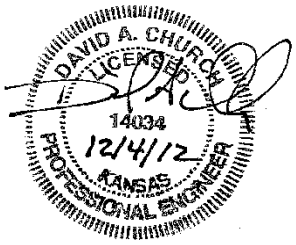
South Kansas Avenue Traffic Report

An analysis of current conditions and recommendations for future improvements along South Kansas Avenue between 14th Street and 24th Street.



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PARSONS BRINCKERHOFF

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1 Introduction and Executive Summary

This study consists of a review of existing conditions, distribution of future trips, traffic operations analysis and recommended future improvements based on projected development along South Kansas Avenue between 14th Street and 24th Street in Newton, KS. The study incorporated information obtained from a public survey which was distributed by the City of Newton to the local businesses and residential areas adjacent to South Kansas Avenue.

1.1 Purpose of Report and Study Objectives

The purpose of the study is to evaluate existing transportation conditions along South Kansas Avenue, look for ways to improve connectivity between existing developments as well as estimate the impact of future commercial development along the corridor.

A site visit was conducted to review the existing infrastructure and conditions and traffic counts were collected at key locations throughout the corridor. This information, in combination with the results from a public survey, will be used to analyze the corridor.
Results from the study will indicate ways for the corridor to continue to grow and support additional development, as well as provide a list of transportation improvements that will support this future growth.

The City of Newton's Comprehensive Plan– *The ReNewton Project: Comprehensive Plan (2010 - 2030)* was utilized as part of the study. The study reflects the community Vision, Values and Goals as presented in the ReNewton Project. The core of the City's Vision Statement is "Between 2010 and 2030, Newton will expand its tax base and enhance community amenities, while preserving its richness of character, heritage, and way of life".

This study touches many of the Values of the City including: Vibrant Economy, Livability, Innovations in Transportation, Healthy Living, Preserving Our Town Character and Housing for All.

1.2 Executive Summary

The existing roadway network which surrounds South Kansas Avenue does not support internal circulation between existing developments and therefore would benefit from additional connections. Completing the roadway network surrounding South Kansas Avenue provides residents with the ability to access adjacent land uses without accessing South Kansas Avenue, thereby reducing the vehicular volume the corridor.

With additional development along the corridor, an increase in traffic volume is expected which will generate enough traffic to warrant additional traffic signals on South Kansas Avenue. Existing intersection spacing is less than desirable for the installation of traffic signals; however with the use of signal coordination technologies, traffic progression can be optimized. The use of roundabouts and access management treatments were investigated along the northern half of the corridor, however it was determined that the preferred type of traffic control with enough capacity to serve

the existing/future developments and still provide good traffic progression along South Kansas Avenue is a coordinated traffic signal system. Several alternative intersection types (roundabouts, right-in/right-out/left-in) were considered for the southern half of the corridor as well as the extension of the raised center median to 24th Street.

While much of the report is focused on vehicular transportation, travel by pedestrians and bicycles were also evaluated. Travel along the east side of South Kansas Avenue using the existing shared use path appears to be an excellent resource for local travelers. The public survey noted the need for a pedestrian crossing at South Kansas Avenue and Medical Center Drive and there is demand for pedestrian/bicycle accommodations along the west side of South Kansas Avenue. There are no sidewalks along the west side of the corridor and there are no pedestrian accommodations at the traffic signal at Medical Center Parkway. Recommendations for pedestrian/bicycle accommodation improvements are included in the list below.

The largest recommendations for South Kansas Avenue which affect vehicle travel are to align Windward Drive West with Windward Drive East and add a third lane in each direction from that intersection north to 14th Street. The third lane is required if the city chooses to maintain the driver's level of service (LOS) into the future along this stretch of the corridor. Traffic signals should be added when warranted (specific traffic volume thresholds are met as a result of future developments/normal traffic growth) and coordination will be required due to the frequency of closely spaced intersections. Additional improvements away from South Kansas Avenue recommend additional connectivity between adjacent residential areas, along with connections between residential and commercial areas to fill in existing gaps in the transportation network. These improvements can be funded through site or infrastructure impact fees.

The signalization of Windward Drive East should occur as soon as development occurs on the west side of South Kansas Avenue so that Windward Drive East can be aligned with roadways internal to the new development. The proposed median from Windward Drive to 24th Street could occur at any point, even before development west of South Kansas Avenue. It is common practice in Kansas for a City to construct a median with turn lanes for future development, and negotiate an agreement with the developers that they will fund the applicable portions of the construction that was specifically for the development such as turn lanes, or medians.

The additional lanes on South Kansas Avenue should be added when the LOS at traffic signals along the corridor falls below an acceptable level of service for the city.

Traffic signals at other locations should be installed when the Manual on Uniform Traffic Control Devices (MUTCD) traffic signal warrants are met and an engineering study is performed to justify a traffic signal. "The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal"(Federal Highway Administration, 2009). From an operational standpoint, the city may desire to wait until Warrant 1 is met before installing a traffic signal. However, Warrant 7, Crash Experience should continue to be monitored at all intersections. Waiting until Warrant 1 is met may lower overall delay throughout the day when compared to installing a signal when only Warrant 2 or 3 are met.

Traffic signal warrants 1 through 3 are based on vehicular volumes using multiple tables and charts which assist with determining if a traffic signal is warranted. The tables and charts utilize the mainline traffic volumes along with side street volumes. The current edition of the MUTCD should be used to determine the thresholds for installing signals. A single vehicular volume alone that warrants a traffic signal does not exist, so ongoing data collection and engineering analysis must be undertaken before a signal is installed. These traffic volume thresholds may be met before or after additional development occurs.

2 Existing Conditions

This section will provide an overview of the existing study area, land uses, intersection types, site accessibility, and traffic volumes. The two public surveys which were distributed as part of the study will also be analyzed in this section.

The City of Newton's Comprehensive Plan– *The ReNewton Project: Comprehensive Plan (2010 - 2030)* was utilized as part of the study. The Comprehensive Plan was adopted by the Newton City Commission in January, 2011.

2.1 Study Area

Within the City of Newton the study area extends along South Kansas Avenue from SE 14th Street on the north to SE 24th Street on the south. Land uses which connect to South Kansas Avenue up to one mile east (I-135) and west (Old Main Street) of South Kansas Avenue were reviewed as part of the study.

2.2 Land Uses

This section describes the current land uses, land usage policies, and anticipated land uses in the future.

2.2.1 Existing Land Uses

The existing land uses along South Kansas Avenue are generally either residential or commercial in nature (Figure 1). From north to south along the east side of South Kansas Avenue exists: the US-50 & I-135 interchange, the Newton Medical Center complex, undeveloped land in the southeast corner of the complex, followed by developed residential areas. From north to south along the west side of South Kansas Avenue exists: on- and off-ramps for US-50, existing Wal-Mart and smaller businesses, an undeveloped plot of land (approximately 80 acres), followed by an existing residential development with some small businesses adjacent to South Kansas Avenue.

Outside of the immediate study area, the majority of the developed parts of the City of Newton are located to the north. Much of the area east, south and west of the study area are undeveloped agricultural lands currently. There are efforts being made north and east of the study area towards the creation of the Kansas Logistics Park (Figure 2). Hundreds of acres of land are available for the development of the Kansas Logistics Park specifically focused on the manufacturing and distribution of products related to the wind energy industry. When the Park is fully developed and operational, it will bring with it hundreds of jobs to the Newton area and spur additional development needed to support this Park. Specific trips were not included to or from the Kansas Logistics Park area in relation to the South Kansas Avenue study area as specific affects are unknown. We do know that traffic along South Kansas Avenue will increase when the Kansas Logistics Park is completed, however the amount of increase would be speculative at this time. More information about the Kansas Logistics Park can be obtained at the following website: http://www.kansaslogisticspark.com.

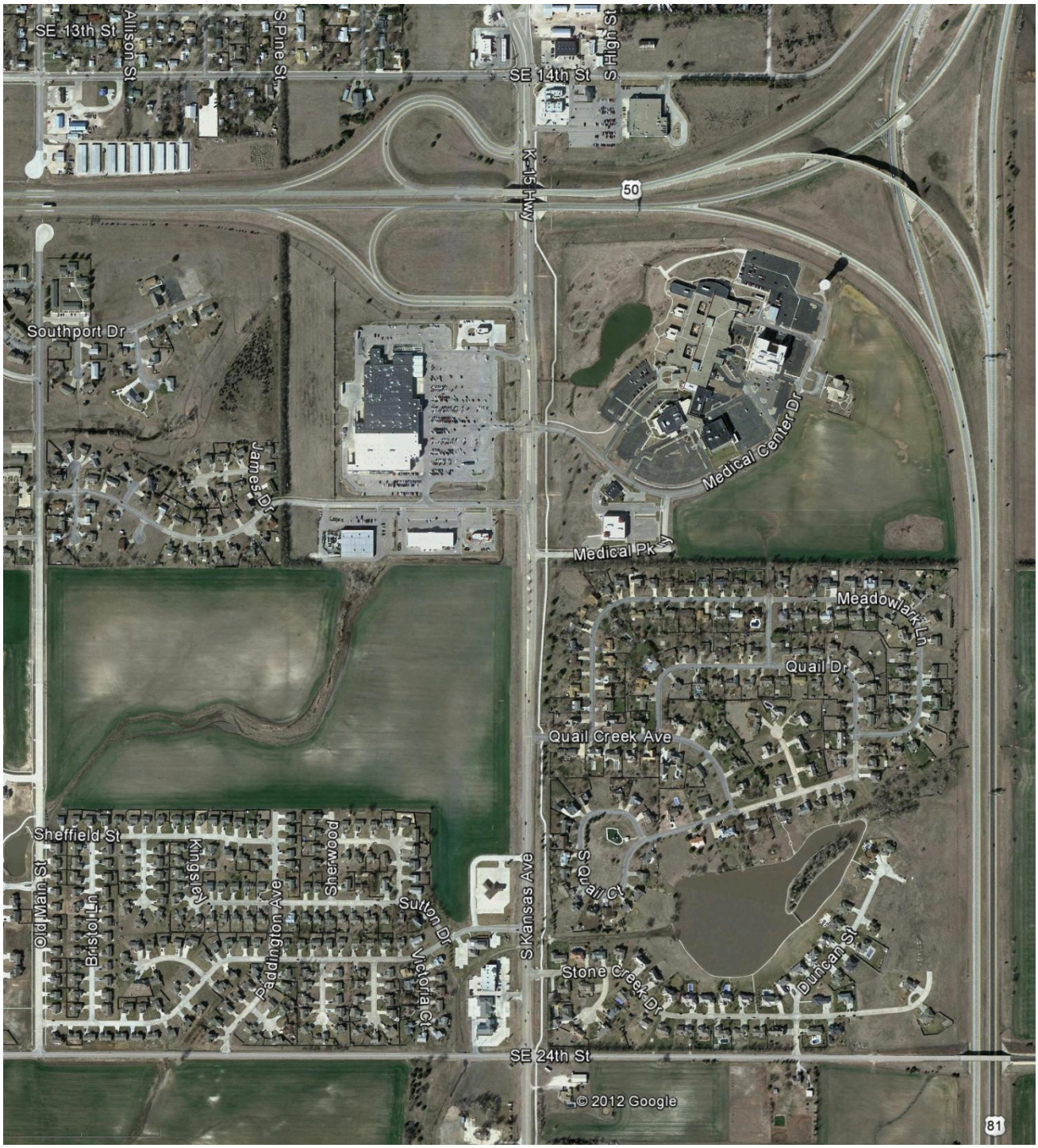

Figure 1 - Existing South Kansas Avenue between 14th Street and 24th Street
Source – Google Earth 2012

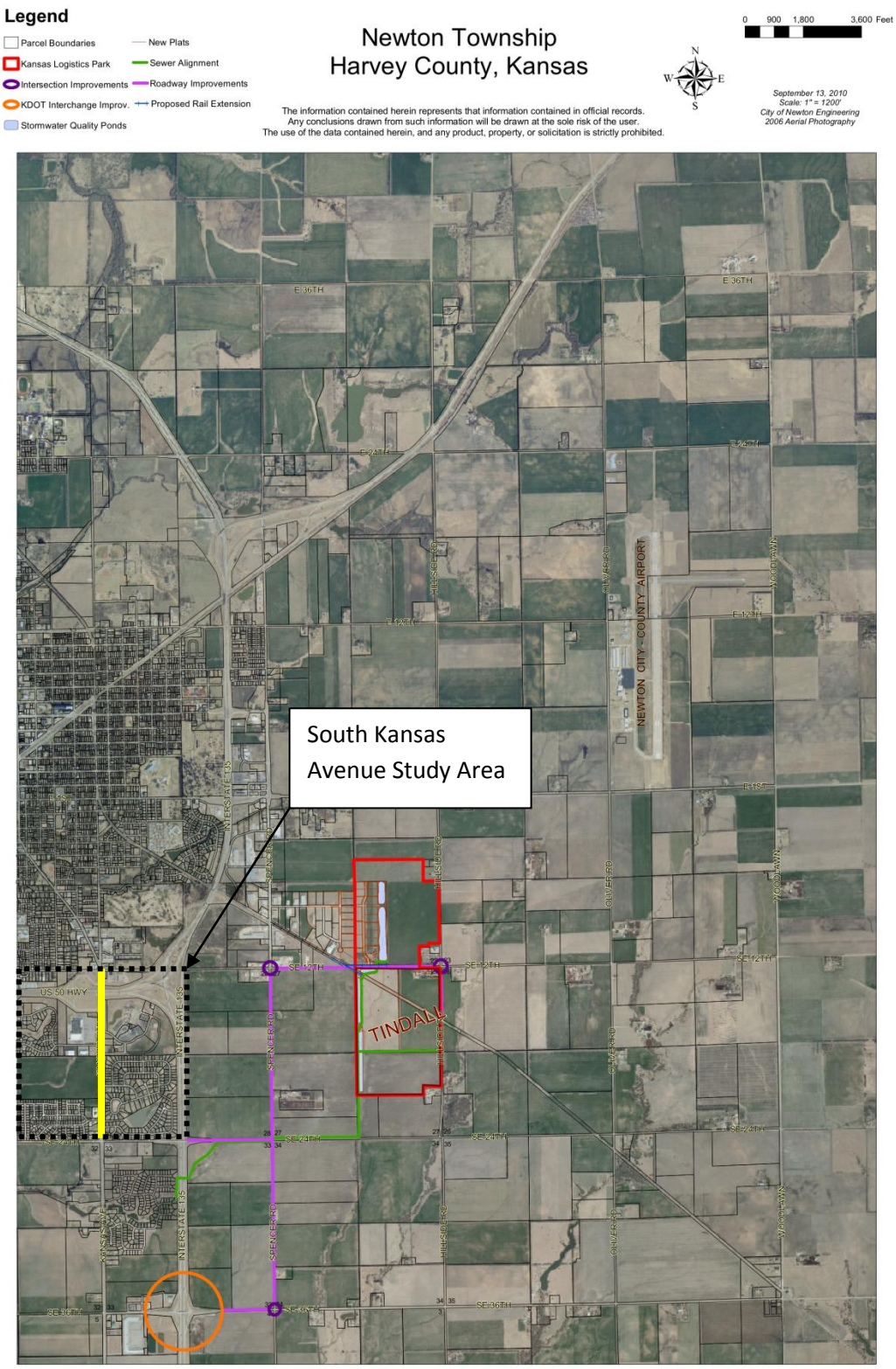

Figure 2 - Kansas Logistics Park Map in Relation to South Kansas Study Area
Source: http://www.newtonkansas.com

2.2.2 Existing Zoning and Comprehensive Plan

The City of Newton provided a zoning map for the area surrounding South Kansas Avenue. The existing developments which were observed in Figure 1 align with the existing zoning. There is still undeveloped land within one mile of South Kansas Avenue which is zoned as "C-2" or "General Business District".

The ReNewton Project discusses future land uses, urban growth, and sustainable development and states the following selected goals (City of Newton, Kansas, 2011):

- Encourage urban development in areas where urban roads and infrastructure can be provided.
- Encourage new residential, commercial, and industrial development that creates a pedestrian-friendly environment that emphasizes walking, biking, and connectivity with nearby neighborhoods or the community.
- Design a community development pattern to enable people to walk and bike.

The comprehensive plan also has specific land use policies (selected) for South Kansas Avenue:

- Continue to strengthen the Newton Medical Center on Kansas Avenue as a focal point for a medical district to accommodate additional medical offices, diagnostic centers, laboratories, and related uses.
- The streetscape or civil spaces on (South) Kansas Avenue should have sidewalks on each side of the street, street trees, and unique street and pedestrian lighting in order to create an aesthetically pleasing and safe environment.

The plan suggests that commercial businesses which would serve the South Kansas Avenue corridor would be "big-box" retailers, multi-tenant retail shops, and national food and service franchisees (City of Newton, Kansas, 2011).

Other notable directions the ReNewton plan provides which are also suggested in this study are:

- Provide crosswalks at intersections.
- Construct five-foot sidewalks on both sides of roads classified as arterial and collector streets. Ensure a seven-foot landscape area from the back-of-curb to the edge of the sidewalk for street trees.
- Provide walkways to connect subdivisions to reduce walking/bicycling distances.
- Provide a continuous interconnected roadway system to preserve mobility throughout the community.

