Introduction

The purpose of this study was to assess the impact of the proposed Metcalf Village development on the surrounding transportation system. The proposed project site is located in the southeast quadrant of the intersection of 159th Street and Metcalf Avenue. The location of the proposed development relative to the major streets in the area has been shown on Figure A-1 in Appendix A. Included in this study is a discussion of existing conditions, the anticipated impact of the proposed development on the adjacent street system, future year 2030 conditions with master planned land uses on the site, and future year 2030 conditions with proposed land uses on the site. The study includes trip generation projections, volume/capacity analyses, and identification of improvements to the street system to mitigate the potential impact of the proposed development.

Proposed Development Plan

The proposed development site is located in Overland Park, Kansas in the southeast quadrant of the 159th Street and Metcalf Avenue intersection. The development consists of a shopping center development with approximately 418,000 square feet of retail space as well as 303 apartment units and 42 townhouses. Access to the site will be via six site entrances; four will be located along Metcalf Avenue and two will be located along 159th Street. A copy of the site plan showing building and driveway locations is included on Figure A-2.

Study Area

To assess the impacts of the proposed development, several intersections were identified for study during the weekday P.M. peak hours. The intersections are located in the general vicinity of the site and include:

- 151st Street and U.S. 69 Southbound
- 151st Street and U.S. 69 Northbound
- 151st Street and Metcalf Avenue
- 159th Street and Antioch Road
- 159th Street and U.S. 69 Southbound (2030)
- 159th Street and U.S. 69 Northbound (2030)
- 159th Street and Metcalf Avenue
- 159th Street and West Site Drive
- 159th Street and East Site Drive
- 159th Street and Riggs Road
- 159th Street and Nall Avenue
- Metcalf Avenue and North Site Drive
- Metcalf Avenue and 161st Street
- Metcalf Avenue and 162nd Street
- Metcalf Avenue and 162nd Terrace
- Metcalf Avenue and 167th Street
- 167th and U.S. 69 Southbound
- 167th and U.S. 69 Northbound

Traffic Counts

Peak hour traffic volumes were collected at the study intersections for this analysis on August 28-30, 2007 from 4:00 to 6:00 P.M. Weather conditions during this three-day period were partly sunny with a high temperature of approximately 85 degrees and no precipitation.

The City of Overland Park provided counts for the northbound and southbound ramps at 151st Street and U.S. 69 and at the intersection of 151st Street and Metcalf Avenue. The counts provided for the ramps at 151st and US 69 were recorded in May 2003, September 2004, August 2005 and June 2006. Counts provided at the intersection of 151st and Metcalf were recorded in October 2003 and July 2006. TranSystems collected counts at these intersections on September 12-13, 2007 from 4:00 to 6:00 P.M. Due to construction in the general vicinity of these three intersections, current counts were compared with historical data to ensure traffic volumes representative of current conditions without construction detours were used for analysis at these intersections.

Zoning

The land surrounding the development site includes single-family and multi-family residential, office space, commercial, industrial and vacant/non-designated land uses. A school is located approximately one-quarter mile to the east of the proposed development on 159th Street.

Street Network

Based on the current Overland Park Road Map, 151st Street, Antioch Road north of 151st Street and Metcalf Avenue north of 159th Street are improved thoroughfares. Metcalf Avenue south of 159th Street, Antioch Road south of 151st Street, Nall Avenue, 159th Street and 167th Street are designated as unimproved thoroughfares. Riggs Road serves as a collector street. One hundred and sixty-first (161st) Street, 162nd Street and 162nd Terrace primarily serve local traffic. US-69 is a north/south freeway that connects Johnson County to the Greater Kansas City Metropolitan Area.

The Overland Park Capital Improvements Program outlines improvements which will widen Antioch Road from two lanes to four lanes between 151st and 167th Street. It also outlines improvements for Nall Avenue from 143rd to 159th Street and for 159th Street from Quivira Road to Antioch Road. These improvements will consist of widening these thoroughfares from two lanes to four lanes with a center median. A full-access interchange will be constructed at 159th Street and US 69, and the interchange at 167th Street and US 69 is planned to include a northbound exit ramp and southbound entrance ramp.

