

PRYOR ROAD AND SHAMROCK AVENUE TRAFFIC IMPACT STUDY

Prepared for:
Dialysis Clinic, Inc.

Lee's Summit, Missouri

September 2019

Olsson Project No. 019-2726

olsson



09/10/2019

TABLE OF CONTENTS

1. Introduction	1
2. Data Collection	3
3. Existing Plus Approved Development Conditions	5
3.1. Network Characteristics	5
3.2. Existing Plus Approved Development Warrant Analysis	6
3.3. Existing Plus Approved Development Capacity Analysis	7
4. Existing Plus Approved plus Proposed Development Conditions	11
4.1. Proposed Development Trip Generation and Distribution	11
4.2. Access Characteristics	12
4.3. Existing Plus Approved Plus Proposed Development Conditions	17
4.4. Existing Plus Approved Plus Proposed Development Capacity Analysis	17
5. Summary	21
5.1. Conclusions	21
5.2. Recommendations	21

LIST OF FIGURES

FIGURE 1. VICINITY MAP	2
FIGURE 2. EXISTING PLUS APPROVED DEVELOPMENT PEAK HOUR VOLUMES.....	4
FIGURE 3. EXISTING PLUS APPROVED DEVELOPMENT LANE CONFIGURATION AND TRAFFIC CONTROL	9
FIGURE 4. EXISTING PLUS APPROVED DEVELOPMENT CAPACITY ANALYSIS.....	10
FIGURE 5. SITE PLAN.....	14
FIGURE 6. PROPOSED DEVELOPMENT TRIP DISTRIBUTION	15
FIGURE 7. EXISTING PLUS APPROVED PLUS PROPOSED DEVELOPMENT PEAK HOUR VOLUMES.....	16
FIGURE 8. EXISTING PLUS APPROVED PLUS PROPOSED DEVELOPMENT LANE CONFIGURATIONS & TRAFFIC CONTROL	19
FIGURE 9. EXISTING PLUS APPROVED PLUS PROPOSED DEVELOPMENT CAPACITY ANALYSIS	20

LIST OF TABLES

TABLE 1. EXISTING NETWORK SUMMARY.....	5
TABLE 2. INTERSECTION LOS CRITERIA.	7
TABLE 3. PROPOSED DEVELOPMENT TRIP GENERATION.....	11
TABLE 4. PROPOSED DEVELOPMENT TRIP DISTRIBUTION.	12
TABLE 5. ACCESS CHARACTERISTICS.....	12

APPENDICES

Appendix A: Data Collection

Appendix B: Existing Plus Approved Development Conditions

Appendix C: Existing Plus Approved Plus Proposed Development Conditions

1. INTRODUCTION

This report studies traffic impacts associated with a proposed dialysis clinic located in the southwest corner of the intersection of Pryor Road and Shamrock Avenue in Lee's Summit, Missouri.

This report will review the impacts of the proposed development on the existing roadway network and will recommend additional turn lanes, storage bays, and intersection control methods per the City of Lee's Summit *Access Management Code (AMC)* and Missouri Department of Transportation's (MoDOT's) *Engineering Policy Guide (EPG)*, as appropriate, for the following study intersection:

- Pryor Road and Shamrock Avenue
- Shamrock Avenue and Private Drive (access as presented in approved reference traffic impact study)

Access to the dialysis clinic is proposed along a private drive internal to the site. Trip generation and access geometrics will be reviewed, but operational analysis will not be conducted for the drive locations due to location along an internal drive.

For this study, the following scenarios were analyzed:

- Existing Plus Approved Development Conditions
 - Considers the approved Woodside Ridge development and Fire Station #3
- Existing Plus Approved Plus Proposed Development Conditions

The approximate location of the proposed development is shown on the vicinity map in **Figure 1**.

FIGURE 1

Vicinity Map

Dialysis Clinic
Lee's Summit, MO



olsson



Source: Google Maps

LEGEND

 Site

2. DATA COLLECTION

The data collection effort included acquiring AM and PM peak hour turning movement counts and documentation of current roadway geometrics. Traffic counts were obtained from the *West Village* traffic impact study, prepared by the City of Lee's Summit, dated September 2018.

Based on information provided in the reference study, intersection turning movement counts were collected during the AM and PM peak hour periods on Tuesday, May 22nd, 2018 at the study intersection of Pryor Road and Shamrock Avenue. Based on the data provided, the peak hour periods for the study area were determined to be 7:00-8:00 AM and 5:00-6:00 PM.

The existing peak hour volumes are illustrated in **Figure 2**. Count data for this study can be found in **Appendix A**.

