ALDRIDGE TRANSPORTATION CONSULTANTS, LLC

Advanced Transportation Planning and Traffic Engineering

TRAFFIC IMPACT STUDY

for

CORNERSTAR

AURORA, COLORADO

Prepared for:

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1. Introduction

This report examines the traffic impact associated with the construction of Cornerstar, a new mixed-use development in Aurora, Colorado. The project will be located on the southwest corner of Arapahoe Road and Parker Road. The vicinity map on Figure One shows the location of the project.

The project will contain both residential and commercial/retail land uses. A 754, 000 square foot shopping center with a central retail plaza, accompanying "big box" retail and 350 multi-family residences are planned at the present time.

Two primary full-movement accesses are proposed. One is located on Arapahoe Road at the western edge of the project and another is on Parker Road on the southern edge. A secondary right in/right out access to Arapahoe Road is also proposed at approximately 750 feet east of the full movement access. The current site plan and access locations are presented in Figure Two.

Both Arapahoe Road and Parker Road are state highways and access is governed by the State Highway Access Code ("code"). Arapahoe Road is SH-88 up to Parker Road. It is categorized as NR-A. It is a six-lane highway with painted center median that currently carries 54,900 ADT according to the CDOT website. The posted speed limit in this area is 35 mph. Parker Road is SH-83. It also is a six-lane highway with a raised center median. The posted speed limit on this section is 45 mph. It carries approximately 38,200 ADT south of Arapahoe Road. The categorical assignment is R-A. The intersection of the Arapahoe and Parker is signalized and features a triple left turn for the EBL and a triple right turn on the SBR. The intersection of the off-bound SBR and the WB through movement is controlled by a secondary signal.

CDOT, Arapahoe County, and adjacent municipalities are planning to grade separate the intersection in the future. Plans have been drawn for the interchange and the concept is shown in Figure Two. Care has been taken to locate the accesses to Cornerstar so that they won't compromise the construction of the interchange.

A major corridor study of Arapahoe Road is currently underway. It is being prepared by David Evans & Associates (DEA). The Arapahoe Corridor Study www.arapahoecorridor.com will incorporate the traffic generation and access configuration from the Cornerstar plan and develop new future (20 year) design projections on Arapahoe and at the new interchange.

CDOT Region One shows the Parker intersection on the access control plan for the Parker Road corridor. Potentially, an eastern leg could be added to the intersection and serve the Foxfield community. But construction timing and budget for the leg have not be identified at the present time. The main intersection on Arapahoe Road is an existing full-movement. CDOT and City of Aurora have agreed on the access configuration which includes the aforementioned right in/right out on Arapahoe Road.

The traffic operations analysis is based on assumptions made on background traffic volumes using a CDOT future volume calculator (no projections are available at the present time from the corridor plan), trip generation rates, and trip distribution for the future full-build weekday AM and PM peak hours peak hours.

In summary, this analysis demonstrates that the recommended access control and the proposed roadway improvements provide safe and convenient access and will function harmoniously with traffic flow on the adjacent streets and intersections.

