1. EXECUTIVE SUMMARY

The City of Lake St. Louis has experienced increasing traffic congestion and delays on the south side of the Lake St. Louis Boulevard interchange with Interstate 70, specifically at the two closely spaced signalized intersections on Lake St. Louis Boulevard, the eastbound I-70 ramps and Veterans Memorial Parkway.

The emphasis of this report was to study two potential roundabout configurations that would help alleviate the traffic flow issues being experienced. Alternative 1 consists of two closely spaced 4-legged smaller diameter roundabouts, one at each intersection operating in tandem. Alternative 2 is a larger diameter 6-legged roundabout configuration that incorporates all entries (legs) of the two existing intersections into one roundabout. Based on our investigation, both roundabout options are feasible and each would provide significant operational improvements to the intersections, with a significant reduction in delay and improvement in Level of Service. Each alternate can be feasibly constructed within the project constraints, with minimal impacts to the adjacent topography.

However, based on the benefits and impacts outlined in this study, Alternate 2, the 6-legged roundabout, is the preferred option for further study. The key items for selection of this alternate are the ability to extend the life span of the existing signalized intersection for the westbound I-70 off ramp, lower implementation costs, and less impact to the commercial entrance on the south leg of the intersection (Hardee's entrance).

2. INTRODUCTION

Oates Associates, in association with MTJ Roundabout Engineering, contracted with the City of Lake St. Louis to provide engineering services for the study of intersection improvements at the Lake St. Louis Boulevard interchange near I-70 (see Exhibit 2-1). The study is being performed to assess intersection improvements, specifically roundabout configurations, for two existing closely spaced signalized intersections on the south side of I-70. The City has experienced continued traffic queuing and backups issues over the past several years.

The goal of the study is to identify conflicts, constraints, impacts (utility and right of way), and cost of improving the intersections and determine the feasibility of the two proposed roundabout configurations. The study will establish design criteria, analyze traffic data, develop conceptual geometry, provide analysis of traffic operations for each alternate, and provide estimates of cost for each alternate.

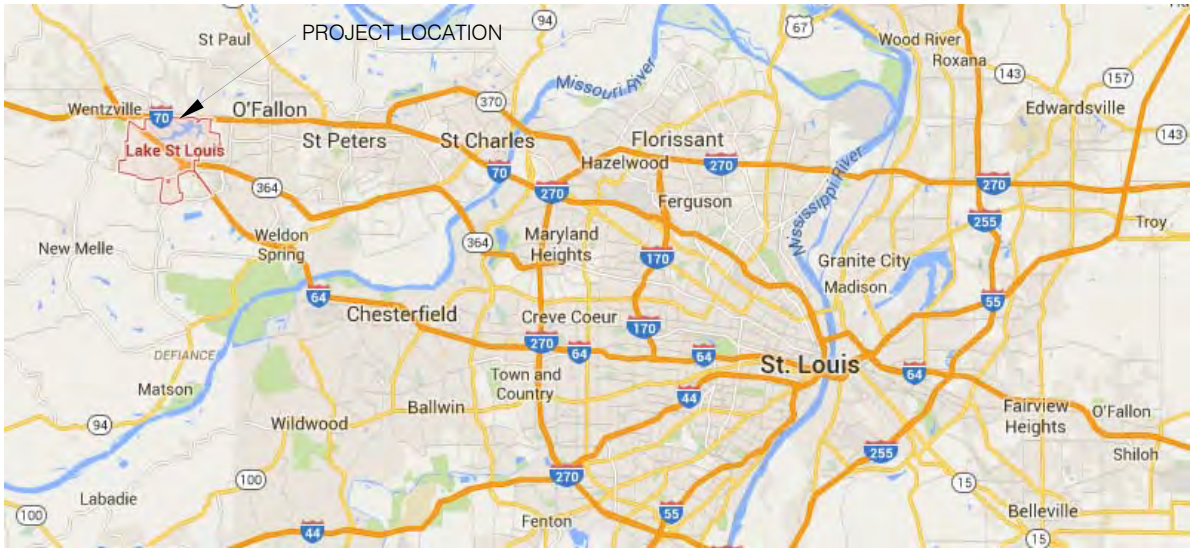

Exhibit 2-1 - Location Map

3. EXISTING CONDITIONS

The City of Lake St. Louis is located approximately 35 miles northwest of downtown St. Louis and about 15 miles west of downtown St. Charles on I-70 in St. Charles County. The population as of the 2010 census is about 14,800 people.

