TOWN OF CHINO VALLEY
HAWKSNEST AT CHINO VALLEY AND
VILLAGE NORTH APARTMENTS
TRAFFIC IMPACT STUDY
SUBMITTAL NO. 1

PREPARED FOR:

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APPENDICES

1.0 INTRODUCTION

1.1 Purpose of Report and Study Objectives

The purpose of this report is to provide a preliminary Traffic Impact Study (TIS) for the development of two apartment complexes near the intersection of SR-89 and Road 2 North in Chino Valley, Arizona. The ***Hawksnest at Chino Valley*** apartment development (Hawksnest) is proposed to be located on the north side of Road 2 North, west of SR-89, and the ***Village North*** apartment development (Village North) is proposed to be located on the north side of Road 2 North, east of SR-89. This report provides a preliminary analysis of the SR-89 and Road 2 North intersection and the surrounding roadway network in the existing condition and with the apartment developments. Average daily traffic counts (ADT) from the Arizona Department of Transportation (ADOT) and the Town of Chino Valley (Town) were used to estimate peak hour traffic volumes. Preliminary recommendations for roadway and intersection improvements and recommendations for additional analysis have been provided.

2.0 PROPOSED DEVELOPMENT

2.1 Site Location

The proposed Hawksnest and Village North apartments are located on Road 2 North, near the intersection of SR-89 in the Town. Hawksnest is located approximately 800 feet west of the intersection and Village North is located approximately 1,200 feet east of the intersection as shown in Figure 1. Both developments are accessed primarily from Road 2 North, although Hawksnest provides for a potential future access to/from the north. A depiction of the location of both developments relative to the adjacent transportation system is provided in Figure 1 herein.

2.2 Land use and Intensity

The two apartments are proposed to be constructed on undeveloped land. Each site is currently proceeding through the Town's rezoning process. Hawksnest is proposed to be developed at a density of 15 dwelling units/acre across 29 separate buildings. Village North is proposed to be developed at a density of 17 dwelling units/acre across 18 separate buildings. Hawksnest is proposing two accesses to Road 2 North, while Village North is proposing one access to Road 2 North.