Figure One – Location and Vicinity Map

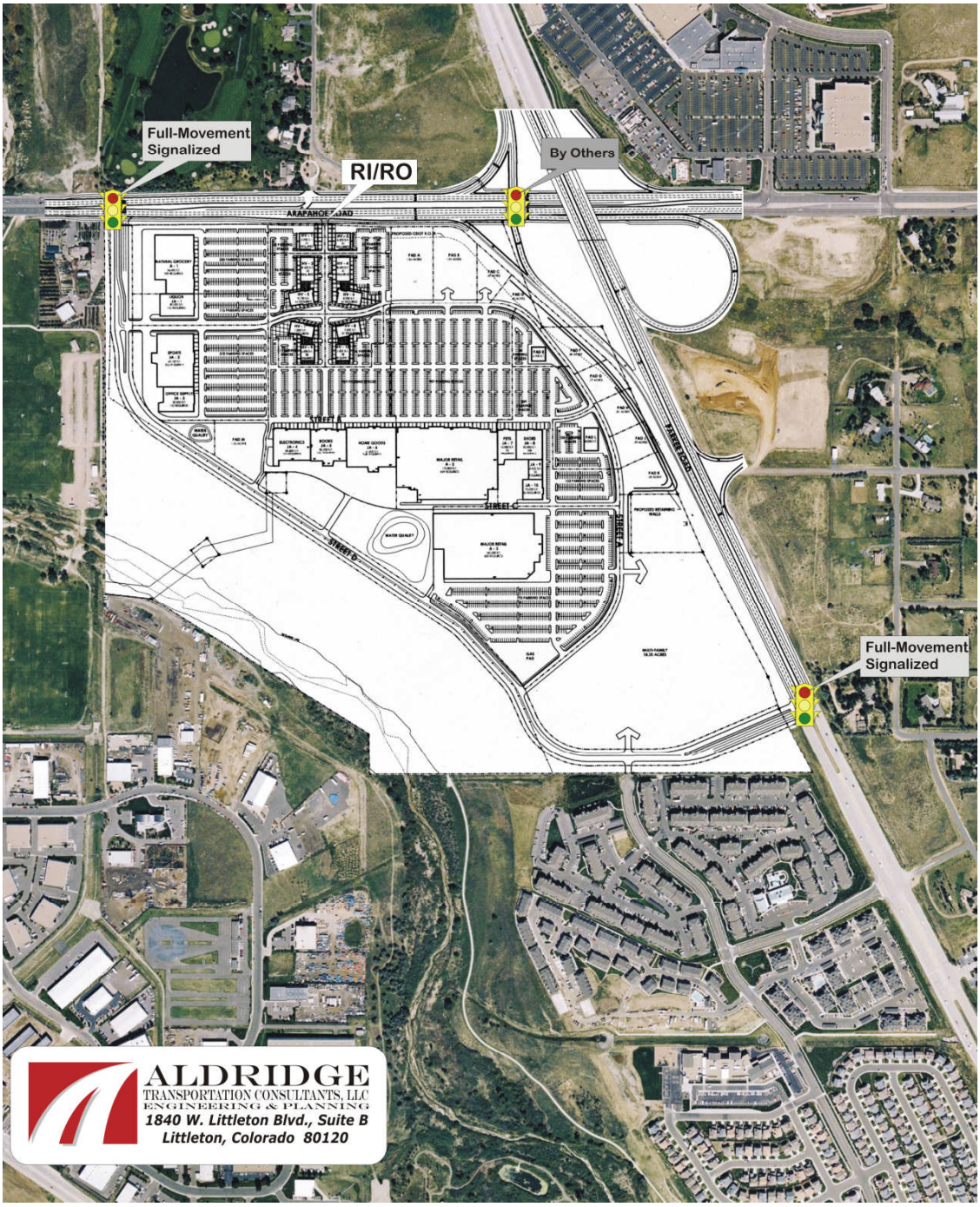

Figure Two – Current Site Plan and Proposed Access Locations. Note that the site plan includes the current design configuration for the new interchange.

2. PROJECT TRIP GENERATION AND DESIGN HOUR VOLUMES

The trip generation from the center is based on the ***ITE Trip Generation Manual, 7th Edition.*** The latest site plan has 350 residences and 754,000 square feet of shopping center. According to ITE, shopping centers of this size frequently include movie theaters, some general office, big box retailers and boutique type retail in various formats (Main Street or Central Area). ITE recommends the use of the fitted curve equations for this type and size of center as they take into account the considerable internal trip making and generally higher vehicle occupancy. The trip generation is shown in the chart on the next page.

As the PM peak hour trips are considerably higher than the AM peak hour, the PM is used as the design hour volume (DHV). A special analysis of the AM peak hour impacts has been prepared to review and check the proposed intersection design and traffic control particularly with the proposed new interchange.

The center will generate a greater number of trips on Saturday during the peak hour, which is generally between 2-3 PM. In this case the center will generate 1,782 in trips and 1,620 out trips. However the background volumes on the adjacent streets and intersections are generally less than the weekday peak hours, so the difference can be minor in terms of overall impact.

