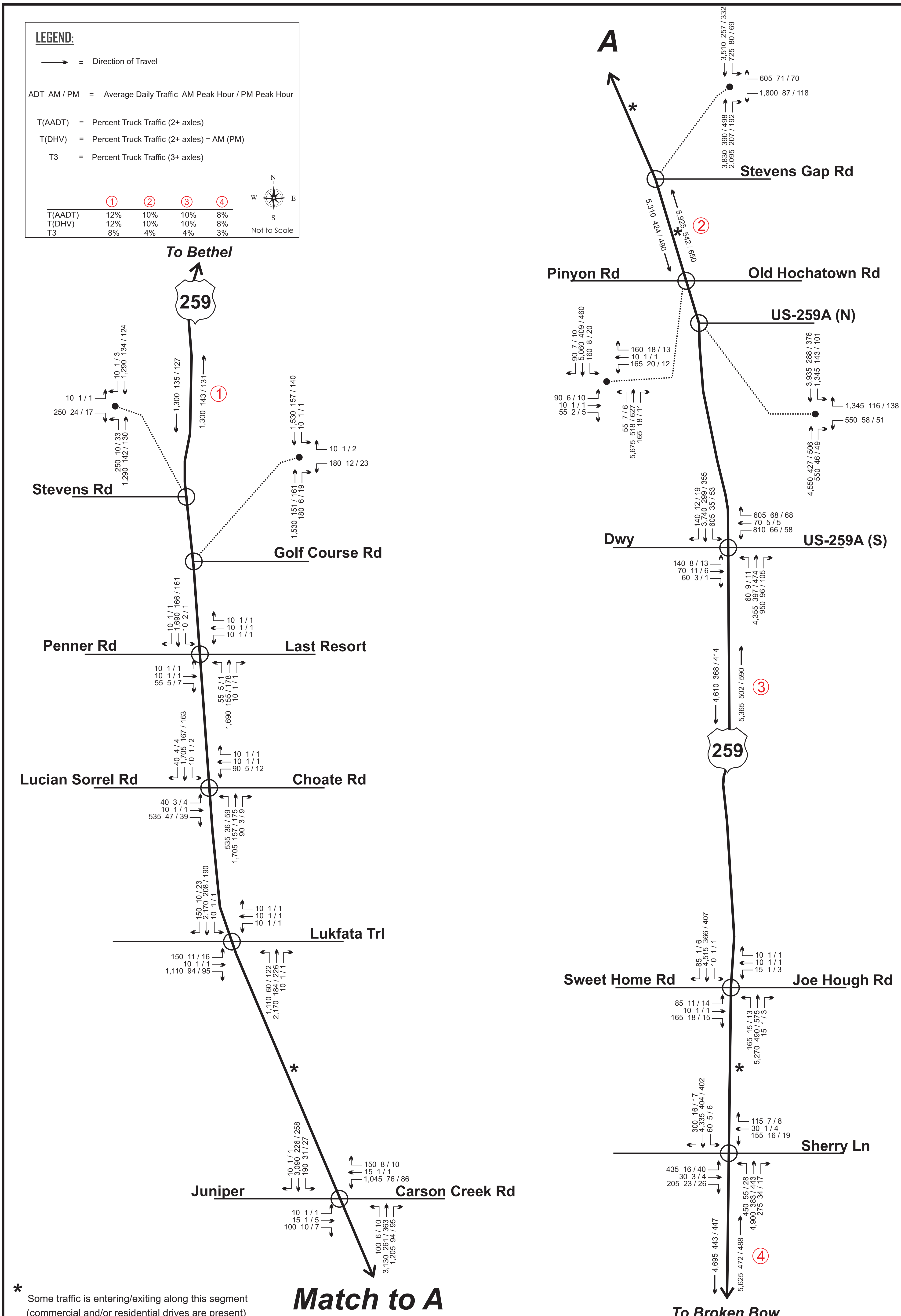

Figure 13

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BASE (2017) EXISTING SYSTEM
HOLIDAY SATURDAY TRAFFIC

4.2 Capacity Analysis

4.2.1 Roadway Link Capacity Analysis

Roadway capacity is defined as the volume of traffic that a roadway can accommodate based on the road's width, traffic control, parking conditions, and several other factors. Service volume for Principal Arterial roadways without left-turn lanes is generally considered to be 13,680 vehicles per day for a level of service (LOS) E according to the *Association of Central Oklahoma Governments* (ACOG) capacity table, shown in **Table 2**.

Table 2: ACOG Planning Level Typical Daily Vehicular Capacities of Roadway Configurations

Route Type	Lanes	LOS E Capacity
Freeways	4 lane freeway	80,000 vpd
	6 lane freeway	125,000 vpd
	8 lane freeway	165,000 vpd
City Arterials	2 lane arterial [1,2]	17,100 vpd
	4 lane arterial (undivided) [1]	34,200 vpd
	4 lane arterial (divided)	38,000 vpd
	5 lane arterial (center turn lane)	36,000 vpd
	6 lane arterial (undivided)	52,300 vpd
	6 lane arterial (divided)	58,000 vpd
	One way street (per lane)	11,000 vpd

1 Apply 20% reduction if no left turn lanes provided within corridor
2 Apply 5% increase for continuous center turn lane

Roadway link LOS can be found by comparing the daily volumes to the LOS E criteria volumes:

- if Volume/Service Volume Ratio is <= 0.45, then LOS = A or B
- if Volume/Service Volume Ratio is > 0.45 and <= 0.65, then LOS = C
- if Volume/Service Volume Ratio is > 0.65 and <= 0.80, then LOS = D
- if Volume/Service Volume Ratio is > 0.80 and <= 1.00, then LOS = E
- if Volume/Service Volume Ratio is > 1.00, then LOS = F

Table 3 provides the roadway link volume and LOS of the four (4) US-259 segments studied during the Average Weekday conditions for Existing (2017), Design Year (2022), and Horizon Year (2037) traffic conditions.

Table 3: Roadway Link Capacity Analysis

Roadway Segment	LOS E Capacity (vpd)	Scenario	Average Weekday Vpd (v/c)	LOS
US-259: North of Stevens Road	13,680	Existing (2017)	2,840 (0.21)	A or B
		Design Year (2022)	5,680 (0.42)	B
		Horizon Year (2037)	6,880 (0.50)	C
US-259: Between Old Hochatown Road and Stevens Gap Road	13,680	Existing (2017)	7,400 (0.54)	C
		Design Year (2022)	11,240 (0.82)	E
		Horizon Year (2037)	14,350 (1.05)	F
US-259: Between Sweet Home Road and US-259A (S)	13,680	Existing (2017)	7,400 (0.54)	C
		Design Year (2022)	11,230 (0.82)	E
		Horizon Year (2037)	14,350 (1.05)	F
US-259: South of Sherry Lane	13,680	Existing (2017)	7,600 (0.56)	C
		Design Year (2022)	11,480 (0.84)	E
		Horizon Year (2037)	14,670 (1.07)	F

vpd = Vehicles Per Day; v/c = Volume-to-Capacity Ratio; LOS = Level of Service

As shown in Table 3, US-259 currently operates at LOS C or better. Under Design Year (2022) conditions, US-259 is predicted to operate near capacity (LOS E) for all segments except for the segment north of Stevens Road that is predicted to operate at LOS B. Under Horizon Year (2037), US-259 is predicted to operate at LOS C north of Stevens Road, but exceed capacity (LOS F) at the remaining segments.

The segment of US-259 through Hochatown, between Old Hochatown Road (Pinyon Road) and Carson Creek Road (Juniper) operates differently than the rest of the study corridor. There are numerous driveways and access roads that connect to US-259 along this segment and the speed data indicates that vehicles travel slower during peak times throughout the day. Roadway link capacity analysis of this specific segment was analyzed using the *Highway Capacity Software (*HCS*)*. The characteristics of the roadway were input into the software for a two-lane highway which analyzes the segment by direction for peak hour conditions and considers additional parameters such as shoulder and lane widths, percent no-passing zones, access point density, etc. The results of this analysis are provided in **Table 4**.

Table 4: HCS Analysis of US-259 Through Hochatown

Direction	Scenario	Traffic Volume (vph) AM / PM	v/c Ratio AM / PM	LOS AM / PM
Northbound	Existing (2017)	445 / 402	0.30 / 0.27	D / C
	Design Year (2022)	620 / 578	0.41 / 0.38	D / D
	Horizon Year (2037)	806 / 750	0.54 / 0.50	D / D
Southbound	Existing (2017)	445 / 489	0.30 / 0.33	D / D
	Design Year (2022)	627 / 710	0.42 / 0.47	D / D
	Horizon Year (2037)	815 / 916	0.54 / 0.61	D / E

vph = Vehicles Per Hour; v/c = Volume-to-Capacity Ratio; LOS = Level of Service

Widening the US-259 study corridor to accommodate additional travel lanes or a continuous center turn lane is shown to be warranted based on future traffic forecasts. This could alleviate congestion especially along the segment through Hochatown which currently contains an average of 29 access points per mile and is anticipated to experience increased development.

4.2.2 Intersection Capacity Analysis

The level of service of an intersection is a qualitative measure of capacity and operating conditions and is directly related to vehicle delay. For unsignalized intersections, the levels of service, as shown in **Table 5**, are defined by average control delay in seconds per vehicle.

Capacity analyses were conducted for the study area intersections for Average Weekday, Holiday Friday, and Holiday Saturday under the following analysis scenarios:

- Existing (2017) Traffic Conditions
- Design Year (2022) Traffic Conditions
- Horizon Year (2037) Traffic Conditions

The intersection capacity analyses were conducted using *Highway Capacity Manual* (HCM) methodologies in the *Synchro 9* traffic analysis software package.

Table 5: Level of Service Criteria for Unsignalized Intersections

Level-of-Service (LOS)	Average Control Delay (seconds/vehicle)	Description
A	≤ 10.0	No delays at intersections with continuous flow of traffic. Uncongested operations: high frequency of long gaps available for all left and right turning traffic. No observable queues.
B	10.1 to 15.0	No delays at intersections with continuous flow of traffic. Uncongested operations: high frequency of long gaps available for all left and right turning traffic. No observable queues.
C	15.1 to 25.0	Moderate delays at intersections with satisfactory to good traffic flow. Light congestion; infrequent backups on critical approaches.
D	25.1 to 35.0	Increased probability of delays along every approach. Significant congestion on critical approaches, but intersection functional. No standing long lines formed.
E	35.1 to 50.0	Heavy traffic flow condition. Heavy delays probable. No available gaps for cross-street traffic or main street turning traffic. Limit of stable flow.
F	> 50.0	Unstable traffic flow. Heavy congestion. Traffic moves in forced flow condition. Average delays greater than one minute highly probable. Total breakdown.

SOURCE: *Highway Capacity Manual, 6th Edition*, Transportation Research Board, 2016

Additional performance measures such as volume to capacity (v/c) ratios and queue lengths also provide an indication of operations. For example, at two-way stop controlled intersections, main street traffic volumes may impose longer average delays for a small number of side-street vehicles, thus creating vehicle delays which correspond to a poor level of service. Motorists and agencies will typically accept longer delays (LOS E or F) if gaps in the traffic stream are anticipated within a reasonable timeframe and the side street traffic volumes do not warrant a traffic signal. As a general guide, gap acceptance thresholds for the longer delay values can be defined when the v/c ratios are under 0.80, which corresponds to 80 percent capacity usage for that movement. Therefore, a traffic movement with a poor level of service and a v/c value below 0.80 could be considered as operating acceptably.

Table 6 presents the analysis results for the study intersections under Existing (2017), Design Year (2022), and Horizon Year (2037) traffic conditions.