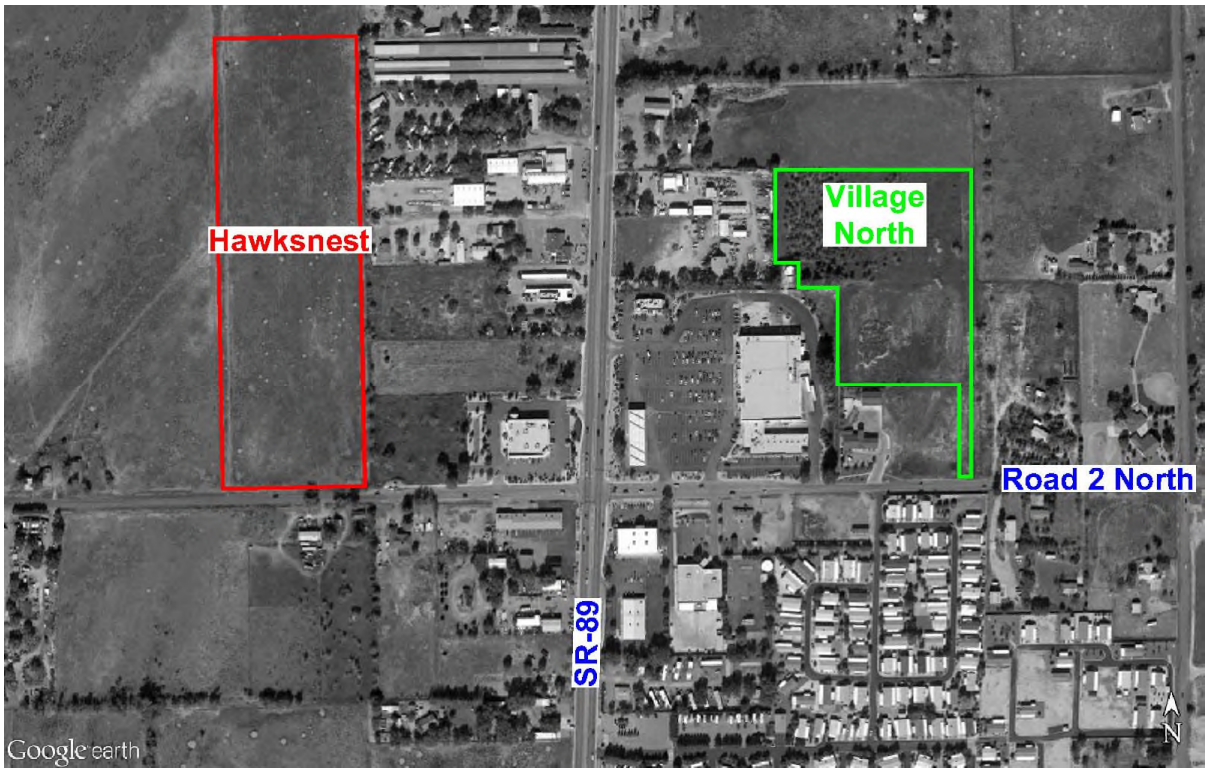

Figure 1 – Development Location

2.3 Development Phasing

Hawksnest is proposed to be developed in two phases. Phase 1 will include 32 one-bedroom and 80 two-bedroom units in 14 buildings on 8.60 acres. Also included in Phase 1 will be a separate reception and clubhouse building. For this phase, 248 parking stalls will be provided to serve the residential units. Phase 2 will include 32 one-bedroom and 80 two-bedroom units in 14 buildings on 6.3 acres. For Phase 2, 226 parking stalls will be provided to serve the residential units. Parking calculations were completed by the developer.

Village North is proposed to be developed in three phases. Phase 1 will consist of 8 one-bedroom, 56 two-bedroom, and 8 three-bedroom units in nine buildings; and will provide 151 parking stalls. Phase 2 will consist of 4 one-bedroom, 20 two-bedroom, and 4 three-bedroom units in three buildings; and will provide 58 parking stalls. Phase 3 will include 16 one-bedroom, 24 two-bedroom, and 16 three-bedroom units in six buildings; and will provide 107 parking stalls. Parking calculations were completed by the developer.

3.0 STUDY AREA CONDITIONS

3.1 Study Area

The study area for this TIS is depicted in Figure 2 by the red boundary. The primary focus of analysis is at the intersection of SR-89 and Road 2 North. Roadways that may be affected by the developments are also being reviewed, and include SR-89, Road 2 North, Perkinsville Road to the north, Road 1 North to the south, Road 1 West to the west, and Road 1 east to the east.

3.2 Existing Land Use

The primary study area is located at the intersection of SR-89 and Road 2 North. The land use at this intersection is mainly commercial with some residential. Notable commercial properties include a Walgreens on the northwest corner; a commercial strip mall on the southwest corner; a United States Post Office and Pet Club on the southeast corner; and a Taco Bell/KFC, Safeway Grocery Store and Gas Station, and a commercial strip mall on the northeast corner. The locations of these commercial properties have been labeled in Figure 2.

Vacant land is also present in the study area which may be developed in the future. The zoning at the study intersection is mainly Commercial Heavy (CH) to the west of SR-89 and Commercial Light (CL) to the east of SR-89. Outside of the study area, on the northwest corner of Road 1 West and Road 2 North is Del Rio Elementary and Heritage Middle School. Sidewalks are currently not extended to the schools.

