PURPOSE

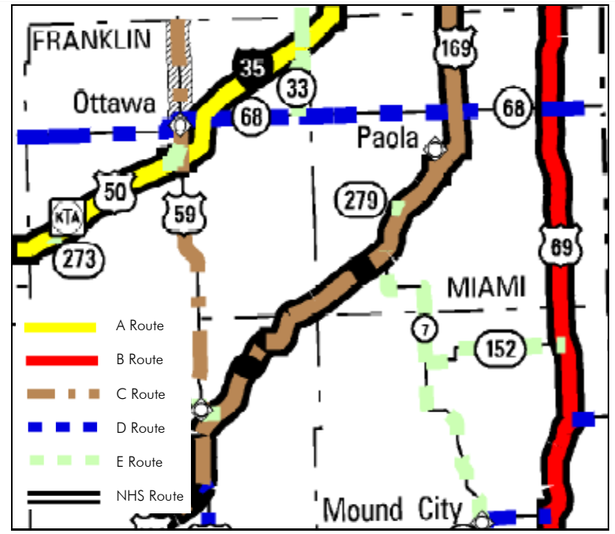
The traffic analysis component of the K-68 Corridor Management Plan incorporates information on the existing transportation network, such as traffic volumes and intersection features, with existing land use data to create a computer travel demand model that replicates existing traffic conditions. Using information gathered from the general public, area agencies, and future land-use plan, the computer model was used to project future traffic growth scenarios along the K-68 corridor. The consultant team used these computer generated traffic projections to identify future traffic congestion at intersections and along segments of the corridor and to determine improvements projects needed to keep traffic flowing efficiently along the corridor.

BACKGROUND

In 2003, KDOT adopted the current Corridor Management Policy. The intent of the policy is to provide criteria and procedures necessary to obtain reasonable access to properties abutting the highway while preserving the transportation system in terms of safety, capacity, and speed. Additionally, the policy is one tool used to help establish statewide consistency in KDOT's management of transportation corridors.

Many of the recommended improvements in this plan are based on criteria from the KDOT Corridor Management Policy. The policy requires a higher level of performance for routes that are expected to experience substantial land use development and traffic growth. In order to achieve this goal, criteria for access spacing and corridor management is based, in part, on KDOT route classifications. See Exhibit 4.1.

K-68 is designated as a Type D route within the planning boundaries. A typical KDOT Type D route recommends indirect, alternative access, and shared access wherever feasible. If new direct access is provided, it shall follow the minimum access spacing criteria defined in the KDOT Corridor Management Policy.



A Route: Interstate Highway System protected by full access control

B Route: State Highway Systems, Non-interstate National Highway System, and Growth Corridors protected by allowing direct access only when alternative access is not feasible.

C Route: State Highway System protected by allowing direct access only when alternative access is not feasible.

D Route: State Highway System protected by a modest level of access management.

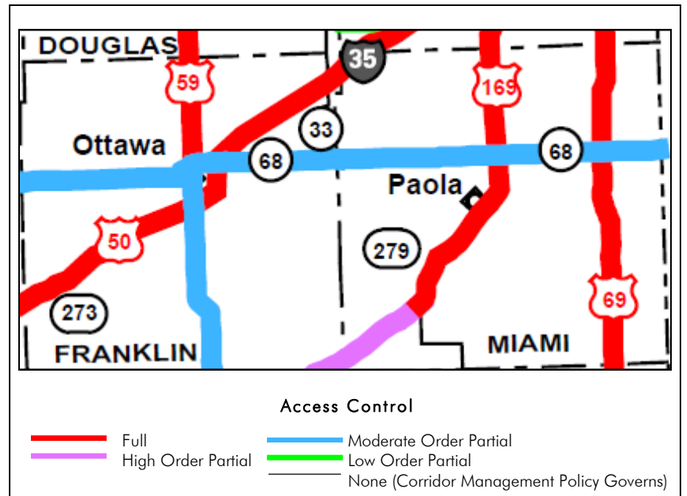
E Route: State Highway System, used for local trips and protected by a minimum level of access management.

NHS Route: State Highway System protected as part of the National Highway System.

Exhibit 4.1: KDOT Route Classification Map

The KDOT policy calls for a 660-foot minimum spacing of access points along the high-speed segments between Ottawa and Louisburg. Along the segments of K-68 within Ottawa and Louisburg, the access point spacing requirement is reduced to between 140 feet and 335 feet, depending on the posted speed and the traffic volume on the side street or drive (i.e., over or under 50 vehicles per day).

KDOT has also developed a Design Access Control Map to provide assistance in determining appropriate access control for future highway improvement projects. See Exhibit 4.2. Depending on designated route access control, as part of the planning process, it is important to consider adequate future highway right-of-way and potential interchange locations. K-68 is classified as a Moderate Order Partial access controlled route.



Full Access Control: Access to the highway is only permitted via grade separated interchange.

Partial Access Control:

- **High Order:** Highway may be built as expressway or two lane highway on four-lane right-of-way but provides for upgrading facility to full access control.
- **Moderate Order:** Highways which may be built as expressways or major urban streets but not intended to be upgraded to a freeway. Access should be limited to public roads only.
- **Low Order:** Arterial highways within or approaching urban areas or rural highways most likely to remain two-lane for the foreseeable future. Access may be either public roads or private entrances.

Exhibit 4.2: KDOT Access Control Map

DATA COLLECTION

Roadway and intersection information was collected for the entire length of the corridor study area. Posted and observed speeds were noted. Traffic counts were taken at key intersections and KDOT provided traffic count information for segments of the corridor. Additional information recorded included the number of lanes along the corridor; acceleration- and deceleration-lane configurations; and traffic controls, such as signals or stop signs. The team used the information for the existing operational analyses and for confirming the network information for the travel demand model.

Speeds and Speed Limits: The consultant team recorded travel speeds along the corridor, which ranged from 12 mph to near 65 mph. From this data, the 85th percentile speed was calculated. Most governmental agencies, including KDOT, use the 85th percentile speed to establish speed limits.

The 85th percentile speed represents the speed at which or below which 85 percent of drivers feel comfortable traveling. Research has shown that the 85th percentile speed is also the safest speed because it has the least speed variation. A motorist's chances of being involved in a crash increase significantly for every five miles per hour the vehicle is driven above or below the 85th percentile speed.