Table 6: Intersection Capacity Analysis Results

US-259 Intersection	Worst Movement	Average Weekday LOS AM / PM		
		Existing (2017)	Design Year (2022)	Horizon Year (2037)
Sherry Ln	WB	C / C	F / F	F / F
Sweet Home Rd (Joe Hough Rd)	WB	C / C	D / E	F / F
SH-259A (S)	WB	C / C	E / E	F / F
SH-259A (N)	WB	C / C	F / F	F / F
Old Hochatown Rd (Pinyon Rd)	WB	C / C	D / D	F / F
Stevens Gap Rd	WB	C / C	E / E	F / F
Carson Creek Rd (Juniper)	WB	C / C	E / F	F / F
Lukfata Trl	WB	C / C	C / D	E / F
Lucian Sorrel Rd (Choate Rd)	WB	B / B	C / C	D / E
Penner Rd (Last Resort)	WB	B / B	C / C	C / C
Golf Course Rd	WB	B / B	C / C	C / C
Stevens Rd	EB	A / A	B / B	B / B
US-259 Intersection	**Worst Movement**	**Holiday Friday LOS AM / PM**		
		Existing (2017)	**Design Year (2022)**	**Horizon Year (2037)**
Sherry Ln	WB	D / E	F / F	F / F
Sweet Home Rd (Joe Hough Rd)	WB	C / D	E / F	F / F
SH-259A (S)	WB	C / E	E / F	F / F
SH-259A (N)	WB	C / D	F / F	F / F
Old Hochatown Rd (Pinyon Rd)	WB	C / C	D / F	F / F
Stevens Gap Rd	WB	C / D	D / F	F / F
Carson Creek Rd (Juniper)	WB	C / C	D / F	F / F
Lukfata Trl	WB	B / C	C / D	D / F
Lucian Sorrel Rd (Choate Rd)	WB	B / C	C / D	D / F
Penner Rd (Last Resort)	WB	B / B	B / C	C / C
Golf Course Rd	WB	B / B	B / C	C / C
Stevens Rd	EB	A / A	B / B	B / B
US-259 Intersection	**Worst Movement**	**Holiday Saturday LOS AM / PM**		
		Existing (2017)	**Design Year (2022)**	**Horizon Year (2037)**
Sherry Ln	WB	C / C	E / F	F / F
Sweet Home Rd (Joe Hough Rd)	WB	C / C	D / E	F / F
SH-259A (S)	WB	C / E	F / F	F / F
SH-259A (N)	WB	D / D	F / F	F / F
Old Hochatown Rd (Pinyon Rd)	WB	C / C	E / F	F / F
Stevens Gap Rd	WB	C / F	F / F	F / F
Carson Creek Rd (Juniper)	WB	C / D	E / F	F / F
Lukfata Trl	WB	B / C	C / C	D / E
Lucian Sorrel Rd (Choate Rd)	WB	B / B	C / C	C / D
Penner Rd (Last Resort)	WB	B / B	B / B	C / C
Golf Course Rd	WB	B / B	B / B	C / C
Stevens Rd	EB	A / A	B / B	B / B

Existing (2017)

The existing lane configurations shown in Figure 10 and the existing traffic volumes shown in Figures 11-13 were used for the Existing (2017) analyses. All intersections were shown to operate at LOS D or better under Average Weekday conditions; all but two (2) intersections were shown to operate at LOS D or better under Holiday Friday conditions; and all but three (3) intersections were shown to operate at LOS D or better under Holiday Saturday conditions. Although some of the approaches at these intersections were shown to operate at LOS E or F, the v/c ratios were less than 0.80 and major queues did not develop. Therefore, these intersections were determined to operate acceptably. Analysis results and *Synchro* worksheets are provided in the Appendix.

Design Year (2022)

The existing lane configurations shown in Figure 10 and the forecasted traffic volumes shown in the Appendix were used for the Design Year (2022) analyses. Five (5) of the 12 intersections were shown to operate at LOS D or better under Average Weekday, Holiday Friday, and Holiday Saturday conditions. Although some of the approaches at these intersections were shown to operate at LOS E or F, the v/c ratios were less than 0.80 at most and major queues were not predicted. However, there were approaches at several intersections that were predicted to operate at LOS E or F with v/c ratios greater than 0.80. Analysis results and *Synchro* worksheets are provided in the Appendix.

Horizon Year (2037)

The existing lane configurations shown in Figure 10 and the forecasted traffic volumes shown in the Appendix were used for the Horizon Year (2037) analyses. Three (3) of the 12 intersections were shown to operate at LOS D or better under Average Weekday and Holiday Friday conditions; four (4) of the 12 intersections were shown to operate at LOS D or better under Holiday Saturday conditions. Although some of the approaches at these intersections were shown to operate at LOS E or F, the v/c ratios were less than 0.80 at most and major queues were not predicted. However, there were approaches at several intersections that were predicted to operate at LOS E or F with v/c ratios greater than 0.80. Analysis results and *Synchro* worksheets are provided in the Appendix.

Improvements at these intersections, such as installation of auxiliary lanes and traffic signals, are recommended and the specific locations are identified in later sections of this report.

4.3 Traffic Signal Warrant Analysis

Based on the results of the intersection capacity analysis, a traffic signal warrant analysis was conducted for three (3) intersections along US-259 to determine if signalization is currently warranted or may be warranted at these locations in the future. This section summarizes the results of the traffic signal warrant analysis conducted for each intersection, US-259 at Sherry Lane, at SH-259A (S), and at SH-259A (N). Details of the traffic signal warrant analysis are provided in the Appendix.

Sherry Lane / US-259

SH-259A (S) / US-259

SH-259A (N) / US-259

The traffic signal warrant analysis was performed using existing traffic counts collected in May 2017 and future volumes projected for Design Year (2022) and Horizon Year (2037). The existing approach volumes were collected over a 9-hour period at each study intersection and the raw data is presented in the Appendix.

The traffic signal warrant analysis is based on the traffic signal warrants contained in Chapter 4C, "Traffic Control Signal Needs Studies," of the 2009 *Manual on Uniform Traffic Control Devices* (MUTCD). Nine warrants are included in the manual for warranting a traffic signal installation. These warrants are:

Warrant 1 – Eight-Hour Vehicular Volume;
Warrant 2 – Four-Hour Vehicular Volume;
Warrant 3 – Peak Hour;
Warrant 4 – Pedestrian Volume;
Warrant 5 – School Crossing;
Warrant 6 – Coordinated Signal System;
Warrant 7 – Crash Experience;
Warrant 8 – Roadway Network;
Warrant 9 – Intersection Near a Railroad Grade Crossing

A summary of the traffic signal warrants for each intersection analyzed are provided in **Table 7**.

Table 7: Signal Warrant Summary

Warrant	Warrant Met?		
	Sherry Lane/US-259	**SH-259A (S)/US-259**	**SH-259A (N)/US-259**
1 – Eight-Hour Vehicular Volume	**YES** (2022 & 2037)	NO	**YES** (2022 & 2037)
2 – Four-Hour Vehicular Volume	**YES** (2022 & 2037)	**YES** (2037)	**YES** (2037)
3 – Peak Hour	N/A	N/A	N/A
4 – Pedestrian Volume	N/A	N/A	N/A
5 – School Crossing	N/A	N/A	N/A
6 – Coordinated Signal System	N/A	N/A	N/A
7 – Crash Experience	NO	NO	NO
8 – Roadway Network	N/A	N/A	N/A
9 – Near a Railroad Grade Crossing	N/A	N/A	N/A

N/A = Not applicable

None of the intersections evaluated currently meet any of the nine (9) signal warrants. Warrants 1 & 2 are met under Design Year (2022) and/or Horizon Year (2037) conditions based on the estimated future traffic forecasts, therefore installation of a traffic signal may be needed at these intersections in the future. It is recommended that these intersections continue to be monitored as increased development is realized within the corridor.

4.4 Auxiliary Lane Analysis

4.4.1 Right-Turn Deceleration Lane Analysis

No right-turn deceleration lanes presently exist along US-259 within the study area. Local drivers have an expectation of turning movements occurring from the through lanes. For highways, the ODOT design guidelines indicate that an auxiliary right-turn deceleration lane should be considered for any location with a right-turn volume greater than 40 vehicles per hour (vph). Based on this threshold as shown in **Table 8**, right-turn deceleration lanes are recommended at the following locations under Existing (2017) conditions:

- Sherry Lane/US-259 – Southbound direction
- SH-259A (N)/US-259 – Northbound direction

Under Design Year (2022) and/or Horizon Year (2037) conditions, right-turn deceleration lanes are recommended at the following additional locations:

- Sherry Lane/US-259 – Northbound direction
- Sweet Home Road (Joe Hough Road)/US-259 – Southbound direction
- Stevens Gap Road/US-259 – Northbound direction
- Carson Creek Road (Juniper)/US-259 – Northbound direction

Table 8: Right-Turn Deceleration Lane Analysis Results

US-259 Intersection	Approach	Right-Turn Volume (vph) AM / PM			
		Threshold	Existing (2017)	Design Year (2022)	Horizon Year (2037)
Sherry Ln	NB	40	24 29	29 / 35	39 / **47**
	SB		**41** / **73**	**50** / **89**	**67** / **120**
Sweet Home Rd (Joe Hough Rd)	NB	40	4 / 1	5 / 1	7 / 2
	SB		9 / 24	11 / 29	15 / 40
SH-259A (S)	NB	40	20 / 19	24 / 23	33 / 31
	SB		5 / 3	6 / 4	8 / 5
SH-259A (N)	NB	40	**45** / 23	**144** / **123**	**163** / **133**
Old Hochatown Rd (Pinyon Rd)	NB	40	10 / 10	12 / 12	16 / 16
	SB		11 / 6	13 / 7	19 / 10
Stevens Gap Rd	NB	40	33 / 34	40 / **41**	**54** / **56**
Carson Creek Rd (Juniper)	NB	40	23 / 34	28 / **41**	38 / **56**
	SB		2 / 2	2 / 2	3 / 3
Lukfata Trl	NB	40	1 / 1	1 / 1	2 / 2
	SB		16 / 15	19 / 18	26 / 25
Lucian Sorrel Rd (Choate Rd)	NB	40	4 / 9	5 / 11	7 / 15
	SB		8 / 5	10 / 6	13 / 8
Penner Rd (Last Resort)	NB	40	2 / 1	2 / 1	3 / 2
	SB		1 / 3	1 / 4	2 / 5
Golf Course Rd	NB	40	7 / 9	9 / 11	12 / 16
Stevens Rd	SB	40	1 / 1	1 / 1	2 / 2

vph = vehicles per hour; **Bold and underline** = warrants a right-turn lane

4.4.2 Left-Turn Deceleration Lane Analysis

The major intersections within the study area were analyzed to determine the need for left turn lanes along US-259. Criteria contained in the *National Cooperative Highway Research Program (*NCHRP*) Report 745: Left-Turn Accommodations at Unsignalized Intersections* were applied. **Table 9** summarizes the projected left turn warrants under Existing (2017) conditions.

As shown in Table 9, the northbound and southbound left turn volumes at all of the study intersections exceed the threshold identified in the *NCHRP Report* for the consideration of a left turn deceleration lane under Existing (2017) traffic conditions. Since traffic volumes are forecasted to increase, the future left turn volumes are also anticipated to exceed the threshold. Although all left turn volumes exceed the threshold, some locations are a higher priority for left-turn deceleration lanes. The highest priority intersections (those with 15 or more existing left-turn movements during a peak hour) for left-turn deceleration lanes (both northbound and southbound) are the following:

- Sherry Lane/US-259
- Sweet Home Road (Joe Hough Road)/US-259
- SH-259A (S)/US-259
- SH-259A (N)/US-259
- Lukfata Trail/US-259
- Lucian Sorrel Road (Choate Road)/US-259

Figure 14 depicts the high priority locations in the US-259 study corridor where deceleration lanes are recommended.

Table 9: Left-Turn Deceleration Lane Warrant Results

Intersection	Approach	Left-Turn Volume (vph) AM (PM)	Highway Volume (vphpl) AM (PM)	Major Two-Lane Highway Volume that Warrants Left-Turn Lane (vphpl)	Exceeds Threshold? AM (PM)	Recommend Left-Turn Lane (High Priority)?
Existing (2017)						
Sherry Lane/US-259	NB SB	30 (32) 8 (17)	472 (466)	50	Yes (Yes)	Yes
Sweet Home Road (Joe Hough Road)/US-259	NB SB	8 (17) 1 (2)	446 (453)	50 150	Yes (Yes)	Yes
SH-259A (S)/US-259	NB SB	3 (3) 15 (16)	442 (441)	150 50	Yes (Yes)	Yes
SH-259A (N)/US-259	SB	33 (34)	437 (443)	50	Yes (Yes)	Yes
Old Hochatown Road (Pinyon Road)/US-259	NB SB	3 (1) 10 (6)	442 (447)	150 50	Yes (Yes)	No
Stevens Gap Road/US-259	SB	9 (10)	433 (450)	100	Yes (Yes)	No
Carson Creek Road (Juniper)/US-259	NB SB	5 (3) 6 (6)	400 (406)	150 50	Yes (Yes)	No
Lukfata Trail/US-259	NB SB	58 (67) 1 (1)	310 (326)	50 150	Yes (Yes)	Yes
Lucian Sorrel Road (Choate Road)/US-259	NB SB	31 (35) 1 (1)	268 (278)	50 150	Yes (Yes)	Yes
Penner Road (Last Resort)/US-259	NB SB	4 (3) 1 (1)	252 (254)	150	Yes (Yes)	No
Golf Course Road/US-259	SB	1 (1)	245 (247)	200	Yes (Yes)	No
Stevens Road/US-259	NB	8 (10)	234 (236)	100	Yes (Yes)	No