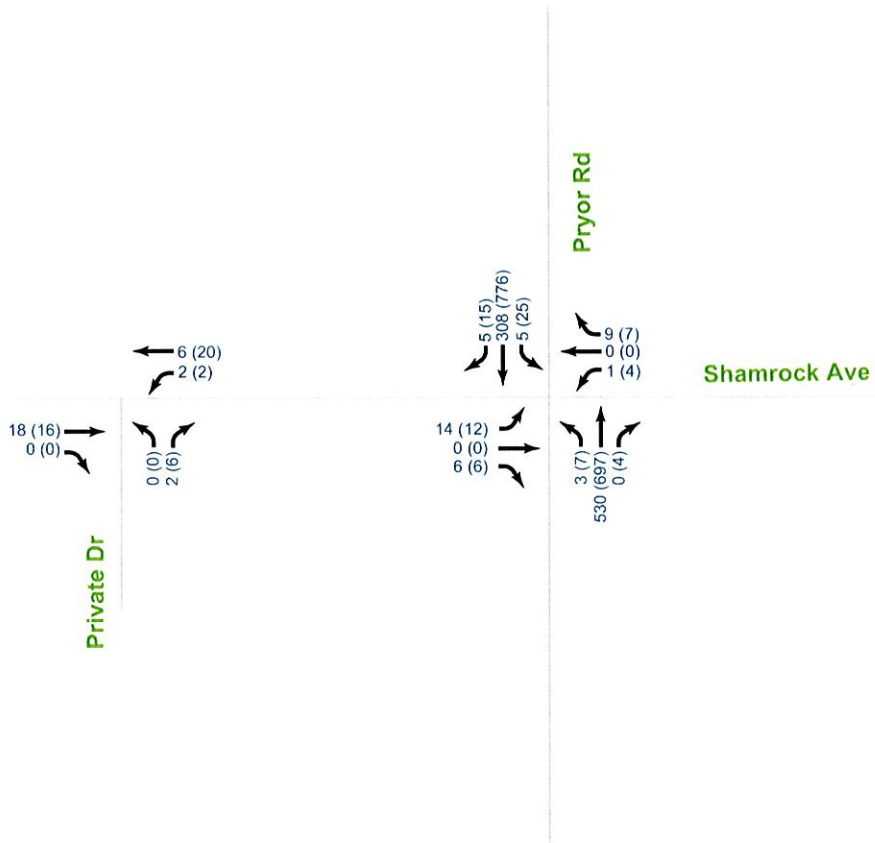
FIGURE 2

Existing Plus Approved Conditions Peak Hour Volumes

Dialysis Clinic
Lee's Summit, MO



olsson



LEGEND

AM (PM) Peak Hour Volume

3. EXISTING PLUS APPROVED DEVELOPMENT CONDITIONS

Existing plus approved development traffic conditions were evaluated to identify any existing deficiencies and to provide a baseline for comparative purposes. This analysis considers the approved Woodside Ridge residential development located on the west side of Pryor Road (generally northwest of the proposed site) and an approved Fire Station #3 located directly west of the proposed site.

3.1. Network Characteristics

Two roadways within the study area were considered during analysis: Pryor Road and Shamrock Avenue. Referencing the City's *Existing Functional Classification Map*, current network characteristics are summarized in **Table 1**. The intersection of Pryor Road with Shamrock Avenue operates under two-way stop control for east/west movements.

Table 1. Existing Network Summary.

Roadway	Functional Classification	Typical Section	Median Type	Posted Speed
Pryor Road	Major Arterial	4-Lane	Raised	35 mph
Shamrock Avenue	Local	2-Lane	None	25 mph

The intersection of Pryor Road and Shamrock Avenue is unsignalized with stop-control provided for the minor street approaches (east/west on Shamrock Avenue). The west leg is currently under construction and is expected to be built prior to the completion of the dialysis clinic. A southbound left-turn lane is currently provided on Pryor Road at Shamrock Avenue. Based on information provided by the City of Lee's Summit, northbound and eastbound left-turn lanes will be constructed with the approved projects. A sidewalk will be provided on the south side of Shamrock Avenue with the approved development. A shared use path is currently provided on the west side of Pryor Road. Marked crosswalks are not provided at the intersection of Pryor Road and Shamrock Avenue.

The intersection of Shamrock Avenue and a private drive located west of Pryor Road was approved in the reference traffic impact study. This access point is expected to serve the approved fire station. The drive is expected to provide stop control for the northbound movement. Dedicated turn lanes are not proposed for the drive location.

3.2. Existing Plus Approved Development Warrant Analysis

Signal Warrants

A traffic signal may be justified if traffic conditions meet any of the applicable nine signal warrants described in the 2009 Manual on Uniform Traffic Control Devices (MUTCD). The MUTCD provides criteria for conducting an engineering study to determine whether a traffic signal is appropriate at any intersection.

For this study, the Peak Hour Signal Warrant (Warrant 3) was reviewed under existing plus approved development conditions to determine if alternative traffic control measures are warranted for the currently unsignalized intersection of Pryor Road and Shamrock Avenue. Based on data provided, the intersection of Pryor Road and Shamrock Avenue does not meet the necessary criteria to warrant a traffic signal.

Turn Lane Warrants

The City of Lee's Summit *Access Management Code* (AMC) was used to determine if any additional turn lanes may be required. The access management code provides direction on when turn lanes should be provided based on intersection control, roadway classification and/or traffic volumes. In addition to the turn lane warrant, vehicular queuing, vehicular delay, as well as volume of turning vehicles were reviewed when considering the need for a turn lane.

As stated in **Section 3.1**, based on information provided by the City of Lee's Summit, dedicated left-turn lanes are expected to be constructed for the northbound and eastbound movements at the intersection of Pryor Road and Shamrock Avenue.

Referencing the Lee's Summit AMC, at the intersection with any local street, left turn lanes shall be provided where the left-turn volume is at least 20 vehicles in any hour. Right turn lanes shall be provided on major arterial streets where right-turn volume is projected to be at least 30 vehicles in any hour. Turn lane standards were reviewed for the westbound left-turn, northbound right-turn, and southbound right-turn movements. No additional left or right-turn lanes are warranted considering the existing plus approved development volumes at the intersection of Pryor Road and Shamrock Avenue.

Existing plus approved development conditions lane configurations and traffic control for the study intersections are illustrated in **Figure 3**. Signal warrant analysis sheets can be found in **Appendix B**.