Analysis

The analysis of the proposed development's impact includes estimates of vehicle trip generation, distribution of trips onto the street network, and analysis of peak hour operations. Each of these analysis techniques and their results are described below. The study focused on typical weekday P.M. peak hour operations.

Trip Generation

The vehicle trips generated by the proposed development were estimated using the Institute of Transportation Engineers' Trip Generation, 7th Edition. The estimated daily and peak hour traffic volumes associated with this development are shown in Table 1. This proposed development differs from the land uses in the City of Overland Park's Master Plan. These trip generation projections were reviewed by City staff prior to completion of this study. Table 1 also indicates the density and type of development anticipated by the master plan land uses and the associated traffic that would be generated. More detailed information on the trip generation is included in Appendix B.

Table 1 Trip Generation										
			ITE		A.M. Peak Hour			P.M. Peak Hour		
Land Use	Intensity		Code	Daily	Total	In	Out	Total	In	Out
Proposed Metcalf Village Shops (9-10-07 Plan)										
Home Improvement Superstore	171,069	sf	86	4,672	205	111	94	419	197	222
Retail	246,928	sf	820	12,221	269	164	105	1,137	546	591
Apartments	312	units	220	2,025	157	31	126	189	123	66
Townhouses	48	units	230	344	29	5	24	33	22	11
		Subtotal Trips		*19,262*	*660*	*311*	*349*	*1,778*	*888*	*890*
		Internal Trips		---	---	---	---	*172*	*86*	*86*
		External Trips		*19,262*	*660*	*311*	*349*	*1,606*	*802*	*804*
		Pass-By Trips		---	---	----	---	*171*	*82*	*89*
		Non-Pass-By Trips		*19,262*	*660*	*311*	*349*	*1,435*	*720*	*715*

Trip Distribution

The estimated new peak hour trips generated by the proposed development were distributed onto the street system based on the trip distributions summarized below. Table 2 illustrates the general distributions used in this study, which were derived based on existing travel patterns and land uses in the area as well as consultations with city staff. The detailed distribution patterns through the study intersections are documented in Appendix B.

Table 2 Trip Distribution				
Direction To/From	Existing Plus Development		Future	
	Retail	Residential	Retail	Residential
North on Switzer Road	5%	5%	5%	5%
South on Switzer Road	--	--	--	--
North on Antioch Road	5	5	5	5
South on Antioch Road	1	1	1	1
North on US 69	25	40	25	35
South on US 69	5	5	5	10
North on Metcalf Avenue	11	10	10	10
South on Metcalf Avenue	5	2	2	2
North on Nall Avenue	5	5	5	5
South on Nall Avenue	1	5	5	5
West on 151st Street	5	5	5	5
East on 151st Street	5	5	5	5
West on 159th Street	15	5	15	5
East on 159th Street	10	5	10	5
West on 167th Street	1	1	1	1
East on 167th Street	1	1	1	1
Total	100%	100%	100%	100%

Traffic Operation Assessment

An assessment of traffic operations was made for four separate scenarios. These scenarios allowed for comparison of the before and after impacts of the proposed development in the study area. The scenarios studied included:

- Existing Conditions
- Existing plus Proposed Development Conditions
- Future Year 2030 Conditions with Master Planned Land Uses
- Future Year 2030 Conditions with Proposed Land Uses

The study intersections were evaluated based on the methodologies outlined in the Highway Capacity Manual, 2000 Edition, published by the Transportation Research Board. The operating conditions at an intersection are graded by the "level of service" experienced by drivers. Level of service (LOS) describes the quality of traffic operating conditions and is rated from "A" to "F". LOS A represents the most desirable condition with free-flow movement of traffic with minimal delays. LOS F generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D, and E reflect incremental increases in the average delay per stopped vehicle. Delay is measured in seconds per vehicle. Table 3 shows the upper limit of delay associated with each level of service for signalized and unsignalized intersections.