It was interesting to note that ReNewton recommends that all arterial and collector streets in the city should have 6-foot bike lanes constructed.

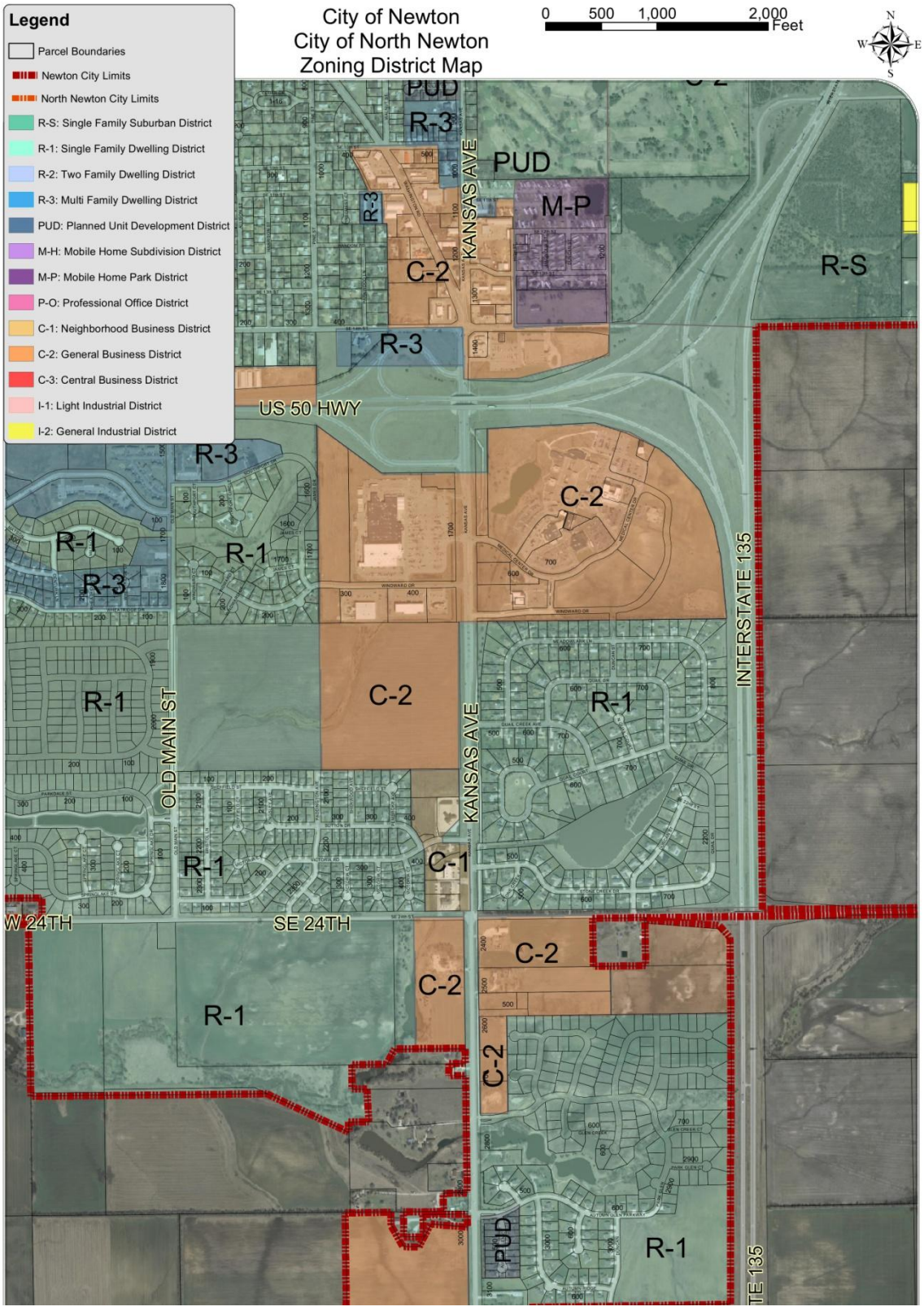

Figure 3 - Existing Zoning Surrounding South Kansas Avenue
Source – City of Newton

2.3 SITE ACCESSIBILITY

The land adjacent to South Kansas Avenue has multiple modes of access available. The primary mode of access is by using the vehicular road network, but the start of a trail system which is attractive to pedestrians and bicyclists was also recently constructed along the east side of South Kansas Avenue.

2.3.1 Roadway Network

The roadway network provides for nearly all of the movement of people and goods currently along South Kansas Avenue.

2.3.1.1 Existing Roadway Network

The existing roadway network is somewhat constrained in this area of South Kansas Avenue due to the access control along both US-50 to the north and I-135 to the east. South Kansas Avenue does have excellent proximity and access for travelers to and from both a US and Interstate Highway which is attractive to potential developers.

Located one mile east of South Kansas Avenue sits I-135 which runs north south paralleling the corridor. The presence of I-135 restricts the ability of travelers to cross east west except at specific points, one of which is located along SE 24th Street. The next closest crossings of I-135 are located 1 mile to the south at SW 36th Street and approximately 1.4 miles north along SE 14th Street which winds up to the northeast to make a crossing of I-135.

US-50 (which is located within the study area) runs east-west along the north side of the corridor and connects with I-135. US-50 can be crossed at Kansas Avenue, and one mile west along Anderson Road (interchange currently under construction). US-50 used to be able to be crossed at Old Main Street, but that connection was removed as a result of safety concerns. The US-50 & Anderson Road interchange, currently under construction, is scheduled to be open in June 2014 and will provide improved local access to and from US-50.

To the south and west of the study area there are no major constraints, with city and county roadways providing general access. Much of the land to the south and west of the study area is undeveloped.

2.3.1.2 Existing Intersection Geometry and Traffic Control

South Kansas Avenue is considered an arterial street in *The ReNewton Project: Comprehensive Plan (2010 - 2030)* between 14th Street and 24th Street. A description of existing intersection geometry and traffic control along South Kansas Avenue is provided:

<u>14th Street</u> – Signalized intersection with two through lanes northbound, two southbound and dedicated left-turn lanes on South Kansas Avenue (also referred to as K-15 north of the US-50 interchange). 14th Street has a single lane eastbound and westbound with a dedicated left-turn lane at the intersection. Pedestrian crosswalks are present across all four legs of the intersection and pedestrian heads and pushbuttons are present on the traffic signals. Curb ramps are present at the crosswalks. Left-turn signal phasing includes protected/permitted on South Kansas Avenue (K-15) and permitted only on 14th Street. Overhead lighting is present on all four quadrants of the

intersection and detection is accomplished through video. This traffic signal is not coordinated with any traffic signals in the area. A raised median island is present both north and south of the intersection to limit full access movement from existing driveways near the intersection. 14th Street is considered an arterial street in *The ReNewton Project: Comprehensive Plan (2010 - 2030).*

US-50 & K-15 (South Kansas Avenue) Interchange – this interchange is a folded diamond interchange to the west of South Kansas Avenue (K-15). The connection to South Kansas Avenue (K-15) is comprised of a westbound US-50 ramp terminal as well as an eastbound US-50 ramp terminal.

> Westbound US-50 ramp terminal – This is a STOP controlled "T"-intersection to the west with two through lanes in each direction on South Kansas Avenue (K-15) and a dedicated northbound left-turn lane. There is a break in the raised median island to provide full access to South Kansas Avenue (K-15).
>
> Eastbound US-50 ramp terminal – This is a STOP controlled "T"-intersection to the west with two through lanes in each direction on South Kansas Avenue (K-15) and a dedicated northbound left-turn lane. There is a break in the raised median island to provide full access to South Kansas Avenue (K-15).

Medical Center Drive – Signalized intersection with two through lanes northbound, two southbound and dedicated left and right-turn lanes on South Kansas Avenue (see Figure 4). Medical Center Drive is the main access to the medical center development to the east and Walmart development to the west. Medical Center Drive has a single lane eastbound and westbound with a dedicated left-turn lane at the intersection. There are no pedestrian accommodations at the intersection including sidewalks, marked crosswalks, pedestrian heads and pushbuttons on the traffic signals. Left-turn signal phasing includes protected/permitted on South Kansas Avenue and permitted only on Medical Center Drive. Overhead lighting is present on all four quadrants of the intersection. The type of vehicle detection is not evident at the intersection. This traffic signal is not coordinated with any traffic signals in the area. A raised median island is present both north and south of the intersection to limit full access movement from existing driveways near the intersection.

Figure 4 - South Kansas Avenue approaching Medical Center Drive (southbound)

Source: Parsons Brinckerhoff

Windward Drive West – This is a STOP controlled "T"-intersection to the west with two through lanes in each direction on South Kansas Avenue and a dedicated northbound left-turn lane (short). There is a break in the raised median island to provide full access to South Kansas Avenue. Windward Drive West provides access to South Kansas Avenue from a housing development east of Old Main Street as well as from the Walmart development area (Orscheln – Farm and Home; Dollar Tree strip mall and Arby's restaurant). Traffic volumes at this intersection increased when direct access to US-50 from Old Main Street was closed. A raised median island is present both north and south of the intersection to limit full access movement from existing driveways near the intersection.

Windward Drive East – This is a STOP controlled "T"-intersection to the east with two through lanes in each direction on South Kansas Avenue and a dedicated southbound channelized left-turn lane (short). This intersection is considered a right-in/right-out/left-in access due to the raised median island on South Kansas Avenue through the intersection. Windward Drive East provides access to South Kansas Avenue from the southern area of the medical center development and will be the most direct access to the proposed YMCA development. It also provides secondary access to Medical Center Drive within the development to the north.

Quail Creek Avenue – This is a STOP controlled "T"-intersection to the east with two through lanes in each direction on South Kansas Avenue (four-lane undivided). The raised median island on South Kansas Avenue terminates just north of this intersection. This intersection provides access to the Quail Creek neighborhood that contains approximately 150 residential homes. There is currently no roadway connection between the Quail Creek neighborhood and the medical center development. A connection between the medical center and the residential area would enable workers to access each location without using South Kansas Avenue. There is currently no roadway connection between the Quail Creek neighborhood and the Stone Creek neighborhood to the south.

Victoria Road – This is a STOP controlled "T"-intersection to the west with two through lanes in each direction on South Kansas Avenue (four-lane undivided) (Figure 5). This intersection provides access to the Stratford Place neighborhood that contains approximately 217 residential homes. There are several connections between the Stratford Place neighborhood and surrounding streets (Paddington Avenue connects with 24th Street to the south; Victoria Road and Sheffield Street connect with Old Main Street to the west). North of the Stratford Place neighborhood is approximately 80 acres of undeveloped land.

Figure 5 - South Kansas Avenue at Victoria Road (southbound)
Source: Parsons Brinckerhoff

Stone Creek Drive – This is a STOP controlled "T"-intersection to the east with two through lanes in each direction on South Kansas Avenue (four-lane undivided). This intersection provides access to the Stone Creek neighborhood that contains approximately 47 residential homes. There is currently no roadway connection between the Stone Creek neighborhood and the Quail Creek neighborhood to the north.

24th Street – This is a STOP controlled intersection (24th Street) with two through lanes in each direction on South Kansas Avenue (four-lane undivided) and one through lane in each direction on 24th Street. 24th Street is an important east/west roadway as it travels over I-135 to the east (no access to I-135) and connects with both Old Main Street and Anderson Road to the west. 24th Street is considered an arterial street in *The ReNewton Project: Comprehensive Plan (2010 - 2030).*

2.3.2 Programmed Improvements

The programmed improvements along South Kansas Avenue within or near the study area are listed below as well as depicted on Figure 6:

- S. Kansas Reconstruction from just south of the eastbound US-50 ramp terminal to Quail Creek Drive (currently under construction) – calendar year 2012
- US-50 & Anderson Interchange – calendar years 2012 – 2014 (near study area)
- S. Kansas Mill and Overlay from Quail Creek Drive to 24th Street – calendar year 2013
- US-50 Ramp Terminals – Addition of protected right-turn lanes on both eastbound and westbound US-50 exit ramps - calendar year 2014
- S. Kansas Mill and Overlay from 24th Street to Autumn Glen Parkway – calendar year 2014 (south of study area)
- S. Kansas Mill and Overlay from Autumn Glen Parkway to 36th Street – calendar year 2015 (south of study area)

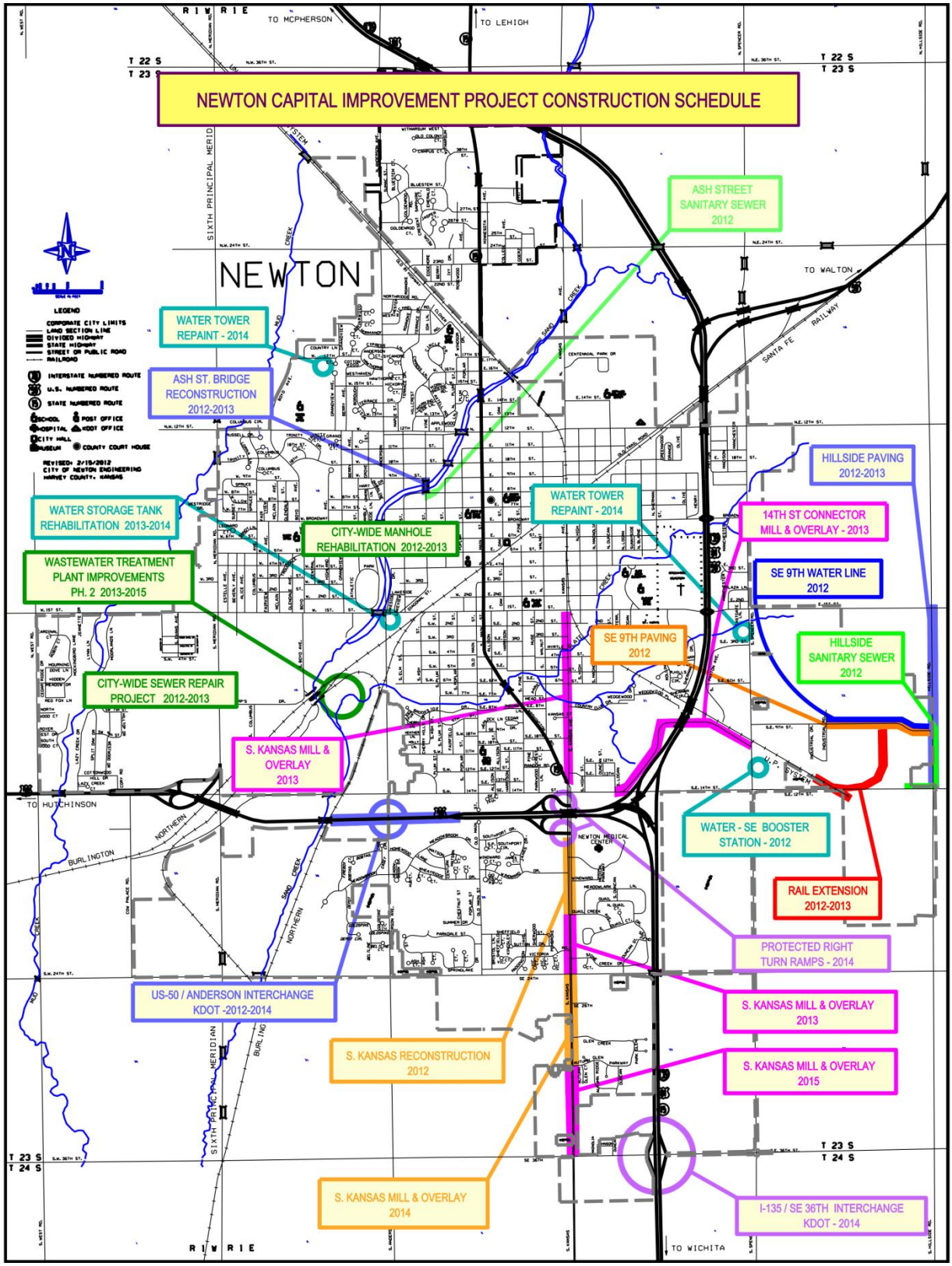

Figure 6 - Newton Capital Improvement Project Schedule (2012)
Source – City of Newton

2.3.3 Alternate Transportation Mode Choices

Other modes of transportation may also be used to move people and goods to and from land uses adjacent to South Kansas Avenue. These modes of transportation include transit, cycling, and walking.

2.3.3.1 Transit

The City of Newton does not operate a general public transit service. Harvey County, which the City of Newton is located in, does operate a limited demand response transit system weekdays from 8am to 5pm (Harvey County, 2012) (Kansas University Transportation Center).

2.3.3.2 Cycling and Walking

A recently completed shared-use path on the east side of South Kansas Avenue is attractive to cyclists and pedestrians for shorter distance trips. Shared-use path designs such as this which have a very limited number of street crossings and driveways protruding into the path could be expanded and extended throughout the city. These types of paths encourage more active transportation and should increase the health of those who use them consistently. There is currently no crosswalk to get from the east side of South Kansas Avenue at Medical Center Drive. There is demand for a signalized crosswalk at this location due to the retail establishments on the west side of South Kansas Avenue. This was mentioned in the public survey responses which were distributed to both residents and businesses within the study area. There is also demand for a sidewalk along with west side of South Kansas Avenue from 14th Street to 24th Street per the comments given in the public survey.