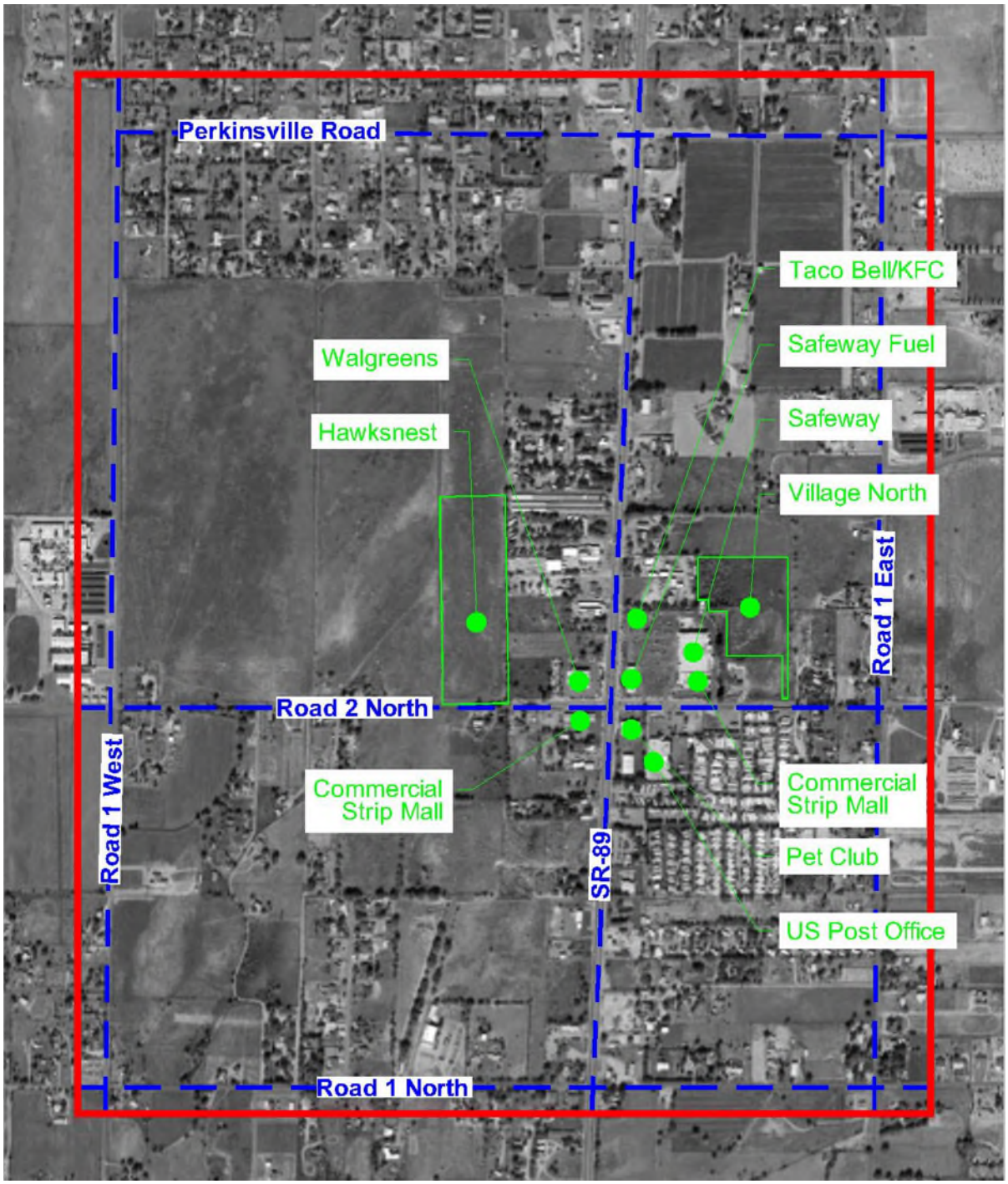

Figure 2 – Study Area

4.0 ANALYSIS OF EXISTING CONDITIONS

4.1 Physical Characteristics

Roadway Characteristics

Existing roadway characteristics were determined using aerial photography. West of SR-89, Road 2 North is fully improved along the north side of the road (curb, gutter, sidewalk), with a right-turn lane provided for westbound traffic. At approximately 700-ft, the turn-lane abruptly ends and Road 2 North becomes a two-lane 24-ft wide asphalt roadway with no shoulders. Approximately 200 feet west of SR-89, Road 2 North widens for eastbound traffic to allow for the addition of an eastbound left-turn lane and a shared through/right-turn lane. The posted speed limit for Road 2 North west of SR-89 is 35 miles per hour (mph).

East of SR-89, Road 2 North is fully improved with curb, gutter, and sidewalk for approximately 200-ft with a single eastbound thru lane and separate westbound left, thru, and right lanes. Along the north side of the road, roadside improvements extend approximately 700 feet east of SR-89 and continue to include left-turn and right-turn auxiliary lanes for westbound traffic. Beyond this section, Road 2 North narrows to a two-lane 24-ft wide asphalt roadway with no shoulders. The posted speed limit for Road 2 North east of SR-89 is 25 mph.

SR-89 is a five-lane state highway with two 12-ft lanes in each direction and one 14-ft two-way left-turn lane (TWLTL). Dedicated left-turn and right-turn lanes are provided for both the northbound and southbound traffic at Road 2 North. Right-turn lanes are also provided for the commercial developments in advance of the intersection. The posted speed limit on SR-89 is 45 mph.

Road 1 West, Road 1 East, Road 1 South, and Perkinsville Road are each two-lane unimproved asphalt roadways with limited development along them. North of the study intersection, Perkinsville Road has the most existing development consisting of mainly residential homes west of SR-89. The intersection of Perkinsville Road with SR-89 includes dedicated left-turn lanes for both eastbound and westbound traffic.

Traffic control Devices

The intersection of SR-89 and Road 2 North is controlled by a traffic signal maintained by ADOT. Left-turns are controlled with protective and permissive phases triggered through video detection on each leg.

All other intersections in the study area are stop controlled on the minor approaches, except the intersections of Road 2 North and Road 1 West, Road 1 South and Road 1 West, and Road 1 South and Road 1 East, which are all-way stop controlled intersections.

Pedestrian/Bicycle Facilities

There are no dedicated bicycle facilities within the study area.

Sidewalks are provided along portions of SR-89 and along the north side Road 2 North adjacent to the commercial developments. Pedestrian actuated crossing indicators are provided at the intersection of SR-98 and Road 2 North for each leg.

4.2 Traffic Volumes

Traffic counts were not conducted as part of this preliminary study. Existing ADT volumes were acquired from ADOT and the Town. Based on an ADOT recommend K Factor of 10, peak hour volumes were calculated for the roadways and directional turning movements were estimated by an assumed breakout. ADT volumes from the surrounding roadways are shown in Figure 3. The *ITE Trip Generation Manual, 8th Edition* (Trip Manual) was used to develop existing trips for the existing developments; those rates can be seen in Figure 4. Figure 5 shows the existing traffic volumes estimated using the ADOT and Town's ADT volumes and the Trip Manual.