Along K-68, the 85th percentile speed in Ottawa at the I-35 interchange was 53.5 mph; east of the Old Kansas City Road Roundabout near Paola was 62.6 mph; and in Louisburg at Metcalf Road it was 38.2 mph westbound and 47.5 mph eastbound.

The posted speed limited between Ottawa and the US-69 interchange near Louisburg is 65 mph. The speed limit is posted at 45 mph west of Louisburg and at 55 mph east of Louisburg. See Exhibit 4.3 for KDOT's map of posted speed limits.

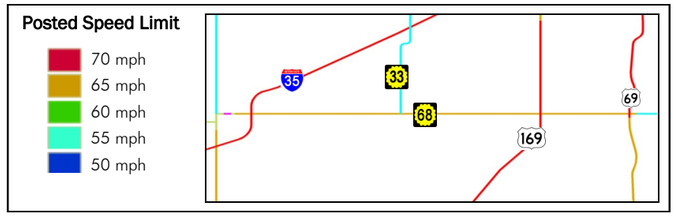


Exhibit 4.3: KDOT Posted Speed Limit Map

Travel Times: Travel time surveys are used to calculate the average traffic speed on the road network or segment of roadway. Data collected in the surveys include location of vehicles, length of segment, time, and direction of travel. The consultant team conducted travel time surveys during AM and PM peak hours along K-68. During the travel time surveys, the drivers of the survey vehicle maintain an average or typical speed, not too fast or too slow. The survey vehicle stayed in groups of the cars, passing only as many vehicles as passed them. Times were recorded as the survey vehicle passed eleven locations along the corridor.

On average, it took approximately 38 minutes to drive from the southbound ramp of I-35 in Ottawa to the Missouri state line in the AM and PM peak hour. The traffic speeds for ten segments of K-68 were calculated from the survey information. See Table 4.A.

Table 4.A: K-68 Average Travel Speeds (mph)

K-68 Segments	AM (EB/WB)	PM (EB/WB)
SB I-35 Ramp to NB I-35 Ramp	48.7 / 48.7	53.5 / 59.5
NB I-35 Ramp to Tennessee Road	66.0 / 61.3	60.0 / 62.3
Tennessee Road to K-33	60.6 / 64.8	61.1 / 62.8
K-33 to Old KC Road Roundabout	62.0 / 62.6	62.4 / 60.9
Old KC Road Roundabout to SB US-169 Ramp	50.7 / 55.4	52.2 / 52.9
SB US-169 Ramp to NB US-169 Ramp	43.9 / 50.1	58.5 / 39.0
NB US-169 Ramp to SB US-69 Ramp	62.2 / 63.3	58.9 / 59.6
SB US-69 Ramp to NB US-69 Ramp	12.8 / 35.8	39.8 / 27.5
NB US-69 Ramp to Metcalf Road	31.5 / 29.8	26.9 / 30.9
Metcalf Road to State Line Road	46.3 / 38.2	49.2 / 47.5

Direction of Travel: EB = Eastbound, WB = Westbound

Volumes: KDOT provided daily traffic volumes recorded along K-68 in 2007. The 24-hour counts showed 8,600 vehicles-per-day (vpd) west of the I-35 interchange in Ottawa; 4,800 vpd near Paola; and 11,500 vpd in Louisburg east of US-69. The peak-hour percentage was computed to be 10 percent of total daily traffic. The 24-hour traffic counts are shown on Exhibit 4.4.

The consultant team manually recorded vehicle turn movement traffic during the morning and evening peak hour from April 8, 2008 through April 10, 2008 at the following nine intersections with K-68:

- Tennessee Road
- Vermont Road
- K-33
- Paola Roundabout (Old KC Road / Hedge Lane)
- Southbound US-169 Ramp
- Northbound US-169 Ramp
- Southbound US-69 Ramp
- Northbound US-69 Ramp
- Metcalf Road

KDOT provided peak hour traffics volumes at the northbound and southbound I-35 ramps. The PM peak hour traffic volumes are summarized in Exhibit 4.8.

The consultant team used the existing traffic data to complete existing level of service analyses as well as to calibrate the existing condition travel demand model.