Table 3
Intersection Level of Service Delay Thresholds

Level of Service (LOS)	Signalized	Unsignalized
A	< 10 Seconds	< 10 Seconds
B	< 20 Seconds	< 15 Seconds
C	< 35 Seconds	< 25 Seconds
D	< 55 Seconds	< 35 Seconds
E	< 80 Seconds	< 50 Seconds
F	≥ 80 Seconds	≥ 50 Seconds

The LOS rating deemed acceptable varies by community, facility type and traffic control device. LOS D is the desirable goal for movements at unsignalized intersections that must yield to other movements; however, a LOS E or F is often accepted for low to moderate traffic volumes where the installation of a traffic signal is not warranted by the conditions at the intersection or the location is deemed undesirable for signalization for other reasons. Other reasons may include the close proximity of an existing traffic signal or the presence of a convenient alternative path. For signalized intersections, level of service and average delay relate to all vehicles using the intersection. LOS D is the minimum desirable standard set by the City of Overland Park for signalized intersections. All study intersections were evaluated using the Synchro analysis software package based on Highway Capacity Manual methods.

Existing Conditions

The results for the intersection analyses of existing P.M. peak hour conditions have been summarized in Table 4. The study intersections were evaluated with the existing lane configurations, traffic volumes, and traffic controls shown on Figures A-3, and A-4. Appendix C contains the analysis output files from Synchro.

Table 4
Intersection Level of Service
Existing Conditions

Intersection / Approach / Movement	P.M. Peak Hour LOS	P.M. Peak Hour Delay	Intersection / Approach / Movement	P.M. Peak Hour LOS	P.M. Peak Hour Delay
151st Street and SB US-69 Ramps			Metcalf Avenue and North Drive		
Signalized (All Movements)	C	21.7	*Eastbound Left-turn*	C	17.0
151st Street and NB US-69 Ramps			Metcalf Avenue and 161st Street		
			Eastbound Left-turn	C	19.6
			Eastbound Right-turn	B	11.9
Signalized (All Movements)	B	13.8	*Northbound Left-turn*	A	0.6
151st Street and Metcalf Avenue			Metcalf Avenue and 162nd Street		
			Eastbound Left-turn	C	15.7
Signalized (All Movements)	C	30.0	*Northbound Left-turn*	A	1.1
159th Street and Antioch Road			Metcalf Avenue and 162nd Terrace		
Eastbound	E	45.1			
Westbound	F	57.7			
Northbound	D	25.1	*Eastbound*	C	15.7
Southbound	C	24.7	*Northbound Left-turn*	A	1.1
159th Street and Metcalf Avenue			167th Street and Metcalf Avenue		
			Eastbound	D	28.9
			Westbound	E	36.4
			Northbound Left-turn	A	2.1
Signalized (All Movements)	C	20.7	*Southbound Left-turn*	A	0.4
159th Street and Riggs Road			167th Street and SB US-69 Ramps		
Eastbound Left-turn	A	8.4			
Westbound Left-turn	A	9.4			
Northbound	D	29.3			
Southbound	D	31.6	*Southbound*	B	10.0
159th Street and Nall Avenue			167th Street and NB US-69 Ramps		
Eastbound	E	47.6			
Westbound	C	16.6			
Northbound	B	11.4			
Southbound	B	11.1	*Eastbound Left-turn*	A	7.7

LOS – Level of Service
Delay – Delay in Seconds per Vehicle

The analysis results indicate that operations at a few of the movements at some study intersections are below desirable levels of service (LOS) under existing traffic conditions. Although the delays are undesirable, traffic volumes at these locations are relatively low and do not appear to meet warrants for the installation of traffic signals. The criteria, or warrants, for assessing the need for a traffic signal are provided by the Federal Highway Administration and the Manual of Uniform Traffic Control Devices (MUTCD).

Existing plus Proposed Development Conditions

Intersection analyses were then conducted to determine the impact of existing conditions with the addition of the proposed Metcalf Village development. The results for the intersection analyses of existing plus proposed development P.M. peak hour conditions have been summarized in *Table 5*. The results reflect the improvements considered for this scenario.