Figure 7 - Shared-Use Path on the East side of South Kansas Avenue
Source: Parsons Brinckerhoff

2.4 EXISTING TRAFFIC VOLUMES

Traffic counts were obtained for 11 different intersections within the study area on South Kansas Avenue, including one on the southwest side of the study area at 24th St & Old Main Street (Figure 8). These locations were counted on Wednesday, August 8th, 2012 from 6:30am to 8:30am and from 4:00pm to 6:00pm. The full set of traffic counts, which were obtained as part of the study, are included in the appendix. The PM traffic counts were much higher overall than the AM traffic counts so the decision was made to analyze the PM traffic only as part of this study. Typically the peak hour during the PM traffic counts was from 4:45pm to 5:45pm, although a couple of intersections had a slightly different peak hour. The peak hour of each individual intersection was used to show the estimated greatest demand possible along the corridor even if the peak hour of the intersection occurred at a time outside of 4:45pm to 5:45pm.

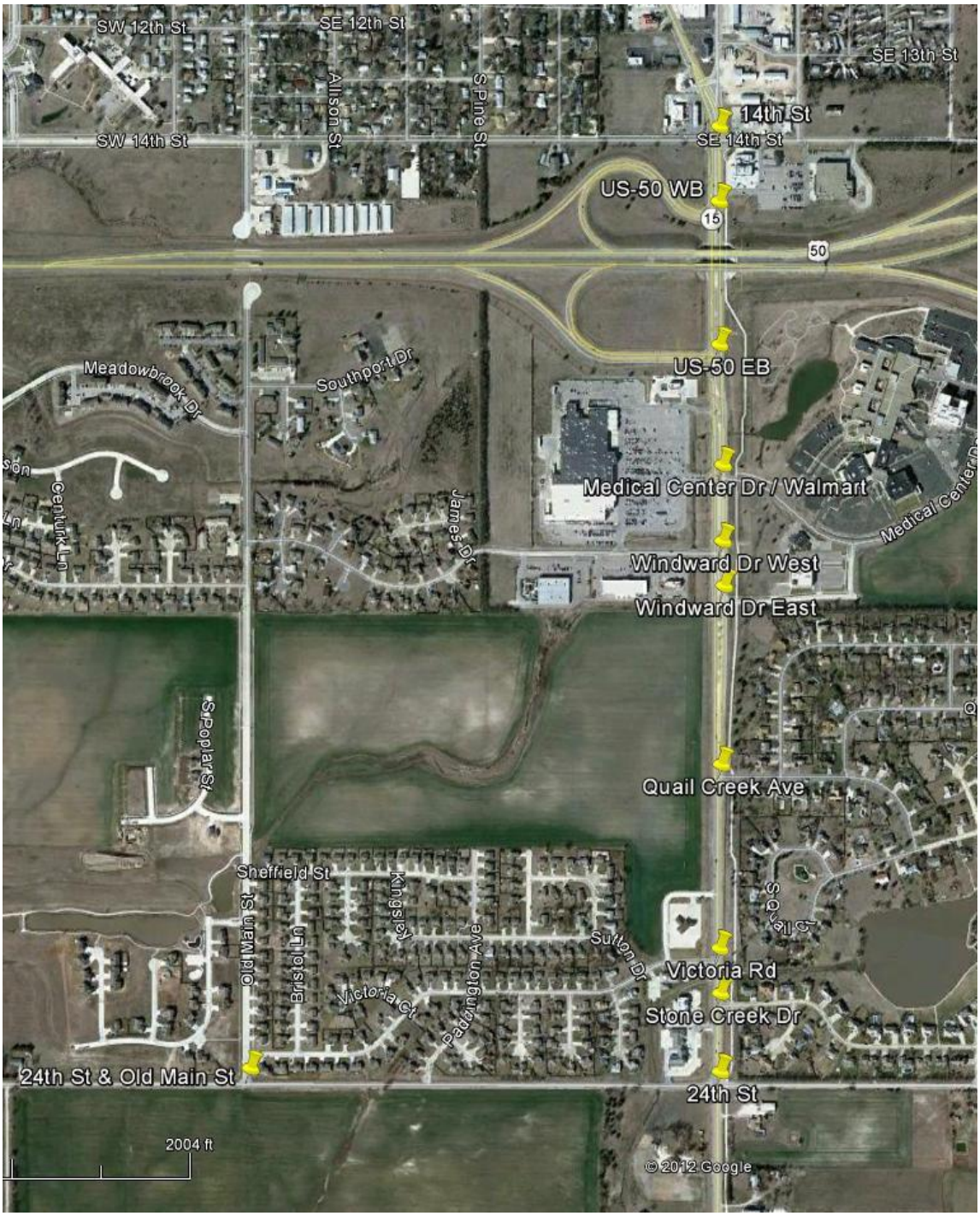

Figure 8 - South Kansas Avenue Traffic Study Traffic Count Locations Labeled by Cross-Street
Source – Google Earth 2012

Heavy vehicle (truck) volumes were generally at or below 2% of all vehicles counted. A heavy vehicle percentage of 2% will be used for all turning movements at all intersections.

2.4.1 Traffic Volumes

The existing PM peak hour traffic volumes are shown in Figure 9.

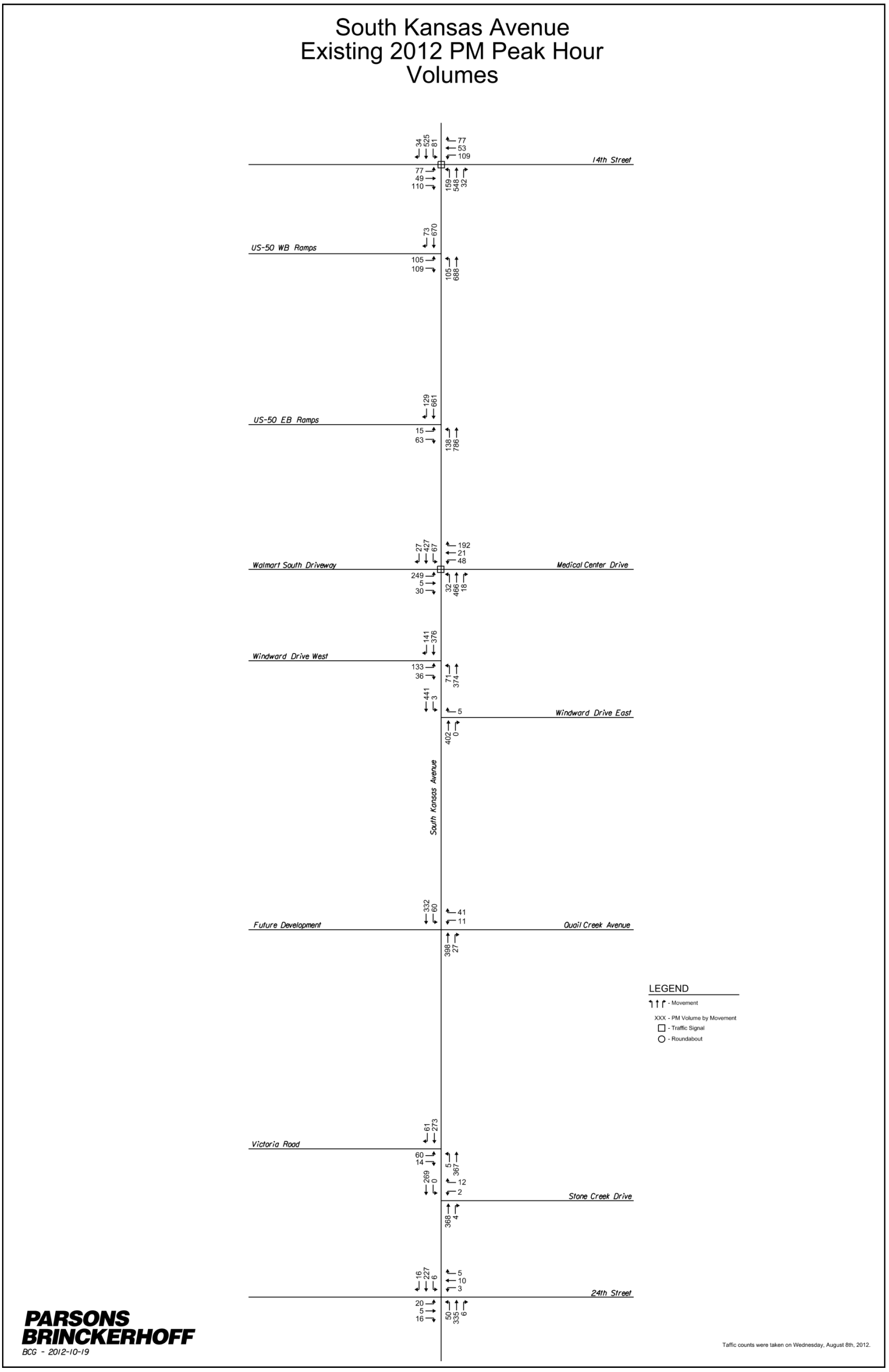

Figure 9 - 2012 Existing PM Peak Hour Volumes

2.4.2 Traffic Signal Warrants

There are nine types of traffic signal warrants which can be used to assist with justifying the installation of a traffic control signal at an intersection. The warrants are listed in the Manual of Uniform Traffic Control Devices (MUTCD). The most commonly analyzed warrants are Warrant 1, 8-Hour Vehicular Volume and Warrant 3, Peak Hour. Some of the higher volume intersections which are not currently controlled by a signal will be analyzed within this section using the existing peak hour and 24-hour 2012 volumes. The MUTCD provides guidance on this topic and states in section 4C.01 that "The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal" along with "A traffic control signal should not be installed unless one or more of the factors described in this Chapter are met."

The following unsignalized intersection currently meets MUTCD traffic signal control Warrant 1A (8-Hour Vehicular Volume):

- Kansas Ave & US-50 WB Ramp Terminal

The following unsignalized intersections currently meet MUTCD traffic signal control Warrant 3B (Peak Hour):

- Kansas Ave & US-50 WB Ramp Terminal
- Kansas Ave & Windward Drive West

The following unsignalized intersections currently do not meet MUTCD traffic signal control Warrant 3B (Peak Hour):

- Kansas Ave & US-50 EB Ramp Terminal
- Kansas Ave & Quail Creek Avenue

While two of the intersections currently meet at least one of the traffic control signal warrants, the installation of traffic signals that meet warrants only during the peak hours may result in more delay during the rest of the day than they help during the peak hours. Further traffic signal warrant analysis data can be found in the appendix.

2.4.3 Capacity and Level of Service

Capacity and Level of Service (LOS) calculations are provided throughout the report for both existing 2012 volumes and for projected 2030 volumes. The 2010 Highway Capacity Manual (HCM) defines ranges that correspond to performance indicators known as LOS. LOS calculations are based on the driver's perception of the traffic conditions. LOS A is the best operating condition from the driver's perspective and LOS F has the longest delays, therefore being the worst operating condition. LOS D or better is considered acceptable in most urban settings during the peak hour. None of these vehicular LOS indicators take into account the user's perspective from other modes and the LOS provided to them such as pedestrians, cyclists, or transit users. The application used for operational analysis was Trafficware's Synchro v8.

Table 1 - Signalized Intersection Level of Service Criteria

Level of Service	Description	Average Control Delay per Vehicle (seconds/vehicle)
A	Little to no delay. Progression is either exceptionally favorable or the cycle length is very short.	≤ 10
B	Volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short.	> 10 - 20
C	Progression is favorable or the cycle length is moderate. Individual cycle failures may begin to appear at this level.	> 20 - 35
D	Volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are noticeable.	> 35 - 55
E	Volume-to-capacity ratio is very high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.	> 55 - 80
F	Volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear to the queue.	> 80

Table 2 - Two-Way and All-Way Stop Controlled Intersection Level of Service Criteria

Level of Service	Description	Average Control Delay per Vehicle (seconds/vehicle)
A	Little or no delay.	≤ 10
B	Short traffic delays.	> 10 - 15
C	Average traffic delays.	> 15 - 25
D	Long traffic delays.	> 25 - 35
E	Very long traffic delays.	> 35 - 50
F	Demand exceeds capacity resulting in extreme delays and queuing.	> 50

2.4.4 Existing 2012 LOS

The current day LOS can be seen in Figure 10.

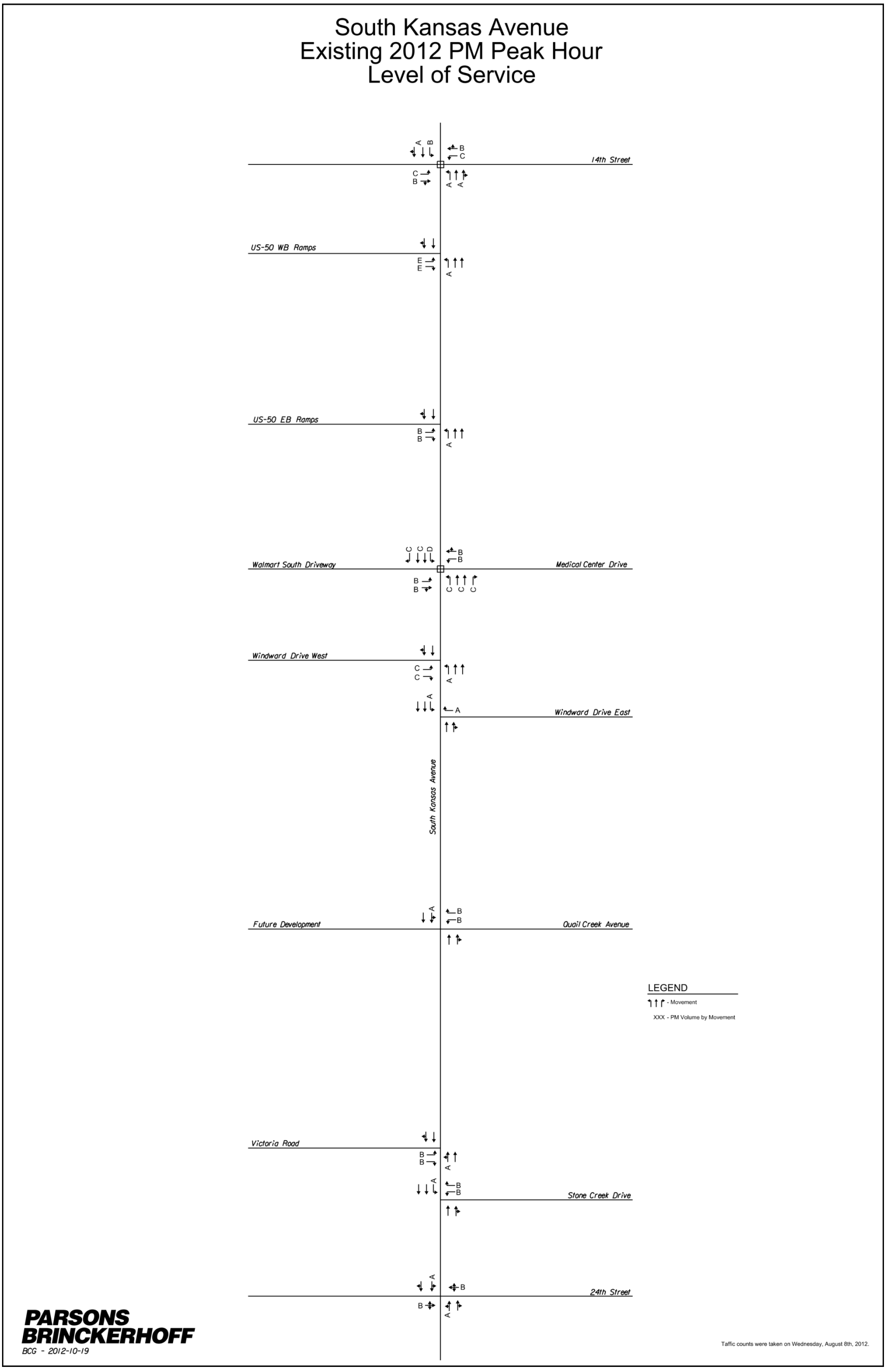

Figure 10 - 2012 Existing LOS

2.5 TRANSPORTATION SYSTEM MANAGEMENT PROGRAMS

The City of Newton does not currently have a transportation system management program in place for South Kansas Avenue. Access management should be used along this corridor to reduce the existing number of connections to South Kansas Avenue, or to at least limit the number of future connections made. More on this topic will be discussed in later sections.

2.6 EXISTING CRASH ANALYSIS

Crashes reports were obtained from the City of Newton Police Department along South Kansas Avenue, between 14th Street and 24th Street, from October 14, 2009 to July 20, 2012 (2.8 years). Crash rates were calculated for both roadway sections as well as individual intersections and were compared against statewide averages for each as well as with a critical crash rate. When the calculated crash rate (section or intersection) is above the critical crash rate, there is a statistically significant crash rate at the intersection that needs to be reviewed in more detail. Table 3 shows the Statewide Average Crash Rates (2007 – 2011) for the Kansas State Highway System. This was used to evaluate the calculated and critical crash rates along two segments of South Kansas Avenue.