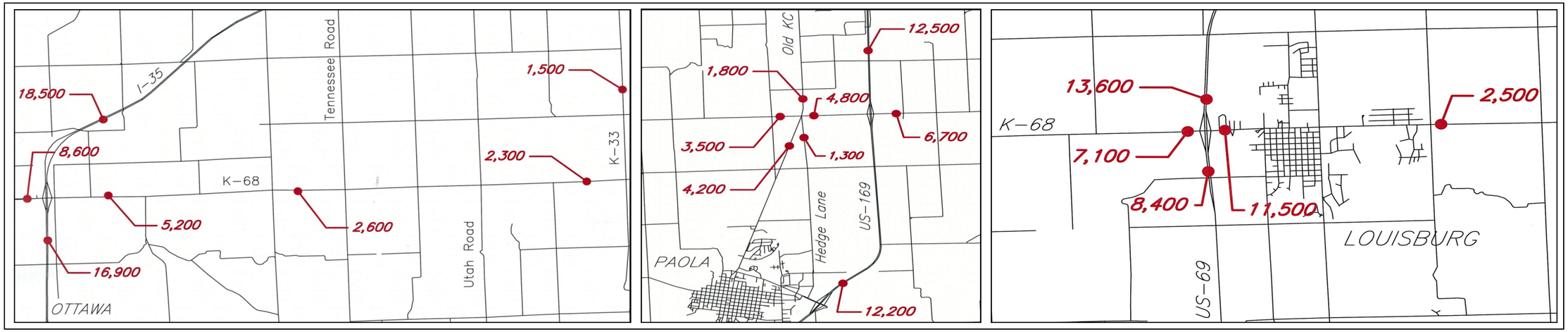


Exhibit 4.4: Existing 24-hour Traffic Counts

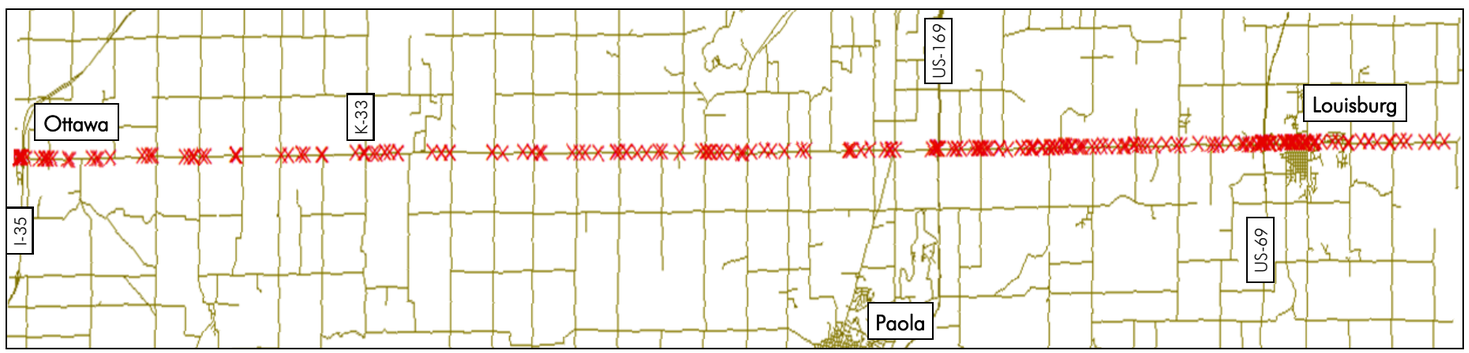


Exhibit 4.5: K-68 Crash Locations (2002-2007)

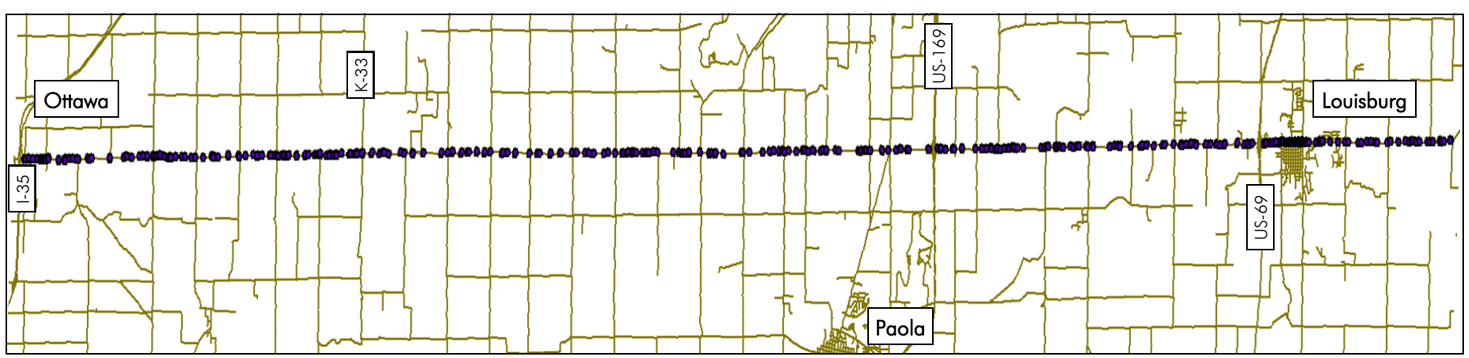


Exhibit 4.6: Access Locations

Crashes: KDOT provided traffic crash data along K-68 for the years 2002 through 2007. The crash types include rear end, right angle, side swipe, backing, head-on and other (e.g. fixed object and run off road). All animal-related crashes were removed from the data set.

Roadway segment crash rates per million vehicle miles were calculated and compared to the statewide average crash rate. All of the segments have crash rates lower than the statewide crash rate by facility type. See crash locations in Exhibit 4.5. On the following page, table 4.B is a summary of KDOT statewide crash rates by facility type. Table 4.C compares crash rates by segments of the K-68 corridor to the state average crash rate on similar facilities.

Access: KDOT provided an inventory of all existing access points (i.e., drives and side streets) along K-68 including full and partial access drives. See Exhibit 4.6 for access locations along the corridor.

There is a relationship between the location of crashes and access locations in Exhibit 4.6. In the urban areas of Ottawa and Louisburg and the rural area near Paola, with high driveway densities, crash patterns indicate many of the crashes are related to the number of access points and may be correctable with median treatments, driveway consolidations, or the addition of turn lanes.

Table 4.B: Statewide Crash Rates

Lanes	Class	Access Control	Statewide Crash Rate
Rural Sections			
2 Lane	Undivided	None	1.517
2 Lane	Undivided	Partial	1.165
2 Lane	Undivided	Full	1.252
4 Lane	Divided	Partial	0.936
4 Lane	Divided	Full	0.391
Urban Sections			
2 Lane	Undivided	None	3.4
4 Lane	Undivided	None	5.458
4 Lane	Divided	Partial	2.026
4 Lane	Divided	Full	0.896

Table 4.C: K-68 Crash Rates

K-68 Segments	Crash Rate	State Average Crash Rate
I-35 to Tennessee Road	0.720	1.517
Tennessee Road to K-33	0.768	1.517
K-33 to Waverly Road	0.820	1.517
Waverly Road to Old Kansas City Road	1.167	1.517
Old Kansas City Road to US-169	1.468	1.517
US-169 to US-69	0.838	1.517
US-69 to Metcalf Road	2.079	5.428
Metcalf Road to Rockville Road	1.369	3.4
Rockville Road to State Line Road	0.935	1.517

EXISTING CONDITIONS ANALYSIS

Existing Levels of Service: The consultant team completed a series of intersection capacity analyses at 11 intersections along the corridor and for specific corridor segments in order to determine the level of service (LOS) that drivers experienced on K-68. The team analyzed the study intersections and segments based upon the latest edition of the Transportation Research Board's (TRB) "Highway Capacity Manual." A description of the LOS criteria used in these analyses is provided in Table 4.D.

A summary of the LOS analysis for existing traffic volumes, traffic controls, and lane configurations is listed in Table 4.E and Table 4.F. Exhibit 4.7 shows a detailed summary of level of service and required storage length by movement. The analyses indicate that all of the existing intersections, as well as the individual movements at all of the existing intersections, currently operate at LOS D or better during the AM and PM peak hours under existing intersection control. Likewise, all roadway segments analyzed along K-68 also operate at LOS B or better during all times during the day as shown in Table 4.F.