The assessment of existing plus development conditions is an iterative process that begins by applying development traffic volumes to the existing street system. As deficiencies were identified, improvements were considered and evaluated to achieve acceptable levels of service. The study intersections were evaluated with the existing plus

development lane configurations, traffic volumes, and traffic controls shown on Figures A-5, and A-6. Appendix C contains the analysis output files from Synchro.

Table 5
Intersection Level of Service
Existing plus Development Conditions

Intersection / Approach / Movement	P.M. Peak Hour LOS	P.M. Peak Hour Delay	Intersection / Approach / Movement	P.M. Peak Hour LOS	P.M. Peak Hour Delay
151st Street and SB US-69 Ramps			159th Street and Nall Avenue		
			Eastbound	F	>100
			Westbound	D	27.3
			Northbound	B	12.3
Signalized (All Movements)	C	26.5	*Southbound*	B	12.2
151st Street and NB US-69 Ramps			Metcalf Avenue and North Drive		
			Eastbound	C	21.3
Signalized (All Movements)	B	14.5	Westbound	B	11.9
151st Street and Metcalf Avenue			Metcalf Avenue and 161st Street		
			Eastbound Left-turn	F	>100
			Eastbound Right-turn	B	12.8
			Westbound Left-turn	F	>100
			Westbound Right-turn	B	11.7
			Northbound Left-turn	A	9.1
Signalized (All Movements)	D	35.9	*Southbound Left-turn*	A	9.1
159th Street and Antioch Road			Metcalf Avenue and 162nd Street		
			Eastbound Left-turn	C	24.0
			Westbound Right-turn	B	10.4
Signalized (All Movements)	B	17.7	*Northbound Left-turn*	A	1.0
159th Street and Metcalf Avenue			Metcalf Avenue and 162nd Terrace		
			Eastbound Left-turn	E	35.4
			Eastbound Right-turn	B	12.5
			Westbound Left-turn	E	44.5
			Westbound Right-turn	B	10.3
			Northbound Left-turn	A	8.8
Signalized (All Movements)	C	32.2	*Southbound Left-turn*	A	8.3
159th and West Drive			167th Street and Metcalf Avenue		
			Eastbound	B	13.4
			Westbound	B	12.1
			Northbound Left-turn	C	15.8
Northbound Right-turn	C	21.0	*Southbound Left-turn*	F	75.3
159th and East Drive			167th Street and SB US-69 Ramps		
Westbound Left-turn	B	11.8			
Northbound Left-turn	F	>100			
Northbound Right-turn	C	19.2	*Southbound*	B	10.8
159th Street and Riggs Road			167th Street and NB US-69 Ramps		
Eastbound Left-turn	A	8.7			
Westbound Left-turn	A	9.8			
Northbound	E	46.1			
Southbound	F	56.3	*Eastbound Left-turn*	A	7.8

LOS – Level of Service
Delay – Delay in Seconds per Vehicle

The following improvements were identified in order to meet acceptable levels of service at the following intersections:

159th Street and West Site Drive

- Construct a raised median on Metcalf Avenue to restrict this driveway to right-turn movements only due to its proximity to the intersection of 159th Street and Metcalf Avenue.
- Construct a westbound right-turn lane due to the heavy volume of traffic making that movement. This lane should be approximately 150 feet in length plus taper.

159th and East Site Drive

- Install a traffic signal due to the high-volume of vehicles turning left out of the development site.
- To minimize the delays for traffic exiting the site, it is recommended that two northbound lanes be constructed (exclusive left and right turn lanes).

Metcalf Avenue and North Site Drive

- Construct a raised median on Metcalf Avenue to restrict this driveway to right-turn movements only; the condition that will exist when Metcalf Avenue is improved.