Table 3 - Statewide Average Crash Rates (2007-2011) on the Kansas Highway System

Accidents for Years 2007 - 2011

Lane Class	Access Control	Urban/Rural	Miles	MVM*	Five Year Statistics: Total Accidents	Fatal Accidents	Injury Accidents	PDO Accidents	Accident Rates	Fatal Rates	Injury Rates
2 Lane Divided	FULL	URBAN	3.110	37.10	14	0	7	7	0.377	0.000	0.189
	PARTIAL	RURAL	0.312	1.74	2	0	1	1	1.151	0.000	0.576
2 Lane Undivided	FULL	RURAL	48.313	295.08	379	9	65	305	1.284	3.050	0.220
		URBAN	13.740	111.51	122	6	24	92	1.094	5.381	0.215
	NONE	RURAL	7,768.411	23,256.50	34,920	450	6,127	28,343	1.502	1.935	0.263
		URBAN	111.155	1,039.41	2,774	13	640	2,121	2.669	1.251	0.616
	PARTIAL	RURAL	805.401	4,342.87	4,835	77	904	3,854	1.113	1.773	0.208
		URBAN	62.792	702.93	1,111	11	245	855	1.581	1.565	0.349
4 Lane Divided	FULL	RURAL	1,615.684	17,979.81	12,756	102	2,323	10,331	0.709	0.567	0.129
		URBAN	447.419	10,812.21	12,872	70	2,744	10,058	1.191	0.647	0.254
	NONE	RURAL	61.210	444.68	450	5	97	348	1.012	1.124	0.218
		URBAN	28.977	517.03	1,256	10	271	975	2.429	1.934	0.524
	PARTIAL	RURAL	453.420	3,444.63	3,323	51	702	2,570	0.965	1.481	0.204
		URBAN	259.123	4,250.57	7,988	48	2,150	5,790	1.879	1.129	0.506
4 Lane Undivided	FULL	URBAN	0.539	6.78	42	0	8	34	6.192	0.000	1.179
	NONE	RURAL	84.337	628.05	1,258	5	265	988	2.003	0.796	0.422
		URBAN	101.051	2,152.44	8,817	31	2,082	6,704	4.096	1.440	0.967
	PARTIAL	RURAL	22.011	228.58	317	2	80	235	1.387	0.875	0.350
		URBAN	24.011	733.57	2,811	4	720	2,087	3.832	0.545	0.982
6 Lane Divided	FULL	RURAL	23.572	759.71	657	1	119	537	0.865	0.132	0.157
		URBAN	157.904	10,725.07	14,765	50	3,580	11,135	1.377	0.466	0.334
	PARTIAL	URBAN	6.620	225.94	250	0	64	186	1.106	0.000	0.283
8 Lane Divided	FULL	URBAN	18.768	2,106.84	2,599	5	650	1,944	1.234	0.237	0.309

*MVM is per million vehicles miles traveled

Friday, August 24, 2012

Source: Kansas Department of Transportation, Bureau of Transportation Planning (2012)

Crashes along the South Kansas Avenue corridor were reviewed in two segments: Segment 1 – 14th Street to just north of Quail Creek Drive (four-lane, divided, no access control, urban); Segment 2 – north of Quail Creek Drive to 24th Street (four-lane, undivided, no access control, urban). The statewide average crash rate for Segment 1 is 2.429 crashes per million vehicle miles per Table 3. The statewide average crash rate for Segment 2 is 4.096 crashes per million vehicle miles per Table 3.

Table 4 shows the crash rate information for both Segment 1 and Segment 2.

Table 4 - South Kansas Avenue Route Characteristics

Limits	Length (Mile)	Speed (MPH)	Through Lanes	Div./ Undiv.	Curb/ Shoulder	Average ADT (VPD)	Total Crashes (Oct 09 to July 12)	Crash Rates (Crashes/MVM)		Note
								Rate	Critical Rate	
14th Street to N. of Quail Creek (Segment 1)	0.67	35 mph / 45 mph	4	Div.	Curb & gutter / Shoulder	14,250	48	4.92	3.21	1, 2, 3
N. of Quail Creek to 24th Street (Segment 2)	0.33	45 mph	4	Undiv.	Shoulder	6,785	10	4.37	5.57	1, 2, 4

1 – The posted speed limit is 35 mph from 14th Street south to Medical Center Drive and 45 mph from south of Medical Center Drive to 24th Street (55 mph south of 24th Street)

2 – Curb, gutter and storm drain exists on the east side of South Kansas Avenue from 14th Street to just north of the K-15 & US-50 interchange where it turns to shoulder to 24th Street. Shoulder is typically present all along the west side of South Kansas Avenue between 14th Street and 24th Street.

3 – Calculated rate is approximately above the statewide average for similar urban corridors (four-lane divided, no access control, urban) across the state (2.43 crashes/mvm) as well as above the critical rate (3.21 crashes/mvm) which is statistically significant.

4 – Calculated rate is slightly above the statewide average for similar urban corridors (four-lane undivided, no access control, urban) across the state (4.1 crashes/mvm) but below the critical rate (5.57 crashes/mvm) therefore is not statistically significant.

Segment 1 contains the commercially developed area of the corridor between 14th Street and Windward Drive. The calculated crash rate is above both the statewide average crash rate as well as critical primarily due to the short length (0.67 miles) and the number of crashes at intersections within this segment. Most crashes occurred at or near intersections, the great majorities are with other vehicles (three were pedestrians/cyclists), most are either angle crashes (side impact) or rear-end and most are non-injury (15% are injury). The focus will be reviewing the crash data at the intersections to see if we can identify patterns that can be addressed. See Figure 11 - Figure 14 for more information regarding crashes within Segment 1.

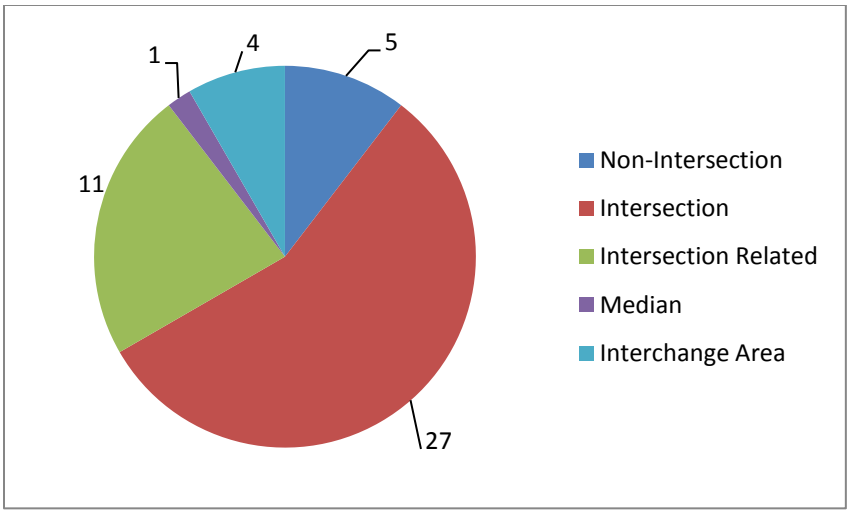

Figure 11 - Segment 1: Crash Location

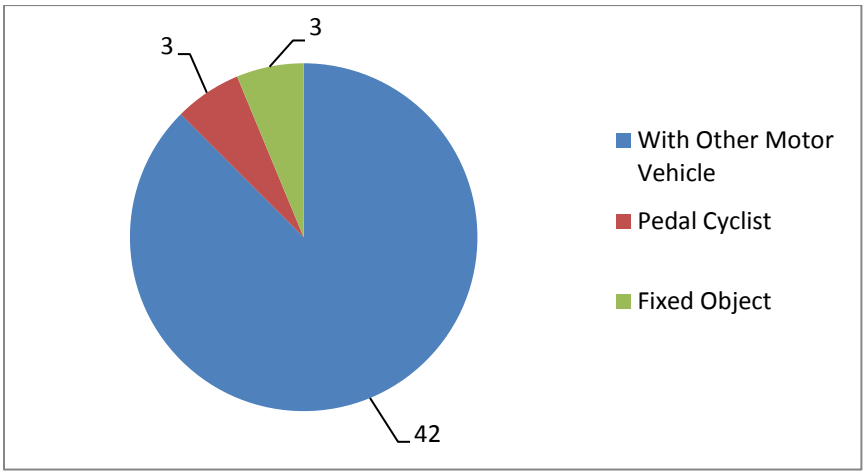

Figure 12 - Segment 1: Accident Class

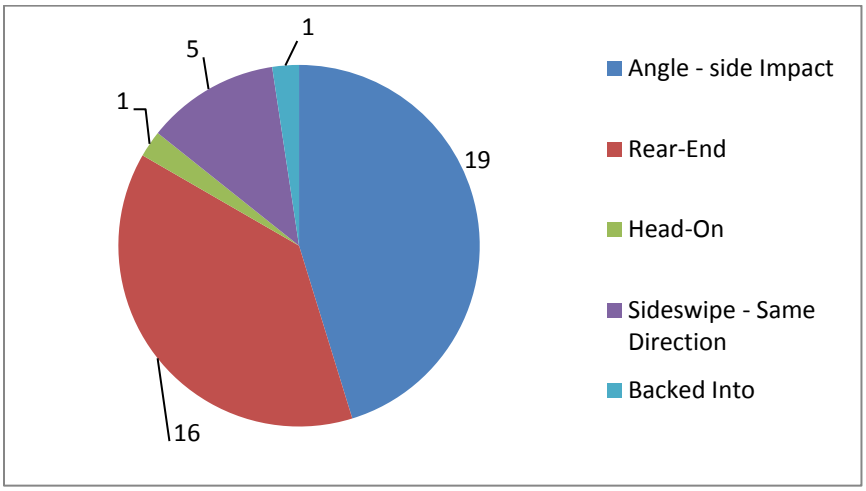

Figure 13 - Segment 1: Collision with Other Motor Vehicle

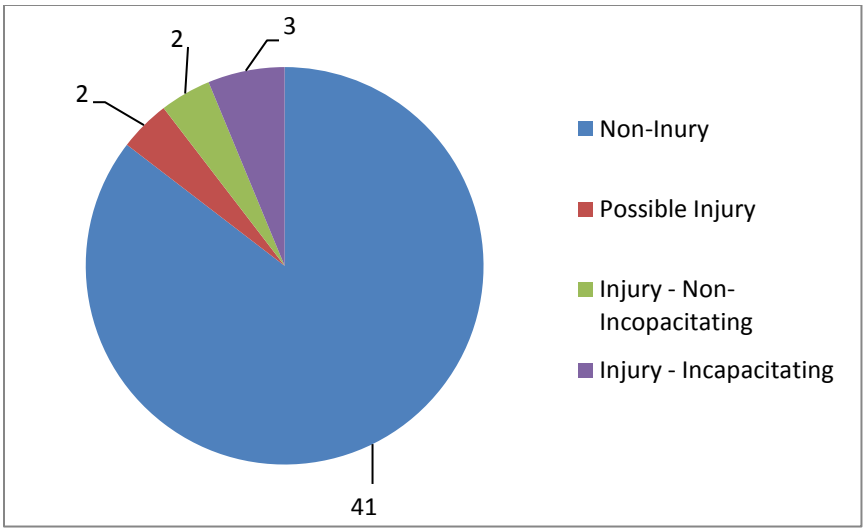

Figure 14 - Segment 1: Crash Severity

Segment 2 contains primarily residential development with only a commercial development on the west side of South Kansas Avenue just northwest of 24th Street. The calculated crash rate is slightly above both the statewide average crash rate but below the critical crash rate. Again the short segment length (0.33 miles) is attributed to bringing the crash rate to just above average. Most crashes occurred at or near intersections however three occurred at the private development driveway. Most crashes are occurring with other vehicles (90%) and most are either angle crashes (side impact) or rear-end. Most of the crashes are non-injury (60%) however 40% are either possible injury or injury. This may be attributed to the higher speed drivers are traveling in Segment 2 (posted speed 45 mph). See Figure 15 - Figure 18 for more information regarding crashes within Segment 2.

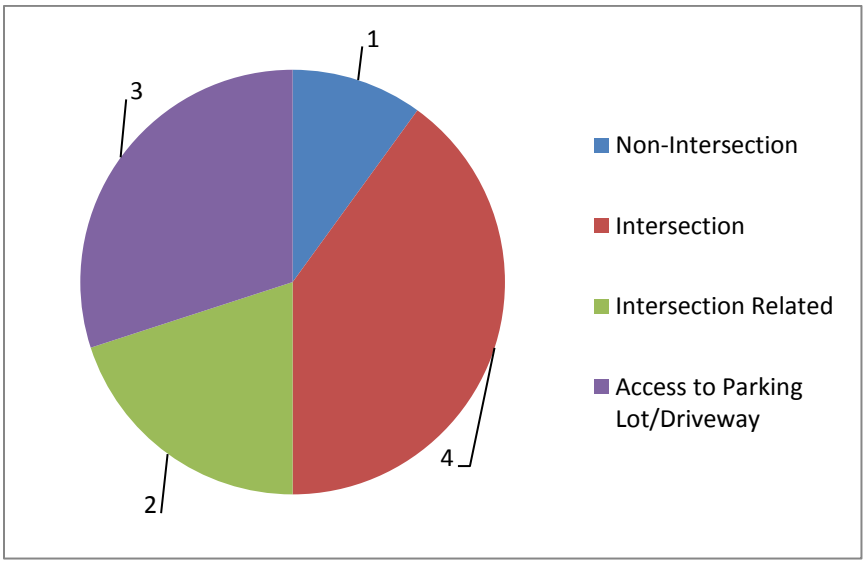

Figure 15 - Segment 2: Crash Location

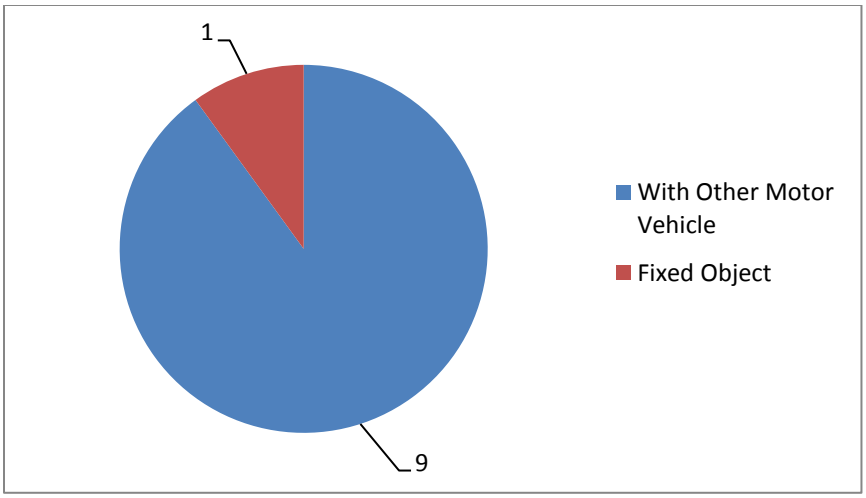

Figure 16 - Segment 2: Accident Class

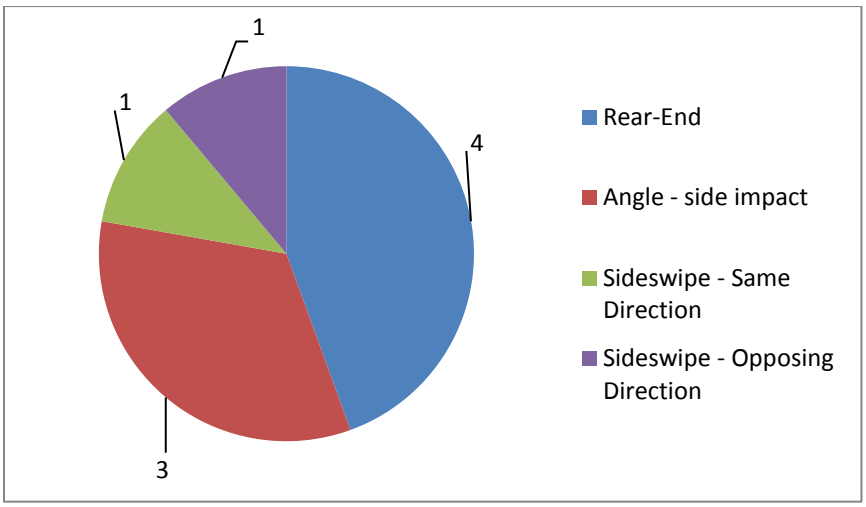

Figure 17 - Segment 2: Collision with Other Motor Vehicle

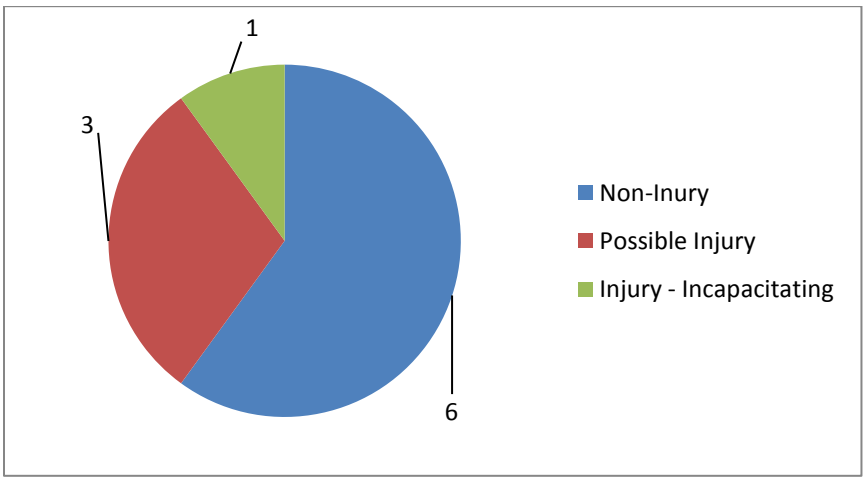

Figure 18 - Segment 2: Crash Severity

Table 5 shows the crash rate information for the intersections along South Kansas Avenue from 14th Street to 24th Street.