Roadway	From	To	ADT
Road 1 North	Road 1 West	SR-89	807
Road 1 North	SR-89	Road 1 East	1,699
Road 2 North	Road 1 West	SR-89	6,715
Road 2 North	SR-89	Road 1 East	4,145
Perkinsville	Road 1 West	SR-89	2,395
Perkinsville	SR-89	Road 1 East	2,395
Road 1 West	Road 1 North	Road 2 North	794
Road 1 West	Road 2 North	Perkinsville	1,487
SR-89	Road 1 North	Road 2 North	21,982
SR-89	Road 2 North	Perkinsville	19,687
Road 1 East	Road 1 North	Road 2 North	1,776
Road 1 East	Road 2 North	Perkinsville	2,046

Figure 3 – Existing ADT's

ITE Code	Description	Unit	Size	Wkday Rate	Wkday Trips	AM Rate	AM Trips	PM Rate	PM Trips
210	Single Family Detached Housing	Houses	53	9.57	507	0.75	40	1.1	58
732	US Post Office	1,000 SF	20	108.19	2164	8.21	164	11.12	222
820	Shopping Center (SW Corner)	1,000 SF	12	42.94	515	1	12	3.73	45
820	Shopping Center (Pet Store)	1,000 SF	10	42.94	429	1	10	3.73	37
820	Shopping Center (Safeway Strip)	1,000 SF	18	42.94	773	1	18	3.73	67
850	Supermarket (Safeway)	1,000 SF	60	102.24	6134	3.59	215	10.5	630
881	Pharmacy/Drugstore with Drive-Through Window (Walgreens)	1,000 SF	16	88.16	1411	2.66	43	10.35	166
934	Fast-Food Restaurant with Window (Taco Bell/KFC)	1,000 SF	3	168.56	506	12.16	36	13.87	42
944	Gasoline/Service Station (Safeway)	Fueling Stations	16	496.12	7938	49.35	790	33.84	541

ITE Code	Description	Unit	Size	Wkday In	Wkday Out	AM In	AM Out	PM In	PM Out
210	Single Family Detached Housing	Houses	53	254	254	10	30	37	21
732	US Post Office	1,000 SF	20	1082	1082	85	79	113	109
820	Shopping Center (SW Corner)	1,000 SF	12	258	258	7	5	22	23
820	Shopping Center (Pet Store)	1,000 SF	10	215	215	6	4	18	19
820	Shopping Center (Safeway Strip)	1,000 SF	18	387	387	11	7	33	34
850	Supermarket (Safeway)	1,000 SF	60	3067	3067	131	84	321	309
881	Pharmacy/Drugstore with Drive-Through Window (Walgreens)	1,000 SF	16	706	706	26	17	81	85
934	Fast-Food Restaurant with Window (Taco Bell/KFC)	1,000 SF	3	253	253	18	18	22	20
944	Gasoline/Service Station (Safeway)	Fueling Stations	16	3969	3969	403	387	271	271