Table 4.D: Level of Service Definitions

Unsignalized Intersections		Signalized Intersections	
Level of Service	Average Control Delay (sec/veh)	Level of Service	Control Delay per Vehicle (sec)
B	> 10 and < 15	B	> 10 and < 20
C	> 15 and < 25	C	> 20 and < 35
D	> 25 and < 35	D	> 35 and < 55
E	> 35 and < 50	E	> 55 and < 80
F	> 50	F	> 80

Level of service criteria are outlined in the 2000 edition of the "Highway Capacity Manual" (HCM) for both signalized and Unsignalized intersections. The HCM defines the level of service as a measure of the quality of traffic flow. There are six levels of service for each facility type, each representing a range of operating conditions. Each level of service is designated by a letter from "A" to "F", with A" being most desirable condition and "F" being the least desirable condition.

Table 4.E: Existing Intersection Level of Service

Intersection Level of Service				
Intersection	AM Peak Hour		PM Peak Hour	
SB US-69 Ramp—Signalized	B		A	
Old KC Road—Roundabout	B		B	
Approach Level of Service				
Intersection	NB	SB	NB	SB
I-35 Southbound Ramp	—	B	—	B
I-35 Northbound Ramp	D	—	B	—
Tennessee Road	B	A	B	B
Vermont Road	B	—	B	—
K-33	B	A	B	A
US-169 Southbound Ramp	—	C / A*	—	C / A*
US-169 Northbound Ramp	C / A*	—	B / A*	—
US-69 Northbound Ramp	D / B*	—	C / B*	—
Metcalf Road	C	B	C	B

* Left Turn Level of Service / Right Turn Level of Service

Intersection Approach Leg: NB = Northbound, SB = Southbound

Table 4.F: Existing K-68 Segment Level of Service

Level of Service		
K-68 Segments	AM Peak Hour	PM Peak Hour
I-35 to Tennessee Road	A	A
Tennessee Road to K-33	A	A
K-33 to Waverly Road	A	A
Waverly Road to US-169	A	A
US-169 to US-69	A	A
US-69 to Metcalf Road	B	B
Metcalf Road to Rockville Road	B	B
Rockville Road to State Line Road	A	A

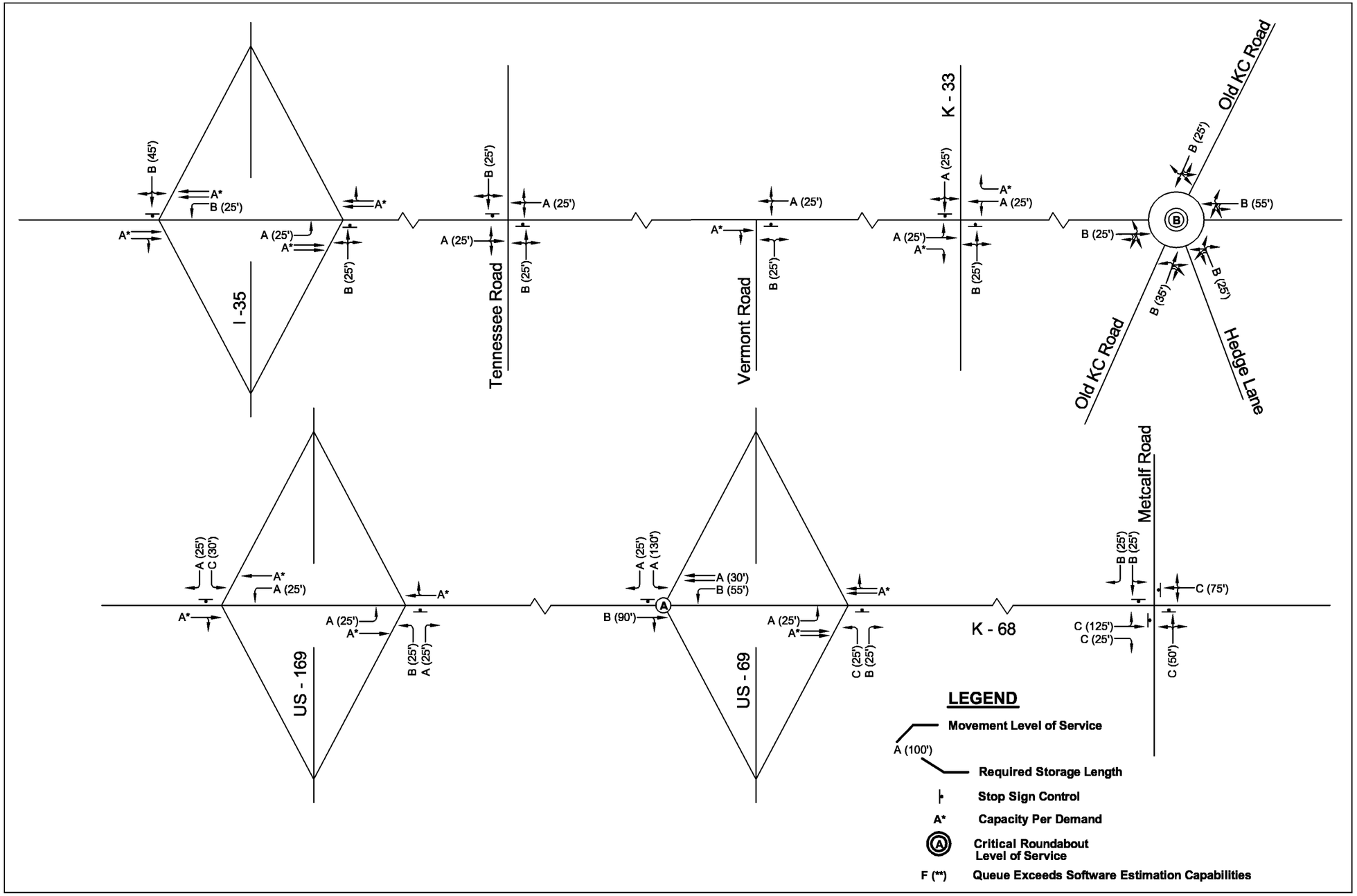


Exhibit 4.7: Existing PM Peak Hour Level of Service

FUTURE CONDITIONS ANALYSIS

Travel Demand Model Development: Travel demand models are used to project future traffic volumes that could be expected due to future development. The models are composed of two basic types of information:

- Street network, including speeds, capacities, and traffic controls
- Trip generation information, based on the existing and proposed land uses in the modeled area

The consultant team created a travel demand model for the study corridor using the existing street network information provided by NAVTEQ, which provides a highly accurate representation of the road network, including attributes like numbers of lanes, turn restrictions, physical barriers, one-way streets and restricted access. NAVTEQ data is most commonly used in onboard navigation-enabled vehicles. The team reviewed and updated the NAVTEQ street links to match the current function classifications of the roads in the study area.