Trip Generation Worksheet for Cornerstar

					Average Weekday AM		Average Weekday PM		Weekend Peak Hour	
ITE Code	Land Use	Unit	Quantity	ADT	In	Out	In	Out	In	Out
230	Townhomes/Condos	DU	350	*5.86* **2,051**	*0.07* **26**	*0.37* **128**	*0.35* **122**	*0.17* **60**	*0.25* **89**	*0.22* **76**
820	Shopping Center	KSF	754	25,248.07 **25,248**	525.97 **321**	525.97 **205**	2,375.01 **1,140**	2,375.01 **1,235**	3,217.97 **1,673**	3,217.97 **1,545**
Note: Shopping center trip generation based on fitted curve equations.										
Total Trips				**27,299**	**347**	**333**	**1,262**	**1,295**	**1,762**	**1,620**

3. Trip Distribution

The trip distribution is based on the concentrations of residential communities and employment centers in the surrounding area. Our assumption is that 35 percent will originate from the west, 35 percent from the south, 15 percent from the north and 15 percent from the south.

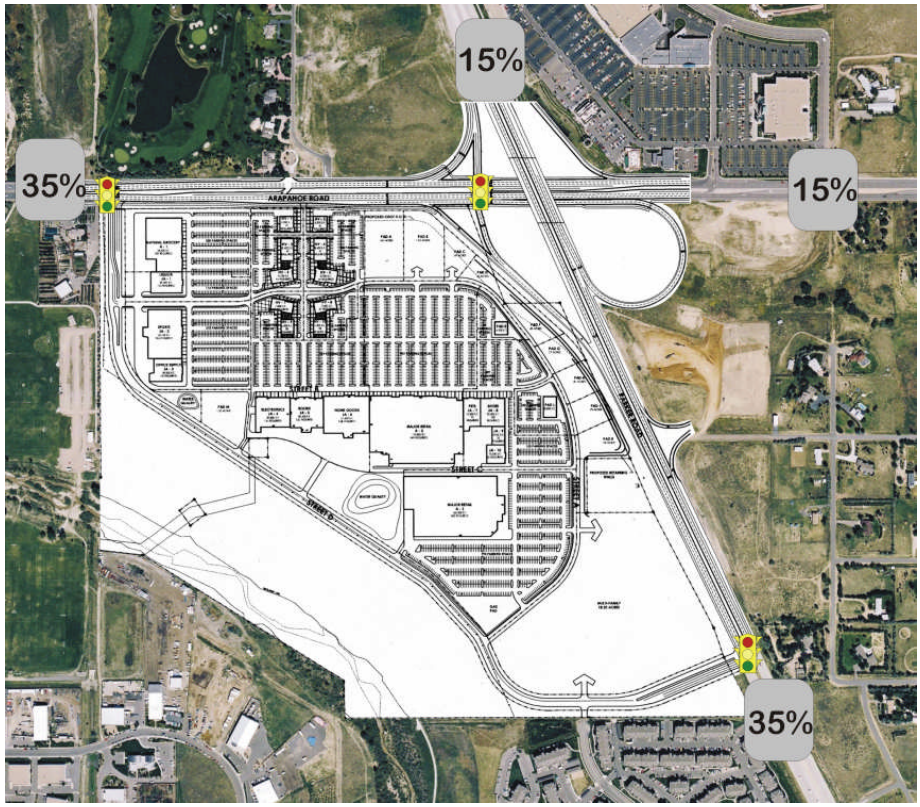

Figure Three – Trip Distribution

4. Existing and Projected Traffic Volumes

The existing traffic volumes throughout the corridor area have been thoroughly identified in the Arapahoe Road Corridor Study and can be found on the www.arapahoecorridor.com website. The AM/PM peak hour turning movements for the Arapahoe/Parker intersection are provided below. In addition the CDOT website has existing AADT for Arapahoe and Parker Roads. The corridor study has yet to produce future volumes. Until they are ready, ATC has projected future 2026 volumes using the CDOT future volume calculator. The average 20 year growth rate is 1.3. For the 2008 projections, ATC assumed an approximate 10 percent increase which is very conservative.

The current volume on Arapahoe Road in this section is 54,900 AADT per CDOT. For 2008, the volume was increased to 60,000 and for 2026 up to 72,000. On Parker Road in this section the volume is 38,200 AADT. This was increased to 42,000 for 2008 and to 50,000 for 2026.