Figure 4 – Trip Generation Rates

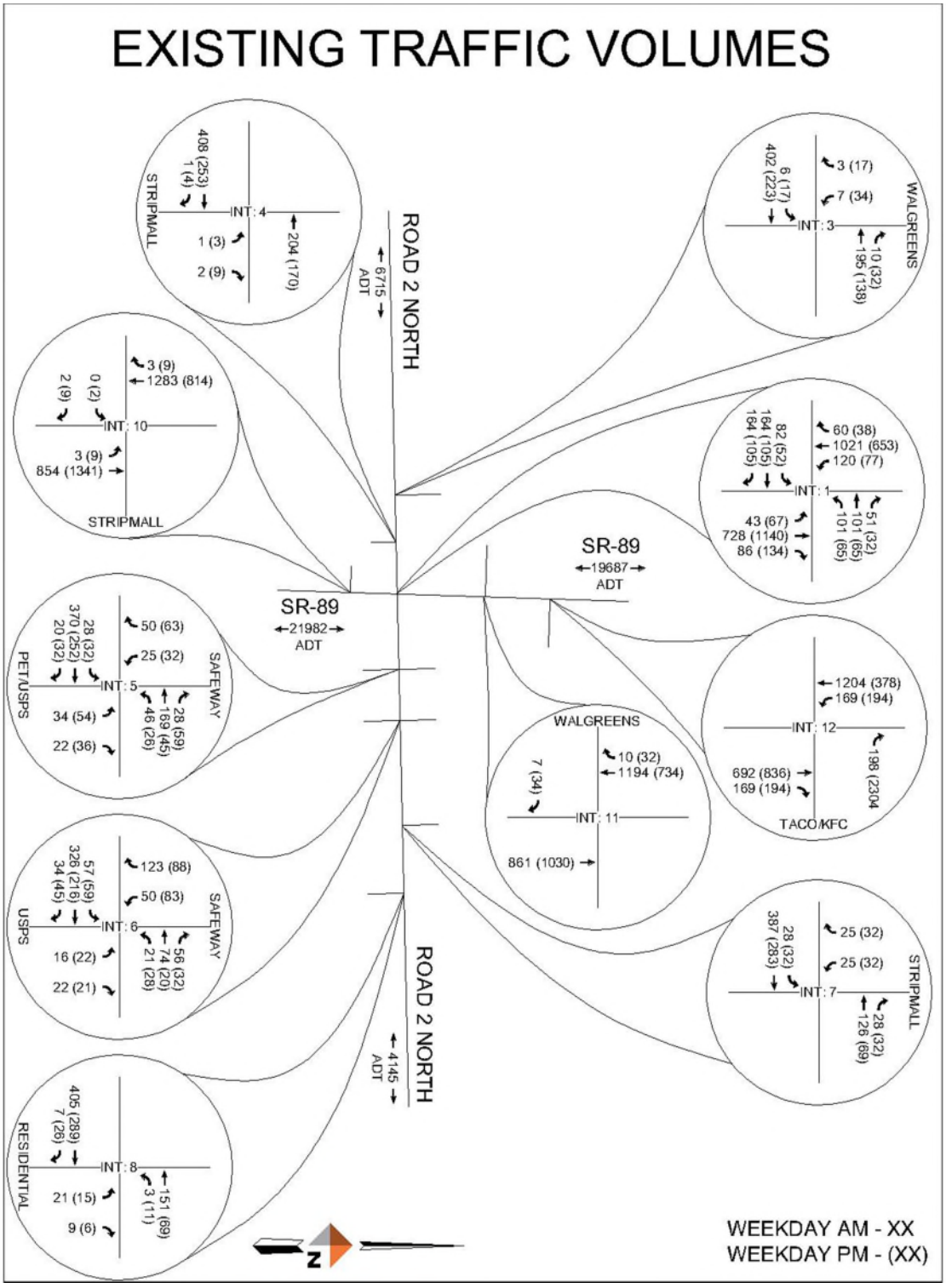

Figure 5 – Existing Estimated Traffic Volumes

4.3 Intersection Level of Service

Intersection capacity analyses have been conducted using the procedures outlined in the *Highway Capacity Manual* (HCM), as appropriate, and through the use of *Synchro 8* traffic signal timing and analysis software and based on HCM delay, capacity, and level-of-service calculations. Calculation forms for the analyses are contained in Appendix A. In accordance with the HCM procedures, Level-of-Service (LOS) has been determined by estimating the average vehicular delay of the intersections and the intersection movements. The range of traffic delays associated with each LOS is presented in Figure 6 for both signalized and unsignalized intersections. It should be noted that delay thresholds for a given LOS for unsignalized intersections are lower than those given for signalized intersections. This difference, as explained in the HCM, is to account for the greater variability in delay associated with unsignalized movements in addition to different driver exceptions associated with each type of intersection control, with the expectation that signalized intersections are designed to carry higher traffic volumes and therefore will experience greater delay than an unsignalized intersection.

LOS	Signalized Intersection Average Delay (sec / veh)	Unsignalized Intersection Average Delay (sec / veh)
A	≤ 10	≤ 10
B	> 10 to 20	> 10 to 15
C	> 20 to 35	> 15 to 25
D	> 35 to 55	> 25 to 35
E	> 55 to 80	> 35 to 50
F	> 80	> 50

Figure 6 – Level of Service Criteria (HCM)

The HCM delay and LOS analysis of the study intersections is summarized in Figure 7, and indicates that all of the existing study intersections operate at a satisfactory LOS C or better in their current configuration and volumes for both the AM and PM peak hours.

Node	Intersection	Worst Case Approach			
		AM Peak		PM Peak	
		Delay	HCM LOS	Delay	HCM LOS
1	SR 89 and Road 2 North	21.7	C	16.5	B
3	Road 2 North and Walgreens	13.0	B	11.4	B
4	Road 2 North and Strip Mall (SW)	12.3	B	10.6	B
5	Road 2 North and Safeway/Pet/USPS	15.2	C	13.5	B
6	Road 2 North and Safeway/USPS	15.9	C	13.0	B
7	Road 2 North and Safeway Strip Mall	12.6	B	11.1	B
8	Road 2 North and Residential	13.2	B	11.3	B
10	SR-89 and Strip Mall (SW)	11.1	B	11.5	B
11	SR-89 and Walgreens	14.2	B	11.5	B
12	SR-89 and Taco Bell/KFC	10.2	B	12.3	B