Table 5 - South Kansas Avenue Intersection Characteristics

Intersection	Traffic Control		Entering Traffic (ADT)	Total Crashes (Oct 09 to July 12)	Crash Rates (Crashes/TMEV)		Note
	East Leg	West Leg			Rate	Critical Rate	
14th Street	Traffic Signal		20,936	9	4.21	11.71	
US-50 WB Off-Ramp	N/A	R1-1	19,391	6	3.03	11.86	
US-50 EB Off-Ramp	N/A	R1-1	19,791	6	2.97	11.82	
Medical Center Dr.	Traffic Signal		19,540	16	8.01	11.84	3
Windward Dr. (west)	N/A	R1-1	11,300	6	5.20	13.05	
Windward Dr. (east)	R1-1	N/A	8,520	0	0.00	13.82	1
Quail Creek Drive	R1-1	N/A	9,037	2	2.17	13.65	
Victoria Road	N/A	R1-1	7,900	2	2.48	14.04	
Stone Creek Drive	R1-1	N/A	6,720	1	1.46	14.55	
Entrance Into Private Develop.	N/A	N/A	6,410	3	4.58	14.71	2
24th Street	R1-1	R1-1	7,109	1	1.38	14.37	

Note: R1-1 is a STOP sign at the intersection

1 – Windward Drive (east) is a "T" intersection to the east with right-in/right-out/left-in access

2 – This entrance is a "T" intersection to the west into a private development. An estimate of 100 vehicles per day was used for calculating the Crash Rates

3 – Calculated rate is approximately the statewide average for similar urban intersections across the state (8.0 crashes/TMEV) but below the critical rate which is not statistically significant

The average crash rate for an urban intersection is 8 to 10 crashes per ten million entering vehicles (TMEV). We selected 8 crashes/TMEV for our average intersection crash rate along the corridor. The only intersection with a crash rate slightly above average was Medical Center Drive. Sixteen crashes occurred at this intersection during this 2.8 year period with the following details: six rear-end, five angle, two sideswipe (same direction), one head-on (lt-turn) and two pedestrian (cyclist). Rear end crashes are typical for traffic signals in urban areas however the five angle and two pedestrian (cyclist) crashes are not. Two of the angle crashes were red-light running in nature, two were failing to yield the

right-of-way (left-turns) and one a disregard for signals. Both pedestrian (cyclist) crashes involved a northbound cyclist on South Kansas that was struck by a southbound left-turner that did not yield to the cyclist. No fault implied to the cyclist, each was traveling on South Kansas Avenue instead of the multi-use path that parallels South Kansas on the east side.

Table 6 shown crash patterns that were identified as part of the analysis and potential countermeasures as improvements are made along South Kansas Avenue:

Table 6 - Identified Crash Patterns and Potential Countermeasures for Intersection Crashes along South Kansas Avenue (14th Street to 24th Street)

Intersection	Crash Pattern	Potential Countermeasure 1	Potential Countermeasure 2	Note
14th Street	Left-turn crashes at traffic signal	As left-turn volumes increase on 14th Street, consider protected-permitted left-turn phasing versus permitted	As left-turn volumes increase on South Kansas, consider protected left-turn phasing versus protected-permitted	1
US-50 EB Off-Ramp	Angle crashes at Stop controlled intersection	Consider the installation of a coordinated traffic signal when signal warrants are met in the future		2
Medical Center Drive	Angle/left-turn crashes and pedestrian (cyclist) crashes	Encourage cycling on shared-use path and provide pedestrian accommodations at the traffic signal (crosswalks and pushbuttons and ped-heads)	As left-turn volumes increase on Medical Center Drive, consider protected-permitted left-turn phasing versus permitted As left-turn volumes increase on South Kansas, consider protected left-turn phasing versus protected-permitted	1,2
Windward Drive (west)	Left-turn crashes eastbound Windward Drive (west) to northbound South Kansas Avenue	Align Windward Drive (west) with Windward Drive (east) and signalize intersection when signal warrants are met		2
Entrance Into Private Develop.	Left-turn crashes eastbound to northbound South Kansas Avenue	Install raised median island along South Kansas Avenue to manage access as right-in/right-out/left-in		2

1 – Provide improvements during normal traffic signal maintenance as left-turn volumes increase and modified left-turn phasing is needed. Cost estimates for these improvements are not provided.

2 – Costs associated with these improvements are included in Table 13.

2.7 PUBLIC INVOLVEMENT

The Kansas Avenue Traffic Study in Newton included a public involvement component developed to gather input from area citizens and businesses. Two surveys, one for individual citizens and one for businesses, were created online at SurveyMonkey.com. Paper copies of the surveys were mailed to area residents and businesses within the study area, encouraging people to fill out the survey online or mail the paper copy to the City of Newton. Links to the survey were also posted on the City of Newton website as well as their Facebook page. The public survey links were advertised via a press release sent to *The Kansan* (Newton's regional newspaper) which featured an article with links to the public survey.

The issues most mentioned in the survey responses included concerns about the intersections of Kansas Avenue and Windward Drive West and Kansas Avenue and US-50. Many respondents shared their desire to see sidewalks on both side of Kansas Avenue, as well as a place(s) for pedestrians and bicyclists to safely cross Kansas Avenue. The surveys included questions about people's use of the study area, what areas they have concerns about, their feelings about specific traffic control solutions and their thoughts on the study area's growth potential. A full summary of the survey results is included in the appendix.

An open house will be held on Tuesday, November 13, 2012 at the fire station located on South Kansas Avenue just south of the intersection with 24th Street to share information about the study and its results with the members of the public in Newton.

3 Planned Development Information

This section addresses the development which is expected to occur before 2030 adjacent to South Kansas Avenue.

3.1 Land Uses

There are two primary locations for development along South Kansas Avenue. One of them is located just southeast of the existing Newton Medical Center on the east side of South Kansas Avenue and the other is located on the West side of South Kansas Avenue south of Wal-Mart and three out lots. Each of these two developments will be described separately.

Both of the development sites are zoned as "C-2" or "General Business District" with a fairly wide range of land uses which could arise from this zoning type.

3.1.1 Site Development East

The undeveloped land on the east side of South Kansas Avenue is expected to be a mixture of a community recreation center, perhaps a YMCA, along with general medical-type office buildings. These office buildings are expected to be medical in nature due to the proximity of Newton's Medical Center which is just across the street along Medical Center Drive.

Figure 19 - Site Development East
Source – Google Earth 2012

3.1.2 Site Development West

The undeveloped land on the west side of South Kansas Avenue is somewhat unknown. ReNewton suggests that this area could contain a "big-box" retailer, multi-tenant retail shops, and national food and service franchisees (City of Newton, Kansas, 2011). City of Newton staff suggested that some general office buildings could located behind the retail stores. According to the City of Newton, there has been no commitment to develop the land at this time. This property does not have an adjacent land use such as the Newton Medical Center which might foretell more specific land uses such as the site development east of South Kansas Avenue. The undeveloped site on the west also has a large drainage ditch running through the northwest corner, from northeast to southwest which can be seen on the aerial.

Figure 20 - Site Development West
Source – Google Earth 2012

3.2 VEHICULAR TRIP GENERATION

Calculating the site generated traffic for both of the developments involves multiple steps and assumptions. The steps include trip generation, reductions for pass-by and/or diverted link trips, trip distribution, modal split, and trip assignment. Assumptions that are made for each step are discussed within each step in the process.

3.2.1 Trip Generation

Vehicular demand for each development was estimated using data from the Institute of Transportation Engineers' "Trip Generation, 8th Ed: An ITE Informational Report" (Institue of Transportation Engineers, 2008). The land use codes used for the South Kansas Avenue Traffic Report were: 720 Medical-Dental Office Building (Medical Center development), 495 Recreational Community Center (Medical Center development), and 820 Shopping Center (development west of South Kansas Avenue). The 720 Medical-Dental Office Building description states "A medical-dental office building is a facility that provides diagnoses and outpatient care on a routine basis but is unable to provide prolonged in-house medical and surgical care. One or more private physicians or dentists generally operate this type of facility. The 295 Recreational Community Center description states "Recreational community centers are stand-alone public facilities similar to and including YMCAs." Various lines from the description of 820 Shopping Center state "A shopping center is an integrated group of commercial establishments that is planned, developed, owned and managed as a unit. … Some of these centers contained non-merchandising facilities such as office buildings, movie theaters, restraints, post offices, banks, health clubs and recreational facilities. … Many shopping centers, in addition to the integrated unit of shops in one building or enclosed around a mall, include outparcels. … These buildings are typically drive-in banks, retail stores, restraints, or small offices."

The number of trips generated by each of the land uses was estimated using either preliminary site plans or an estimate of the number of square feet that could be developed as part of the building per acre of land. Square footages of one site plan for the east side development was used to calculate a square-footage of building per acre to estimate the number of square feet that might be developed in the other parcels assuming they will be built at a similar intensity. For the shopping center development on the west side of South Kansas Avenue, existing "big-box" type stores were located and the square footage of the building per acre was calculated for three different stores. The square footage per acre was very similar for the stores measured and was then used to calculate an estimated number of square feet that would be developed for the west side development.

The volume of trips generated by the land use 495 Recreational Community Center was thought to be low, and the number of data points available in the ITE references was only four so this land use was investigated further. The YMCA Operations Director for the Wichita, KS area along with the YMCA CEO for the Salina, KS building were contacted for further information about membership and the pattern of arrivals over the course of a day. We received limited data from the YMCA Operations Director for the Wichita, KS area which was insufficient to incorporate into ITE's trip generation methodology. The CEO for the Salina YMCA provided some high level information that suggested that the volume of trips generated using the ITE equations may be low. A modified value of 124 inbound in the PM peak hour and 211 outbound in the PM peak hour would be more appropriate for the proposed YMCA in Newton.

Table 7 through Table 10 estimates the number of trips in and out of the developments during specific times.

Table 7 - East Side Trip Generation with ITE Defaults

			ITE Vehicle Trip Generation Rates (peak hours are for peak hour of adjacent street traffic)							Total Generated Trips			Total Distribution of Generated Trips			
Description/ITE Code	Units	Value	Weekday	AM	PM	AM In	AM Out	PM In	PM Out	Daily	AM Hour	PM Hour	AM In	AM Out	PM In	PM Out
Medical-Dental Office Building 720	KSF	129.174	Eqn1	2.3	Eqn2	79%	21%	27%	73%	5067	297	353	235	62	95	258
Recreational Community Center 495	KSF	104	n/a	1.62	Eqn3	61%	39%	37%	63%	n/a	168	135	103	66	50	85
East Side Development Total													337	128	145	343

Table 8 - ITE Trip Generation Equations

X = 1000 Sq. Ft. GFA	
Eqn1	T = 40.89 * X - 214.97
Eqn2	Ln(T) = 0.88 * Ln(X) + 1.59
Eqn3	Ln(T) = 0.58 * Ln(X) + 2.21
Eqn4	Ln(T) = 0.65 * Ln(X) + 5.83
Eqn5	Ln(T) = 0.59 * Ln(X) + 2.32
Eqn6	Ln(T) = 0.67 * Ln(X) + 3.37

Table 9 - East Side Trip Generation with YMCA Modification

			ITE Vehicle Trip Generation Rates (peak hours are for peak hour of adjacent street traffic)							Total Generated Trips			Total Distribution of Generated Trips			
Description/ITE Code	Units	Value	Weekday	AM	PM	AM In	AM Out	PM In	PM Out	Daily	AM Hour	PM Hour	AM In	AM Out	PM In	PM Out
Medical-Dental Office Building 720	KSF	129.174	Eqn1	2.3	Eqn2	79%	21%	27%	73%	5067	297	353	235	62	95	258
Recreational Community Center - YMCA Data	KSF	104	n/a	n/a	n/a	n/a	n/a	37%	63%	n/a	n/a	n/a	n/a	n/a	124	211
East Side Development Total													n/a	n/a	219	469

Table 10 - West Side Trip Generation

			ITE Vehicle Trip Generation Rates (peak hours are for peak hour of adjacent street traffic)							Total Generated Trips			Total Distribution of Generated Trips			
Description/ITE Code	Units	Value	Weekday	AM	PM	AM In	AM Out	PM In	PM Out	Daily	AM Hour	PM Hour	AM In	AM Out	PM In	PM Out
Shopping Center 820	KSF	330	Eqn4	Eqn5	Eqn6	61%	39%	49%	51%	14756	312	1416	190	121	694	722
West Side Development Total													190	121	694	722

3.2.2 Reductions for Pass-By and Diverted-Link Trips

Pass-by and diverted-link trips are vehicles that are already on the road network in the area and will just stop by the new development on their way to or from somewhere else. These are not new trips to the roadway network, and as such, need to be removed or re-routed using existing trips. There are no expected diverted-link trips for either the east or west development due to the lack of roadway network redundancy in the area, and the location of the developments on the outside of the main part of the city. The shopping center development on the west side of South Kansas Avenue is expected to attract some pass-by trips. Pass-by trips would be drivers which are already travelling along South Kansas Avenue and just decide to "drop-in" to visit one of the developments in the shopping center and then continue along their original path.

The percentage of generated trips which are pass-by trips can be estimated using ITE's Trip Generation Handbook (Institute of Transportation Engineers, 2004). For the land use 820 Shopping Center with a floor space of 300,000 square feet it is estimated that 27% of all trips will be pass-by trips. These trips can be removed from the additional trips generated by the development and future drivers can just be routed into the development and back out onto South Kansas Avenue to account for the 27% of the trips ITE predicts will be pass-by trips.

3.2.3 Trip Distribution

Using turning movement counts from the existing intersections the trip distributions for the new developments were estimated. Overall, it appears that about 80% of the trips were turning north on South Kansas Avenue, with 20% of the trips turning south. Of the 80% of the trips that were turning north, a noticeable percentage were entering and leaving the US-50 ramps.

Final origin and designation percentages for the developments were: 60% from the north side of South Kansas Avenue, 10% from the WB US-50 ramps, 10% from the EB US-50 ramps, and 20 % from the south side of South Kansas Avenue.

In order to avoid a situation like SW Wannamaker Road, in Topeka, KS where there are full access intersections nearly every 600 feet and people avoid the street due to the delays cause by too much access to local land uses, it was assumed that the intersections on the southern end of the study corridor could be changed to three-quarter access with right-in, right-out, and left-in movements allowed to and from South Kansas Avenue. This would minimize the need for future traffic signals at both Victoria Road and Stone Creek Drive while still providing reasonable access. Three-quarter access at these intersections also provides a reduced potential for future crashes therefore improving safety for the traveling public.

Figure 21 shows the available routes to replace the left-out movement which is proposed to be restricted by the raised median. The purple and yellow routes show two available routes for a driver to make what was an EBL at Victoria Road, while the green route shows the replacement for the WBL at Stone Creek Drive. As a roundabout is proposed at 24th Street, the yellow route would be most similar to the existing Victoria Road EBL, however even if a roundabout is not installed at 24th Street the purple route would still be available.