The topography of the surrounding area consists of mainly rolling/hilly land with agriculture and sparse industry to the north of I-70 with business/ light commercial and residential to the south. Land use immediately adjacent to the study area is made up of service oriented business such as convenience stores, restaurants, and banking facilities (see Exhibit 3-1). Larger traffic generators nearby include SSM Medical/St. Joseph Hospital, which is located approximately 750' west of the Lake St. Louis Boulevard/Veterans Memorial Parkway Intersection and the General Motors Wentzville Assembly plant, which is located about 2.5 miles west of the study area. The majority of the area north of I-70 bound by Highway P to the north, Highway M to the east, I-70 to the south and Josephville Road/Wortman Road/ Highway A to the west is mostly open and has potential for future development. Development further south of study area is predominately single family residential with little or no room for expansion or growth.

Lake St. Louis Boulevard runs north south through the study area (see Exhibits 3-2 and 3-3). It is functionally classified as a minor arterial (see Exhibit 3-4). Between Veterans Memorial Parkway (south outer road) and W. Terra Lane (Old US 40 – north outer road) the roadway consists of two through lanes in each direction with turn lanes at the intersections. Veterans Memorial Parkway runs east west and is functionally classified a major collector route and mainly consists of single through lanes in each direction with a two-way left turn lane. There are two signalized intersections north of I-70, at W. Terra Lane and the westbound I-70 ramps.

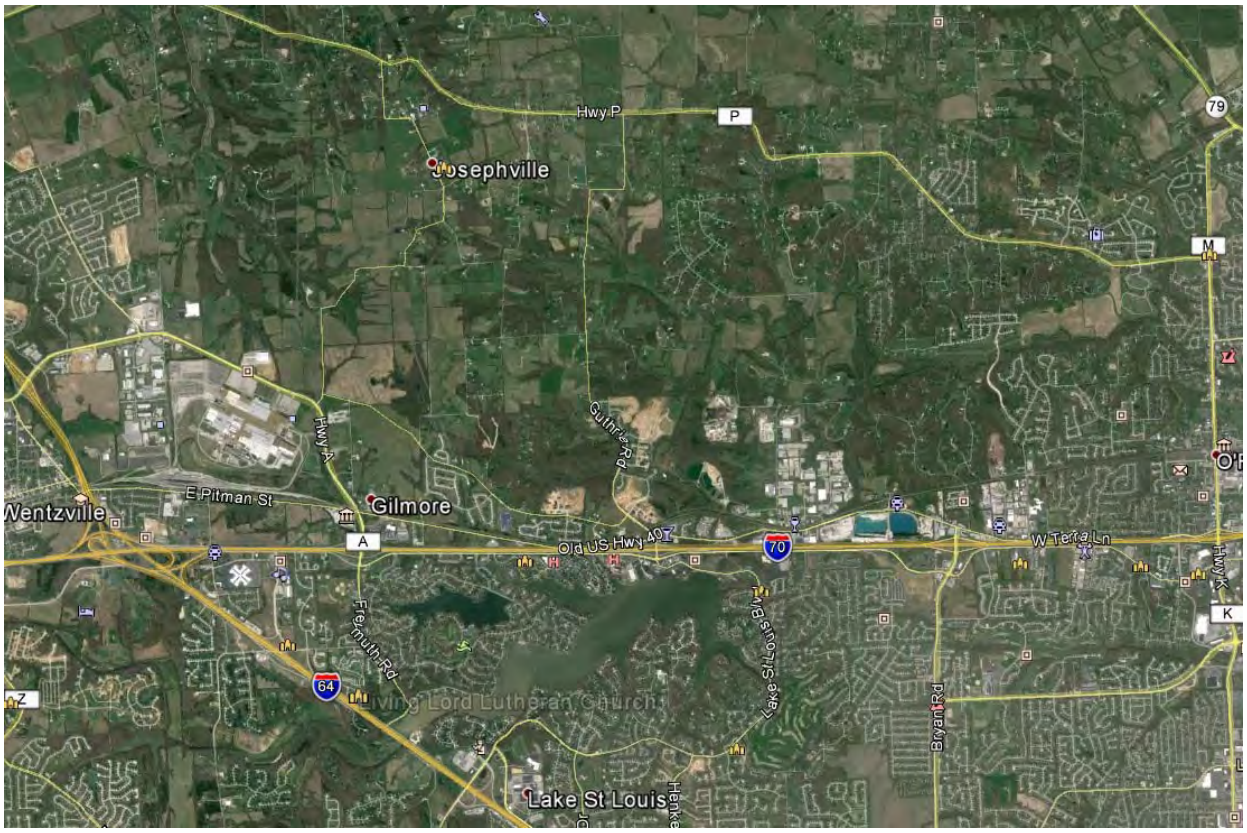

Exhibit 3-1 - Aerial Image of the Study Area

The study area is bound by W. Terra Lane to the north, Veterans Memorial Parkway (south outer road), and the limits of the Lake St. Louis Boulevard interchange. More specifically, the intersections being directly studied are the eastbound on and off ramps and Veterans Memorial Parkway with Lake St. Louis Boulevard (see Exhibit 3-2).