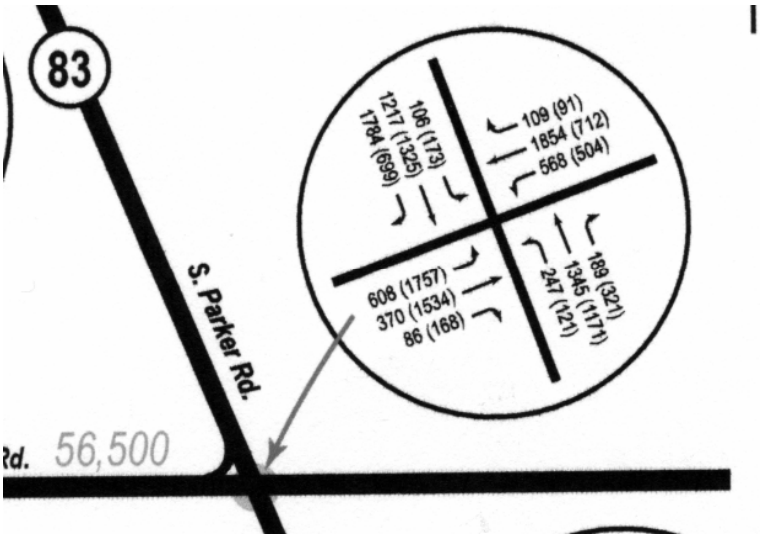

Figure Four – Current AM/PM Turning Movements Counts per the Arapahoe Road Corridor Study – David Evans & Associates.

5. Trip Assignment

The site-generated volumes were assigned to the adjacent roadways and intersections per the aforementioned distribution. To be conservative, a generally allowed 20 percent reduction for shopping center pass-by trips and diverted link trips was not taken in this analysis. The reduction estimate is per an average in the ITE trip generation manual.

The following figures shows the total traffic assignment for the weekday 2008 and 2026 AM and PM peak hour assuming full-build of Cornerstar. In addition 100 vph has been added to the Cornerstar Road for potential through traffic.

Please note that for the 2008 analysis, ATC used the existing laneage and geometric configuration of the Arapahoe/Parker intersection. For the 2026 condition, ATC programmed the proposed design for the new interchange and eight lanes on Arapahoe Road. The eight lane cross-section was necessary to achieve a reasonable LOS on Arapahoe Road at all intersections, not just the main entrance. Based on the projected volume and high AM/PM directional split we can only assume that the Arapahoe Road Corridor Study will reach the same conclusion. Please note that the traffic generated by Cornerstar is only minor part of projected increase. The increases in the overall background volumes necessitate the widening.