3.3. Existing Plus Approved Development Capacity Analysis

Capacity analysis was performed for the study intersection utilizing the existing lane configurations and traffic control. Analysis was conducted using Synchro, Version 10, based on the Highway Capacity Manual (HCM) delay methodologies. For simplicity, the amount of control delay is equated to a grade or Level of Service (LOS) based on thresholds of driver acceptance. The amount of delay is assigned a letter grade A through F, LOS A representing little or no delay and LOS F representing very high delay. **Table 2** shows the delays associated with each LOS grade for signalized and unsignalized intersections, respectively.

Table 2. Intersection LOS Criteria.

Level of Service	Average Control Delay (seconds)	
	Signalized	Unsignalized
A	< 10	< 10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

Highway Capacity Manual (HCM 6th Edition)

Queuing analysis was conducted using the 95th-percentile queue length. This represents the queue length that has a 5 percent probability of being exceeded during the peak hour period.

Results of the analysis indicate that all movements at the unsignalized study intersection of Pryor Road and Shamrock Avenue are expected to operate at LOS D or better with acceptable queues during both the AM and PM peak hour periods with the following exceptions:

PM Peak Hour

- Pryor Road and Shamrock Avenue
 - The eastbound left-turn movement is expected to operate at LOS F with a 95th-percentile queue length of 45 feet, which is contained within the available storage.

Referencing Section 20.7 of the HCM for Two-Way Stop-Controlled Intersections, minor street approaches with movements operating at a lower level of service during peak hour periods are not uncommon at an unsignalized intersection. This is more prevalent for stop-controlled left-turn movements in urban areas, as higher volumes on the main road are accommodated. The HCM suggests that performance measures in addition to delay, such as volume-to-capacity (v/c) ratios for individual movements and queue lengths, should also be considered when

evaluating the overall performance at two-way stop-controlled intersections. At the unsignalized minor street approach listed above, the v/c ratios and 95th-percentile queues are expected to be acceptable during the peak hour periods.

The existing capacity analysis summary is illustrated in **Figure 4**. Detailed results may be found in **Appendix B**.

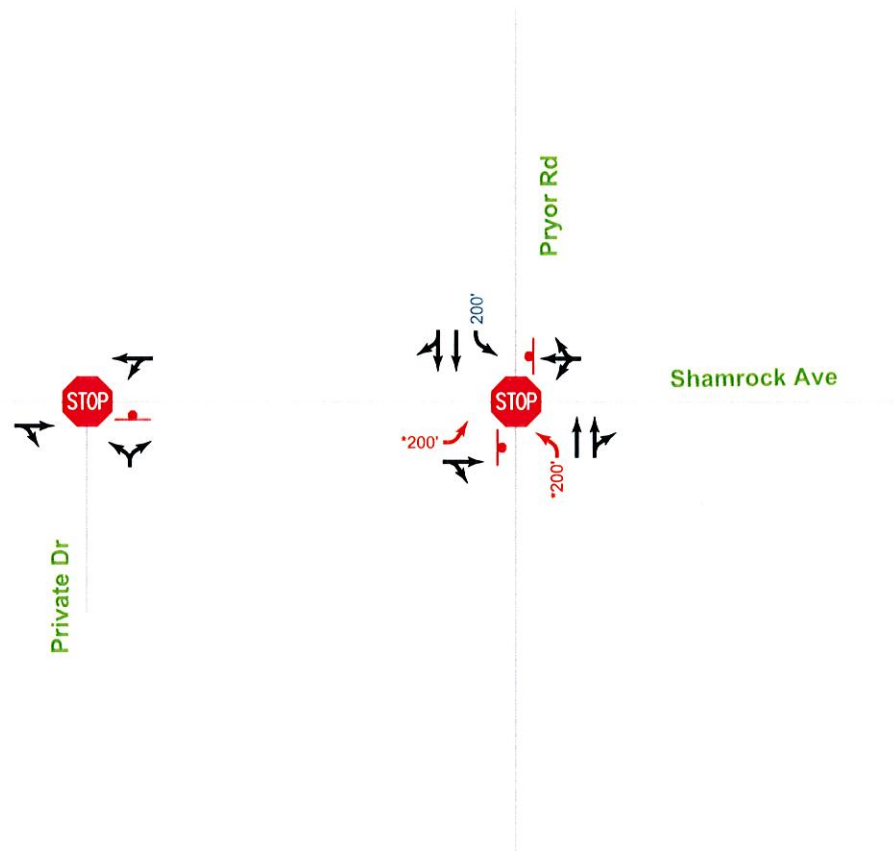
FIGURE 3

Existing Plus Approved Conditions Lane Configuration and Traffic Control

Dialysis Clinic
Lee's Summit, MO



olsson



LEGEND

- xx' Proposed Lane Configuration
- xx' Lane Configuration & Storage Length
- Stop Controlled Intersection
- Stop Sign