vph = Vehicles Per Hour; vphpl = Vehicles Per Hour Per Lane

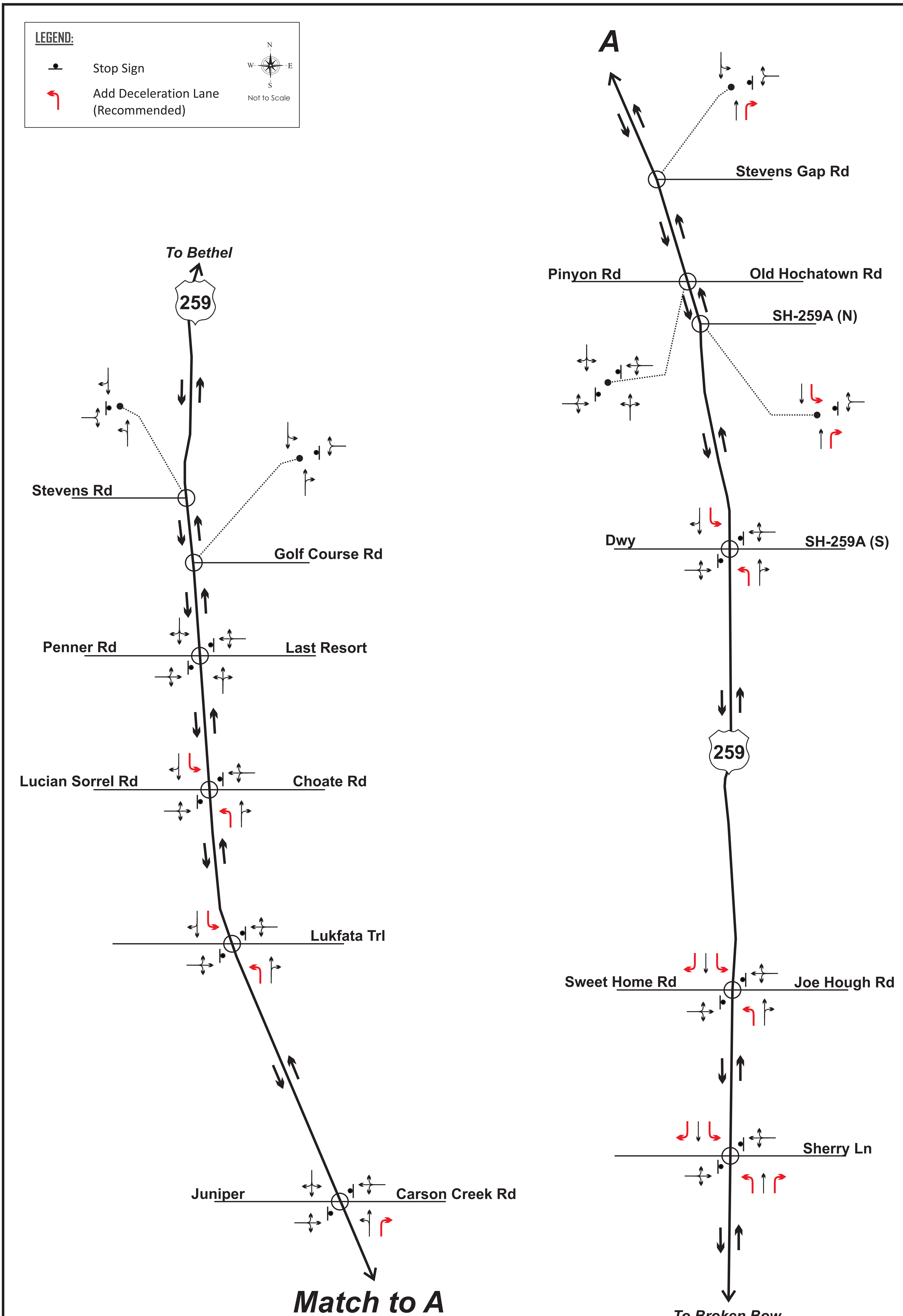

Figure 14

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HIGH PRIORITY LOCATIONS OF RECOMMENDED DECELERATION LANES

4.5 Intersection Sight Distance

As part of this traffic analysis, the available and required intersection sight distance for motorists accessing the adjacent roadways from the twelve (12) study intersections and potentially problematic access points/driveways was analyzed. The sight distance required at these locations was estimated using the procedures developed by the *American Association of State Highway and Transportation Officials* (AASHTO) and published in the 2011 edition of *A Policy on Geometric Design of Highways and Streets, "Green Book"*.

At study intersections, the motorist should be able to see if and when adequate gaps exist to perform their desired maneuver. Adequate sight distance is technically provided at all studied locations for passenger cars and combination trucks, but sight distance evaluation for combination trucks was only performed at locations where combination trucks are known to travel. There were several locations where potential sight distance issues were perceived during field reconnaissance and **Table 10** presents the sight distance requirements at these locations. Additional detail related to the sight distance evaluation is provided in the Appendix.

Table 10: Intersection Sight Distance Requirements

US-259 Intersection	Design Vehicle	Required Intersection Sight Distance (feet)	Available Sight Distance to the North (feet)	Available Sight Distance to the South (feet)
Sherry Ln	Passenger Car	495	>1,000	>1,000
	Combination Truck	760		
Sweet Home Rd (Joe Hough Rd)	Passenger Car	715	>1,100	>1,100
	Combination Truck	1,100		
SH-259A (S)	Passenger Car	605	~900	~900
SH-259A (N)	Passenger Car	605	>1,000	~900
Old Hochatown Rd (Pinyon Rd)	Passenger Car	605	>1,000	>1,000
Stevens Gap Rd	Passenger Car	605	>1,000	>1,000
Carson Creek Rd (Juniper)	Passenger Car	715	~750	>1,000
Lukfata Trl	Passenger Car	715	>1,100	>1,100
	Combination Truck	1,100		
Lucian Sorrel Rd (Choate Rd)	Passenger Car	715	>1,000	>1,000
Penner Rd (Last Resort)	Passenger Car	715	>1,000	>1,000
Golf Course Rd	Passenger Car	715	~1,000	>1,000
Stevens Rd	Passenger Car	715	~1,000	~1,000

The field reconnaissance results of the available sight distance indicate that minimum requirements are met at all study intersections and access points/driveways evaluated. However, the following should be noted:

- Sweet Home Road – This intersection experiences a larger number of combination trucks than many other locations along this corridor. Available sight distance at this intersection is slightly greater than that required for combination trucks, however increased travel speeds at this location make gaps harder to judge.
- Lukfata Trail – This intersection experiences a larger number of combination trucks than many other locations along this corridor. Available sight distance at this intersection is slightly greater than that required for combination trucks. Although this location technically meets sight distance requirements, the presence of the horizontal roadway curve to the north as well as the posted speed limit of 65 mph gives the perception that sight distance is problematic for combination trucks.

Looking north from Lukfata Trl/US-259 intersection

During the field reconnaissance, there were also several locations identified that need maintenance to improve available sight distance:

- Sherry Lane – Tree limbs on both the west and east sides of US-259 may partially obstruct sight distance and should be trimmed.
- Old Hochatown Road (Pinyon Road) – Trees on the east side of US-259 partially obscure sight distance and should be trimmed or removed.
- Carson Creek Road (Juniper) – A sign on the east side of US-259 and trees on both the west and east sides partially obstruct sight distance. The trees should be trimmed or removed.

Looking north from Old Hochatown Road (Pinyon Rd)/US-259 intersection

Looking south at Carson Creek (Juniper)/US-259 intersection

4.6 Passing Zones Analysis

An analysis of the existing passing/no passing zones was conducted throughout the US-259 study corridor from the beginning of the 55 mph posted speed zone, approximately 0.5 miles north of Sherry Lane, to the northern extents of the study area, approximately 14 miles north of Sherry Lane. Passing and No Passing Zones are made known to motorists via centerline pavement markings. A solid yellow line denotes a 'No Passing Zone' (NPZ) where motorists are prohibited from overtaking another vehicle. A dashed yellow line denotes a 'Passing Zone' (PZ) where the overtaking of a slower moving vehicle is permitted as long as other present conditions allow the maneuver to be executed safely. Existing Passing/No Passing Zones were measured and recorded during field reconnaissance. Additionally, record drawings for US-259 within the study area were obtained from ODOT to accurately determine the lengths of the existing zones.

No Passing Zone pavement marking on US-259 north of Stevens Rd

4.6.1 Existing Passing Zones

Throughout the study corridor, US-259 operates as a typical two-lane highway. The highway does not feature passing lanes, which provide opportunities for motorists to overtake slower vehicles without entering lanes regularly used by opposing vehicles. Thus, all passing maneuvers are accomplished by entering an opposing vehicle lane, overtaking the slower moving vehicle, and then returning to the right lane. To safely accomplish this maneuver, sufficient sight distance is needed to ensure the left lane is clear of opposing traffic. Limitations to sight distance such as horizontal curves, crest vertical curves, or other obstructions may limit sight distance and reduce safe passing opportunities. Guidance for minimum passing sight distances for use in design of passing zones is presented in Chapter 3 of the MUTCD. From Section 3B.02 of the MUTCD:

> *04 On roadways with center line markings, no-passing zone markings shall be used at horizontal or vertical curves where the passing sight distance is less than the minimum shown in Table 3B-1 for the 85th-percentile speed or the posted or statutory speed limit. The passing sight distance on a vertical curve is the distance at which an object 3.5-feet above the pavement surface can be seen from a point 3.5-feet above the pavement. Similarly, the passing sight distance on a horizontal curve is the distance measured along the center line (or right-hand lane line of a three-lane roadway) between two points 3.5-feet above the pavement on a line tangent to the embankment or other obstruction that cuts off the view on the inside of the curve.*

Table 3B-1. Minimum Passing Sight Distances for No-Passing Zone Markings	
85th-Percentile or Posted or Statutory Speed Limit	**Minimum Passing Sight Distance**
25 mph	400-feet
30 mph	500-feet
35 mph	550-feet
40 mph	600-feet
45 mph	700-feet
50 mph	800-feet
55 mph	900-feet
60 mph	1,000-feet
65 mph	1,100-feet
70 mph	1,200-feet

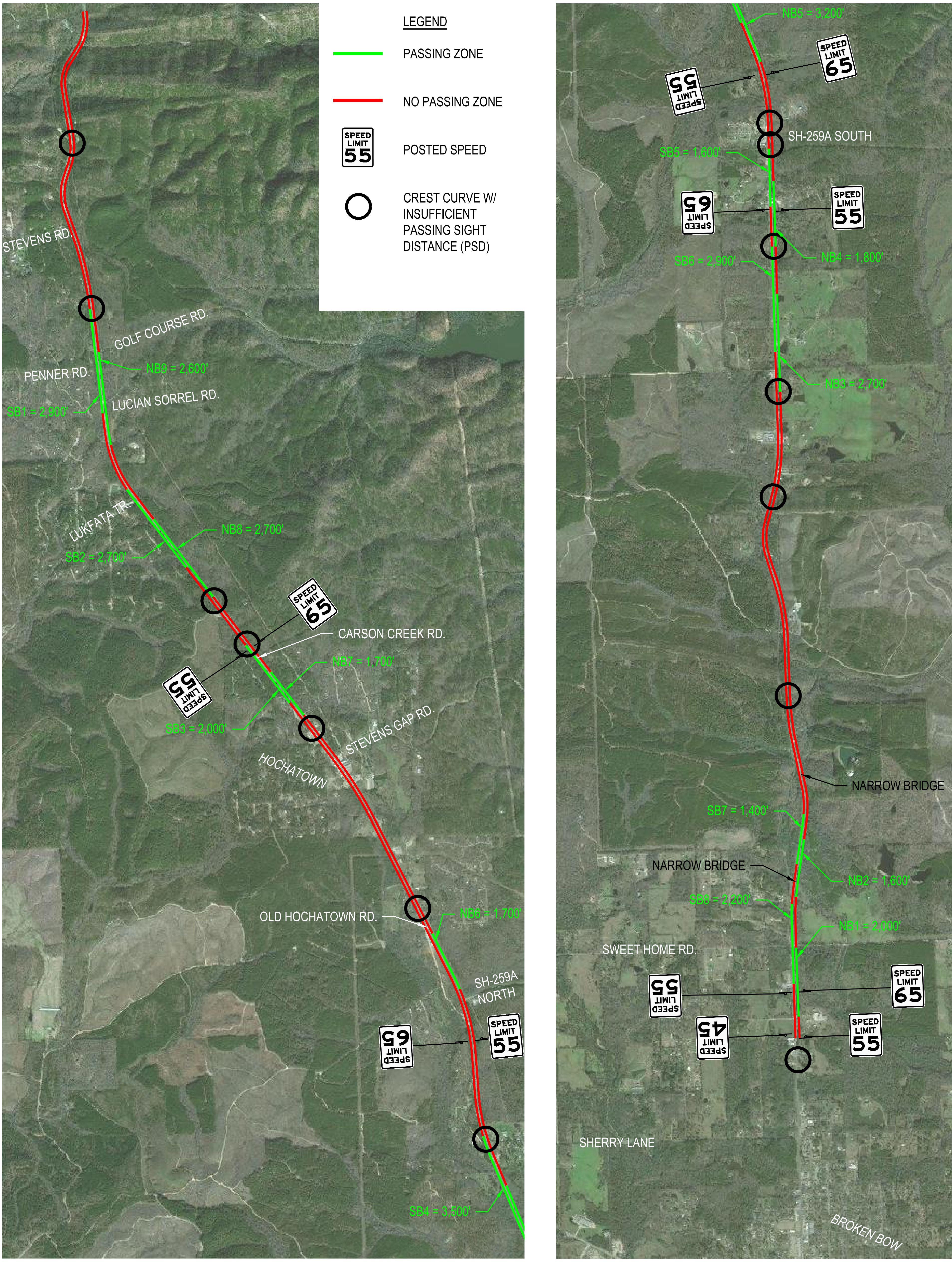
US-259 features posted speed limits of 55 mph and 65 mph throughout the study corridor. Minimum passing sight distances of 900-feet and 1,100-feet, respectively, are required to permit a Passing Zone. Passing Zones should be provided frequently on a two-lane highway, however there is not a practical measure for frequency of Passing Zones as the zones are determined by site specific physical limitations. Additionally, each Passing Zone should be as long as practical given the site-specific limitations. Passing Zones shorter than 800-feet contribute little to improving the operational efficiency of a two-lane highway. Therefore, AASHTO recommends maintaining 800-feet as the minimum length for a Passing Zone at speeds of 55 mph and 65 mph.