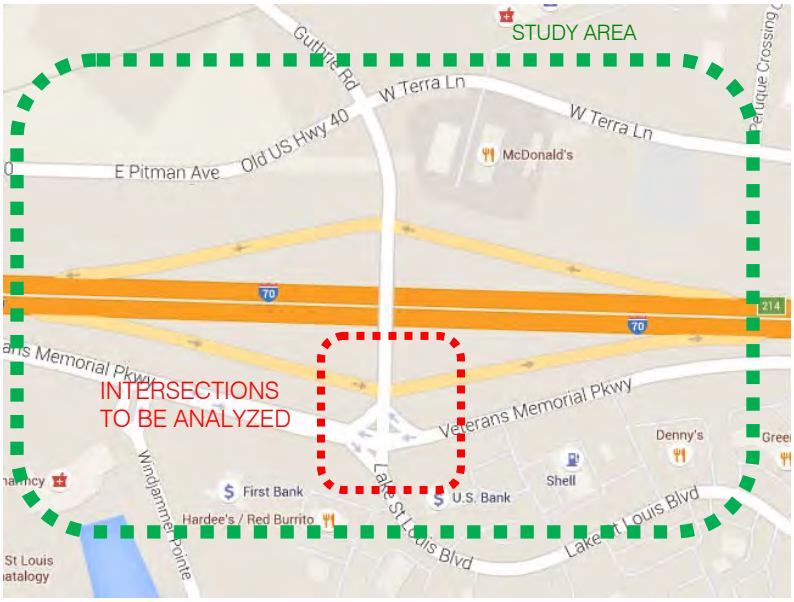

Exhibit 3-2 - Study Area

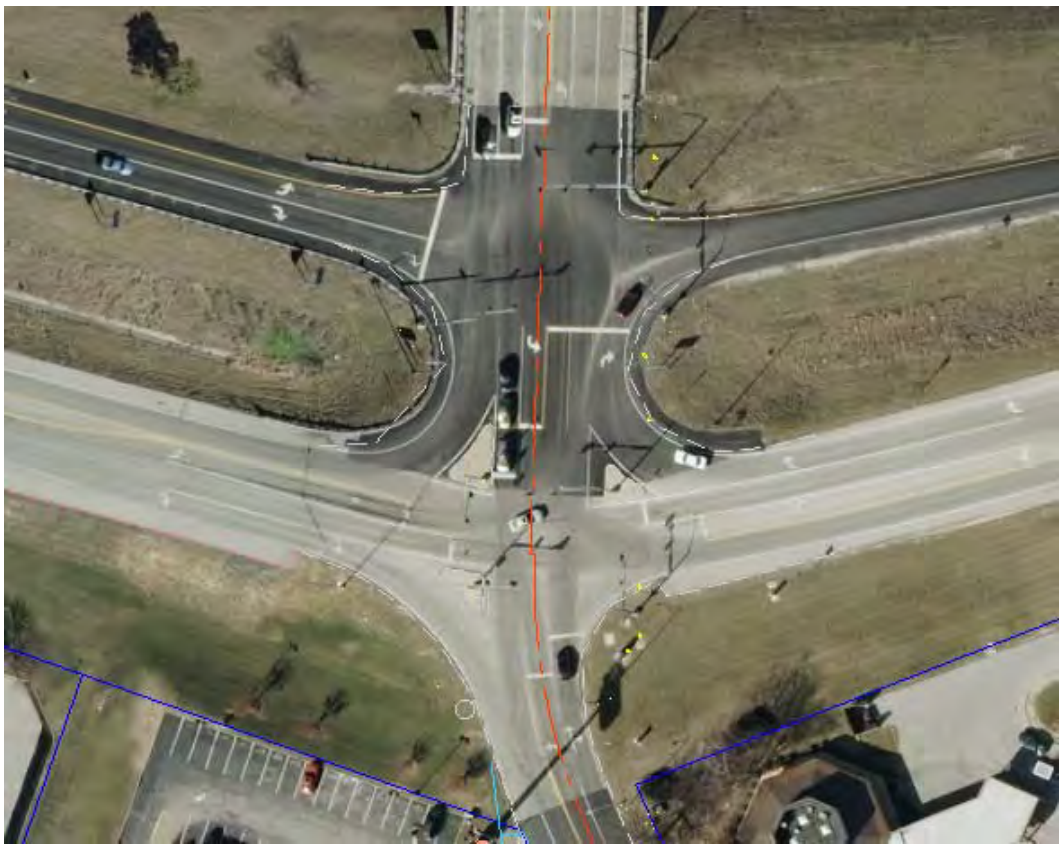

Exhibit 3-3 - Subject Intersections

The close proximity of the Lake St. Louis Boulevard intersections with the eastbound ramps to I-70 and Veterans Memorial Parkway cause traffic backups and delays. According to the Gateway Green Light Phase II Signal Coordination Report and the study application provided by the City, the intersections are currently functioning at a Level of Service (LOS) of D.

Two sets of traffic counts were analyzed for this study. MoDOT completed a set of counts in August, 2015, and the City of Lake St. Louis completed updated traffic counts in April, 2016. The counts completed by the City were found to be 5%-10% lower than the MoDOT counts, and this discrepancy was attributed to normal fluctuations in traffic volumes observed. In order to be more conservative in our analysis, it was determined that the MoDOT counts from August, 2015 would be used for the study. Truck traffic was taken from the City counts and found to generally be 5% or less of the observed traffic volumes.

There currently are no bicycle or pedestrian facilities in the immediate study area. There are intermittent sidewalks that were constructed specifically as part of a particular development approximately 700' south of the intersections. Also, a multiuse path exists along the south side of Lake St. Louis Boulevard, but terminates approximately 1,300 feet south east. Expansion of the bicycle and pedestrian network is anticipated to be developed over the next several years to include access to the Veteran's Memorial Parkway intersection and along Veteran's Memorial Parkway. Expansion to the north side of the study area, across the existing bridge over I-70, is not anticipated. There are no bus or mass transit facilities in the area.

Exhibit 3-4 - Roadway Classifications in the Study Area

Limited field work was done for the study. Most of the information shown in this report was derived from record sources. Photogrammetry came from E-W Gateway Council of Governments and the surface data came from LiDAR data obtained through the Missouri Spatial Data Information Service (MSDIS). Existing right of way was developed from record information. Utility companies in the area were obtained via Missouri One Call. Traffic counts provided by MoDOT, completed in August 2015, were used as a basis for the analysis. Projected growth rates were derived from adjacent land use and projected future developments within the study area. Ground level photographs of the study area are shown in Appendix C.