**Improvements are proposed with approved development*

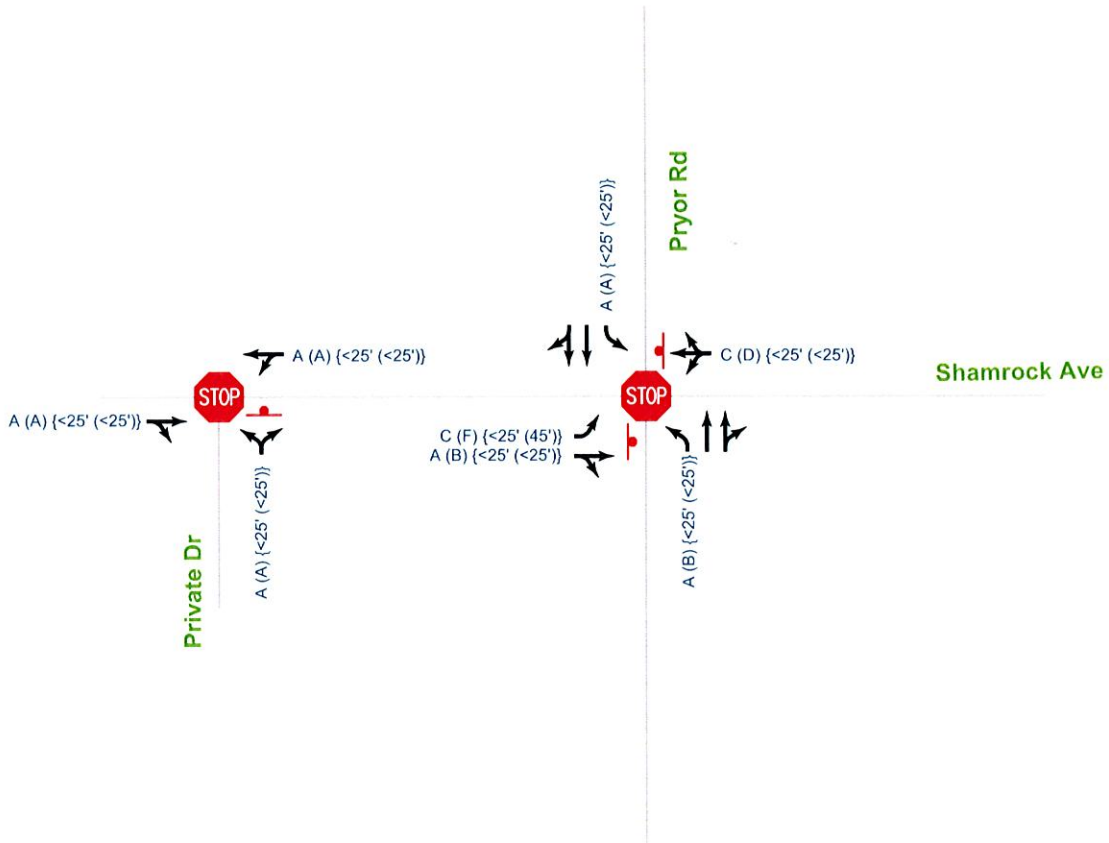
FIGURE 4

Existing Plus Approved Conditions Capacity Analysis

Dialysis Clinic
Lee's Summit, MO



olsson



LEGEND

- AM (PM) {AM' (PM')} Movement LOS & {95th Percentile Queue}
- Lane Geometry
- Stop Controlled Intersection
- Stop Sign

4. EXISTING PLUS APPROVED PLUS PROPOSED DEVELOPMENT CONDITIONS

This scenario considers a proposed dialysis clinic located in the southwest quadrant of Pryor Road and Shamrock Avenue. The proposed development is located southeast of the approved residential development and east of the approved Fire Station #3. The proposed development consists of a 10,274 square foot medical office building. The site plan associated with this proposed development is illustrated in **Figure 5**.

The approved study considered a general office use for the proposed site. Trip generation and distribution for the site has been revised to reflect the proposed land use.

4.1. Proposed Development Trip Generation and Distribution

To determine the impact of potential site traffic on the roadway network, expected trips associated with the proposed site were generated and applied to the study network. The Institute of Transportation Engineers (ITE) provides methods for estimating traffic volumes of common land uses in the Trip Generation Manual (10th Edition). The land use that most resembles that which is planned for this site is Land Use Code 720 (Medical-Dental Office Building).

Based on the *ITE Trip Generation Manual*, trip generation characteristics were developed for the proposed site. Trip generation characteristics expected for the site are shown in **Table 3**. Detailed ITE trip generation information can be found in **Appendix C**.

Table 3. Proposed Development Trip Generation.

Land Use	Size	Average Weekday	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
Medical-Dental Office Building	10,274 SF	308	30	23	7	37	10	27

Trips were distributed based on the directional trip distribution percentages presented in the referenced *West Village* traffic impact study. Directional trip distribution percentages expected for the site are illustrated in **Table 4**.

Table 4. Proposed Development Trip Distribution.

Direction	Trip Distribution
Pryor Road (North)	70%
Pryor Road (South)	30%
TOTAL	100%

The expected trip distribution for the proposed development is shown in **Figure 6**. The resulting existing plus approved plus proposed development volumes are illustrated in **Figure 7**.

4.2. Access Characteristics

Proposed Access

A private drive is proposed to extend south from Shamrock Avenue with the construction of approved development. This private drive is proposed to be constructed with the approved Fire Station #3 and will provide access to the proposed development. Proposed access to the site includes two driveways located along the east side of the private drive. An illustration of the proposed access is provided on the site plan (**Figure 5**). Due to the location of the proposed access along a private drive, geometrics will be reviewed, and guidance provided regarding minimum requirements. However, operational analysis will not be conducted for drive access located internally to the site.

Access Spacing

Drive 1 is located approximately 81 feet south of Shamrock Avenue, center to center, on the east side of the private drive. Drive 2 is located approximately 202 feet, center to center, south of Drive 1. **Table 5** provides proposed drive characteristics.

