



Source: Public Works

Agenda Item No: REP 106-13

To: City Council
From: City Manager and Staff

Council Meeting Date: Jul 15, 2013

Re: Right Turn Lane from Keene Street to St. Charles (CM 3629)

EXECUTIVE SUMMARY:

Staff has prepared for Council consideration a report concerning whether a northbound right turn lane could be added to Keene Street, onto St. Charles Road, at a reasonable cost.

DISCUSSION:

At the May 21, 2012 Council meeting, staff was directed to evaluate the location at Keene Street and St Charles Road, to see if a northbound right turn lane could be added, and the approximate cost to do so. Initial evaluation indicated that the turn lane would probably be significant enough (between \$100,000 and \$200,000) that additional assessment of options was prudent.

The location is currently a span-wire signal with wooden poles. There are no pedestrian signals, and significant utility issues east of the intersection. A 16" water main and underground three-phase electric would need to be adjusted. Overhead electric may also need to be adjusted based on the selected improvement.

During evaluation, some signal timing issues were identified. The signal currently operates at Level of Service (LOS) E, during the peak hour. Staff is adjusting the timing plans for more efficient operation, but the best peak hour operation will likely be LOS D, due to physical constraints. Staff has attached a section of Chapter 5 from the CATSO 2030 Long Range Transportation Plan defining the Levels of Service, or LOS.

When the signal was constructed in the mid-2000s, there were plans for a larger Community Improvement District (CID) project along Keene Street that would have converted the location to a more permanent signal configuration, or a roundabout, as well as pursuing other significant improvements along the Keene Street corridor. Those plans have not come to fruition, and there is no known activity to continue pursuit of the CID by local constituents.

Staff completed analysis of four different options:

1. "Minimal" impact northbound right turn lane.

The estimated cost is \$145,000 with no pedestrian signal upgrades, and \$180,000 with pedestrian signal upgrades. The intersection would operate at LOS C, in the peak hour. This improvement may slightly improve safety at the intersection (see attached diagram and cost estimate).

2. More functional northbound right turn lane that would also include addition of a westbound left turn lane - St. Charles Road construction to the south.

Span-wire modified but remains as span-wire signal. The estimated cost is \$420,000. This intersection would probably operate at LOS B, or possibly C, in the peak hour depending on traffic growth. Modifying to mast-arms and poles would add \$90,000. This improvement would improve safety of pedestrians and may moderately improve overall safety at the intersection (see attached diagram and cost estimate)

3. More functional northbound right turn lane and westbound left turn lane - St. Charles Road construction to the north.

Span-wire modified but remains as span-wire signal. The estimated cost is \$420,000. This intersection would probably operate at LOS B, or C, in the peak hour depending on traffic growth. Modifying to mast-arms and poles would add \$90,000. This improvement would improve safety of pedestrians and may moderately improve overall safety at the intersection (see attached diagram and cost estimate).

4. Conversion to a roundabout.

The estimated cost is \$510,000. The roundabout would operate at LOS A, or B. During the CID evaluation, there was some concern about long term capacity with a roundabout. The timing of Rolling Hills Road being connected to WW was not known. With the Rolling Hills Road extension connection, and better connectivity north of I-70 to US 63, St. Charles Road traffic volumes do not pose as much of a concern as they did when the intersection was previously evaluated. The roundabout improvement would increase safety of pedestrians and would improve overall safety at the intersection. This option is probably the best long term solution (see attached diagram and cost estimate).

Options 2, 3, and 4 would require additional right of way. Initial evaluation indicates Options 2 and 3 are similar enough, from a budget perspective, that in-depth analysis of utility impacts and right of way would be needed to lead to a preferred alternative.

Staff recommends that Council consider adding the intersection of Keene Street and St. Charles Road to the Capital Improvement Program (CIP) at a budgetary cost of \$600,000.

FISCAL IMPACT:

Options and costs are identified above. If Council chooses to add the intersection as a future CIP project, funding would need to be identified.

VISION IMPACT:

<http://www.gocolumbiamo.com/Council/Meetings/visionimpact.php>

Dedicate funds to identify routes and corridors for all modes, preserve rights of way, and improve existing intersections to enhance safety and improve capacity.

SUGGESTED COUNCIL ACTIONS:

If Council chooses to move forward with one of the above listed options, direct staff to add the intersection as a future CIP project, and identify the funding.