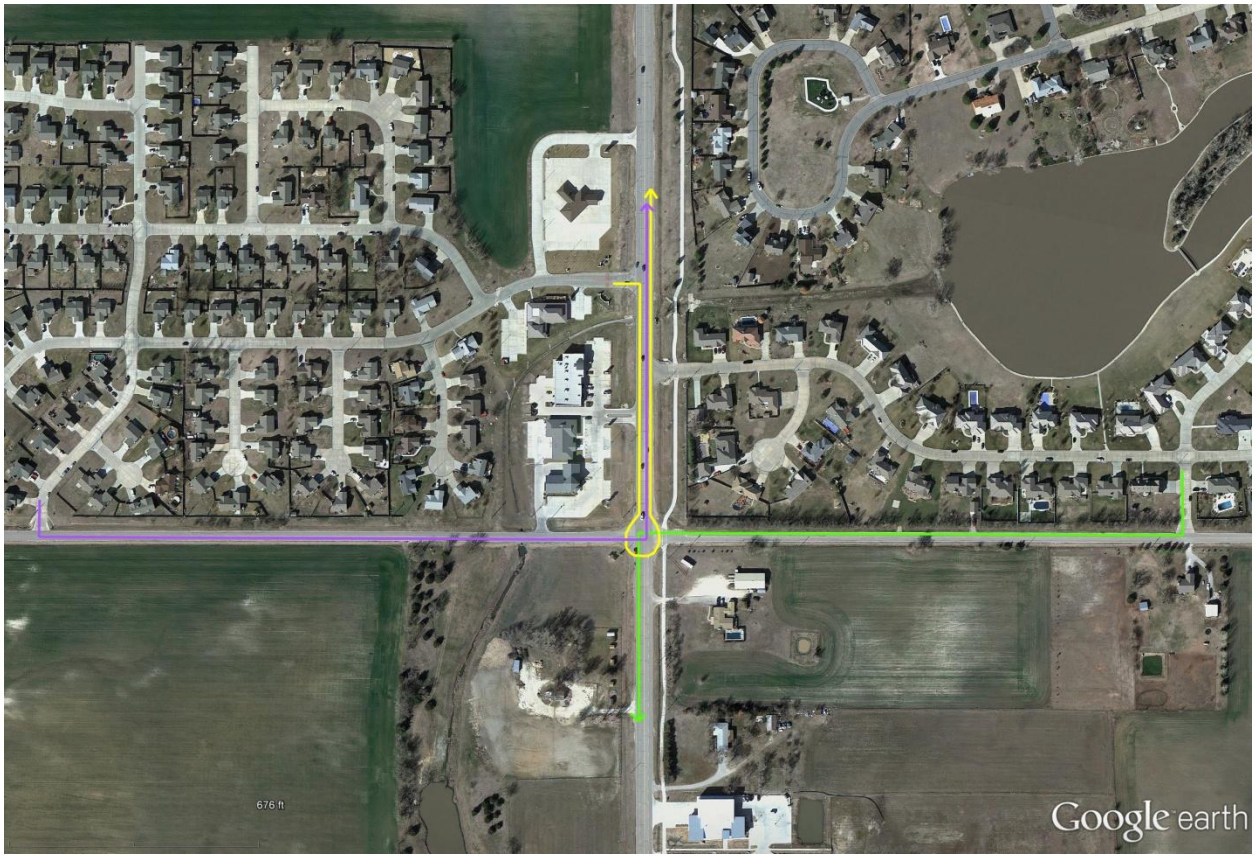

Figure 21 - Routes Available to Replace the Left-Out Movement at Victoria Road and Stone Creek Drive

3.2.4 Development Trip Assignment

The trip assignment is conducted by taking into account the trip generation, reductions for pass-by and/or diverted link trips, and trip distribution. The final traffic volumes expected to be generated by the developments are displayed below for the year 2030 (Figure 22).

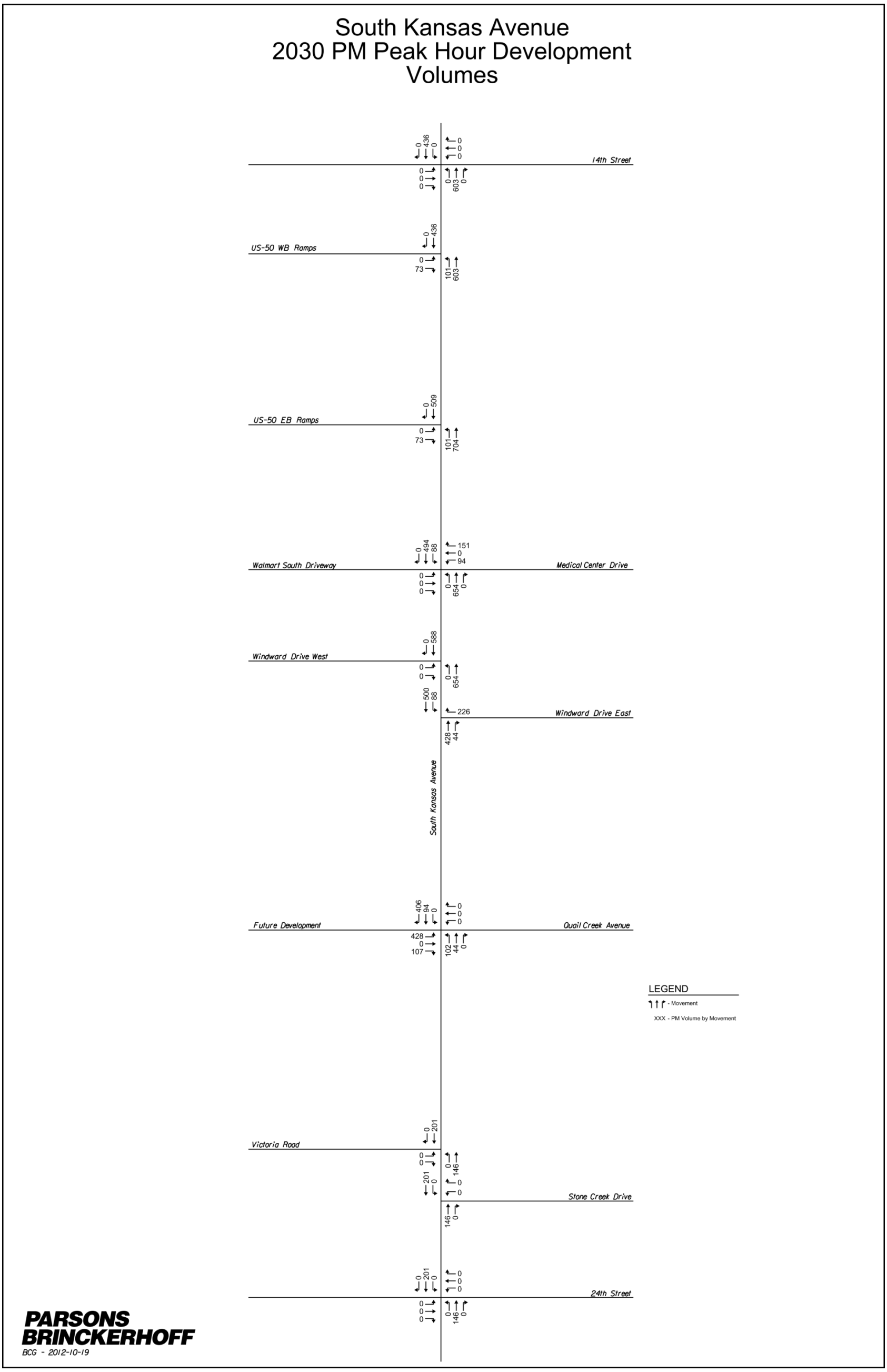

Figure 22 - 2030 PM Peak Hour Development Volumes

3.3 FUTURE BACKGROUND TRAFFIC

The traffic volumes which existed in 2012 were grown to estimate future traffic in the year 2030 without the impact of any developments. The volumes were grown for 18 years at 2% per year which was approved by the City of Newton staff. Given this growth rate, the following equation was used to increase the existing turning movement volumes along the study corridor.

Growth Rate Equation
Growth factor = (1+r)^t, growth over t years
Where
r = Rate (% in decimal form)
t = Time period (in years)
Growth rate from 2012 to 2035:
Growth factor = (1+.02)^18 = 1.428

Figure 23 shows the future 2030 background traffic volumes without any development.

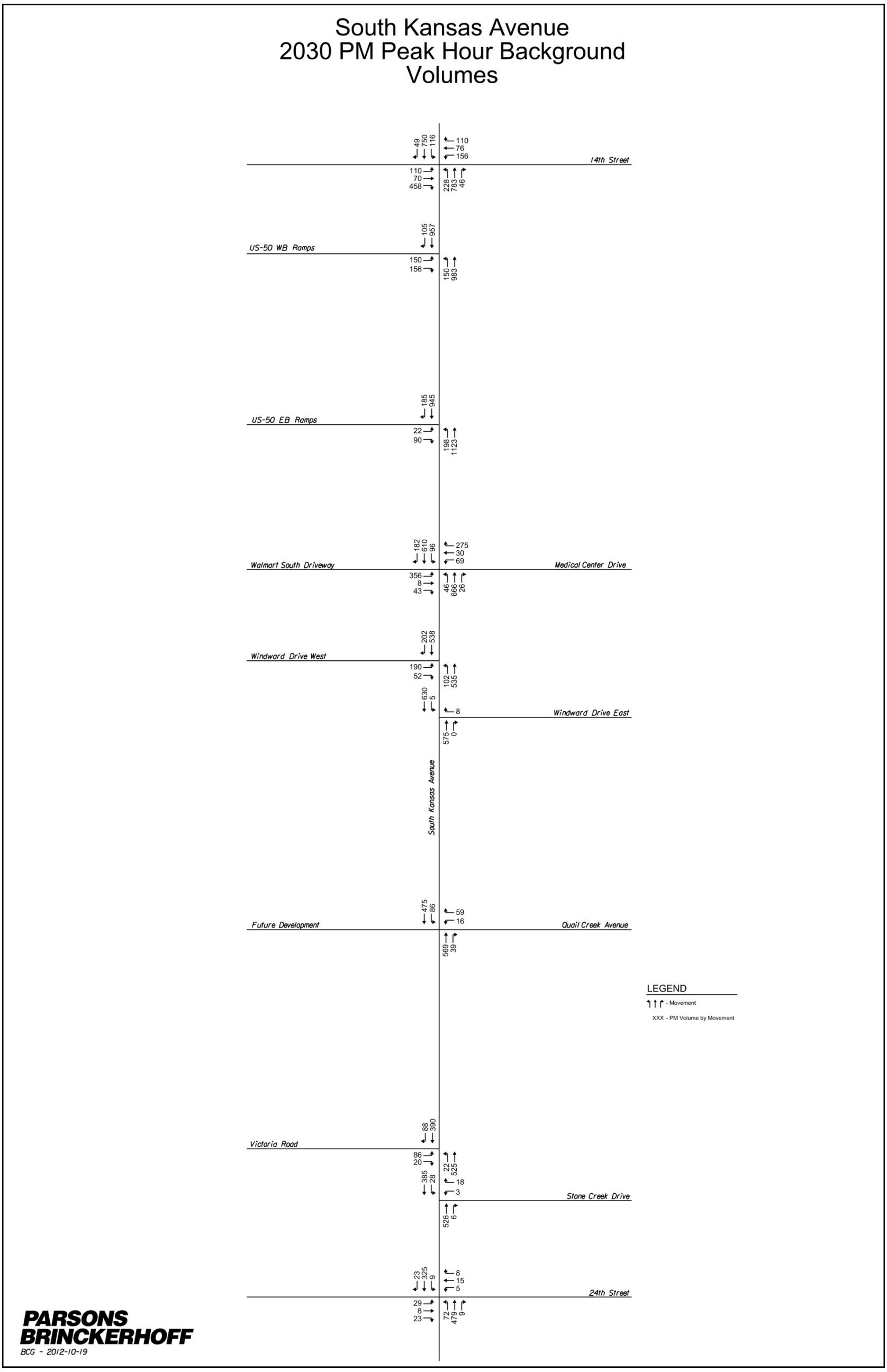

Figure 23 - 2030 PM Peak Hour Background Volumes

3.4 COMBINED DEVELOPMENT AND BACKGROUND TRAFFIC IN 2030

Figure 24 shows the future 2030 background traffic volumes with development included. Some of the traffic volumes shown in this figure will be rerouted in the alternative analysis to account for restricted movements which are being recommended.

These are the future volumes that will be used for the 2030 future volumes traffic analysis.

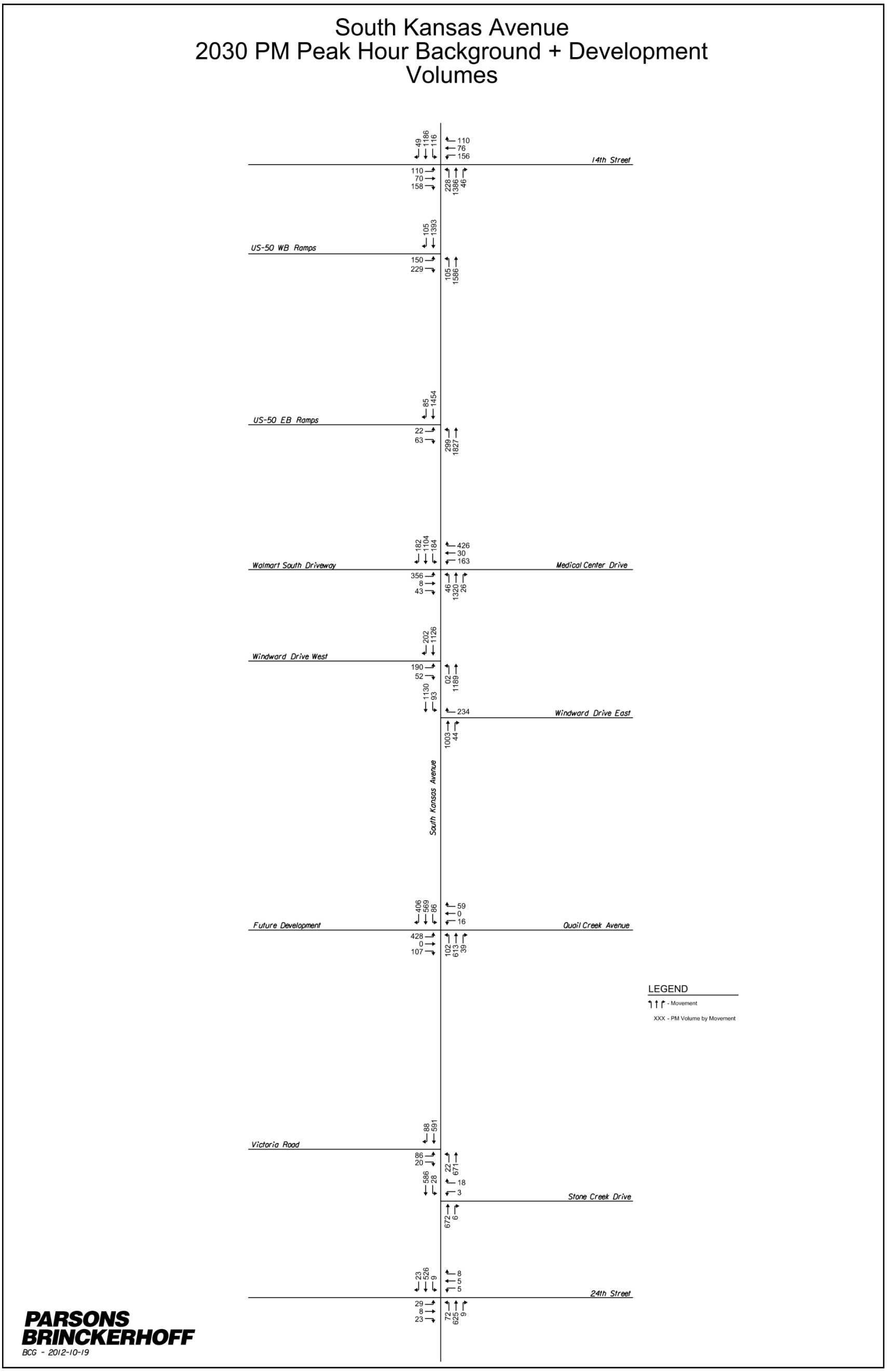

Figure 24 - 2030 PM Peak Hour Combined Volumes

4 Future 2030 Traffic Analysis

This section provides traffic analysis along South Kansas Avenue and the surrounding street system in the year 2030.

4.1 NO-BUILD ANALYSIS

This analysis shows what can be expected in the future without any additional developments including the ones which are analyzed as part of this report. This scenario assumes that no additional pavement is added at any of the intersections along South Kansas Avenue and that additional traffic control signals were not constructed by 2030.

4.1.1 Site Access and Circulation

All of the existing roadway configurations and access points remain as they are currently. No additional access points were added, and none were removed.

4.1.2 Traffic Signal Warrants

The following unsignalized intersection met MUTCD traffic signal control Warrant 1A (8-Hour Vehicular Volume) in the year 2012 and will not be analyzed again:

- Kansas Ave & US-50 WB Ramp Terminal

The following intersections met MUTCD traffic signal control warrant 3B in the year 2012 and will not be analyzed again:

- Kansas Ave & US-50 WB Ramp Terminal
- Kansas Ave & Windward Drive West
- Kansas Ave & Quail Creek Avenue (with development to the west)

The following intersections would still not meet MUTCD traffic signal control warrant 3B in the year 2030 NoBuild scenario:

- Kansas Ave & US-50 EB

4.1.3 Capacity and Level of Service

The LOS for 2030 NoBuild is shown in Figure 25.