Figure Five – 2008 AM Peak Hour

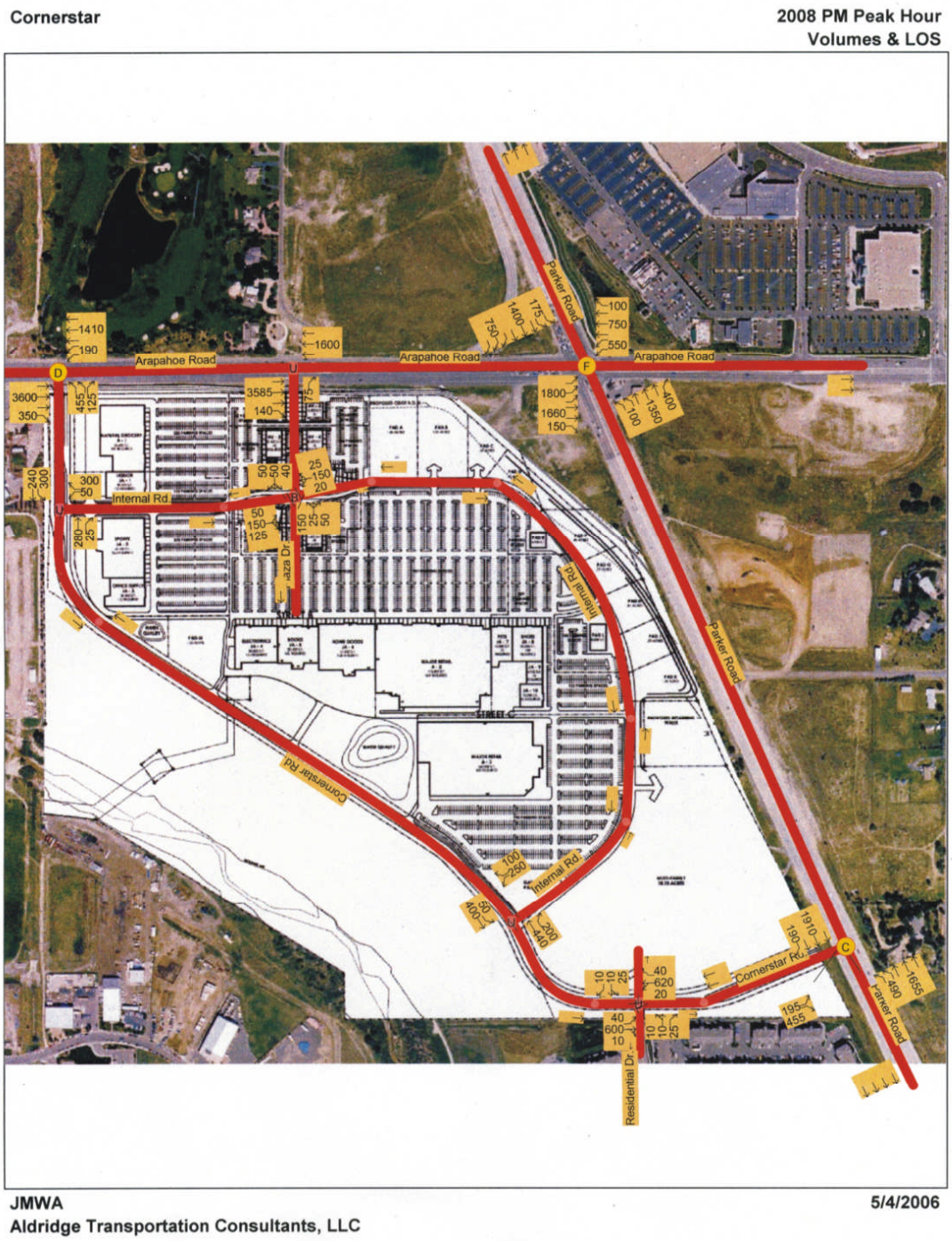

Figure Six – 2008 PM Peak Hour

Figure Seven- 2026 AM Peak Hour

Figure Eight – 2026 PM Peak Hour

6. Internal Roadway Design and Traffic Control

The internal road system features a peripheral access road, Cornerstar Rd., located on the west and south sides of the project. This road will connect the two primary intersections on Arapahoe and Parker Roads. A central internal road provides access to the parking lots and the central plaza area. A north/south road from the right in/right out access on Arapahoe Road provides direct access to the central plaza area. Cornerstar Road will be a two-lane roadway and feature auxiliary lanes at the primary entry roads into the commercial and residential areas.

The internal street system and traffic control have been designed so that the inbound traffic flow will not have to stop at an intersection for at least 400 feet. This allows the inbound traffic to enter encumbered and virtually eliminates the chance of back-up into the mainline flow on Arapahoe Road.

All the primary intersections with in the will be stop-sign controlled. A four-way stop sign controlled intersection is planned for the intersection of in the commercial area at the intersection of the main internal road and Plaza Dr.

Right or left turn pockets will be included at the high volume intersections that are generally the first intersections from Arapahoe and Parker Roads. At the four-way intersections, turn pockets will be provided there as well.

Many of the internal streets close to the plaza area will have on-street parking. Most will be 36 feet wide with two 11 foot travel lanes and seven foot parking lanes on each side. The cross-section for the internal streets in the residential section will be provided later. However, most will be 30 to 32 feet wide with eight foot travel lanes and two seven foot parking lanes. These streets will not carry anymore than 2,000 trips per day. In the commercial section the primary streets vary in width from 36 feet (two 12 foot travel lanes and a 12 center turn lane) to 50 feet. Some of the 36 foot streets near the stores will consist of two 11 foot travel lanes and two seven foot parking lanes.

7. Capacity and Level of Service (LOS) Analysis

A series of Synchro traffic operations and SimTraffic simulation models have been developed to analyze the traffic operations of each scenario. The operations analysis is used to determine the veracity of access locations, type of control and intersection geometry. It also provides several key indicators on arterial traffic flow, level of service, signal coordination and significant queuing data.