As part of the travel demand model, the study group divided the study corridor into traffic analysis zones (TAZ). Based on the land uses within each TAZ, traffic related data is computed for vehicle-trip production and attraction by trip type. Trip types include home-based trips to and from work (HBW), home-based trips to other locations (HBO), and non-home based trips (NHB). Each TAZ boundary follows an existing census block group boundaries, a parcel boundaries, or the current street network. See Exhibit 4.8.

Next, the existing land use for the corridor plan study area was added to the travel demand model. The data was sorted into the following categories for analysis: single family residential, multi family residential, apartment, retail, office, and industrial.

After the model construction was complete, the model was run and calibrated to the recorded field data to determine how well the initial assumptions and model inputs replicated recorded conditions. The travel demand model was validated against existing traffic counts, travel times, and delay conditions at major intersections to verify accuracy. After the review, the individual inputs were modified as required and the resulting outputs were compared to the recorded conditions. This process was repeated until an acceptable level of correlation was attained.

Future Traffic Volumes: Future travel demand models were developed using the existing street network coupled with the future intermediate and future high land use growth projections.

Each of the model scenarios reflect traffic volumes that could be expected due to the future land use within the plan area. The traffic along the K-68 corridor, under the intermediate land use projection, would be expected to increase between 10 and 250 percent, depending on the segment of the corridor. Traffic projections under the high scenario could be expected to increase as much as 6 times the existing traffic volumes at various locations along the corridor. Exhibit 4.9 provides a summary of existing traffic volumes and future traffic volumes expected during the PM peak hour.

Under the high land use scenario, the 24-hour traffic volume west of the I-35 interchange in Ottawa is expected to 23,500; 21,00 vpd near Paola; and 17,700 vpd in Louisburg east of US-69. traffic. The existing and future 24-hour traffic counts are shown on Exhibit 4.10 on page 4.8.