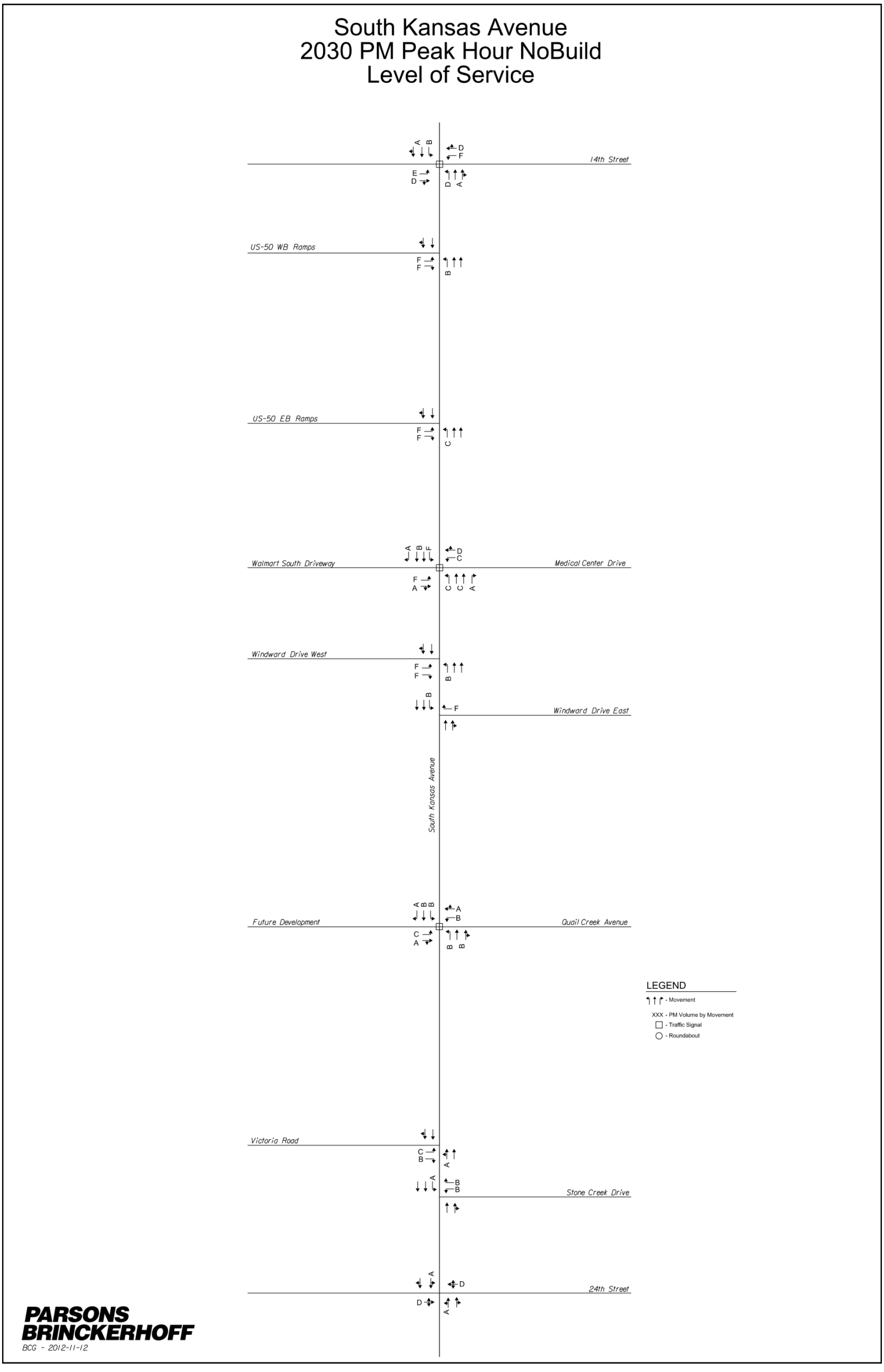

Figure 25 - 2030 NoBuild LOS

4.2 Potential Improvement Analysis

Potential major improvement to South Kansas Avenue to begin the capacity analysis include adding widening to provide a third lane in each direction from 14th Street to Windward Drive West/Windward Drive East, widening to provide a raised median island from north of Quail Creek Drive to 24th Street and a roundabout 24th Street. The last improvement is to align Windward Drive West with Windward Drive East which allows for a single signalized intersection.

4.2.1 Site Access and Circulation

Most existing access locations and movements remain as they exist in 2012. Access at Victoria Road and Stone Creek Drive were changed to three-quarter access (right-in/right-out/left-in). Both of these roadways lead to residential areas on opposite sides of South Kansas Avenue. Each of these residential areas has roadway networks which connect to 24th Street which will allow all movements on to South Kansas Avenue. There are a few businesses just north of 24th Street on the west side of South Kansas Avenue. Customers that wish to return to the north along South Kansas Avenue can make a U-turn at the proposed roundabout at 24th Street.

The internal residential and collector street network should be further connected as development occurs. These internal networks make the system as a whole more redundant, and may alleviate some traffic from South Kansas Avenue. All of the connections are labeled (Eg. A, B…) and will be discussed below. A map of the recommended connections is shown in Figure 26.

On the east side of South Kansas Avenue three local road connections should be constructed. The first connection (A) should be made between the medical-centered commercial use and Meadowlark Lane along Duncan Street (Quail Creek neighborhood). This connection provides residents an additional way to access the medical center, and provides redundancy to the medical center's street network by providing an alternate route. The second local road connection (B) on the east side should be to connect the residential roadways east of the lake and west of I-135 (Stone Creek neighborhood to Quail Creek neighborhood). This local street connection provides redundancy to the street network, and also enables adults and children to access other residential areas without accessing South Kansas Avenue. This connection may encourage at least a few more active transportation choices. For example, a young adult may be allowed to walk to a friend's house along a residential street between neighborhoods, where the parents might have discouraged the same trip had it been along South Kansas Avenue. The third connection (C) will likely be built as the housing development completes their expansion although it seemed prudent to include. Connection (A) should be made as soon as additional commercial development occurs near the medical center. Connection (B) should be made as soon as funds are available in order to connect the neighborhoods, while connection (C) will likely be built as houses are constructed.

On the west side of South Kansas Avenue there are six new local street connections that should be made as part of future development. The first is a connection (E) along the north side of the land which is zoned C-2 and should connect South Kansas Avenue (Stratford Place neighborhood) with Windward Drive West west of Orscheln Farm & Home and east of the residential area. This connection will be termed "New Northern Road" during the analysis to separate it from the existing

Windward Drive (West). At the same time this connection is built Windward Drive East should be realigned to meet up with New Northern Road. This alignment provides additional separation between the signalized intersection at Medical Center Drive and a signalized intersection at New Northern Road/Windward Drive East. A traffic signal at the existing Windward Drive West is too close to Medical Center Drive to provide sufficient storage for the left turns, and would not align well with Windward Drive East. The existing Windward Drive West access would be modified to a Right-In, Right-Out configuration. The left turns out would be handled through the traffic signal at New Northern Road/Windward Drive East.

A second new local street connection (D) would extend Quail Creek Avenue thought the development while curving south toward Sherwood and Paddington Avenue. This is essentially a continuation of Quail Creek Avenue west of South Kansas Avenue. This runs straight through the land zoned C-2, but as seen in the C-2 land just north of there, a similar roadway was constructed without any issues.

A third connection (G) would extend Paddington Avenue from the existing residential area to connection (D) which extended Quail Creek Avenue to the west through the undeveloped C-2 zoning. This would provide local residents with access to the commercial properties located in the undeveloped C-2 or the existing commercial development to the north without needing to access South Kansas Avenue.

The fourth connection (F) is recommended to provide internal site circulation and would be recommended along the front of the site. This connection in combination with connection (G) would provide an internal ring road which is associated with larger developments.

The last two connections are outside the study area, but are obvious extensions to complete the street network in the area. Both connections (I) and (H) should be added to provide cross access through the land currently zoned as residential and the undeveloped C-2 land.

The connections labeled (D), (E), (F) and (G) should occur as soon as development occurs in the commercial area or before. The locations and alignments of (D) and (E) are the most critical since they align the street network with existing roadways and provide sufficient spacing for future traffic signals. When connection (E) is constructed, it is recommended that the Windward Drive East roadway be relocated to align with connection (E) and the Windward Drive West intersection with South Kansas Avenue be changed to a right-in right-out connection.

The connection (E) is recommended to be constructed immediately as a traffic signal is warranted at Windward Drive and South Kansas Avenue, but constructing a traffic signal at the existing location is not recommended. Constructing connection (E) would allow for improved traffic signal spacing along South Kansas Avenue and a traffic signal would be recommended to be installed during the construction of connection (E).

Connection (G) is the next priority, with (F) following last. Single-lane roundabouts are the suggested intersection control type at the intersections of Connection (G),(I), and (E) along with the intersection of Windward Drive West and Connection (E). The roundabouts should reduce the

number of required stops to access South Kansas Avenue northbound from Windward Drive West's residential area.

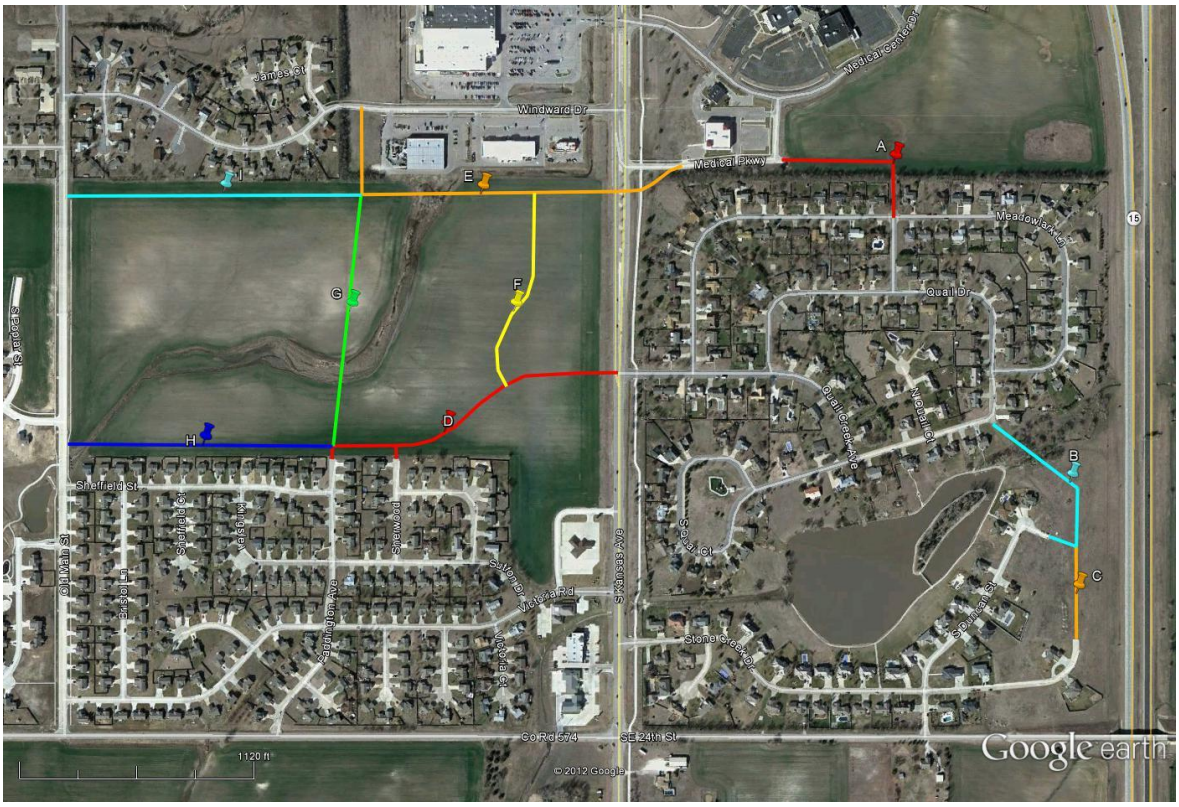

Figure 26 - Recommended Internal Roadway Connections
Source – Google Earth 2012

The estimated cost of these connections can be seen in Table 11. Further detail about the cost estimates can be found in the appendix. Estimated costs of connections do not include turn lanes South Kansas Avenue that may be desired or warranted as part of the connection process. Estimated costs of turn lanes on South Kansas Avenue are accounted for in Table 13.

Table 11 - Estimated Construction Costs of Recommended Local Connections

Connection Designation	Estimated Construction Cost*
A) East Side Medical to Residential	$726,000
B) East Side Residential to Residential	$386,000
C) East Side Residential to Residential	$182,000
D) Quail Creek Extension to Paddington	$824,000
E) New Northern Road and Windward East Alignment Shift (includes traffic signal and two single-lane roundabouts)	$1,574,000
F) West Side Site Internal Circulation	$467,000
G) Paddington Avenue Extension	$520,000
H) Quail Creek Extension (does not include traffic signal; signal included in South Kansas Avenue from Windward Drive to 24th Street cost estimate in Table 13)	$539,000
I) New Northern Roadway Extension	$526,000

*2012 cost to construct (does not include other costs such as preliminary engineering (PE), final design, acquisition of right-of-way, utility relocation or construction engineering (CE). Estimated costs should be updated to reflect the proposed year of construction when that is determined by the City of Newton.

4.2.2 Traffic Signal Warrants

The following unsignalized intersection met MUTCD traffic signal control Warrant 1A (8-Hour Vehicular Volume) in the year 2012 and will not be analyzed again:

- Kansas Ave & US-50 WB Ramp Terminal

The following intersections met MUTCD traffic signal control warrant 3B (peak hour) in the year 2012 and will not be analyzed again:

- South Kansas Ave & US-50 WB Ramp Terminal
- South Kansas Ave & Windward Drive West

It is assumed that many of the trips that were using Windward Drive West are now using New Northern Road. Windward Drive West would no longer be receiving a traffic signal; the New Northern Frontage Road/Windward Drive East intersection would receive the traffic signal. This New Northern Road would also be supporting additional development trips and it is assumed that the combination of these trips would still support a traffic signal in the future. As for all signal installations, current traffic counts and an engineering study should be performed before a signal is installed.

The following intersections would also meet MUTCD traffic signal control warrant 3B (peak hour) in the year 2030 potential improvements scenario:

- South Kansas Ave & US-50 EB
- South Kansas Ave & Quail Creek Avenue

It is likely that the intersection of South Kansas Avenue and Quail Creek will be warranted as soon as development occurs west of intersection. Any of the developments may trigger the traffic volumes required for a traffic signal at the South Kansa Avenue and US-50 EB intersection and volumes should continue to be monitored.

4.2.3 Traffic Signal Coordination

All traffic signals along South Kansas Avenue are assumed to be interconnected and coordinated by the year 2030. The signals are located exceptionally close together at less than 700 ft (1/8 mile) in some cases and South Kansas Avenue will function poorly without coordination. There are multiple ways to provide coordination both from a signal timing aspect, and a communications aspect.

The conventional method of providing traffic signal coordination and optimization is using multiple timing plans which change throughout the day (TOD plans). These timing plans are analyzed by engineers using data collected in the field and the resulting timings for each plan are deployed into the traffic signal controller in the field. These plans are typically not adjusted more than every two years and will not typically self-adjust based on irregular events.

A more recent method of providing traffic signal coordination is through adaptive traffic signals. These traffic signals attempt to adjust to real-time fluctuations in the traffic volumes and communicate with adjacent signalized intersections to provide a “green wave” for drivers to travel along a corridor. The Missouri Department of Transportation says that “Locations with frequently or rapidly changing traffic demands are good candidates for the installation of an adaptive traffic signal system” (Midwest Research Institue and Missouri Department of Transportation, 2012). Kansas communities such as the City of Wichita, Topeka, Manhattan and Lenexa currently have adaptive traffic signals along key corridors to improve travel times and reduce delay for through traffic. The estimated cost of implementation is approximately $30,000 per traffic signal. The estimated cost does not include communications between signals which is required for coordination along the corridor.

Communication between traffic signals can be accomplished using either wired or wireless technology. Current wired networks are typically fiber optic and not copper as was used previously. The other option is to use a wireless network for communications. Fiber optic networks are capital intensive, but generally more reliable and lower maintenance. Wireless network are less capital intensive, but can have degraded communications during inclimate weather and generally require more maintenance than fiber optic networks. It may be possible for additional city communications to use a fiber optic network, depending on the bandwidth required for the traffic signal operations. The estimated cost for a fiber optic network is $115,000 per mile, but costs vary significantly depending on the length of the project and the capabilities of the network. Wireless networks require line of sight from one traffic signal to the next, and the equipment is approximately $8,000 per intersection.

4.2.4 Roadway Modifications

The following roadway modifications are suggested for the future to accommodate expected background growth and future developments within the study area. An additional lane should be

added to South Kansas Avenue from 14th Street to Windward Drive West southbound, and from Windward Drive East to 14th Street northbound. South Kansas Avenue from Quail Creek Avenue to 24th Street should be reconfigured from 4-lane undivided to 4-lane divided. See Figure 27 for a sketch of recommended improvements, Table 12 for a description of each improvement ant Table 13 for the estimated cost.

All of the traffic signals and additional turn lanes at traffic signals that are not directly tied to additional development should occur on an as-needed basis after evaluation of the safety and operational conditions of the intersections. Expected issues if traffic volumes continue to rise are additional delay to drivers, traffic signal cycle failures, and queue spillback from adjacent intersections and from turn lanes into adjacent through lanes. General guidance for urban areas during peak periods would suggest that LOS D is acceptable for overall intersection LOS. It is the preference of individual cities including general public, elected officials, and city staff to determine what an acceptable LOS for individual movements at a given intersection.

The median that is suggested to be added on South Kansas Avenue from Windward Drive to 24th Street could be constructed whenever funds are available. The construction of a median does not limit development opportunities and provides the ability for the city to locate the access points. Some cities in the Kansas City metro region such as Overland Park and Olathe construct medians initially as part of their roadway design along with left and right turn lanes and then install traffic signals if necessary later on. This gives them the ability to space the full access locations up to ¼ mile apart or more. When development does finally occur, the cities charge the developer a site impact fee for the cost of the turn lanes, traffic signal, and other infrastructure changes which may be required to safely and efficiently accommodate the development.

The construction cost estimates provided in Table 13 are the 2012 cost to construct (does not include other costs such as preliminary engineering (PE), acquisition of right-of-way, utility relocation or construction engineering (CE). Estimated costs should be updated to reflect the proposed year of construction when that is determined by the City of Newton.