Preliminary operations analyses demonstrate that the proposed access locations type of traffic control, and roadway/intersection geometry are adequate and can operate at an acceptable level of service (LOS). An animation of the traffic movement throughout the center and on the adjacent streets and intersections is available via the SimTraffic software.

To optimize the signal timing and coordination, the Synchro program examines hundreds of signal timing options and selects the one with the best "minimum delay." The operations analysis in this report represents the best minimum delay scenario with some refinements by ATC to reduce queues on the approaches to Arapahoe Road.

The Arapahoe/Cornerstar intersection will operate at LOS D/D in the both the 2008 and 2026 AM/PM peak hours. The Parker/Cornerstar intersection will operate at LOS A/C in the 2008 and 2026 AM/PM peak hours.

The queuing data shows that all the projected queues can be accommodated in the proposed storage lanes under normal traffic conditions during the 2026 weekday and weekend PM peak hours. The queues shown are the maximum observed in SimTraffic. These are provided as an indication only of the very low potential of blocking. The critical movements are shown for the approaches to the signalized intersections.

Queuing Analysis						
Arapahoe Road/Cornerstar						
			Maximum Queue Observed (ft)			
	Movement	Storage per Lane	2008 AM	2008 PM	2026 AM	2026 PM
	WBL	400	29	178	51	111
	NBL	500	138	180	111	237
Parker Road/Cornerstar						
			Maximum Queue Observed (ft)			
	Movement	Storage per Lane	2008 AM	2008 PM	2026 AM	2026 PM
	NBL	400	156	436	54	286
	EBL	500	52	223	49	155

ATC optimized the signal timing plans for these analyses and maintained a 120 second cycle length. Special timing plans for seasonal events can be implemented to adjust for specific flows. For instance, Douglas County will adjust the signal timing plans for the Christmas Season traffic at the Park Meadows Mall.

Signal progression efficiency is a common measure of effectiveness for movement on an arterial. It measures the bandwidth in each direction divided by two times the cycle length.

With good progression efficiency, sequential green time is provided through the signals on Arapahoe Road. CDOT generally requires .35 efficiency.

In the 2008 AM conditions the efficiency is rated at .30 which is good. In the 2008 PM condition it is also at .30. The efficiency is constrained by the operations at the Arapahoe/Parker intersection, not the new intersection for Cornerstar. In 2026 the efficiency will rise to .36 in the AM and .52 in the PM. The time/space diagrams are provided in the appendix.

The right in/right out intersection on Arapahoe Road will function efficiently in all scenarios. The NBR movement shows only a minimal delay of 10 seconds and a queue length of one vehicle in the 2008 and 2026 PM peak hours.

All Synchro worksheets are provided in the appendix for reference.

8. Summary, Conclusions and Recommendations

This analysis demonstrates that the traffic generated by Cornerstar can be accommodated well with the programmed improvements to the adjacent streets, intersections, new interchange, and the access control recommended in this report.

The access locations on Arapahoe and Parker are consistent with access control plans agreed to by CDOT, City of Aurora, and Arapahoe County. While this analysis precedes the Arapahoe Road Corridor Study and the design for the new interchange every effort will be made to coordinate plans and data in order to maintain consistency with the overall program to improve traffic operations on Arapahoe and Parker Roads.

The main access to the center from Arapahoe Road will be from one full-movement signalized intersections and a centrally located right in/right out. Another full-movement signalized intersection will be from Parker Road on the southeast corner of the site. The signalized intersections will have dual left turns on all approaches to maximize the green time on the mainline through movements.

Internally, the center will feature a peripheral road that connects the two main accesses from Arapahoe and Park Roads. An internal road will service the central area of shops, restaurants, big box facilities, and parking lots. In addition a central road will connect the plaza area to Arapahoe Road at the right in right in/right out access. The circulation and access to parking will function very efficiently.

In conclusion, this report finds that the roadway layout in the site plan and the recommended accesses will operate at an acceptable level of service and that overall traffic flow on the adjacent streets and intersections will be efficiently handled by the proposed improvements.

APPENDIX