Metcalf Avenue and 161st Street

- Construct a southbound left-turn lane on Metcalf Avenue. This turn lane should be approximately 150 feet plus taper.
- A northbound left-turn lane should be constructed which will align with the southbound left-turn lane. This turn lane should be approximately 150 feet in length plus taper, and allow the opposing northbound and southbound left-turn movements to have improved visibility, which will in turn improve the safety at this intersection.
- To minimize delays for traffic exiting the site, it is recommended that two westbound lanes be constructed (an exclusive right-turn lane and shared left/through lane).

Metcalf Avenue and 162nd Street

- Construct a raised median on Metcalf Avenue to restrict the proposed driveway to right-turn movements only. The offset of the proposed driveway with the existing 162nd Street will allow the proposed driveway to be restricted to right-turns only while allowing full access to the west side.

Metcalf Avenue and 162nd Terrace

- Construct a southbound left-turn lane on Metcalf Avenue. This turn lane should be approximately 150 feet plus taper.
- A northbound left-turn lane should be constructed which will align with the southbound left-turn lane. This turn lane should be approximately 150 feet in length plus taper, and allow the opposing northbound and southbound left-turn movements to have improved visibility, which will in turn improve the safety at this intersection.
- To minimize delays for traffic exiting the site, it is recommended that two westbound lanes be constructed (an exclusive right-turn lane and shared left/through lane).

While a traffic signal is recommended at the intersection of 159th Street and the proposed East Driveway, its location, measured approximately 900 feet east of Metcalf, is less than the distance typically desired for signalized intersections (generally desired at a ¼-mile spacing, or 1,320 feet). Traffic exiting the site does have the opportunity to utilize Metcalf Avenue to drive west on 159th Street and a traffic signal at this location could potentially be delayed for several years.

The intersection of 159th Street and Antioch Road is projected to have sufficient traffic volumes to warrant the installation of a traffic signal with full development. However, this intersection, which currently operates as an all-way stop, is scheduled for improvements in the Overland Park Capital Improvements Program for 2008-2009 when Antioch Road will be widened from two to four lanes. Signalization of this intersection may be planned as part of that project and would not be recommended in the interim period.

The northbound and southbound movements at 159th Street and Riggs Road operate at higher delays than what is typically desired. It is common on arterial roadways for low-volume side streets to encounter similar delays. The projected side-street traffic volumes at this intersection are not sufficient to meet warrants outlined in the MUTCD for the installation of a traffic signal. Further, the areas to the north and south are both provided with additional means of access to Metcalf Avenue. For these reasons, no additional improvements are recommended at this intersection.

At the intersections of 161st Street and Metcalf Avenue and 162nd Terrace and Metcalf Avenue, the eastbound and westbound left-turn movements also operate at higher delays than what is typically desired. Traffic volumes at these intersections are not sufficient to warrant the installation of traffic signals as outlined in the MUTCD. Therefore, additional improvements are not recommended at these intersections.

The traffic volumes at 167th Street and Metcalf Avenue are close to warranting a signal. Currently, eastbound and westbound approaches are stop-controlled; however, this scenario was analyzed utilizing four-way stop control on all approaches. A four-way stop as well as the addition of left-turn lanes on all approaches could provide an interim solution with the installation of a traffic signal in the future.

At the intersection of 159th Street and Nall Avenue, the volumes are also close to warranting a signal. Currently, only the eastbound left-turn operates at a level of service rated worse than what is typically desired. It is recommended that the intersection be monitored for the possible installation of a signal in the future.

Future 2030 Conditions

Two separate future condition scenarios were analyzed as part of this study: future 2030 conditions with 1) Master Plan land uses, and 2) Proposed land uses. Analyzing these scenarios allows for a comparative assessment of the impacts for the approved land uses versus the proposed land uses on the development site. The Overland Park Traffic Model was used to develop traffic projections for this study.

In general, the same access configurations were considered for all scenarios in order to maintain a direct comparison of the results with changes only at the study intersections. The Overland Park Traffic Model is projecting significant growth on major roadways in this area, and as such, several significant improvements will be needed. This includes providing six-lane facilities on Metcalf Avenue and portions of 159th Street, as well as interchange improvements on US 69 at both 159th Street and 167th Street. More information on each of the future scenarios and their results are described below, and depicted on the figures in Appendix A.