Figure 27 - Proposed Roadway Configuration Sketch

Table 12 - 2030 Recommended South Kansas Avenue Roadway Modifications

Intersection	Modifications
14th Street	End additional third lane here as a continuous NBR Add an additional third southbound lane just south of 14th Street
US-50 Westbound Off-ramp	Stripe separate left and right turn lanes (added in 2014 project) for EB traffic Add a SBR turn lane Signalize intersection as warrants are met currently and add EB left and right turns are separated into individual lanes (included in programmed projects)
US-50 Eastbound Off-ramp	Stripe separate left and right turn lanes (added in 2014 project) for EB traffic Add a SBR turn lane Signalize when warrants are met and EB left and right turns are separated into individual lanes (included in programmed projects)
Medical Center Drive	Add an additional EBL turn lane Add a WBR turn lane Install pedestrian signals
Windward Drive West	Change Windward Drive West connection with South Kansas Avenue to a right-in, right-out configuration (referred to in detailed cost estimate as north median) End additional third lane here as a continuous SBR
Windward Drive East	Realign Windward Drive East to the south to align with New Northern Road Modify intersection for full access Install traffic signal when warrants are met and geometric changes can be made Install pedestrian signals when traffic signal is installed Start an additional third northbound lane just north of Windward Drive East
Quail Creek Avenue	Widen South Kansas Avenue to provide raised median island Add NBL turn lane Stripe separate WBL turn lane from shared WBT and WBR lane Add SBL turn lane Add SBR turn lane Add dual EBL turn lanes Add shared EBT and EBR lane Add west leg when development occurs and signalize when warrants are met and geometric changes can be made Install pedestrian signals when traffic signal is installed
Victoria Road	Widen South Kansas Avenue to provide raised median island Add NBL turn lane Restrict EBL turns (3/4 access)
Stone Creek Drive	Widen South Kansas Avenue to provide raised median island Add SBL turn lane Restrict WBL turns (3/4 access)

24th Street	Construct two-lane roundabout which allows SB U-turn movements Include pedestrian crossings of all four legs of the roundabout
South Kansas Avenue from 14th Street to Windward Drive West	Construct additional through travel lane in each direction
South Kansas Avenue from Quail Creek Avenue to 24th Street	Reconfigured from 4-lane undivided to 4-lane divided roadway
South Kansas Avenue Entire Length	Construct five-foot sidewalk on west side of South Kansas Avenue

Table 13 - Estimated Construction Costs of South Kansas Avenue-related Recommended Improvements

Roadway Modification	Estimated Construction Cost*
North Median to change intersection of Windward Drive West and South Kansas Avenue to right-in, right-out (Development-related)	$8,000
Northbound left turn lane at intersection of New Northern Road and South Kansas Avenue (Development-related)	$43,000
Southbound right turn lane at intersection of New Northern Road and South Kansas Avenue (Development-related)	$51,000
Northbound left turn lane at intersection of Quail Creek Avenue and South Kansas Avenue (Development-related)	$104,000
Southbound right turn lane at intersection of Quail Creek Avenue and South Kansas Avenue (Development-related)	$51,000
South Kansas Avenue from 14th Street to Windward Drive, all other geometric recommendations, additional third lane and traffic signals	$2,142,000
South Kansas Avenue from Windward Drive to 24th Street, all other geometric recommendations, medians, traffic signals, and roundabout	$1,989,000

*2012 cost to construct (does not include other costs such as preliminary engineering (PE), final design acquisition of right-of-way, utility relocation or construction engineering (CE). Estimated costs should be updated to reflect the proposed year of construction when that is determined by the City of Newton.

The additional third lane on South Kansas Avenue is needed if the City desires to keep the vehicular LOS above LOS F overall at the signalized intersections into the future. This recommendation is confirmed by using the Florida Department of Transportation's Level of Service Tables (Florida Department of Transportation, 2009) which is commonly used as a reference by the State of Kansas and other states and municipalities across the United States. The generalized peak hour two-way volume for areas transitioning into urban areas with state signalized arterials is shown in Table 14. Given the predicted two-way peak hour volume on South Kansas Avenue is nearly 3,600 vph in 2030 it can be seen that a 4-lane divided roadway is insufficient and would presumably be LOS F along the corridor. Expanding South Kansas Avenue in this high volume section would provide approximately LOS D along the corridor. The Highway Capacity Manual LOS methodology does not account for queue spillback into a subject intersection from a downstream intersection which is the issue with the 4-lane cross section noted in SimTraffic microsimulation.

Table 14 - Florida DOT Level of Service Table

Class III/IV(more than 4.50 signalized intersections per mile)

Lanes	Median	B	C	D	E
2	Undivided	**	460	1,040	1,300
4	Divided	**	1,110	2,480	2,800
6	Divided	**	1,750	3,860	4,260

These modifications change the vehicular network and the volumes are adjusted slightly to account for the modified network in Figure 28.

The name designation of New Northern Road, Windward Drive West, and Windward Drive East should be discussed internally by the City of Newton staff and elected officials. There are a couple options available. One is to leave Windward Drive West as is and rename Windward Drive East. The new name for Windward Drive East would also be the new name of New Northern Road as they would be aligned with each other at the intersection. This would be the recommended option as there is little to no development existing along New Northern Road and Windward Drive East. This also means that the existing Windward Drive that residents use as their address would not change. This eliminates the confusion those residents may experience if they were required to change their address with all banks, institutions, families, and other organizations. Continuing with the medical-centered theme of Medical Center Drive, one possible name to provide Windward Drive East/New Northern Road would be Medical Center Parkway. The City of Newton does not appear to have a consistent naming convention for existing streets so the re-named and new streets could be designated with any name desired. Another option would be to keep the existing Windward Drive West and Windward Drive East name, and name New Northern Road something different. This may cause confusion however for drivers are the two Windward Drives would not line up with each other and would be offset along South Kansas Avenue.

The city should scrutinize street naming and address standards from a city-wide perspective. Other cities such as Overland Park, KS have done so to clarify addresses and standardize the issue (City of Overland Park, KS, 2011)(City of Overland Park, KS). It also assists emergency responders as they have a consistent order to street names and numbers they can use to decrease response time and increase geospatial awareness.

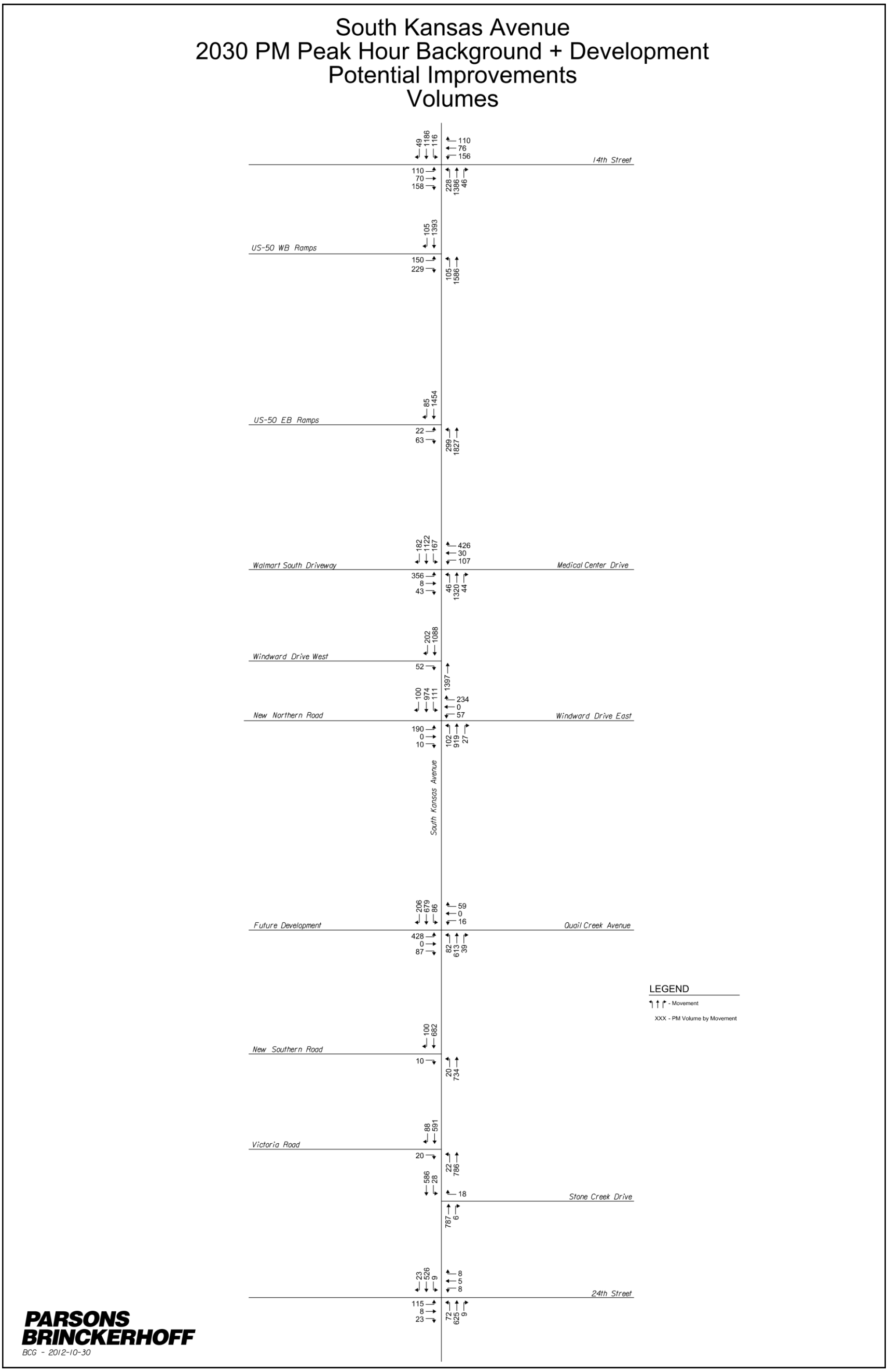

Figure 28 - Proposed Improvement Volumes

4.2.5 Capacity and Level of Service

The estimated LOS in 2030 utilizing the changes recommended for a Potential Improvements alternative is shown in Figure 29.

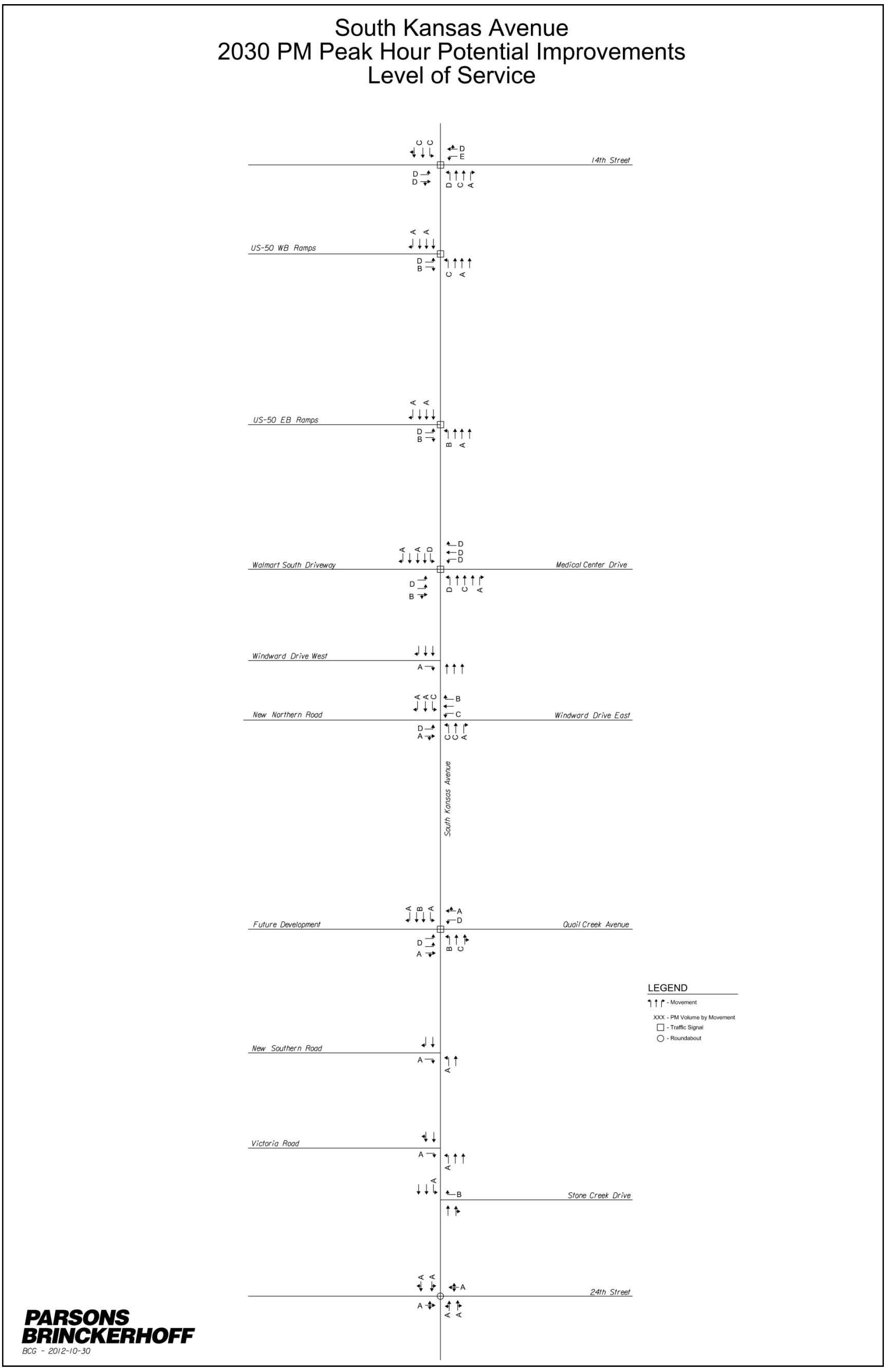

Figure 29 - 2030 Alt1 PM Peak Hour LOS

5 Summary

South Kansas Avenue is a moderately developed corridor with many public roadways connecting to it which are offset from each other.

5.1 Findings and Conclusions

These numerous offsetting roadways on each side of South Kansas Avenue create capacity issues along South Kansas Avenue. Many of the three leg intersections will warrant traffic signals in the future, and some of the intersections warrant them currently during the peak hour. As the number of traffic signals grows along the corridor coordination will become an issue with such tight spacing between intersections.

There is a need to improve local connectivity within the local street network within the study area particularly within a half mile east and west of South Kansas Avenue. These local roadway connections may relieve some of the congestion on South Kansas Avenue for a limited number of travelers who would be able to access adjacent land uses if the roadway network was fully connected. Further development on the west side of South Kansas Avenue should be required to make the internal connections mentioned in the report to attempt to provide a higher degree of network connectivity.

Along with monitoring volumes at intersections to see if an intersection would warrant a traffic signal, the most needed improvements along South Kansas Avenue proper are bicycle and pedestrian accommodations. While there is a wide shared use path on the east side of South Kansas Avenue, there are not sidewalks on the west side of South Kansas Avenue. There are also no pedestrian accommodations to cross South Kansas Avenue at Medical Center Drive. Providing acceptable pedestrian accommodations to travel along the west side of South Kansas Avenue as well as to cross South Kansas Avenue would meet public expectations based on the feedback provided in the public survey.

5.2 Recommendations

There are two primary recommendations which were found as part of the South Kansas Avenue traffic study. The first is site access and improving network circulation for the area. The second is future infrastructure located presumably within the South Kansas Avenue right of way.

5.2.1 Site Access and Circulation

There are numerous network connections which are located on each side of South Kansas Avenue which would extend local collector and residential roadways into adjacent land uses. These roadways would enable travelers to access adjunct residential and commercial areas without using South Kansas Avenue. Any further development of these areas should have these connections required as part of their development.

5.2.2 South Kansas Avenue Infrastructure

There are two intersections along South Kansas Avenue that currently warrant traffic signals. One is at the US-50 westbound ramp terminal, and the other is at Windward Drive East/New Northern Road. Both of these locations along with the US-50 eastbound ramp terminal received many comments from the public desiring traffic signals at these locations as well.

The other desire which was noticed in the public survey was the lack of pedestrian and bike accommodations along the west side of South Kansas Avenue and the current inability to safely cross South Kansas Avenue, particularly at Medical Center Drive. Pedestrian accommodations should be added at the intersection of South Kansas Avenue and Medical Center Drive to enable a safe crossing of South Kansas Avenue. A sidewalk should be added along the west side of South Kansas Avenue when possible to comply with the general public's request and to comply with ReNewton. All future traffic signals should have pedestrian accommodations installed when the initial signal is installed along this corridor.

The largest recommendations for South Kansas Avenue which affect vehicle travel are to align Windward Drive West with Windward Drive East and add a third lane in each direction from that intersection north to 14th Street. The third lane is required if the city chooses to maintain the driver's level of service (LOS) along this stretch of the corridor in the future. Traffic signals should be added when warranted and coordination will be required due to the frequency of closely spaced intersections. Additional improvements away from South Kansas Avenue recommend additional connectivity between adjacent residential areas, along with connections between residential and commercial areas to fill in existing gaps in the transportation network.

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