Table 5. Access Characteristics

Proposed Access	Public Roadway Intersected	Access Type	Proposed Throat Length	Proposed Width	Median Divided
Drive 1	Private Drive	Full Access	35 feet	27 feet	No
Drive 2	Private Drive	Full Access	90 feet	27 feet	No

The location and geometrics of the private drive were approved with the reference traffic impact study. To ensure adequate throat length is provided from Shamrock Avenue to the first proposed access (Drive 1), throat length of the private drive was reviewed. According to the Lee's Summit AMC, driveways servicing between 10-50 vehicles per hour (vph) during the peak hour period should have a minimum throat length of 50 feet adjacent to a local roadway for two-way access. The private drive meets City standards considering approved and proposed development.

Drive 1: Lee's Summit driveway width criteria is based on projected peak hour and daily traffic volumes. Trip generation completed in **Section 4.1** of this report projects that Drive 1 will service 30 vehicles during the highest peak hour period. Drive 1 has a proposed driveway width of 27 feet. Referencing *Table 18-1* of the AMC, driveways servicing less than 150 vehicles per hour (vph) during the peak hour period should have a driveway width between 28 feet and 42 feet for two-way access. The proposed width of Drive 1 does not meet City standards, however is expected to be acceptable for the proposed development.

Throat length standards for a proposed access is based on projected peak hour volumes, per the City of Lee's Summit AMC. Drive 1 has a proposed driveway throat length of 35 feet. Referencing *Table 18-2* of the AMC, driveways servicing between 10 to 50 vph during the peak hour period should have a minimum throat length of 50 feet adjacent to a local roadway. Standards are not provided for access along a private drive. Due to the expected low volumes, the provided driveway throat is expected to be adequate.

Drive 2: Trip generation completed in **Section 4.1** of this report projects that Drive 2 will service less than 10 vehicles during the highest peak hour period. Drive 2 has a proposed driveway width of 27 feet. Referencing *Table 18-1* of the AMC, driveways servicing less than 150 vph during the peak hour period should have a driveway width between 28 feet and 42 feet for two-way access. The proposed width of Drive 2 does not meet City standards, however is expected to be acceptable for the proposed development.

Drive 2 has a proposed driveway throat length of 90 feet. Referencing *Table 18-2* of the AMC, driveways servicing less than 10 vph during the peak hour period should have a minimum throat length of 30 feet adjacent to a local roadway. Standards are not provided for access along a private drive. Due to the expected low volumes, the provided driveway throat is expected to be adequate.