4. PROPOSED ALTERNATIVES

Two roundabout configurations were considered for this study. One option was the use to two closely spaced, smaller diameter roundabouts operating in tandem. The other was one larger 6-legged roundabout.

Projected traffic growth was developed by analyzing existing and projected land use in and around the study area, and the potential impacts to the intersection and the proposed layouts. The areas to the east, south, and west of the intersections are fully developed and any redevelopment will likely be infill. It is anticipated that this future redevelopment will generate an annual nominal growth rate of approximately 1% for these three legs of the project, or 20% growth over the 20-year design period. The portion of the study area north of I-70 is currently undeveloped and will likely experience significant residential growth over the next several years. It is anticipated that the overall ADT from this area will increase 50%-75% over the design period, approximately 2.5% annually. However, in order to allow for additional potential development, the study used a more aggressive 1.5% annual growth rate, or 35% increase, for the east, south, and west legs, and a 3.5% growth rate, or 100% increase, for the north leg.

The conceptual layout and detailed operational analysis for each alternate was completed by MTJ Roundabout Engineering. The analysis was completed with the roundabout-specific analysis program Rodel (v.1.88). For a more detailed explanation of the Rodel analysis software see the Roundabout Analysis Software section included in Appendix A. The two signalized intersections north of I-70 were analyzed using Synchro (v. 9.1) to determine if the operation of these intersections would have an impact on either proposed alternate or if the anticipated traffic growth would affect their operation and negatively impact the proposed roundabout. See Appendix B for more detail on the Synchro Analysis.

A summary of each alternate is outlined as below:

Alternative 1 – two closely spaced roundabouts (see Exhibit 4-1)

This alternate will consist of two closely spaced, small diameter roundabouts, each with 4 legs. It was assumed that the existing bridge over I-70 will remain in place and that any modifications to the structure would be cosmetic in nature (adjust pavement marking / lane configurations, possible addition of raised median). See Exhibit 4.1 for the conceptual layout of this alternate.