Figure 7 – Existing HCM Level of Service

An additional but separate measure of effectiveness (MOE) for intersection LOS analysis has been included in this study; the *intersection capacity utilization level-of-service* (ICU LOS) calculation. This measure of effectiveness is based on procedures outlined in *Intersection Capacity Utilization: Evaluation Procedures for Intersections and Interchanges, 2003 ED* developed for use with the Synchro Traffic Signal and Intersection Analysis software. The ICU factor is characterized as a means to measure an intersection's capacity through the review of saturation (similar to reviewing critical volumes to saturation flow rates) to determine the expected or potential reserve capacity at an intersection, independent of delay, allowing for a slightly different picture of the intersection's operation. *It should be cautioned, however, that this method of analysis is not yet nationally recognized as a viable method of intersection analysis. As such, the values reported by this method are presented for information only, and are not intended to replace or supersede the LOS values as developed by the HCM.* The range of reserve capacity associated with each ICU LOS is presented in Figure 8 for both signalized and unsignalized intersections. ICU values calculated for the study intersections are included in the worksheets located within the appendix of this report and are not specifically identified herein. The analysis indicates an ICU LOS of A for all unsignalized intersections in current conditions. However, for the intersection of SR-89 and Road 2 North the ICU LOS is D indicating that the intersection typically has no congestion and that most traffic can be served through one signal cycle. However, accidents, sub optimal signal timings, and lane closures may cause congestion.

LOS	ICU (Estimate of Reserve Capacity)
A	≤ 55.0%
B	> 55% to 64.0%
C	> 64% to 73.0%
D	> 73% to 82.0%
E	> 82% to 91.0%
F	> 91% to 100.0%
G	> 100% to 109.0%
H	> 109%

Figure 8 – Level of Service Criteria (ICU)

4.4 Safety (Traffic, Bicycle & Pedestrian)

Crash data was not analyzed as part of this preliminary study. Crash data should be reviewed during the final analyses. The area around the intersection of SR-89 and Road 2 North appears to have pedestrian activity. There is a residential development in the southeast quadrant of the intersection which has a sidewalk connection to SR-89, but no sidewalk connection to Road 2 North. Extending the sidewalk between residential areas commercial areas, and schools should be considered to improve pedestrian safety. There does not appear to be any dedicated bicycling facilities in the Town. As roadways are improved and widened, the addition of dedicated bicycle lanes should be considered to improve bicycle safety and encourage ridership.

5.0 PROJECTED TRAFFIC

5.1 Site Traffic Forecasting

Future traffic volumes were developed using the Trip Manual. Figure 9 shows the trips generated by Hawksnest and Village North. The trips generated by Hawksnest and Village North were distributed with 60 percent traveling towards SR-89 and 40 percent traveling away from SR-89 when leaving the developments. When entering the development it was assumed that 60 percent would be coming from SR-89 and 40 percent would be coming from the opposite direction. At SR-89 it was assumed that, of the 60 percent, 30 percent would be coming to/from the north, 60 percent would be coming to/from the south, and 10 percent would be coming straight through the intersection.

ITE Code	Description	Unit	Size	Wkday Rate	Wkday Trips	AM Rate	AM Trips	PM Rate	PM Trips
221	Low-Rise Apartments (Village North)	Units	154	4.2	647	0.3	46	0.35	54
221	Low-Rise Apartments (Hawksnest)	Units	224	4.2	941	0.3	67	0.35	78

ITE Code	Description	Unit	Size	Wkday In	Wkday Out	AM In	AM Out	PM In	PM Out
221	Low-Rise Apartments (Village North)	Units	154	324	324	12	35	33	21
221	Low-Rise Apartments (Hawksnest)	Units	224	471	471	17	50	48	30

Figure 9 – Trip Generation Rates

5.2 Total Traffic

The combined existing estimated traffic and development traffic volumes can be seen in Figure 10.

6.0 Traffic and Improvement Analysis

6.1 Site Access

The proposed developments will be accessed from Road 2 North. Based on the preliminary estimated traffic volumes, it does not appear that left-turn lane or right-turn lanes are necessary at the development entrances per *the American Association of State Highway and Transportation Official's* (AASHTO) *Policy of Geometric Design of Highways and Streets* (Greenbook). Left-turn and right-turn lane warrants should be evaluated during the final analysis using actual intersection volume counts (not estimates) from SR-89 and Road 2 North. Available sight distance should also be reviewed at the developments driveways. Landscaping should not be provided as to interfere with the required sight distance per the AASHTO Greenbook.