FIGURE 5

Site Plan

Dialysis Clinic
Lee's Summit, MO



olsson

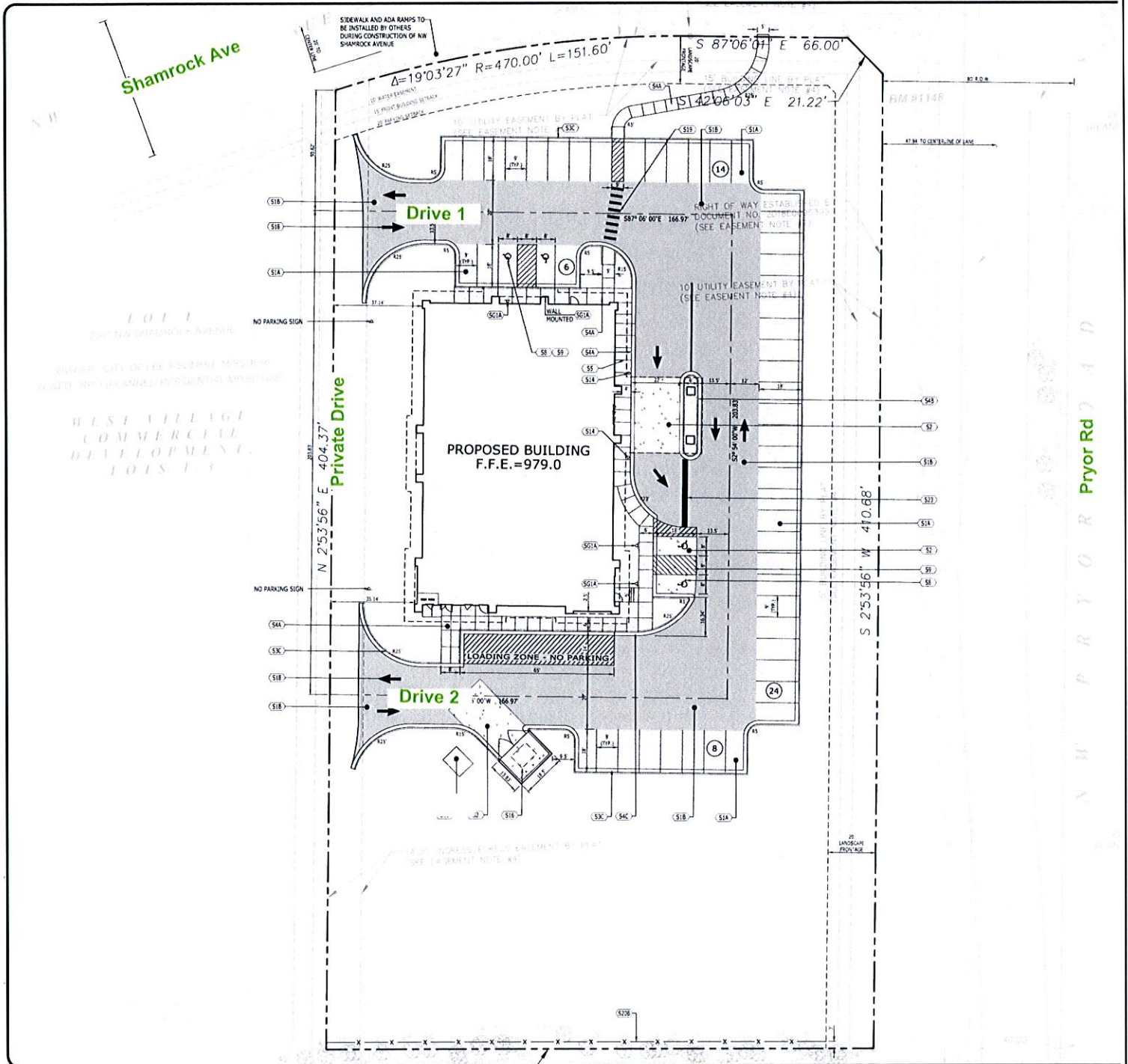
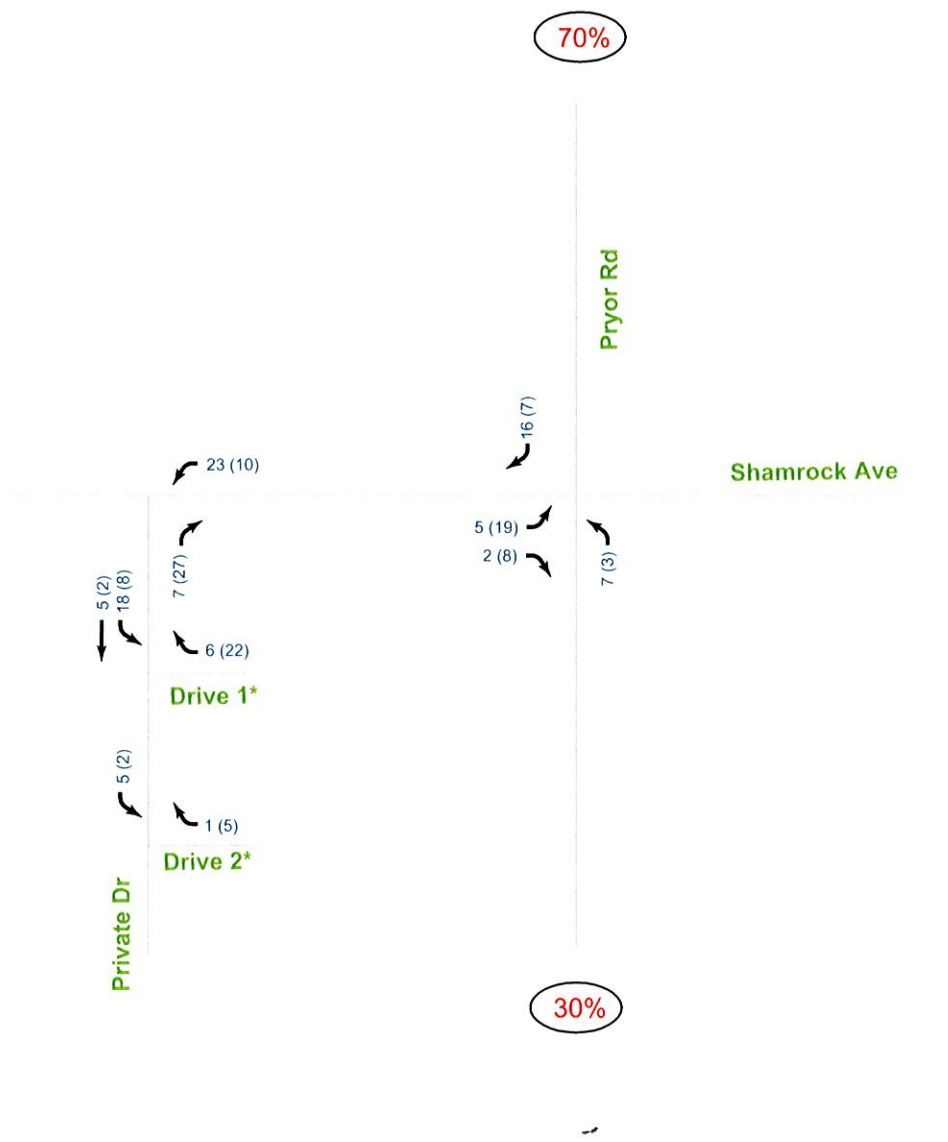