2030 with Master Plan

The results of the future 2030 conditions with approved land uses intersection analyses during the P.M peak hour operations are summarized in Table 6. For this scenario, traffic volumes associated with the Master Plan land uses on the Metcalf Village Development site were added to the existing traffic volumes plus background growth. The results reflect the improvements considered for this scenario. The study intersections for this scenario were evaluated with the lane configurations and traffic volumes shown on Figures A-7 and A-8. Appendix C contains the analysis output files from Synchro.

Table 6
Intersection Level of Service
2030 plus Master Plan Development Conditions

Intersection / Approach / Movement	P.M. Peak Hour LOS	P.M. Peak Hour Delay	Intersection / Approach / Movement	P.M. Peak Hour LOS	P.M. Peak Hour Delay
151st Street and SB US-69 Ramps			159th Street and Riggs		
			Eastbound Left-turn	C	21.9
			Westbound Left-turn	C	15.4
			Northbound	F	>100
Signalized (All Movements)	D	39.2	*Southbound*	F	>100
151st Street and NB US-69 Ramps			159th Street and Nall Avenue		
Signalized (All Movements)	C	25.5	*Signalized (All Movements)*	D	51.5
151st Street and Metcalf			Metcalf Avenue and North Drive		
			Eastbound Right-turn	B	10.0
Signalized (All Movements)	F	156.0	*Westbound Right-turn*	A	0.1
159th Street and Antioch			Metcalf Avenue and 161st Street		
Signalized (All Movements)	E	60.4	*Signalized (All Movements)*	C	22.7
159th Street and SB US-69 Ramps			Metcalf Avenue and 162nd Street		
			Eastbound Left-turn	F	>100
			Westbound Right-turn	A	0.1
Signalized (All Movements)	C	28.1	*Northbound Left-turn*	C	24.4
159th Street and NB US-69 Ramps			Metcalf Avenue and 162nd Terrace		
Signalized (All Movements)	B	19.8	*Signalized (All Movements)*	B	19.0
159th Street and Metcalf Avenue			167th Street and Metcalf Avenue		
Signalized (All Movements)	F	84.1	*Signalized (All Movements)*	F	175.0
159th and West Drive			167th Street and SB US-69 Ramps		
Northbound Right-turn	A	0.1	*Signalized (All Movements)*	C	27.1
159th and East Drive			167th Street and NB US-69 Ramps		
Northbound	F	>100			
Westbound Left-turn	B	13.5	*Signalized (All Movements)*	C	20.1

LOS – Level of Service
Delay – Delay in Seconds per Vehicle

Even with significant improvements to the arterial roadways, several of the study intersections are projected to operate at poor levels of service by year 2030. The study intersections assumed the maximum feasible improvements of three through lanes, dual left-turn lanes, and exclusive right-turn lanes. Further improvements could be made through signal coordination.

2030 with Proposed Land Uses

The results of the future 2030 conditions with proposed land uses intersection analyses during the P.M peak hour operations are summarized in Table 7. For this scenario, traffic volumes associated with the proposed Metcalf Village Development Plan were added to the existing traffic volumes plus background growth. The same basic access to the site as utilized in the previous scenario was assumed for analysis purposes. The study intersections for this scenario were evaluated with the lane configurations and traffic volumes shown on Figures A-9 and A-10. Appendix C contains the analysis output files from Synchro.