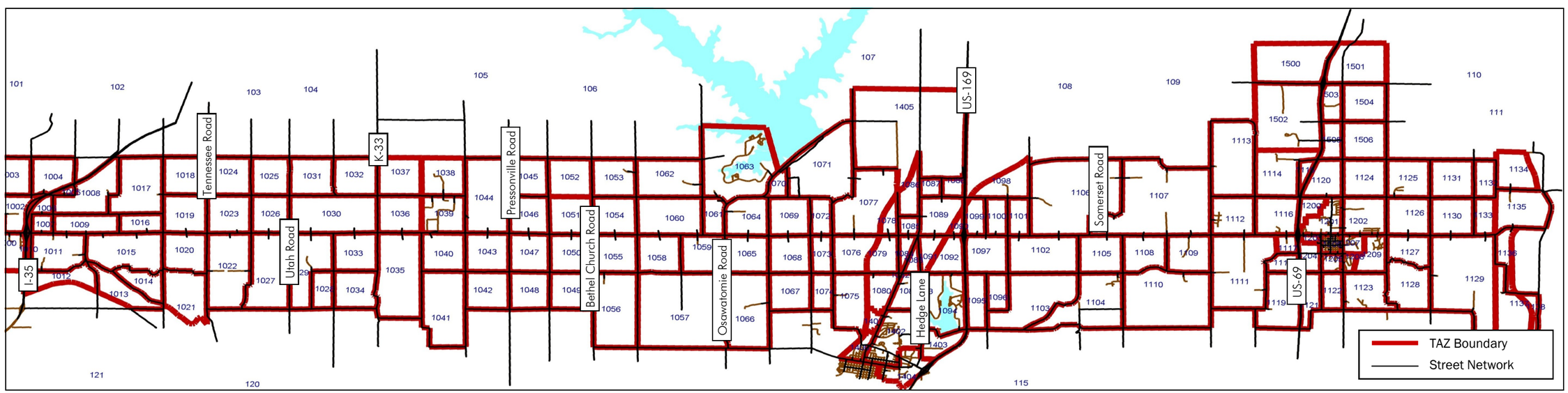


Exhibit 4.8: Traffic Analysis Zones

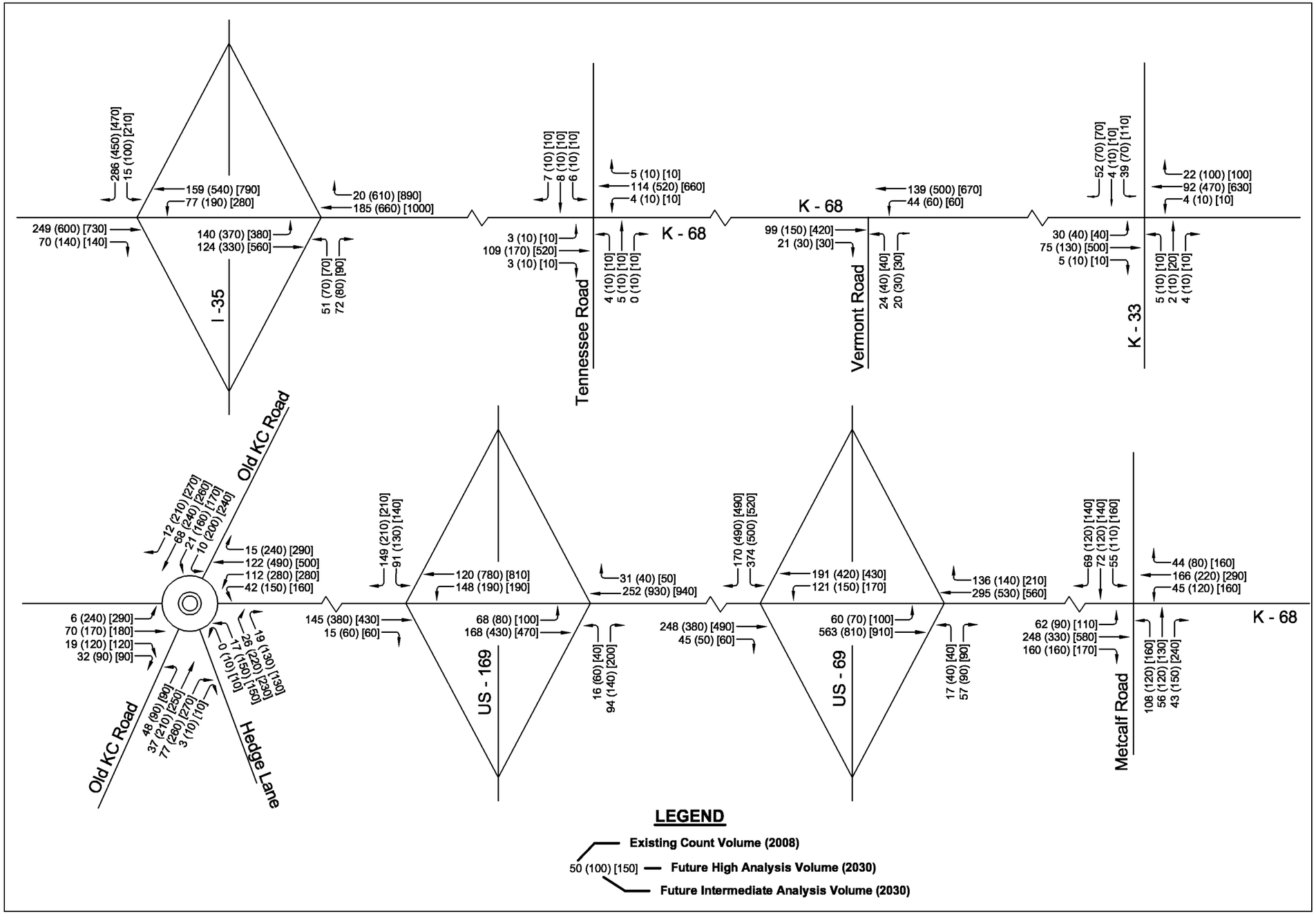


Exhibit 4.9: Traffic Volumes Summary

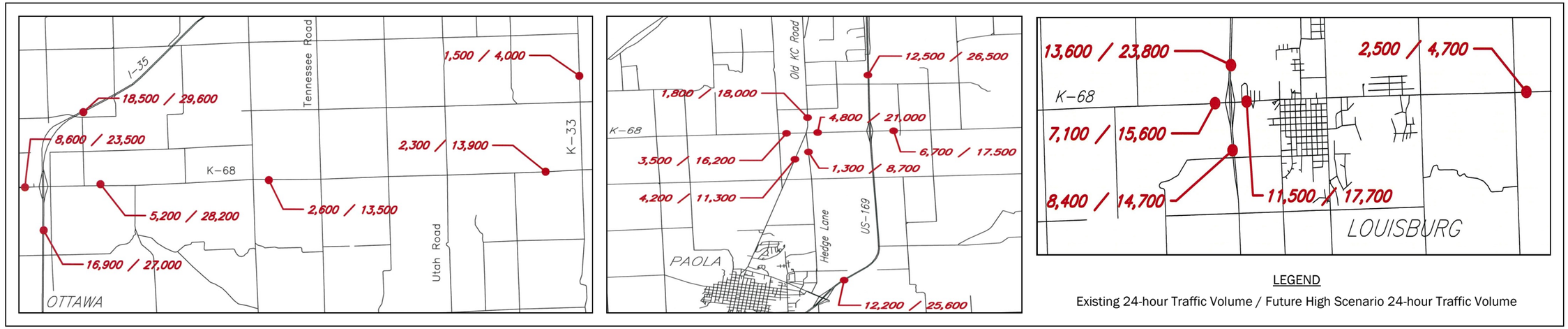


Exhibit 4.10: Future 24-hour Traffic Volumes

Future Capacity Analysis: A series of capacity analyses were completed at the 11 previously analyzed intersections along the corridor to determine the expected LOS that drivers will experience. Each intersection was analyzed using the existing geometry with the future traffic volumes.

A summary of the completed analysis for the critical PM peak hour traffic volumes is shown in Table 4.G and on Exhibits 4.11 and 4.12, LOS of Future 2030 Intermediate Land Use and LOS of Future 2030 High Land Use for each of the travel demand model scenarios.

The completed analyses indicate improvements need to be considered at many of the intersections along the K-68 corridor. Additionally much of the corridor will need to be widened to a four lane, expressway facility.

Table 4.G: PM Peak Hour Future 2030 Intersection Level of Service

Intersection Level of Service				
Intersection	Intermediate		High	
SB US-69 Ramp—Signalized	B		B	
Old KC Road—Roundabout	F		F	
Approach Level of Service				
Intersection	NB	SB	NB	SB
I-35 Southbound Ramp	—	F	—	F
I-35 Northbound Ramp	F	—	F	—
Tennessee Road	C	C	D	D
Vermont Road	C	—	C	—
K-33	C	C	E	F
US-169 Southbound Ramp	—	F / D*	—	F / D*
US-169 Northbound Ramp	F / B*	—	F / B*	—
US-69 Northbound Ramp	F / B*	—	F / B*	—
Metcalf Road	F	D	F	E