Exhibit 4-1 - Alternative 1 - Two Closely Spaced Roundabouts

The north intersection, the eastbound I-70 exit and entrance ramps, would shift slightly to the south, with minor realignment of the ramps to the south to provide the proper approach angles.

The south intersection, Veteran's Memorial Parkway, would shift farther south, nominally 50 feet, to provide a minimum amount of separation between the two roundabouts. This will require the widening and realignment of each approach of Veteran's Memorial Parkway to provide splitter islands and introduce proper approach angles.

This option is feasible and can be designed to fit the parameters of the project. See Appendix A – Operational Analysis, completed by MTJ Roundabout Engineering, for a detailed description of this alternate and the output of the RODEL analysis.

Benefits of this option include a simpler design and analysis, as the two roundabouts can be can be conceptualized independently, and simpler navigation by motorists due to the single lane nature of each roundabout. The circulating volumes in each roundabout will be lower since some of the traffic will not need to traverse both roundabouts. Additionally, the tighter radii will result in lower circulating speeds through the intersections creating a safer environment for all users, including motorists, bicyclists, and pedestrians.

Potential issues to resolve include reconfiguring the pavement marking to provide lane continuity across the I-70 bridge, possible ROW acquisition, and utility coordination. Currently there are dual left turn lanes from the westbound I-70 off ramp which lead to two southbound through lanes, in addition to a southbound left turn lane, for a total of three southbound lanes across I-70. The proposed roundabout configuration only requires two entry lanes, one to circulate left turns around the north roundabout to the eastbound I-70 on ramp and one to direct traffic to the south roundabout. The distance between the westbound and eastbound off ramps is approximately 300 feet.

Transitioning from the three existing lanes down to two can be accomplished by converting the thru-right lane at the westbound I-70 on ramp into a right only lane, and restriping the bridge for two lanes. The dual left turn lanes from the off ramp will be impacted as well, since drivers will likely favor the outside lane entering the roundabout as the inside lane would be directing them back onto eastbound I-70.

In this scenario the dual left turn lanes from the westbound I-70 ramp would tend to act as a single lane, potentially causing queuing issues on the off ramp. To mitigate this issue, a weaving analysis could be completed to determine if the 300-foot spacing allows enough room for traffic to merge into one lane, or an additional entry lane could be added to the north roundabout to provide a bypass for traffic heading to westbound Veteran's Memorial Parkway.

Another issue of concern is the commercial entrance on the west side of Lake St. Louis Boulevard just south of the intersection (Hardee's entrance). The existing entrance is approximately 100 feet south of the intersection with Veteran's Memorial Parkway. Shifting the intersection to the south as shown in the proposed roundabout layout reduces the gap to the entrance to approximately 50 feet. While this reduced distance is a concern, the improved traffic flow through the intersection and relatively slow circulating speeds of the vehicles exiting the roundabout should mitigate any impacts to the function of the entrance.

Lastly, if projected traffic growth develops as anticipated over the design period, traffic could begin to queue into the roundabouts from the signalized intersections north of I-70, potentially reducing the level of service of the roundabouts. Future intersection improvements north of I-70 may be required to mitigate this issue as future development occurs and traffic volumes increase.

In summary, the advantages and disadvantages for this alternate are summarized below:

Advantages

- Better traffic flow and increased Level of Service
- Less circulating volume
- Tighter radii produce lower circulating speeds
- Reduced speeds aids in future bicycle and pedestrian accommodations
- Simple concept, usability for drivers

Disadvantages

- Higher implementation costs
- Impacts to the commercial entrance on the south leg (Hardee's entrance)
- May require adding median pavement to the existing bridge deck
- Dual left turn lanes from westbound I-70 off ramp may experience reduced level of service

Alternative 2 – larger 6-legged roundabout (See Exhibit 4-2)

This alternate will consist of a single, larger diameter, 6-legged roundabout. It was again assumed that the existing bridge over I-70 will remain in place and that any modifications to the structure would be cosmetic in nature (adjust pavement marking / lane configurations, possible addition of raised median). See Exhibit 4.2 for the conceptual layout of this alternate.

Exhibit 4-2 - Alternative 2 - Larger 6-Legged Roundabout

The north south location of each intersection will not change significantly, and the larger diameter of the roundabout will require additional grading and pavement on the east and west side of Lake St. Louis Boulevard. Minor realignment of the ramps to the south will provide the proper approach angles, while Veteran's Memorial Parkway will be shifted slightly south to provide splitter islands and introduce proper approach angles.