Table 7
Intersection Level of Service
2030 plus Proposed Development Conditions

Intersection Approach / Movement	P.M. Peak Hour LOS	P.M. Peak Hour Delay	Intersection Approach / Movement	P.M. Peak Hour LOS	P.M. Peak Hour Delay
151st Street and SB US-69 Ramps			159th Street and Riggs		
			Eastbound Left-turn	C	23.6
			Westbound Left-turn	B	13.7
			Northbound	F	>100
Signalized (All Movements)	D	38.8	*Southbound*	F	>100
151st Street and NB US-69 Ramps			159th Street and Nall Avenue		
Signalized (All Movements)	C	26.2	*Signalized (All Movements)*	D	50.3
151st Street and Metcalf Avenue			Metcalf Avenue and North Drive		
			Eastbound Right-turn	B	10.4
Signalized (All Movements)	F	161.0	*Westbound Right-turn*	A	9.7
159th Street and Antioch Road			Metcalf Avenue and 161st Street		
Signalized (All Movements)	E	65.2	*Signalized (All Movements)*	C	30.3
159th Street and SB US-69 Ramps			Metcalf Avenue and 162nd Street		
			Eastbound Left-turn	F	74.2
			Westbound Right-turn	A	9.0
Signalized (All Movements)	C	27.9	*Northbound Left-turn*	D	28.0
159th Street and NB US-69 Ramps			Metcalf Avenue and 162nd Terrace		
Signalized (All Movements)	C	20.7	*Signalized (All Movements)*	C	20.2
159th Street and Metcalf Avenue			167th Street and Metcalf Avenue		
Signalized (All Movements)	F	111.3	*Signalized (All Movements)*	F	180.1
159th and West Drive			167th Street and SB US-69 Ramps		
Northbound Right-turn	A	9.9	*Signalized (All Movements)*	C	26.2
159th and East Drive			167th Street and NB US-69 Ramps		
Signalized (All Movements)	B	11.4	*Signalized (All Movements)*	B	19.9

LOS – Level of Service
Delay – Delay in Seconds per Vehicle

As with the projected 2030 conditions with the Master Plan land use, several of the study intersections are projected to operate at poor levels of service. The intersection at 151st and Metcalf operates at an LOS F with a delay of 161.0 seconds in this scenario which is an increase from 156.0 seconds in the master plan scenario. One hundred and fifty-ninth (159th) Street and Metcalf Avenue also experiences increased delay of approximately 27 second per vehicle. The intersection of 159th Street and Antioch Road operates at a LOS E, but increases delay by about 6 seconds per vehicle in this scenario. Finally, 167th Street and Metcalf Avenue also worsens and continues to operate a LOS F with the increased traffic volumes in this scenario. The northbound and southbound movements at Riggs Road and 159th Street and the eastbound left-turn movement at 162nd Street and Metcalf Avenue operate poorly due to the heavy through traffic volumes, but traffic volumes at these intersections are not projected to meet signal warrants according to the MUTCD.

Summary

This study documents the impact of the proposed Metcalf Village development project to be located in the southeast quadrant of the 159th Street and Metcalf Avenue intersection in Overland Park Kansas. This study included operational analyses for the intersections adjacent to and surrounding the proposed development during a typical weekday P.M. peak hour. Brief descriptions of the results for each study scenario have been provided below.

Existing Conditions

This scenario considered only the existing traffic volumes at the study intersections. The analysis indicates that operations at a few of the movements at some of the study intersections are below desirable levels of service (LOS) in this scenario. Although the delays are undesirable, traffic volumes at these locations are relatively low and do not appear to meet traffic signal warrant thresholds.

Existing plus Proposed Development Conditions

This scenario took into consideration the impact of the proposed development on the existing infrastructure. Under this scenario several transportation improvements were identified as being needed, including:

159th Street and West Site Drive

- Construct a raised median on Metcalf Avenue to restrict this driveway to right-turn movements only due to its proximity to the intersection of 159th Street and Metcalf Avenue.
- Construct a westbound right-turn lane due to the heavy volume of traffic making that movement. This lane should be approximately 150 feet in length plus taper.

159th and East Site Drive

- Install a traffic signal due to the high-volume of vehicles turning left out of the development site.
- To minimize the delays for traffic exiting the site, it is recommended that two northbound lanes be constructed (exclusive left and right turn lanes).

Metcalf Avenue and North Site Drive

- Construct a raised median on Metcalf Avenue to restrict this driveway to right-turn movements only; the condition that will exist when Metcalf Avenue is improved.