For the northbound direction, the study corridor was found to have nine (9) distinct Passing Zones. For northbound vehicles travelling through the entire study area, passing is prohibited for 70% of the total length and permitted for 30% of the total length. All existing northbound Passing Zones meet criteria for passing sight distance and minimum length. A summary of the recorded Passing/No Passing Zones for northbound traffic is provided in **Table 11** and **Figure 15.**

Table 11: Northbound Passing Zone Summary

PZ SEGMENT NO.	LENGTH (FT)	POSTED SPEED (MPH)	PZ CONDITION	REMARKS
	600	55	NO PASSING	Begin @ 55 MPH Sign 0.5 miles N of Sherry Ln
NB1	1,900	55/65	PASSING PERMITTED	
	1,400	65	NO PASSING	Horizontal curve
NB2	1,600	65	PASSING PERMITTED	Narrow bridge present within PZ
	12,500	65	NO PASSING	Crest curves/Horizontal curves/Narrow bridge
NB3	2,700	65	PASSING PERMITTED	
	1,300	65	NO PASSING	Insufficient SD for crest curve
NB4	1,800	65/55	PASSING PERMITTED	
	3,300	55/65	NO PASSING	Crest curves/US-259A (S) JCT/Horizontal curve
NB5	3,200	65	PASSING PERMITTED	
	5,600	65/55	NO PASSING	Crest curve/Horizontal Curve/US-259A (N) JCT
NB6	1,700	55	PASSING PERMITTED	
	6,800	55	NO PASSING	Hochatown/Crest curves
NB7	1,700	55	PASSING PERMITTED	
	2,600	55/65	NO PASSING	Insufficient SD for crest curves
NB8	2,700	65	PASSING PERMITTED	
	2,400	65	NO PASSING	Horizontal curve
NB9	2,600	65	PASSING PERMITTED	
	9,700	65	NO PASSING	Crest curves/Horizontal curves - End @ MP 14.05

PZ = Passing Zone; MPH = Miles Per Hour; NB = Northbound; SD = Sight Distance; MP = Milepost



PERCENT NO PASSING
NB = 69.9%
SB = 71.0%

FIGURE 15

US-259 EXISTING PASSING ZONES

0 .25 .5
SCALE: 1" = .5 MILES

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For the southbound direction, the study corridor was found to have eight (8) distinct Passing Zones. For southbound vehicles travelling through the entire study area, passing is prohibited for 71% of the total length and permitted for 29% of the total length. All existing southbound Passing Zones meet criteria for passing sight distance and minimum length. A summary of the recorded Passing/No Passing Zones for southbound traffic is provided in **Table 12** and was also shown in Figure 15.

Table 12: Southbound Passing Zone Summary

PZ SEGMENT NO.	LENGTH (FT)	POSTED SPEED (MPH)	PZ CONDITION	REMARKS
	8,500	65	NO PASSING	Begin @ MP 14.05 - Crest curves/Horizontal curves
SB1	2,900	65	PASSING PERMITTED	
	2,200	65	NO PASSING	Horizontal curve
SB2	2,700	65	PASSING PERMITTED	Lukfata Trail development within PZ
	2,700	65	NO PASSING	Insufficient SD for crest curves
SB3	2,000	55	PASSING PERMITTED	
	13,300	55/65	NO PASSING	Hochatown/Crest curves/US-259A (N) JCT
SB4	3,500	65	PASSING PERMITTED	
	3,600	65/55	NO PASSING	Horizontal curve/Crest curves/US-259A (S) JCT
SB5	1,600	55	PASSING PERMITTED	
	1,100	65	NO PASSING	Insufficient SD for crest curve
SB6	2,900	65	PASSING PERMITTED	
	12,900	65	NO PASSING	Crest curves/Horizontal curves/Narrow bridge
SB7	1,400	65	PASSING PERMITTED	
	1,100	65	NO PASSING	Horizontal curve/Narrow bridge
SB8	2,200	65	PASSING PERMITTED	
	1,500	65/55	NO PASSING	End @ 45 MPH Sign 0.5 N of Sherry Ln

PZ = Passing Zone; MPH = Miles Per Hour; SB = Southbound; SD = Sight Distance; MP = Milepost

4.6.2 Crest Curves

Crest vertical curves are a prominent limiting factor to available sight distance on US-259 within the study corridor. The design values for minimum passing sight distance are based on MUTCD Table 3B-1. For design and analysis, a value for rate of curvature, or ‘K’ value, can be utilized. The ‘K’ value is determined by dividing the length of the parabolic, vertical curve by the percent algebraic difference in intersecting grades. Table 3-35 in AASHTO’s *A Policy on Geometric Design of Highways and Streets “Green Book”*, provides minimum “K” values for adequate passing sight distance given the posted speed. This minimum value is included in **Table 13** along with the location and calculated existing “K” value for each crest vertical curve in the study corridor. The table then summarizes which curves provide sufficient sight distance for passing. Curves with inadequate passing sight distance are represented with circles on Figure 15, which also presents the existing Passing/No Passing Zones.

Table 13: Summary of Crest Curves

CREST CURVE NO.	LOCATION (MILE POST)	POSTED SPEED (MPH)	MIN. 'K' VALUE FOR PSD	CURVE LENGTH (FEET)	CURVE 'K' VALUE	SUFFICENT PSD?
C1	1.65	55	289	400	294	YES
C2	2.84	65	432	400	399	NO
C3	3.33	65	432	1,000	189	NO
C4	4.39	65	432	200	250	NO
C5	4.94	65	432	600	241	NO
C6	5.70	65	432	400	166	NO
C7	6.23	55	289	400	200	NO
C8	6.34	55	289	400	170	NO
C9	6.78	65	432	200	476	YES
C10	7.54	65	432	400	211	NO
C11	8.03	65	432	400	515	YES
C12	8.81	55	289	200	200	NO
C13	9.90	55	289	450	207	NO
C14	10.45	65	432	400	198	NO
C15	10.74	65	432	900	168	NO
C16	12.44	65	432	500	147	NO
C17	13.33	65	432	1,600	162	NO

MPH = Miles Per Hour; PSD = Passing Sight Distance

4.6.3 Passing Zone Recommendations

The US-259 study corridor contains many horizontal and vertical curves that limit available forward sight distance for motorists. The study of the existing Passing Zones found that all existing Passing Zones meet the requirements for adequate passing sight distance and minimum length. Significant changes to existing Passing/No Passing Zones are not recommended for the corridor due to the numerous sight distance limitations. However, there are several locations where modifications to the length of existing Passing Zones would be recommended. Those locations and corresponding modifications are as follows:

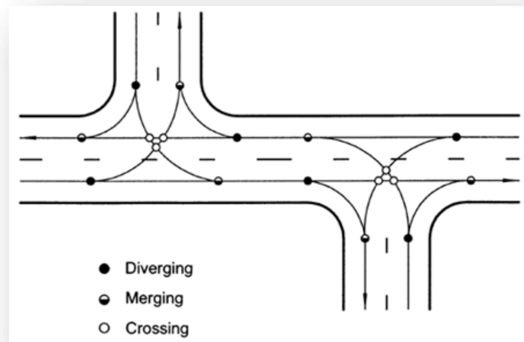
- Move beginning of NB2 (MP 2.27) north 400-feet to MP 2.35 and begin NB2 PZ just north of narrow bridge. Although adequate sight distance is provided at the current location for the start of the PZ, the existing bridge has no shoulders and barriers just outside of the driving lane. This would shorten the length of the PZ from 1,600-feet to 1,200-feet (length still greater than minimum length of 800-feet). Although ODOT plans to widen this bridge to contain 40-feet of clear roadway, a PZ is still not recommended along the bridge.
- Move beginning of SB2 (MP 11.48) south 500-feet to MP 11.38 and begin SB2 PZ just south of the intersection of US-259 and Lukfata Trail. Although adequate sight distance is provided at the current location for the start of the PZ, Lukfata Trail is a rapidly developing area with heavy turning movements observed. Due to the high volume of turning movements at the location, it is recommended that passing be prohibited at the intersection location. This would shorten the length of the PZ from 2,700-feet to 2,200-feet.

The recommended changes to the existing passing zones are minor and any additional delay in corridor travel times would be insignificant. No existing passing zones are proposed to be entirely eliminated at this time, however, as development along the US-259 corridor increases, some areas may need to be reevaluated if there is a significant increase to the number of turning vehicles at a particular location.

4.7 Access Management Evaluation

Access management is the programmatic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway. The purpose for evaluating the access along this corridor is to create a balance of mobility for through drivers while also allowing access to local businesses, which is a vital component to the economies of Hochatown and Broken Bow. The lack of adequate access management is a significant contributor to collisions, congestion, and the deterioration of a highway's function, and this has already been realized in Hochatown.

Within the study area, most of the land along US-259 is undeveloped; however, there are areas near Broken Bow and Hochatown that have numerous businesses located along the corridor with direct access to US-259. Driveways are inevitable and necessary but as their numbers increase, so too does the propensity for collisions in that corridor. Access management has many benefits that include preserving the integrity of the roadway system, improving safety and capacity, providing a more efficient and predictable driver experience, improving travel times through a corridor, and improving aesthetics. However, poor access management can increase collision rates, increase vehicle delays, reduce the roadway efficiency, and decrease through capacity.



Points of conflict at driveways

4.7.1 Access Management Study

Within the extents of the study corridor there are a total of 167 access points, 89 on the west side of US-259 and 78 on the east side. While it is understood that a property owner has a right to access his property and not be landlocked, the owner does not have the right to absolute access from any point. With this principle in mind, opportunities exist to remove or modify 15% of the existing driveways. Modification of a driveway includes geometric reconfiguration, consolidation, or a reduction in width. Affected driveways are summarized in **Table 14**. Driveways noted as High or Medium Priority will provide an immediate and significant increase in safety and functional operation within the corridor.