FIGURE 6

Proposed Development Trip Distribution

Dialysis Clinic
Lee's Summit, MO



LEGEND

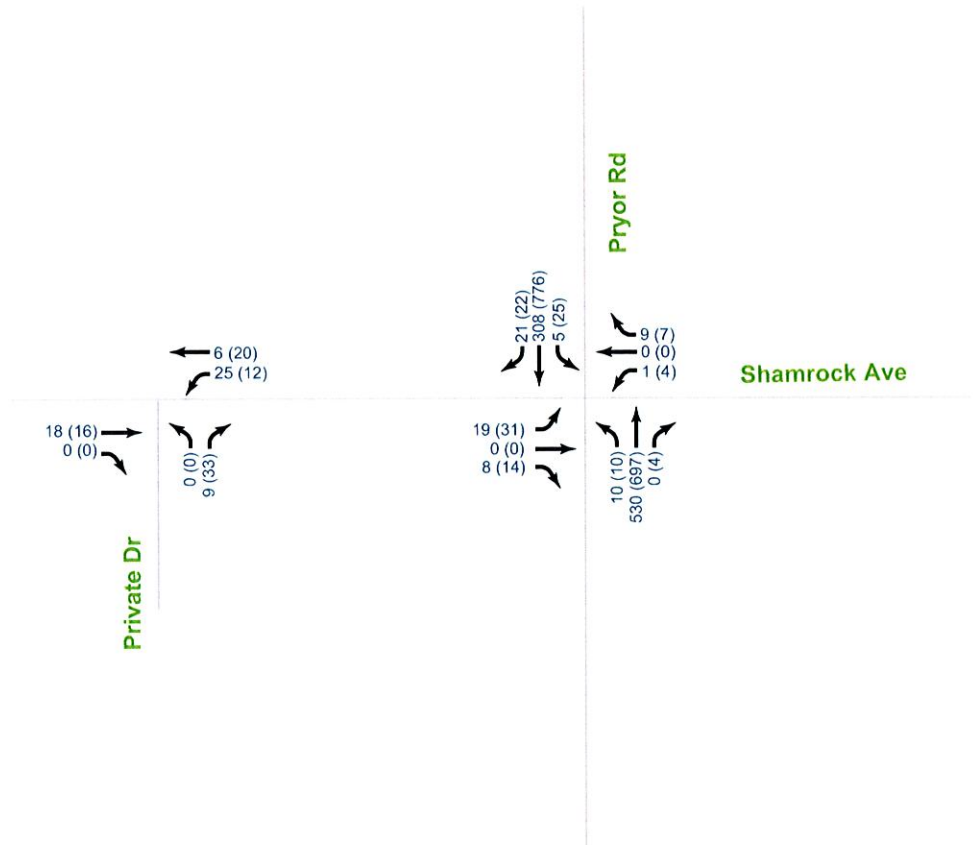
- AM (PM) AM (PM) Peak Hour
- XX% To/From Trip Distribution Percentages

*Not a study intersection

FIGURE 7

Existing Plus Approved Plus Proposed Development
 Conditions
 Peak Hour Volumes

Dialysis Clinic
 Lee's Summit, MO



LEGEND

AM (PM) Peak Hour Volume

4.3. Existing Plus Approved Plus Proposed Development Conditions

Existing Plus Approved Plus Proposed Development Signal Warrants:

Considering existing plus approved plus proposed development volumes, the intersection of Pryor Road with Shamrock Avenue is not expected to meet the criteria for signalization during either peak hour period based on Warrant 3 (peak hour warrant). Signal warrant analysis sheets can be found in **Appendix C**.

Existing Plus Approved Plus Proposed Development Turn Lane Warrants:

Turn lane warrants were reviewed per the City's AMC, as stated in **Section 3.2**. Turn lane standards were reviewed for westbound left-turn, northbound right-turn, and southbound right-turn movements. Based on existing plus approved plus proposed development traffic volumes, no additional turn lanes are warranted. Capacity analysis will be reviewed to determine if a turn lane is needed based on operations.

Existing plus approved plus proposed development conditions lane configurations and traffic control for the study network are illustrated in **Figure 8**.

4.4. Existing Plus Approved Plus Proposed Development Capacity Analysis

Capacity analysis was performed under existing plus approved plus proposed development conditions using the methodologies described in **Section 3.3**. The peak hour factors observed under existing plus approved development conditions were utilized for this scenario except for movements which experienced an increase in traffic after the proposed development. At these locations, the peak hour factors were conservatively adjusted considering the synchro suggested values and expected traffic conditions after development.

Results of the capacity analysis indicate similar operations to existing plus approved development conditions. At the intersection of the private drive with Shamrock Avenue, all movements are expected to continue operating at a LOS A during AM and PM peak hour periods. At the intersection of Pryor Road with Shamrock Avenue, the eastbound left-turn movement is expected to continue operating at a LOS F during the PM peak hour period with a slight increase of the 95th-percentile queue length of approximately two vehicles. As discussed in **Section 3.3**, minor street approaches with movements operating at a lower level of service during peak hour periods are not uncommon at an unsignalized intersection. At the unsignalized minor street approach listed above, the v/c ratios and 95th-percentile queues are expected to be acceptable during the peak hour periods.

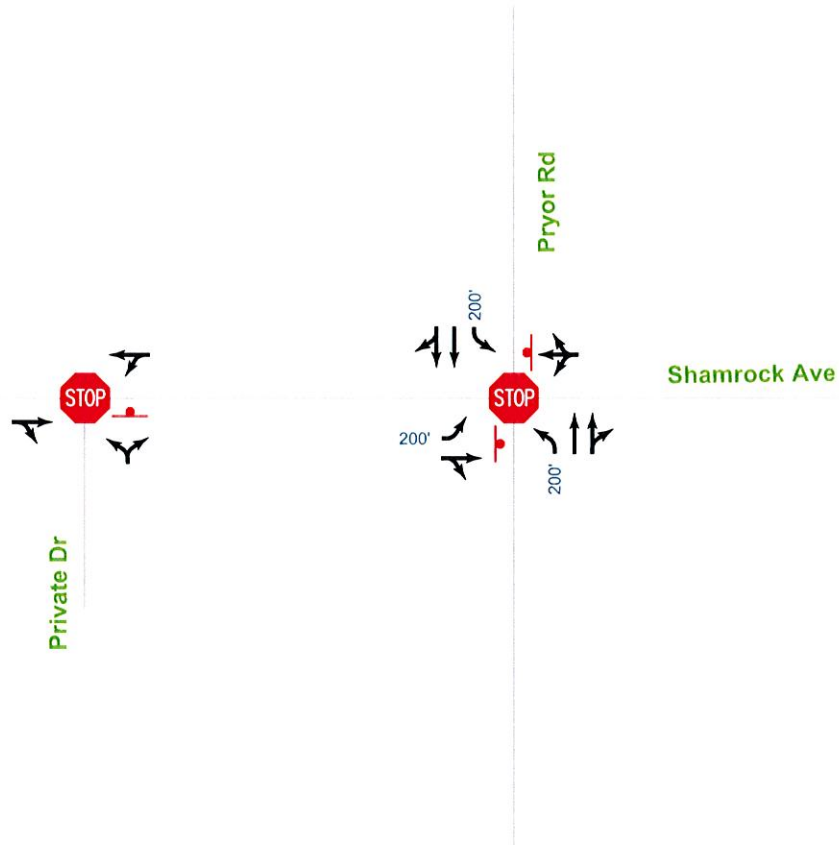
The existing plus approved plus proposed development conditions capacity analysis summary is illustrated in **Figure 9**. Detailed results may be found in **Appendix C**.