* Left Turn Level of Service / Right Turn Level of Service

Intersection Approach Leg: NB = Northbound, SB = Southbound

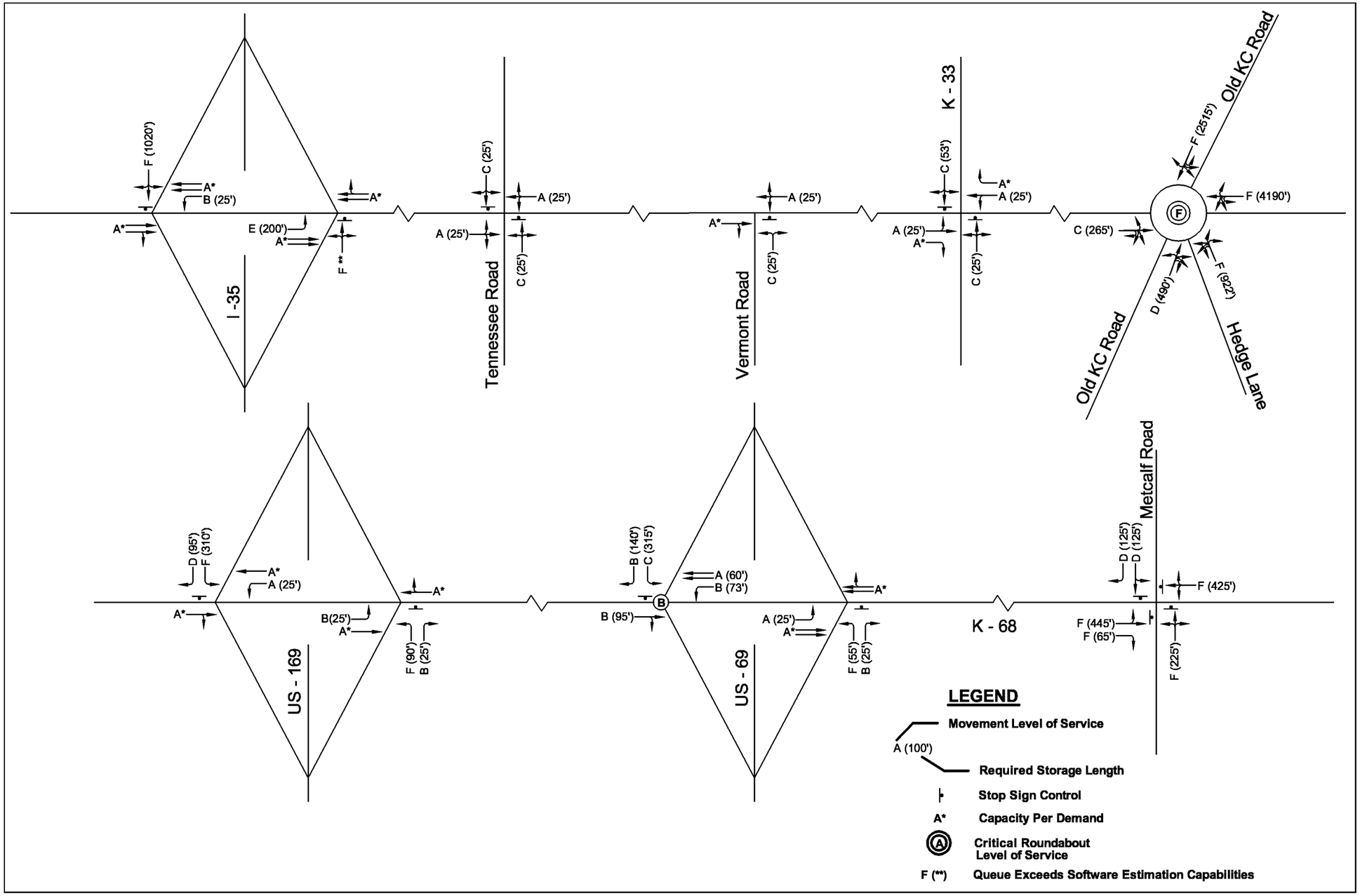


Exhibit 4.11: Level of Service for Future 2030 Intermediate PM Peak Hour Traffic Volumes