Table 14: Proposed Access Modifications for US-259

Access No.	Mile Post	Description	Location	Remove	Modify
E03	1.02	Kohler's Four Seasons Realty, Broknbo Vintage Market, and McCurtain County Propane Inc.	Between Sherry Ln and Sweet Home Rd		1
W04	1.46	Mountain Fork	Between Sherry Ln and Sweet Home Rd		1
E15	1.46	Little Dixie Transit and Antiques Etc.	Between Sherry Ln and Sweet Home Rd		1
W05	1.50	Doug Story Body Shop	Between Sherry Ln and Sweet Home Rd		1
W06	1.52	Doug Story's Body Shop	Between Sherry Ln and Sweet Home Rd		1
W11	1.92	Vacant Dwy	Between Sherry Ln and Sweet Home Rd	1	
W12	1.96	Vacant Dwy	Between Sherry Ln and Sweet Home Rd	1	
W14	2.26	Burton Rd	Between Sweet Home Rd and SH-259A (S)		1
W15	3.01	Vacant Dwy	Between Sweet Home Rd and SH-259A (S)	1	
E25	4.47	Once Upon a Time and Residential Dwys	Between Sweet Home Rd and SH-259A (S)		1
E28	4.69	Unmarked Business	Between Sweet Home Rd and SH-259A (S)		1
W26	5.01	Doug's Small Engine Repair	Between Sweet Home Rd and SH-259A (S)		1
W33	5.90	Janet's Treasure Chest	Between Sweet Home Rd and SH-259A (S)		1
W35	5.95	Beavers Bend Lodging Inc.	Between Sweet Home Rd and SH-259A (S)		1
W36	5.97	Fresh Farm Produce and Hochatown Gifts	Between Sweet Home Rd and SH-259A (S)		1
W38	6.09	Shady Oaks	Between Sweet Home Rd and SH-259A (S)		1
W41	6.24	Adam & Eve's General Store and Hochatown Amusements	Between SH-259A (S) and SH-259A (N)		1 (High Priority)
W44	6.42	Vacant Dwy	Between SH-259A (S) and SH-259A (N)	1	
E49	8.86	Chapel Pines	Between Old Hochatown Rd and Stevens Gap Rd	1	
E58	9.49	Spearfish Rd	Between Old Hochatown Rd and Stevens Gap Rd		1
W70	9.65	E-Z Mart Gas Station	Between Old Hochatown Rd and Stevens Gap Rd		1 (Medium Priority)
E64	9.80	Twin Pine Cabins	Between Stevens Gap Rd and Carson Creek Rd		1
E65	9.83	Girls Gone Wine	Between Stevens Gap Rd and Carson Creek Rd		1 (High Priority)

Table 14 (Continued): Proposed Access Modifications for US-259

E66	9.96	Orca Rd	Between Stevens Gap Rd and Carson Creek Rd		1
E67	9.98	Mailbox Dwy	Between Stevens Gap Rd and Carson Creek Rd	1	
W79	12.15	WhipPoorWill Resort Cabins	Between Penner Rd and Golf Course Rd		1
			Totals:	6	20

Figure 16 depicts the location of all existing access points and identifies those that are recommended for removal or modification. The recommendations listed above that are noted as High or Medium Priority are also exhibited in further detail in **Figures 17 through 19**. It is recommended that new and modified driveways be designed to accommodate large turning radii of oversized vehicles such as recreational vehicles, trucks with trailers and boats, and commercial trucks. All recommended access management improvements are within ODOT's existing right-of-way.

Location of Adam & Eve's (W41) High Priority access modification

Location of E-Z Mart Gas Station (W70) Medium Priority access modification

Location of Girls Gone Wine (E65) High Priority access modification

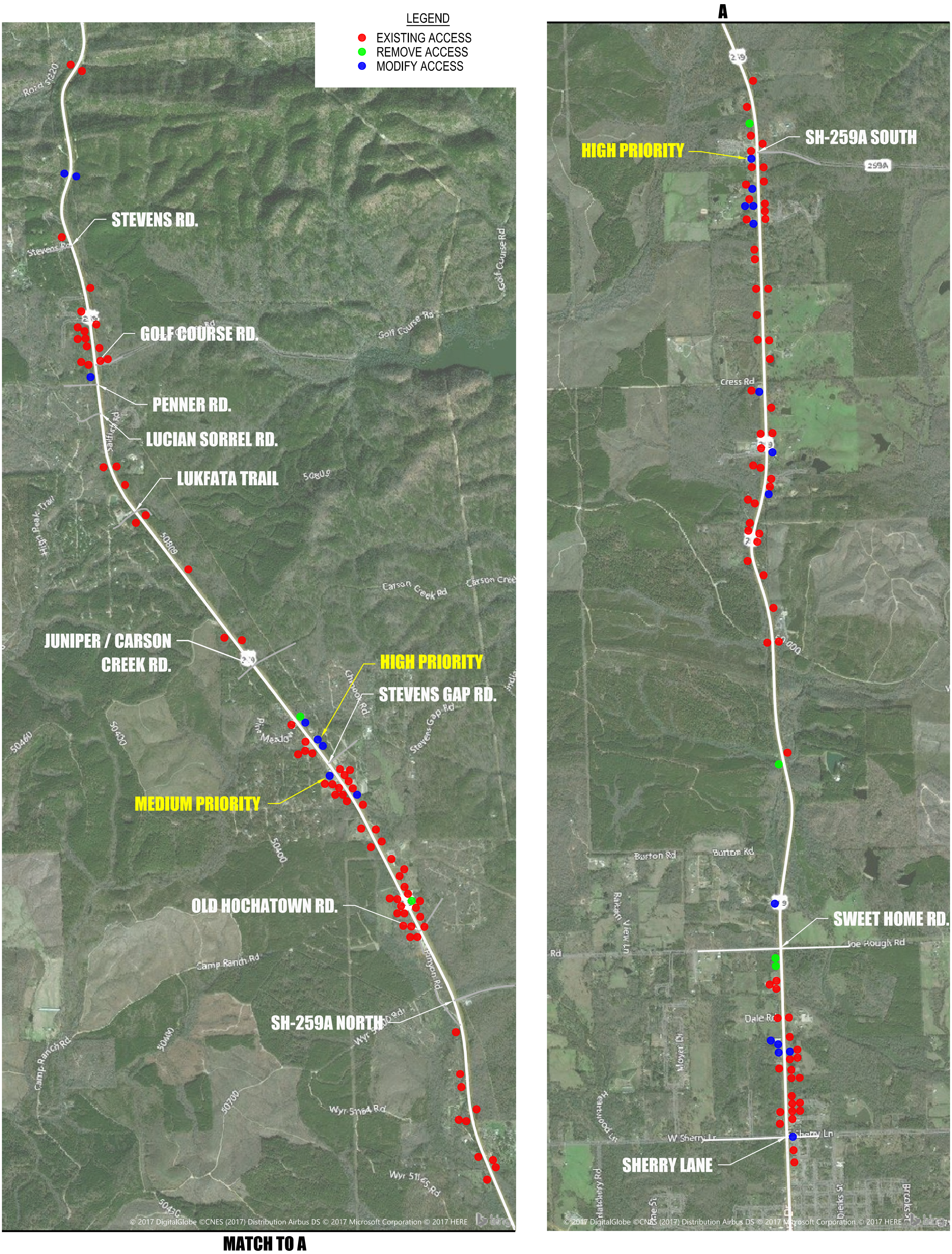


FIGURE 16

1000 W WILSHIRE BLVD.
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ACCESS MANAGEMENT RESULTS

0 .25 .5
SCALE: 1" = .5 MILES

FIGURE 17

ACCESS MODIFICATION FOR
ADAM & EVE'S GENERAL STORE
AND HOCHATOWN AMUSEMENTS
(W41)

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0 20' 40'
SCALE: 1" = 40'

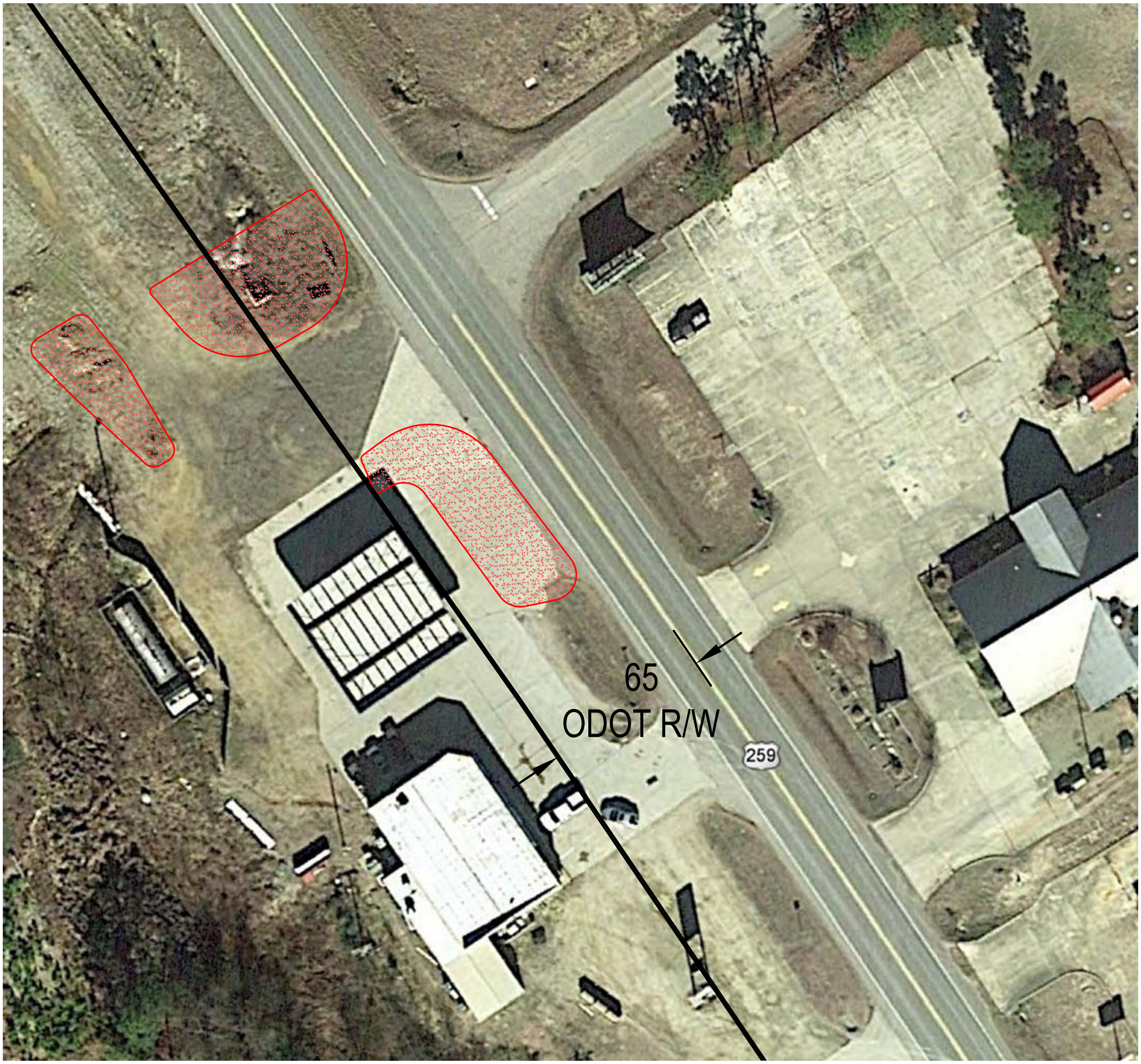

FIGURE 18

1000 W WILSHIRE BLVD.
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ACCESS MODIFICATION FOR
E-Z MART GAS STATION
(W70)

0 30' 60'
SCALE: 1" = 30'

FIGURE 19

ACCESS MODIFICATION FOR
GIRLS GONE WINE
(E64 AND E65)

0 30' 60'
SCALE: 1" = 60'

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4.8 Signing

As part of the field reconnaissance effort for this study, a qualitative review was conducted of the signs along the US-259 study corridor. These signs were evaluated against the criteria detailed in the MUTCD for design and placement.

4.8.1 Street Name Signs

According to the MUTCD, street name signs shall be retroreflective or illuminated to show the same shape and similar color both day and night. The normal guide sign color is green, however alternative background colors may be used where the highway agency determines this is necessary. If an alternative color is used however, that alternative color should be applied to the street name signs on all roadways under the jurisdiction of a particular highway agency. In this case, all street name signs along US-259 in the study corridor should be designed with a green background color with a white legend and border, though a border may be omitted from a street name sign.

The lettering for names of streets on street name signs shall be composed of a combination of lower-case with initial upper-case letters. Table 2D-2 of the MUTCD identifies the recommended minimum letter heights on street name signs. Due to the presence of unfamiliar drivers in the area and the recreational nature of the study corridor, it recommended that all street name signs utilize 8 inches for upper case letter and 6 inches for lower case letters.

Table 2D-2. Recommended Minimum Letter Heights on Street Name Signs

Type of Mounting	Type of Street or Highway	Speed Limit	Recommended Minimum Letter Height	
			Initial Upper-Case	Lower-Case
Overhead	All types	All speed limits	12 inches	9 inches
Post-mounted	Multi-lane	More than 40 mph	8 inches	6 inches
Post-mounted	Multi-lane	40 mph or less	6 inches	4.5 inches
Post-mounted	2-lane	All speed limits	6 inches*	4.5 inches*

*On local two-lane streets with speed limits of 25 mph or less, 4-inch initial upper-case letters with 3-inch lower-case letters may be used

Street name signs should be mounted with their faces parallel to the streets they name. They may be placed above a regulatory ‘STOP’ sign with no required vertical separation. At intersection crossroads where the same road has two different street names for each direction of travel, both street names may be displayed on the same sign along with directional arrows.

During the field reconnaissance, it was noted that several street name signs contained lettering that was too small to be visible by motorists traveling the posted speed limits. Also, several street name signs were displayed on the wrong background color (white), improperly placed in roadside area, and/or mounted at an improper height. The list of street name signs shown in **Table 15** do not currently meet the criteria of the MUTCD and should be replaced to improve driver recognition.