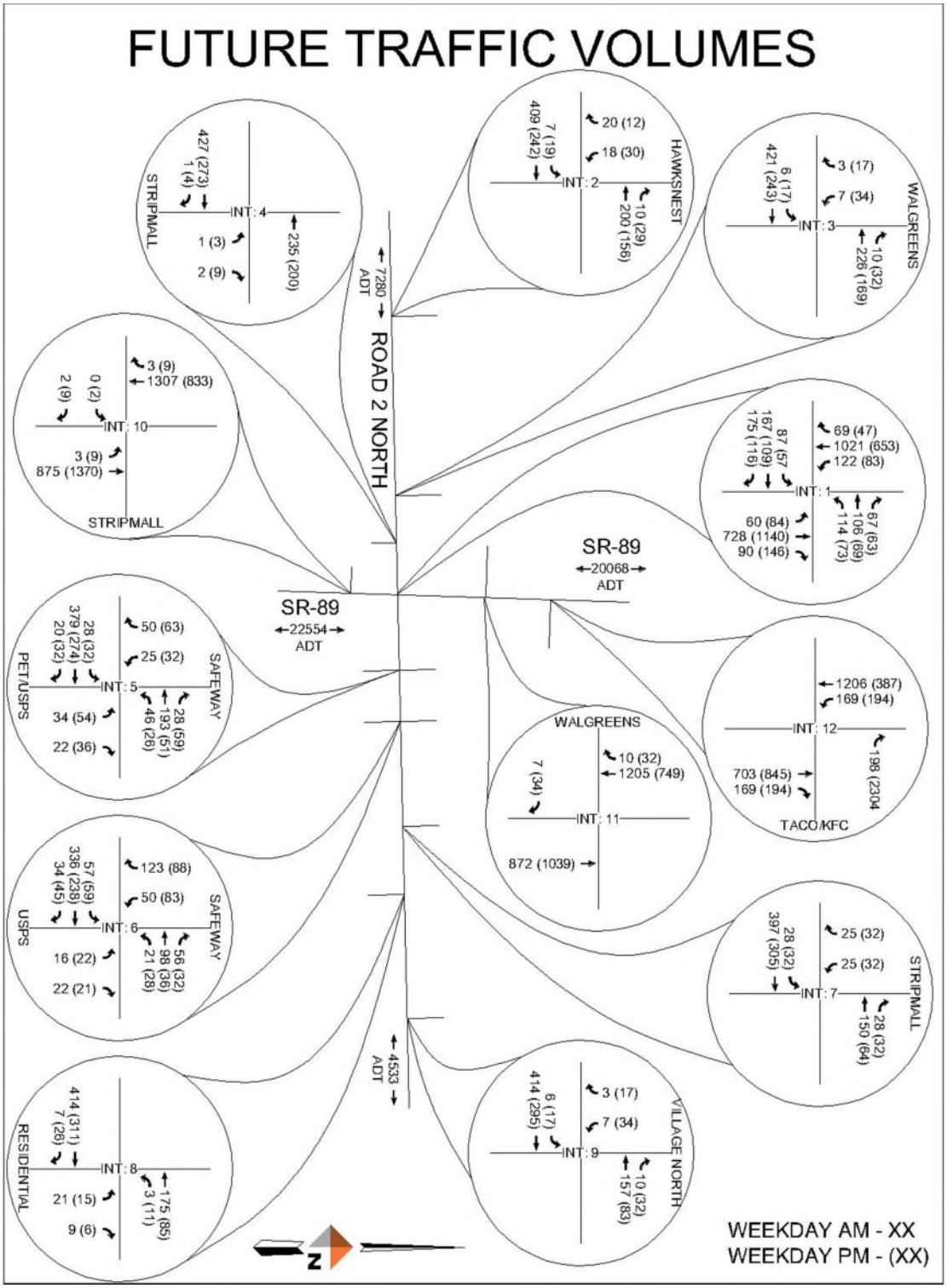

Figure 10 – Projected Future Traffic

6.2 Level of Service Analysis

The HCM delay and LOS analysis of the study intersections is summarized in Figure 11, and indicates that all of the existing study intersections operate at a satisfactory LOS C or better in the future with the developments traffic for both the AM and PM peak hours.

Node	Intersection	Worst Case Approach			
		AM Peak		PM Peak	
		Delay	HCM LOS	Delay	HCM LOS
1	SR 89 and Road 2 North	23.0	C	18.5	B
2	Road 2 North and Hawksnest	13.6	B	11.5	B
3	Road 2 North and Walgreens	13.6	B	11.9	B
4	Road 2 North and Strip Mall (SW)	12.7	B	10.3	B
5	Road 2 North and Safeway/Pet/USPS	15.6	C	13.9	B
6	Road 2 North and Safeway/USPS	16.5	C	13.5	B
7	Road 2 North and Safeway Strip Mall	13.0	B	11.4	B
8	Road 2 North and Residential	13.6	B	11.7	B
9	Road 2 North and Village North	11.9	B	10.5	B
10	SR-89 and Strip Mall (SW)	9.8	A	11.4	B
11	SR-89 and Walgreens	14.2	B	11.6	B
12	SR-89 and Taco Bell/KFC	10.2	B	12.4	B

Figure 11 – Future HCM Level of Service

ICU values calculated for the study intersections are included in the worksheets located within the appendix of this report and are not specifically identified herein. The analysis indicates an ICU LOS of A for all unsignalized intersections in current conditions. However, for the intersection of SR-89 and Road 2 North the ICU LOS is D indicating that the intersection typically has no congestion and that most traffic can be served through one signal cycle. However, accidents, sub optimal signal timings, and lane closures may cause congestion.