Metcalf Avenue and 161st Street

- Construct a southbound left-turn lane on Metcalf Avenue. This turn lane should be approximately 150 feet plus taper.
- A northbound left-turn lane should be constructed which will align with the southbound left-turn lane. This turn lane should be approximately 150 feet in length plus taper, and allow the opposing northbound and southbound left-turn movements to have improved visibility, which will in turn improve the safety at this intersection.
- To minimize delays for traffic exiting the site, it is recommended that two westbound lanes be constructed (an exclusive right-turn lane and shared left/through lane).

Metcalf Avenue and 162nd Street

- Construct a raised median on Metcalf Avenue to restrict the proposed driveway to right-turn movements only. The offset of the proposed driveway with the existing 162nd Street will allow the proposed driveway to be restricted to right-turns only while allowing full access to the west side.

Metcalf Avenue and 162nd Terrace

- Construct a southbound left-turn lane on Metcalf Avenue. This turn lane should be approximately 150 feet plus taper.
- A northbound left-turn lane should be constructed which will align with the southbound left-turn lane. This turn lane should be approximately 150 feet in length plus taper, and allow the opposing northbound and southbound left-turn movements to have improved visibility, which will in turn improve the safety at this intersection.
- To minimize delays for traffic exiting the site, it is recommended that two westbound lanes be constructed (an exclusive right-turn lane and shared left/through lane).

The intersection of 159th Street and Antioch Road is projected to have sufficient traffic volumes to warrant the installation of a traffic signal. However, this intersection, which currently operates as an all-way stop, is scheduled for improvements in the Overland Park Capital Improvements Program for 2008-2009 when Antioch Road will be widened from two to four lanes. Signalization of this intersection may be planned as part of that project and would not be recommended in the interim conditions before the construction.

The northbound and southbound movements at 159th Street and Riggs Road operate at higher delays than what is typically desired. It is common on arterial roadways for low-volume side streets to encounter similar delays. The projected side-street traffic volumes at this intersection are not sufficient to warrants outlined in the MUTCD for the installation of a traffic signal. Further, the areas to the north and south are both provided with additional means of access to Metcalf Avenue. For these reasons, no additional improvements are recommended at this intersection.

At the intersection of 161st Street and Metcalf Avenue, the eastbound and westbound left-turn movements also operate at higher delays than what is typically desired. Traffic volumes at this intersection are not sufficient to warrant the installation of a traffic signal as outlined in the MUTCD. Therefore, additional improvements are not recommended at this intersection.

The eastbound left-turn movement at 162nd Street and Metcalf Avenue experiences a higher delay than what is typically desired. Traffic volumes at this intersection are not sufficient to warrant the installation of a traffic signal as outlined in the MUTCD.

The traffic volumes at 167th Street and Metcalf Avenue are close to warranting a signal. Currently, eastbound and westbound approaches are stop-controlled; however, this scenario was analyzed utilizing four-way stop control on all approaches. A four-way stop as well as the addition of left-turn lanes on all approaches could provide an interim solution with the installation of a traffic signal in the future.

At the intersection of 159th Street and Nall Avenue, the volumes are also close to warranting a signal. Currently, only the eastbound left-turn operates at a level of service rated worse than what is typically desired. It is recommended that the intersection be monitored for the possible installation of a signal in the future.

Future Year 2030 Conditions

The future year 2030 conditions were analyzed based on projections from the Overland Park Traffic Model, with separate analyses conducted for the proposed development and what is currently shown on the City's Master Plan for this site. Under both scenarios, the growth in traffic along the major corridor necessitates significant enhancements to the arterial network. This includes providing three through lanes in each direction on Metcalf Avenue and portions of 159th Street as well as interchange improvements with US 69 at 159th Street and 167th

Street. The study intersections assumed the maximum feasible improvements of three through lanes, dual left-turn lanes, and exclusive right-turn lanes.

Although, further improvements could be made through signal coordination, even with these improvements, many of the intersections are projected to operate at poor levels of service with either the Master Plan land uses or the proposed land uses.

Appendix A - Figures

Appendix B – Trip Generation and Distribution

See separately bound Technical Appendix.

Appendix C – Capacity Analysis Worksheets

See separately bound Technical Appendix.