Table 15: Street Name Signs Not Meeting MUTCD Criteria

Roadway	Existing Sign	Proposed MUTCD Sign
Sherry Lane		
Sweet Home Road		
Old Hochatown Road		
Spearfish Road		
Pinyon Road		
Carson Creek Road		
Juniper Road		
Lucian Sorrel Road		
Choate Road		

Table 15 (Continued): Street Name Signs Not Meeting MUTCD Criteria

Stevens Gap Road		
Lukfata Trail		
Penner Road		
Last Resort		
Golf Course Road		
Stevens Road		

4.8.2 Advance Street Name Signs

Advance street name signs identify an upcoming intersection. If used, advance street name signs shall supplement rather than be used in lieu of street name signs at the intersection. They may be installed in advance of intersections to provide motorists with information to identify the name of the next intersecting street in order to prepare for crossing traffic and to facilitate timely deceleration in preparation for a turn.

According to guidance in Section 2D.44 of the MUTCD, advance street name signs should be used in advance of all signalized intersections and in advance of all intersections with exclusive turn lanes on arterial highways in rural areas. They shall have a white legend and border on a green background and the heights of the letters should be the same as those used for street name signs.

Advance street name signs are recommended along the US-259 study corridor at major intersections to improve driver recognition. Based on the guidance contained in the MUTCD as well as the intersection improvements recommended in this report, advance street name signs are recommended at the following high priority locations:

- Sherry Lane (southbound direction only)
- Sweet Home Road (Joe Hough Road)
- Stevens Gap Road
- Carson Creek Road
- Lukfata Trail
- Lucian Sorrel Road (Choate Road)

4.9 Qualitative Speed Assessment

Speed is a critical parameter to evaluate along the US-259 study corridor considering it is a two-lane rural highway for most of its length and includes both vertical and horizontal curves, narrow shoulders, and a large percentage of heavy trucks. While the corridor serves mostly through traffic, there are portions through Broken Bow and Hochatown that experience higher access point density and the absence of auxiliary lanes causes a speed differential between those continuing along US-259 versus those entering and exiting driveways. The purpose of this speed assessment is to determine whether the posted speed limits along the corridor are appropriate considering the speed data, collision rates and history, and proportion of heavy trucks in the traffic stream.

The posted speed limits along the US-259 study corridor vary between 45 and 65 mph and the speed limit zones are as follows:

- 45 mph zone – From south of Sherry Lane to milepost 1.53
- 55 mph zone – From milepost 1.53 to 1.72
- 65 mph zone – From milepost 1.72 through Sweet Home Road to milepost 5.83
- 55 mph zone – From milepost 5.83 through SH-259A (S) to milepost 6.56
- 65 mph zone – From milepost 6.56 to 8.01
- 55 mph zone – From milepost 8.01 through SH-259A (N), Old Hochatown Road, Stevens Gap Road, and Carson Creek Road to milepost 10.32
- 65 mph zone – From milepost 10.32 through Lukfata Trail, Lucian Sorrel Road, Penner Road, Golf Course Road, and to north of Stevens Road

Speed data was collected at four (4) locations along the study corridor for a continuous 2-week period in May 2017. **Table 16** summarizes the speed data collected in May 2017. The 85th percentile speed is the speed that 85% of vehicles do not exceed which means 85% of vehicles are traveling at or below this speed. The mean (or average) speed is the speed that 50% of vehicles are exceeding. Posted speed limits are typically based on the 85th percentile speed data.

Table 16: Speed Data (May 2017)

Major Roadway	US-259	US-259	US-259	US-259
Milepost	0.96	5.61	9.12	13.49
Limits	South of Sherry Ln	Between Opah Trl and SH-259A (S)	Between Old Hochatown Rd and Spearfish Rd	North of Stevens Rd
Posted Speed Limit	45 mph	65 mph	55 mph	65 mph
Mean Speed (Average)	40 mph	62 mph	50 mph	59 mph
85th Percentile Speed	46 mph	67 mph	58 mph	66 mph

In addition to the speed data collected as part of this study, ODOT collected speed data at eleven (11) locations along the US-259 study corridor over a 24-hr period on a weekday in April 2016. **Table 17** summarizes the speed data collected by ODOT in April 2016.

Table 17: ODOT Speed Data along US-259 (April 2016)

No.	Location	Posted Speed Limit	Mean Speed (Average)	85^{th} Percentile Speed
1	MP 6.09 (Approx. 0.15 miles south of SH-259A [S])	55 mph	54 mph	58 mph
2	MP 6.39 (Approx. 0.15 miles north of SH-259A [S])	55 mph	57 mph	62 mph
3	MP 7.42 (Approx. 0.81 miles south of SH-259A [N])	65 mph	60 mph	65 mph
4	MP 8.38 (Approx. 0.15 miles north of SH-259A [N])	55 mph	54 mph	58 mph
5	MP 8.83 (Approx. 0.18 miles north of Old Hochatown Rd)	55 mph	53 mph	59 mph
6	MP 9.33 (Approx. 0.37 miles south of Stevens Gap Rd)	55 mph	53 mph	57 mph
7	MP 9.85 (Approx. 0.15 miles north of Stevens Gap Rd)	55 mph	50 mph	54 mph
8	MP 10.15 (Approx. 0.15 miles south of Carson Creek Rd)	55 mph	58 mph	62 mph
9	MP 11.30 (Approx. 0.03 miles south of Lukfata Trl)	65 mph	60 mph	66 mph
10	MP 11.70 (Approx. 0.19 miles south of Lucian Sorrel Rd)	65 mph	62 mph	68 mph
11	MP 12.20 (Approx. 0.05 miles north of Golf Course Rd)	65 mph	59 mph	65 mph

MP = Mile Post; mph = miles per hour

The speed data collected and observations noted during the field reconnaissance indicate the posted speed limits appear appropriate for much of the corridor except for the segment through Hochatown, between Old Hochatown Road (Pinyon Road) and Carson Creek Road. Throughout Hochatown, the posted speed limit is 55 mph and the collected 85^{th} percentile speeds vary between 54-62 mph. The speed data collected by ODOT in April 2016 clearly shows the 85^{th} percentile speed decreases as it enters Hochatown, 57 mph on the south end and 54 mph on the north end. The 85^{th} percentile speed data summarized in the tables above is the average for a 24-hour period and does not necessarily reflect the speeds driven during the peak hours.

The *Methods and Practices for Setting Speed Limits: An Informational Report* prepared by the *Institute of Transportation Engineers* (ITE) for the FHWA states, “Speed limits are set to inform motorists of appropriate driving speeds under favorable conditions. Drivers are expected to reduce speeds under certain conditions (e.g. poor visibility, adverse weather, congestion, warning signs, or presence of bicycles and pedestrians) ...The primary purpose of the speed limit is to advise drivers of the maximum reasonable and safe operating speed under favorable conditions. It provides a basis for enforcement and ought to be fair in the context of traffic law.” State law requires speed limits on state highways be based on engineering studies which ODOT conducts in accordance with traffic engineering practices as stated in the MUTCD, adopted by the Oklahoma Transportation Commission. Speed limits are set by the 85^{th} percentile method which represents the speed most drivers will be traveling at or below. Speed data used in setting speed limits are collected on weekdays during off peak hours under favorable weather conditions to ensure an accurate reflection of a normal traffic condition.

ODOT's *Setting Speed Limits* brochure states, "In rare situations, the posted speed limit may be lowered a small amount below the 85th percentile speed if some of the following conditions are present:

- Narrow pavement width
- Curves and hills
- Hidden street returns
- High number of driveways
- Lack of improved shoulders
- High crash ranking"

Safety is the Primary Concern

Most traffic problems are not simple and do not have simple solutions. Requests for lower speed limits are sometimes made with the admirable motive to "quick fix" a particular problem. However, rarely does a single traffic control tool solve all the traffic problems in a community.

Research has shown that speed limits set below the reasonable speed of most drivers do not significantly reduce the number of crashes on a road. In fact, crashes may increase with unreasonably low speed limits.

ODOT's goal has always been to set speed limits that maximize safety and are respected and obeyed by motorists. By using sound engineering principles, we can provide a balanced transportation system that gets motorists to their destination as safely and as quickly as possible.

Who are We?

ODOT is responsible for building and maintaining the state transportation system. We have no authority to cite vehicle violations of any kind. That jurisdiction falls under the Oklahoma Department of Public Safety and local authorities.

Other Actions:

In addition to setting reasonable speed limits based on accepted engineering principles, ODOT uses a variety of traffic control devices to improve safety. These include the use of traffic signals, flashing beacons to alert motorists, pavement markings, and signs to advise drivers of reduced speed limits ahead.

Please remember that observing speed limits means more than driving faster or slower than the posted speed. ***It means driving to conditions.*** When it's raining or foggy, when ice is on the road, when traffic is heavy, when the road is hilly or curvy, or when construction is ahead, adjust your speed accordingly.

For More Information

To learn more about ODOT and how speed limits are set, contact your local division office.

Division	Phone	Location
Division 1	(918) 687-5407	2800 S. 32nd St. Muskogee
Division 2	(580) 298-3371	US-271 South Antlers
Division 3	(580) 332-1526	12844 SH-3W Ada
Division 4	(580) 336-7340	2609 US-77W Perry
Division 5	(580) 323-1431	1745 S. US-183 Clinton
Division 6	(580) 735-2561	US-64 West Buffalo
Division 7	(580) 255-7586	2205 S. US-81Bypass Duncan
Division 8	(918) 838-9933	4002 N. Mingo Valley Expressway Tulsa

ODOT

www.ok.gov/odot

Traffic Engineering Division
200 NE 21st St
Oklahoma City OK 73105

Oklahoma Department of Transportation

Setting Speed Limits

ODOT Speed Study Brochure – Side 1

Changing a Speed Limit

Have you ever wondered how speed limits are determined and who sets them? Does lowering speed limits slow down traffic? How do you get one changed? Would changing a speed limit solve a problem? This brochure will help answer some of these questions.

What Speed Limits Do

Speed limits are established to reflect the reasonable speed of the majority of drivers on a particular roadway. Most drivers naturally select a comfortable speed, not too slow or not too fast, but one that will get them where they want to go safely and without undue delay.

Speed limits are posted primarily to inform motorists of the speed considered reasonable by a majority of drivers on a particular roadway. Motorists, especially those unfamiliar with the road, can use this information to evaluate how they should drive on a particular road. A safer driving environment is established when motorists drive at the same speed.

Setting Speed Limits

The state law setting maximum speed limits based on type of highway was repealed in 2016 and the new law requires speed limits on state highways be based on engineering studies. Certain speed restrictions apply to motor scooters, mopeds, gopeds, and other motorized or electric devices, school buses, work zones, and school zones.

How are speed limits set? City governments and the Oklahoma Department of Transportation (ODOT) must conduct engineering studies in accordance with traffic engineering practices as stated in the Manual of Uniform Traffic Control Devices (MUTCD) adopted by the Oklahoma Transportation Commission.

Speed limits on all highways are approved by the Commission. When inside city limits, the speed limits must have city concurrence. Citizen requests for speed zone studies on highways should be made to the local ODOT division office with jurisdiction over the roadway.

ODOT only has jurisdiction over setting speed limits on the state highway system. Questions about speed limits on city streets or county roads should be directed to the transportation departments of those local governments.

Speed Zone Studies

Speed limits on Oklahoma highways are set by the 85th percentile method, which represents the speed the majority of drivers will be traveling at or below. This is a sound engineering principle used to set speed limits on highways nationwide for the past 60 years.

Speed checks are conducted to determine the 85th percentile speed. The observed free-flowing speed for vehicles is tallied and the 85th percentile speed is calculated using gathered information. To ensure a true reflection of a normal traffic situation, speed studies are made on weekdays during off peak hours under favorable weather conditions.

Other data collected typically shows roadway features such as curves, surface width and type, right of way width, crash history, cross streets, school crossings and sites that generate traffic.

The speed limit is normally set at the nearest value to the 85th percentile speed ending in a 5 or 0. In rare situations, the posted speed limit may be lowered a small amount below the 85th percentile speed if some of the following conditions are present:

- Narrow pavement width
- Curves and hills
- Hidden street returns
- High number of driveways
- Lack of improved shoulders
- High crash ranking

Once the study is completed, black-on-white speed limit signs are posted along the highway to alert drivers of the maximum legal speed for that section of roadway.

Can a Speed Limit Be Too Low?

There are disadvantages to setting speed limits far below the 85th percentile speed. If reasonable drivers see an unreasonably low speed limit without seeing a need to drive that slowly, they tend to ignore the signs and develop disrespect for speed limits in general.

When a speed limit is set below the 85th percentile; law enforcement officials must deal with reasonable people being ticketed for exceeding the posted limit, as well as motorists who drive too fast.

ODOT Speed Study Brochure – Side 2

For the 1.5-mile segment from Old Hochatown Road (Pinyon Road) to south of Carson Creek Road (Juniper), considering the following factors of lack of improved shoulders, high number of driveways, the calculated collision rate being almost 20% greater than the statewide average and the reporting of unsafe speed being a contributing factor in 23% of collisions, it is recommended that a speed reduction be implemented through Hochatown. Additional considerations include the large number of vehicles turning into the existing driveways and the amount of future growth anticipated for this area. Due to its rural location and seasonal traffic volume fluctuations, a variable speed zone through Hochatown may be appropriate. A variable speed zone would adjust the posted speed limit when traffic volumes or 85th percentile speeds meet established thresholds. Variable speed limits are discussed in further detail later in this chapter.