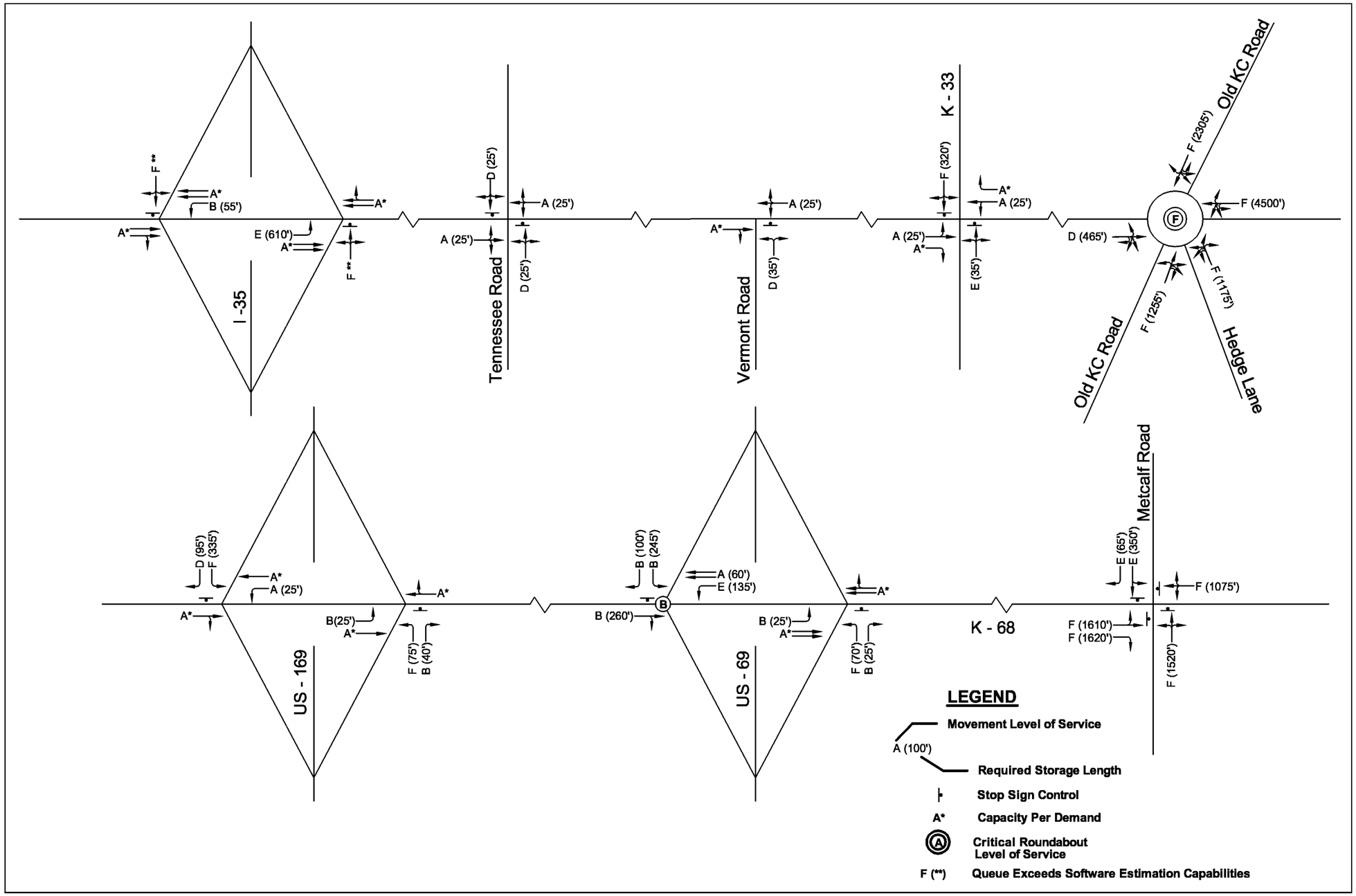


Exhibit 4.12: Level of Service for Future 2030 High PM Peak Hour Traffic Volumes

Louisburg Interchange Alternate: Due to the significant amount of traffic on K-68 through old-town Louisburg, generated by the residential growth projected to occur along 287th Street in the southern portion of Louisburg, an alternative was developed to alleviate congestion on this portion of the highway. A final traffic demand model was developed to examine the effects of constructing a new interchange on US-69 at 287th Street as an alternative access to these large areas of future development and review the options for minimizing traffic lanes on K-68 through Louisburg.

A diamond type interchange would utilize the existing overpass of 287th Street over US-69 to provide nearly direct access to the proposed development areas. In addition to access for the residential development tracts, this interchange would also allow for additional US-69 highway oriented commercial development within Louisburg away from the K-68 corridor. The interchange of 287th Street with US-69 would be expected to serve nearly 8,000 vehicles per day based on the current high land use scenario in this area of the city. With the potential addition of commercial type developments at the interchange, this number would be expected to increase.

This interchange would significantly reduce traffic volumes on K-68 between US-69 and Metcalf Avenue. Approximately 4,000 vehicle per day would be expected to use the new interchange reducing the traffic at the K-68 to about 13,700 vpd east of US-69. The lower highway traffic volumes would reduce the need for widening K-68 to a 5-lane roadway and allow either maintaining the existing 4-lane section, or modify K-68 to a 3-lane section with one through lane in each direction and a center turn lane. Without this proposed interchange, traffic volumes on K-68 would be expected to be 17,700 vehicles per day immediately east of US-69. A comparison of traffic volumes for the high land use scenario and the high land use scenario with the interchange at 287th Street is shown on Exhibit 4.12.

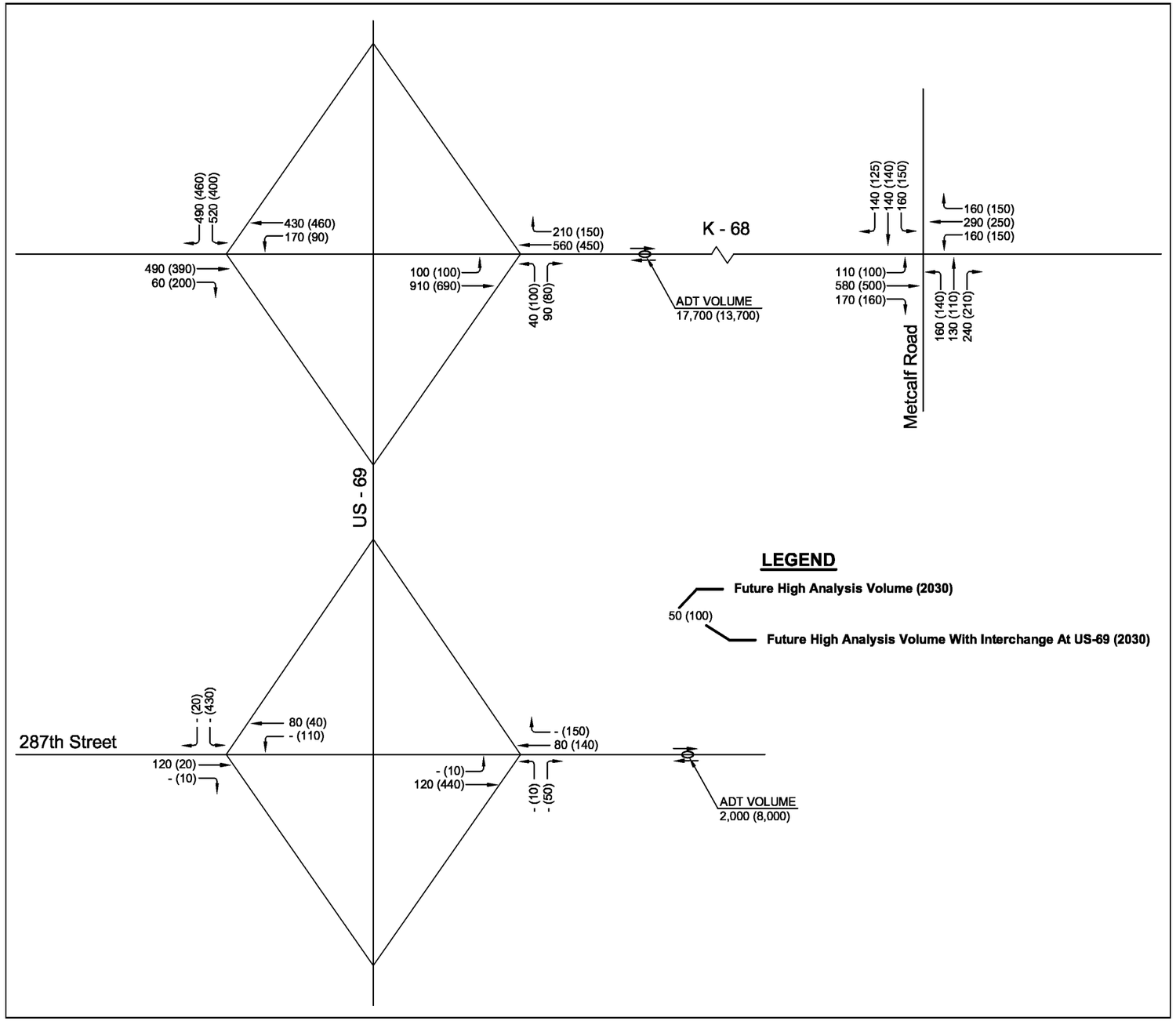


Exhibit 4.12: Level of Service for Future 2030 High PM Peak Hour Traffic Volumes