FIGURE 8

Existing Plus Approved Plus Proposed Development
Conditions

Lane Configuration and Traffic Control

Dialysis Clinic
Lee's Summit, MO



LEGEND

xx' → Lane Configuration

 Stop Controlled Intersection

 Stop Sign

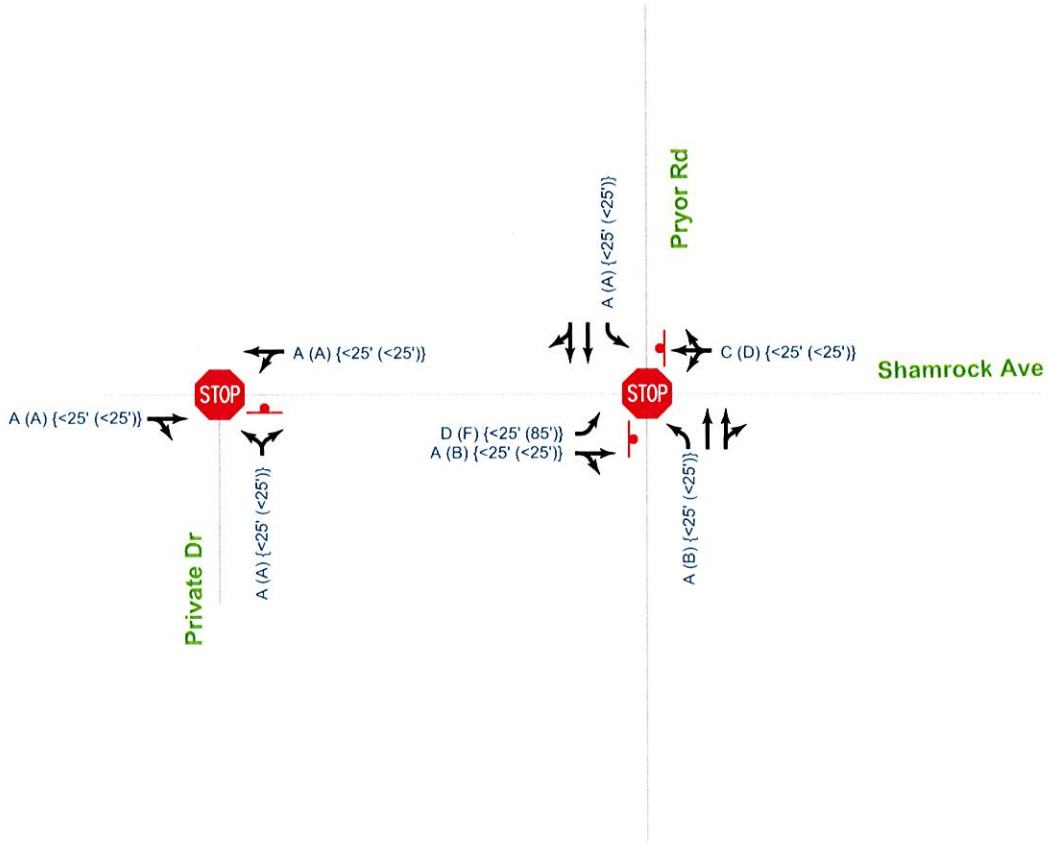
FIGURE 9

Existing Plus Approved Plus Proposed Development Conditions Capacity Analysis

Dialysis Clinic
Lee's Summit, MO



olsson



LEGEND

- AM (PM) {AM' (PM')} Movement LOS & {95th Percentile Queue}
- Lane Geometry
- STOP Stop Controlled Intersection
- Stop Sign

5. SUMMARY

The purpose of this study was to summarize traffic impacts regarding a proposed dialysis clinic located in the southwest quadrant of the intersection of Pryor Road and Shamrock Avenue in Lee's Summit, Missouri.

5.1. Conclusions

The general findings of note for the traffic impact study include the following:

1. In general, traffic operations are not expected to be significantly impacted by the proposed development.
2. The intersection of Pryor Road and Shamrock Avenue is not expected to require signalization or additional turn lanes with the proposed development in place.
3. The proposed accesses associated with the development are located along a private drive proposed with approved development. Drive geometrics are expected to be adequate for the proposed development.

5.2. Recommendations

There are no recommended improvements associated with the approved or proposed development conditions analysis conducted for this study.