4.9.1 Truck Speeds

Heavy trucks (3 or more axles) currently represent 8% to 12% of total weekday traffic; therefore speed data by vehicle classification was deduced from the data collected in May 2017. **Table 18** summarizes the speed data by classification. As shown in this table, heavy truck speeds do not vary significantly from the passenger car speed data.

Table 18: 85th Percentile Speed Data by Classification (May 2017)

No.	Location	Posted Speed Limit	Classification	
			Passenger Cars	Trucks (3+ axle)
1	South of Sherry Ln	45 mph	45 mph	46 mph
2	Between Opah Trl and SH-259A (S)	55/65 mph	67 mph	68 mph
3	Between Old Hochatown Rd and Spearfish Rd	55 mph	57 mph	58 mph
4	North of Stevens Gap Road	65 mph	66 mph	64 mph

mph = miles per hour

While the overall speed data does not indicate a problem with trucks and excessive speeding, the field reconnaissance did suggest that heavy trucks typically travel faster than the posted speed limits and do not exercise necessary caution when approaching congested segments through Hochatown or in dense driveway locations. The weight and momentum of heavy trucks makes it much more difficult for them to decelerate and stop compared to passenger cars and a collision is more likely to result in an injury or fatality when a heavy truck is involved. Higher speeds directly affect the severity of injuries in collisions. According to the *National Highway Traffic Safety Administration's* (NHTSA) 2015 data, heavy trucks accounted for over 12 percent of all vehicles involved in fatal collisions in the state of Oklahoma (over four percent (4%) higher than the national average).

It is recommended that speed enforcement be increased along the US-259 corridor. As an additional option, standalone speed trailers could be employed at critical locations to alert drivers of their speeds.

Standalone speed trailer

4.9.2 Variable Speed Limits

Variable speed limits (VSLs) are achieved using changeable message signs and are generally used to adjust the posted speed limits for a variety of reasons including but not limited to, traffic congestion, weather conditions, work zones, and collision management. Ideally, the speed limit is automated and does not require intervention from an operator. Speeds should change in increments of 5 or 10 mph and can be set by time of day, weather condition, traffic volume, or other established thresholds through the use of sensors.

VSLs can improve safety by reducing the likelihood and severity of collisions. The success of the VSL is closely linked to the extent to which drivers comply with the signing, therefore enforcement and communication with the public is imperative. VSLs should be implemented in response to a community need that is vetted through the public stakeholders, otherwise compliance rates will be low. The reason for the adjusted speed limit should be explained through a public outreach campaign and with corridor signing in advance of the VSL, if the reason is not apparent.

VSL in a work zone

ODOT has not initiated any projects to date that include VSLs, although development of a VSL temporary work zone detail and specification is in progress. Other states such as Colorado, Utah, and Wyoming are pursuing the use of VSLs along highways and through work zones. Some of the potential difficulties in implementing VSLs relate to the installation and maintenance of the system. The cost of acquiring, installing, and maintaining the changeable message signs and detection equipment can be considerable. The costs for the system increase depending on the complexity of the VSL. For example, a system that is based on traffic volumes and weather conditions would require detection equipment or cameras to determine when a speed limit should be changed; whereas a system that operates similar to a work zone or school zone would not be as costly since the speed limits could be set based on time of day and day of week. Speed enforcement can be difficult since law enforcement must be aware of the speed limit currently in effect and have a way to document it when issuing a citation. Legislation may be needed to allow agencies to implement variable speed limits and to enforce who has the authority to change speed limits and under what conditions.

The segment of US-259 through Hochatown is a suitable location for a VSL pilot project. It is recommended that the limits of the project begin at Old Hochatown Road (Pinyon Road) and extend 1.5 miles north towards Carson Creek Road (Juniper). In this segment, the posted speed limit would vary depending on the traffic volume or 85th percentile speeds. As a default, the posted speed limit would be 55 mph, consistent with the current posted speed limit. As detected traffic volumes increase and/or the 85th percentile speeds decrease, the posted speed limit would decrease to 45 mph. This type of VSL system would require electronic detection of traffic volumes and vehicle speeds that would transmit this information to an operator, who would confirm the data and adjust the posted speed limit signs in VSL mode.

Based on the analysis provided in this report, the following thresholds are recommended for use in a VSL pilot project:

- When peak hour traffic volumes exceed 700 vehicles per hour (both directions), posted speed limit should be reduced to 45 mph.
- When the 85th percentile speed is less than or equal to 49 mph, posted speed limit should be reduced to 45 mph.

As a pilot project, additional studies should be conducted to document conditions before and after implementation of the VSL system in order to confirm this area is an appropriate location for VSLs. Speed data, compliance, and collision rates should be included in the before and after study. If ODOT prefers not to implement a VSL in the short-term, the agency may want to conduct a speed study to verify whether the existing 55 mph posted speed limit is appropriate for conditions in this segment, particularly considering the dense development and frequent turning movements.

5.0 FIELD RECONNAISSANCE

Field reconnaissance of the US-259 study corridor was performed over the 2017 Memorial Day weekend. A video log documenting the travel speeds, weather conditions, and corridor features was recorded. The following observations and subsequent recommendations were made based on the information collected during field reconnaissance.

5.1 Speed

- While there was no posted speed limit on the west side of Sherry Lane, the observed speeds were at least 45 mph. A speed study could be conducted at this location to determine an appropriate posted speed limit.
- Less than 100-feet north of Carson Creek Road (Juniper), the posted speed limit for southbound traffic reduces to 55 mph. It is recommended that this posted speed limit sign be moved approximately 1,000-feet to the north to attempt to reduce the speed of vehicles traveling through this intersection. The posted speed limit for northbound traffic of 65 mph should also be relocated.
- Heavy trucks typically travel faster than the posted speed limits and do not exercise necessary caution when approaching congested segments through Hochatown or in dense driveway locations.

5.2 Passing Maneuvers

- Vehicles were observed passing in the shoulder along US-259 near SH-259A (S) instead of stopping and waiting for northbound left-turning vehicles. "DO NOT PASS ON SHOULDER" signs could be installed in accordance with the MUTCD.
- A vehicle was observed passing a left-turning vehicle on the left (in the opposing lane of traffic) near the Stevens Gap Road and US-259 intersection.
- Numerous vehicles were observed passing in No Passing zones. Additional "NO PASSING ZONE" signs could be installed in accordance with the MUTCD.

5.3 General Traffic Operations

Eastbound right-turn "cut through" at Sherry Lane/US-259 intersection

- At the eastbound approach on Sherry Lane at US-259, 90% of the right-turning traffic cut through the gravel on the southwest corner and used this as a continuous right turn lane. This approach should be modified to restrict vehicles from cutting through this lot. It is recommended that the eastbound approach be widened to include either a dedicated left-turn lane or right-turn lane.
- There were many heavy trucks observed making a southbound right-turn (traveling westbound) from US-259 onto Sherry Lane which provides a direct connection to SH-3.
- Trucks with trailers were observed making wide turns across both lanes at the Stevens Gap Road and US-259 intersection.
- Heavy southbound right turns and northbound left turns were observed at Lukfata Trail.
- Stevens Road, Penner Road, and Last Resort Drive have steep grades approaching US-259.

5.4 Access Management

Wide, open driveways across from SH-259A (S)/US-259 intersection

- Vehicles (including boats and trailers) were observed parking in the right-of-way at the Adam & Eve's General Store and Hochatown Amusements. Access modifications are recommended at this location.
- New retail development is being constructed south of the intersection at Old Hochatown Road (Pinyon Road) and US-259. Signs for this development must be placed in a location that does not obstruct sight distance.
- The Spearfish Road connection at US-259 does not operate as a roadway, but as an extension of the Shell gas station parking area. Access modification options are recommended at this location.
- Numerous opposing turning movements were observed through Hochatown as vehicles accessed developments. Without the presence of exclusive turn lanes, these turning movements occur from the through lane and deceleration of vehicles greatly affects the 85th percentile speed during various parts of the day.
- Vehicles were observed using excessively wide driveways as deceleration lanes. Access modifications are recommended at several of these locations.
- A near miss rear-end collision was observed at the Girls Gone Wine driveway due to driver inattention and speed.
- The tree limbs located north of the Grateful Head driveway (on the west side) limit sight distance and should be removed.
- The tree limbs located north of Orca Road (on the east side) limit sight distance and should be removed.
- The golf course sign on the northeast corner of the Golf Course Road/US-259 intersection partially obstructs sight distance to the north.

5.5 Signing and Striping

Penner Rd street sign

- The 'STOP' sign at the westbound approach on Sherry Lane is approximately 45-feet back from where a stop bar should be and is not well placed considering the intersection's current geometry. This is due to the fact that the parking lot/access for the office space on the northeast corner is not delineated from US-259 or Sherry Lane which could cause confusion for vehicles desiring to make a westbound right turn from Sherry Lane. The access should be delineated and a stop bar should be installed.
- The street name signs for Sherry Lane on the southwest and southeast corners are white and not well placed. These signs should be replaced with appropriate street signs and relocated.
- The street name signs for all intersecting roadways within the US-259 study corridor are too small and difficult to read, especially considering the posted speed limits. It is recommended that all street name signs be replaced with ones of appropriate size to improve driver recognition. Advanced signing is also recommended for the major roadways and intersections.
- The Spearfish Road street sign has been struck and should be replaced.
- Numerous temporary signs denoting private development spaces were located in the right-of-way along various segments of the US-259 study corridor. ODOT should regularly monitor these signs and remove ones that may limit sight distance.
- The driveway on the west side of US-259 directly across from Golf Course Road is unnecessarily wide and should have a reduced cross section.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This section documents the conclusions made as a result of the analysis detailed in this report as well as the improvements recommended to increase safety and capacity along the US-259 study corridor.

Collision Analysis

- The adjusted collision rate for the US-259 study corridor is lower than the Statewide rate:
    - Statewide rate is approximately 96 collisions per 100 million vehicle miles (2011-2013).
    - US-259 study corridor rate is approximately 67 collisions per 100 million vehicle miles (2011-2015).
- The fatal collision rate for the US-259 study corridor is lower than the Statewide rate:
    - Statewide rate is 2.79 collisions per 100 million vehicle miles (2011-2013).
    - US-259 study corridor rate is 1.07 collisions per 100 million vehicle miles (2011-2015).
- The segment of US-259 between Sherry Lane and SH-259A (N) has the highest number of reported collisions at 74 collisions (including intersection-related):
    - The most common type of collision (38%) in this segment was a vehicle colliding with a fixed object (e.g. concrete barrier, tree, ditch, fence, guardrail, utility pole, or culvert). Unsafe speed, driving while intoxicated (DWI), driver inattention, and improper turn or lane change were cited as contributing factors in this type of collision.
    - 25% of collisions were rear-end collisions. Driver inattention, following too close, and DWI were cited as contributing factors in this type of collision.
    - The intersections at Sherry Lane and Sweet Home Road (Joe Hough Road) also had the highest number of reported collisions of all intersections studied with 10 and 7 collisions, respectively.
- The segment of US-259 between Old Hochatown Road (Pinyon Road) and Carson Creek Road (Juniper) had the highest number of reported collisions that included an injury or possible injury:
    - The most common type of collision (32%) in this segment was an angle turning collision. The contributing factor in all of these was improper turn.
    - 27% of collisions occurred when a vehicle collided with a fixed object (e.g. ditch, tree). Unsafe speed and driver inattention were cited as contributing factors in this type of collision.
    - 27% of collisions were rear-end collisions. Unsafe speed, following too close, and driver inattention were cited as contributing factors in this type of collision.
    - Unsafe speed was cited as a contributing factor in 27% of non-intersection related collisions in this segment.

- <u>The following list of safety improvements are recommended for implementation in the short-term</u>:
    - Trim or remove foliage that impedes sight distance
    - Upgrade bridge barricades
    - Install curve warning signs
    - Remove objects within roadway clear zone
    - Install guardrails
    - Repaint stop bars at all intersections
    - Install rumble strips parallel to edge lines at major intersections
    - Install centerline rumble strips along the entire corridor except at intersections and major commercial driveways
    - Relocate 55 mph posted speed limit sign north of Carson Creek Road (Juniper)
    - Increase speed enforcement along the corridor

Curve warning sign

Roadway Link Capacity Analysis

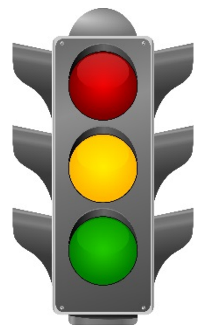
- The US-259 study corridor currently operates at LOS D or better. Under Design Year (2022) conditions, US-259 is predicted to operate near capacity (LOS D or E) for all segments except for the segment north of Stevens Road that is predicted to operate at LOS B. Under Horizon Year (2037), US-259 is predicted to operate at LOS C north of Stevens Road, but near or exceeding capacity (LOS D, E, or F) at the remaining segments.
- <u>The following improvement would increase roadway capacity and is recommended in the long-term when warranted by future traffic volumes</u>:
    - Widen the US-259 study corridor to accommodate additional travel lanes or a continuous center turn lane.