6.3 Roadway Improvements

SR-89 is an ADOT controlled state highway. Dedicated right-turn lanes and left-turn lanes/TWLTL's are provided at major developments primarily near Road 2 North. It does not appear that any improvements will be required to SR-89 with the development of Hawksnest and Village North.

Road 2 North is a two-lane roadway. Pavement markings for the roadway are only located where the roadway widens to provide turn-lanes at the SR-89 intersection. As part of the development of Hawksnest and Village North, pavement markings should be extended along the entire frontage of the developments at a minimum.

The surrounding roadway network of Road 1 West, Road 1 East, Road 1 North, and Perkinsville Road are two-lane asphalt roadways. It is anticipated that a percentage of vehicles from Hawksnest and Village North will use these roadways to avoid the intersection of SR-89 and Road 2 North.

A review of these surrounding roadways indicates that improvements should be made to improve the safety along the roadways. According to the AASHTO Roadside Design Guide (RDG), roadways with a speed limit less than 40 mph and an ADT of 750-1,500 should have a minimum of 7 feet of clear zone from the edge of pavement. Roadways with a speed limit less than 40 mph and an ADT of 1,500-6,000 should have a minimum of 10 feet of clear zone from the edge of pavement. There are numerous utility poles, fences, drainage ditches, irrigation ditches, and other miscellaneous structures and may be in the roadway clear zone. At multiple intersections there are utility poles that are adjacent to the edge of pavement making it difficult for large vehicles to navigate around the corner. The radius of the pavement edges at the intersections should be reviewed. A minimum radius should be constructed at each intersection, typically 25-feet or 35-feet depending on the design vehicle determined. The Town should also address existing safety concerns along these roadways by removing obstructions in the clear zone. Obstructions that cannot feasibly be moved should have an adequate barrier installed.

These roadways and intersections should also be addressed in the final development analyses since vehicles from these developments are anticipated to use the surrounding roadways.

6.4 **Pedestrian Considerations**

The proposed developments are located within walking distance to multiple commercial properties. Therefore, an increased number of walking pedestrians can be anticipated. Sidewalk should be extended to each of the developments along Road 2 North. Sidewalk ramps meeting the American with Disabilities Act (ADA) requirements should be installed at each driveway crossing. It appears that adequate pedestrian controls are present at the intersection of SR-89 and Road 2 North; however, the crosswalk striping has been worn away and should be restriped. The Town should also consider constructing sidewalk from SR-89 to Del Rio Elementary and Heritage Middle School at the intersection of Road 2 North and Road 1 West.

6.5 **Traffic Control/Signal Needs**

A stop sign should be provided at the exit of each development driveway and pavement markings should be extended along the frontage of each development.

A traffic signal is provided at the intersection of SR-89 and Road 2 North. No additional intersections in the study area warrant a traffic signal. After each phase of the developments is completed, traffic counts should be conducted at the intersection of SR-89 and Road 2 North. These traffic counts should be used to re-time the intersection to the optimal length.

7.0 CONCLUSIONS

Two apartment developments are proposed near the intersection of SR-89 and Road 2 North; Hawksnest to the west and Village North of the east. Each of these developments will have an impact on the adjacent roadway network. This report provided a preliminary study for the effect the developments will have. The final analyses provided for the developments should include a turning movement traffic count at the intersection of SR-89 and Road 2 North to aid in developing more accurate traffic volume data.

8.0 Recommendations

To continue to provide a safe and efficient roadway network, improvements and additional analyses are recommended to be completed with the proposed developments. Some of these recommendations should be completed by the Developers, while others may need to be completed by the Town. These recommendations are listed below.

- Complete a turning movement count during the AM Peak Hour and PM Peak Hour at the intersection of SR-89 and Road 2 North.
- Analyze LOS's along Road 2 North based on updated traffic volumes from the turning movement counts. Provide recommendations for improvements if LOS is decreased due to the developments traffic.
- Analyze the need for left-turn and right-turn lanes at the developments entrances based on updated traffic volumes from the turning movement count.
- Extend sidewalk along the developments frontage and install sidewalk ramps meeting ADA requirements at all intersections and driveways.
- Extend the sidewalk on Road 2 North to the residential development on the southeast quadrant of the SR-89 intersection.
- Extend sidewalk Del Rio Elementary and Heritage Middle School at the intersection of Road 2 North and Road 1 West.
- Extend pavement markings along the developments frontage at a minimum.
- Update striping along Road 2 North at the intersection of SR-89.
- Re-time the intersection of SR-89 and Road 2 North after each developments phase.
- Review available clear zone on the surrounding roadway network in the study area. Remove obstructions in the clear or provide adequate barriers if the obstruction cannot be removed. Provide adequate pavement radii at all intersections.
- Review available crash data and provide additional safety measures if warranted.
- Provide adequate sight visibility at the developments entrances. Ensure landscaping is properly designed and installed to not obstruct sight visibility.