Intersection Capacity Analysis

- All of the study intersections were shown to operate satisfactorily under Existing (2017) conditions. There were some approaches at intersections that were shown to operate at LOS E or F, however the v/c ratios and the queuing results did not indicate that improvements were needed.
- Under Design Year (2022) conditions, there were several intersections that were predicted to operate unsatisfactorily:
    - Sherry Lane/US-259 for Holiday Friday
    - SH-259A (S)/US-259 for Holiday Friday and Holiday Saturday
    - SH-259A (N)/US-259 for Average Weekday, Holiday Friday, and Holiday Saturday
    - Stevens Gap Road/US-259 for Holiday Friday and Holiday Saturday
    - Carson Creek Road (Juniper)/US-259 for Holiday Saturday

- Under Horizon Year (2037) conditions, there were additional intersections that were predicted to operate unsatisfactorily:
    - Sherry Lane/US-259 for Average Weekday, Holiday Friday, and Holiday Saturday
    - Sweet Home Road (Joe Hough Road)/US-259 for Holiday Friday
    - SH-259A (S)/US-259 for Average Weekday, Holiday Friday, and Holiday Saturday
    - SH-259A (N)/US-259 for Average Weekday, Holiday Friday, and Holiday Saturday
    - Old Hochatown Road (Pinyon Road)/US-259 for Holiday Friday and Holiday Saturday
    - Stevens Gap Road/US-259 for Average Weekday, Holiday Friday, and Holiday Saturday
    - Carson Creek Road (Juniper)/US-259 for Average Weekday, Holiday Friday, and Holiday Saturday
    - Lukfata Trail/US-259 for Holiday Friday
- Traffic operations appear to be worse during the holiday weekend (Memorial Day weekend) than they are during an average weekday.

Traffic Signal Warrant Analysis



- The three (3) intersections on US-259 that were analyzed to determine if signalization is currently warranted or may be warranted in the future are Sherry Lane, SH-259A (S), and SH-259A (N). None of the intersections evaluated currently meet any of the nine (9) signal warrants. Warrants 1 & 2 are met under Design Year (2022) and/or Horizon Year (2037) conditions.
- Installation of traffic signals at these locations would increase intersection capacity and the following is recommended in both the short- and long-term:
    - Continue monitoring these intersections as increased development is realized within the corridor.

Right-Turn Deceleration Lane Analysis

- No right-turn deceleration lanes presently exist along US-259 within the study area. For highways, the ODOT design guidelines indicate that an auxiliary right-turn deceleration lane should be considered for any location with a right-turn volume greater than 40 vehicles per hour (vph).
- Providing dedicated right-turn deceleration lanes at the following locations on US-259 would increase roadway capacity and is recommended in the long-term:
    - Sherry Lane/US-259 – Southbound direction
    - SH-259A (N)/US-259 – Northbound direction
- Providing dedicated right-turn deceleration lanes at the following additional locations on US-259 would also increase roadway capacity and is recommended in the long-term when warranted by future traffic volumes:
    - Sherry Lane/US-259 – Northbound direction
    - Sweet Home Road (Joe Hough Road)/US-259 – Southbound direction
    - Stevens Gap Road/US-259 – Northbound direction
    - Carson Creek Road (Juniper)/US-259 – Northbound direction

Left-Turn Deceleration Lane Analysis

- The major intersections within the study area were analyzed to determine the need for left turn lanes along US-259. The northbound and southbound left turn volumes at all of the study intersections exceed the threshold identified in the *NCHRP Report* for the consideration of a left turn deceleration lane under Existing (2017) traffic conditions. Since traffic volumes are forecasted to increase, the future left turn volumes are also anticipated to exceed the threshold.
- Providing dedicated left-turn deceleration lanes (both northbound and southbound) at the following high priority locations on US-259 would increase roadway capacity and is recommended in the long-term:
  - Sherry Lane/US-259
  - Sweet Home Road (Joe Hough Road)/US-259
  - SH-259A (S)/US-259
  - SH-259A (N)/US-259
  - Lukfata Trail/US-259
  - Lucian Sorrel Road (Choate Road)/US-259

Intersection Sight Distance Evaluation

- As part of this traffic analysis, the available and required intersection sight distance for motorists accessing the adjacent roadways from the twelve (12) study intersections and potentially problematic access points/driveways was analyzed. Adequate sight distance is technically provided at all studied locations for passenger cars and combination trucks, but sight distance evaluation for combination trucks was only performed at locations where combination trucks are known to travel.
- The following list of maintenance items to improve sight distance are recommended in the short-term:
  - Sherry Lane – Tree limbs on both the west and east sides of US-259 may partially obstruct sight distance and should be trimmed.
  - Old Hochatown Road (Pinyon Road) – Trees on the east side of US-259 partially obscure sight distance and should be trimmed or removed.
  - Carson Creek Road (Juniper) – A sign on the east side of US-259 and trees on both the west and east sides partially obstruct sight distance. The trees should be trimmed or removed.

Passing Zones Analysis

- For the northbound direction, the study corridor was found to have nine (9) distinct Passing Zones; passing is prohibited for 70% of the total length and permitted for 30% of the total length. All existing northbound Passing Zones meet criteria for passing sight distance and minimum length.
- For the southbound direction, the study corridor was found to have eight (8) distinct Passing Zones; passing is prohibited for 71.0% of the total length and permitted for 29.0% of the total length. All existing southbound Passing Zones meet criteria for passing sight distance and minimum length.

- There are several locations where modifications to the length of existing Passing Zones would be recommended in the short-term:
  - Move beginning of NB2 (MP 2.27) north 400-feet to MP 2.35 and begin NB2 PZ just north of narrow bridge. Although adequate sight distance is provided at the current location for the start of the PZ, the existing bridge has no shoulders and barriers just outside of the driving lane. This would shorten the length of the PZ from 1,600-feet to 1,200-feet (length still greater than minimum length of 800-feet). Although ODOT plans to widen this bridge to contain 40-feet of clear roadway, a PZ is still not recommended along the bridge.
  - Move beginning of SB2 (MP 11.48) south 500-feet to MP 11.38 and begin SB2 PZ just south of the intersection of US-259 and Lukfata Trail. Although adequate sight distance is provided at the current location for the start of the PZ, Lukfata Trail is a rapidly developing area with heavy turning movements observed. Due to the high volume of turning movements at the location, it is recommended that passing be prohibited at the intersection location. This would shorten the length of the PZ from 2,700-feet to 2,200-feet.
- No existing passing zones are proposed to be entirely eliminated at this time. However, as development along the US-259 corridor increases, it is recommended that US-259 be reevaluated in the long-term if there is a significant increase to the number of turning vehicles at a particular location.

Access Management Evaluation

- Within the extents of the study corridor there are a total of 167 access points, 89 on the west side of US-259 and 78 on the east side. While it is understood that a property owner has a right to access his property and not be landlocked, the owner does not have the right to absolute access from any point. With this principle in mind, opportunities exist to remove or modify 15% of the existing driveways. Modification of a driveway includes geometric reconfiguration, consolidation, or a reduction in width.
- Driveways noted as High or Medium Priority will provide an immediate and significant increase in safety and functional operation within the corridor and it is recommended that access modifications be implemented at the following locations in the short-term:
  - Adam & Eve's General Store and Hochatown Amusements (W41) – High Priority
  - Girls Gone Wine (E65) – High Priority
  - E-Z Mart Gas Station (W70) – Medium Priority

Recent improvements at Grateful Head driveways

Signing

- During field reconnaissance it was noted that several street name signs contained lettering that was too small to be visible by motorists traveling the posted speed limits. Also, several street name signs were displayed on the wrong background color (white), improperly placed in roadside area, and/or mounted at an improper height.
- The following list of street name signs do not currently meet the criteria of the MUTCD and should be replaced to improve driver recognition in the short-term:
  - Sherry Lane
  - Sweet Home Road
  - Old Hochatown Road
  - Pinyon Road
  - Spearfish Road
  - Carson Creek Road
  - Juniper Road
  - Lucian Sorrel Road
  - Choate Road
  - Stevens Gap Road
  - Lukfata Trail
  - Penner Road
  - Last Resort
  - Golf Course Road
  - Stevens Road
- Advance street name signs are recommended at the following high priority locations to improve driver recognition in the short-term:
  - Sherry Lane (southbound direction only)
  - Sweet Home Road (Joe Hough Road)
  - Stevens Gap Road
  - Carson Creek Road
  - Lukfata Trail
  - Lucian Sorrel Road (Choate Road)

<u>Qualitative Speed Assessment</u>

- The speed data collected and observations noted during field reconnaissance indicate the posted speed limits appear appropriate for much of the corridor except for the segment through Hochatown, between Old Hochatown Road (Pinyon Road) and Carson Creek Road.
  - Throughout Hochatown, the posted speed limit is 55 mph and the collected 85th percentile speeds varied between 54-62 mph. The speed data collected by ODOT in April 2016 clearly shows the 85th percentile speed decreases as it enters Hochatown, 57 mph on the south end and 54 mph on the north end.
  - For the 1.5-mile segment from Old Hochatown Road (Pinyon Road) to south of Carson Creek Road (Juniper), considering the following factors of lack of improved shoulders, high number of driveways, the calculated collision rate being almost 20% greater than the statewide average and the reporting of unsafe speed being a contributing factor in 23% of collisions, it is recommended that a speed reduction be implemented through Hochatown. Additional considerations include the large number of vehicles turning into the existing driveways and the amount of future growth anticipated for this area.
- <u>The segment of US-259 through Hochatown is a suitable location for a VSL pilot project in the short-term.</u>
  - It is recommended that the limits of the project begin at Old Hochatown Road (Pinyon Road) and extend 1.5 miles north towards Carson Creek Road (Juniper). In this segment, the posted speed limit would vary depending on the traffic volume or 85th percentile speeds. As a default, the posted speed limit would be 55 mph, consistent with the current posted speed limit. As detected traffic volumes increase and/or the 85th percentile speeds decrease, the posted speed limit would decrease to 45 mph. This type of VSL system would require electronic detection of traffic volumes and vehicle speeds that would transmit this information to an operator, who would confirm the data and adjust the posted speed limit signs in VSL mode.
  - As a pilot project, additional studies should be conducted to document conditions before and after implementation of the VSL system in order to confirm this area is an appropriate location for VSLs.
- While the overall speed data does not indicate a problem with trucks and excessive speeding, the field reconnaissance did suggest that heavy trucks typically travel faster than the posted speed limits and do not exercise necessary caution when approaching congested segments through Hochatown or in dense driveway locations.
- <u>It is recommended in the short-term that speed enforcement be increased along the US-259 corridor. As an additional option, standalone speed trailers could be employed at critical locations to alert drivers of their speeds.</u>

Field Reconnaissance

- Field reconnaissance of the US-259 study corridor was performed over the 2017 Memorial Day weekend.
- The following short-term recommendations were made based on the information collected during field reconnaissance:
    - Less than 100-feet north of Carson Creek Road (Juniper), the posted speed limit for southbound traffic reduces to 55 mph. It is recommended that this posted speed limit sign be moved approximately 1,000-feet to the north to attempt to reduce the speed of vehicles traveling through this intersection. The posted speed limit for northbound traffic of 65 mph should also be relocated.
    - Signs for the new retail development being constructed south of the intersection at Old Hochatown Road (Pinyon Road) and US-259 must be placed in a location that does not obstruct sight distance.
    - The tree limbs located north of the Grateful Head driveway (on the west side) limit sight distance and should be removed.
    - The tree limbs located north of Orca Road (on the east side) limit sight distance and should be removed.
    - The 'STOP' sign at the westbound approach on Sherry Lane is approximately 45-feet back from where a stop bar should be and is not well placed considering the intersection's current geometry. The access should be delineated and a stop bar should be installed.
    - Numerous temporary signs denoting private development spaces were located in the right-of-way along various segments of the US-259 study corridor. ODOT should regularly monitor these signs and remove ones that may limit sight distance.
- The following additional long-term recommendation was made:
    - At the eastbound approach on Sherry Lane at US-259, 90% of the right-turning traffic cut through the gravel on the southwest corner and used this as a continuous right turn lane. This approach should be modified to restrict vehicles from cutting through this lot. It is recommended that the eastbound approach be widened to include either a dedicated left-turn lane or right-turn lane.

7.0 APPENDIX