FISCAL and VISION NOTES:					
City Fiscal Impact Enter all that apply		Program Impact		Mandates	
City's current net FY cost	\$0.00	New Program/ Agency?	No	Federal or State mandated?	No
Amount of funds already appropriated	\$0.00	Duplicates/Expands an existing program?	No	Vision Implementation impact	
Amount of budget amendment needed	\$0.00	Fiscal Impact on any local political subdivision?	No	Enter all that apply: Refer to Web site	
Estimated 2 year net costs:		Resources Required		Vision Impact?	Yes
One Time	\$0.00	Requires add'l FTE Personnel?	No	Primary Vision, Strategy and/or Goal Item #	13.2.2
Operating/ Ongoing	\$0.00	Requires add'l facilities?	No	Secondary Vision, Strategy and/or Goal Item #	13
		Requires add'l capital equipment?	No	Fiscal year implementation Task #	

CATSO 2030 Long Range Transportation Plan

CHAPTER FIVE: TRANSPORTATION SYSTEM MANAGEMENT

5.1 Congestion and Congestion Management

Traffic congestion and travel delay are among the most visible manifestations of an area's transportation problems. Drivers experience congestion for the most part as a personal annoyance although traffic congestion is a problem that wastes time, consumes energy resources, and contributes to lowered air quality.

Traffic congestion in the metro area is typically confined to the morning and evening peak hours of travel. Delays from congestion occur at specific locations such as Interstate ramps, signalized intersections, and bridges. Congestion in the metro area lasts less than 30 minutes in the morning and evening. In the Columbia area, the average travel time to work of 17.8 minutes in 2000 did not change significantly from 1990 when this number was 16.7 minutes. An examination of national trends points to the consistency of the average travel time while the duration of traffic congestion during the peak hours increases.

Expanding the capacity of roadways is not the sole solution to congestion. The new roadways, bridges, and highways built to relieve congestion satisfy latent and shifted demand for travel. The use of alternate modes, land use regulation, access management, and improvements to intersections and traffic signals can all contribute to an overall program to manage traffic congestion.

There are two major methods of gauging congestion, facility-based measures and travel time. The facility based congestion methods focus on the road itself, and usually are based on traffic volume and capacity comparisons. Such comparisons may include volume-to-capacity ratios and traffic volume per lane-mile. The travel time method of measuring congestion indicates the same conclusion, however. These trip-based measures, which are tied to the individual traveler's congestion problems, are oriented to the length of the trip. Average travel time to work is an example of one such measure.

A 1994 National Research Council report notes that changes in individual behavior keep congestion from getting worse, as travelers make route and other changes to avoid delay. So travel times do not necessarily increase in proportion to congestion on particular sections of roadway. With continued population growth, and with residential development spreading further into outlying areas, vehicle trips have been increasing. Existing streets are forced to carry greater volumes. Traffic volumes are increasing, and an examination of individual streets would likely show that capacity is not keeping up. The conclusion might be drawn that congestion is worsening in the metro area as more roadways are becoming crowded.

A number of indicators may be used to gauge and manage congestion in the Columbia area. These are divided into four categories:

1. Facility-based measures:

- Average vehicle speed in peak hour
- Ratio between peak volume & nominal capacity (V/C)
- Total vehicle-hours of delay
- Proportion of daily travel by speed or V/C range
- Frequency and duration of incidents

Average daily traffic (ADT) per freeway lane

2. Personal travel effects:

- Proportion of personal travel by speed range
- Delay added to average person trips by time of day, travel purpose
- Delay added to average person trip by place of residence
- Delay to transit vehicles
- Number of accidents due to congestion

3. Effects on the economy:

- Delay added to average commuter trip by place of work
- Percentage of truck travel by speed or V/C range
- Vehicle-hours of delay to trucks/delivery vehicles
- Truck scheduling costs attributable to travel time uncertainty
- Market perceptions of congestion as an influence on economic activity

4. Environmental impacts 32

- Extra vehicle emissions due to stop-and-go conditions
- Extra gas consumption due to stop-and-go condition

1. Levels of Service

Level of Service is defined as conditions within a traffic stream as perceived by the users of a traffic facility. In practice, levels of service have been defined by measures of effectiveness for each facility type, relating more to speed, delay and density than to qualitative factors or safety.

The following describes levels of service, according to the Highway Capacity Manual.

Level of Service A describes primarily free flowing operations at average travel speeds usually about 90 percent of the free flow speed for the arterial class. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Stopped delay at signalized intersections is minimal.

Level of Service B represents reasonably unimpeded operations at average travel speeds usually about 70 percent of the free flow speed for the arterial class. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome.

Level of Service C represents stable operations. However, ability to maneuver and change lanes in mid-block locations may be more restricted than in LOS B, and longer queues and/or adverse signal coordination may contribute to lower average travel speeds of about 50 percent of the average free flow speed for the arterial class.

Level of Service D borders on a range on which small increases in flow may cause substantial increases in approach delay and, hence, decreases in arterial speed. This may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these. Average travel speeds are about 40 percent of free flow speed.

Level of Service E is the point at which the roadway has reached its maximum capacity. Traffic operations are unstable, speeds and flow rates fluctuate, and there is little independence for driver speed selection or maneuvering.

Level of Service F characterizes forced flow at extremely low speeds below one-third to one-quarter of the free flow which will drop to zero at times. Intersection congestion is likely at critical signalized locations, with high approach delays resulting. Adverse progression is frequently a contributor to this condition.

The Technical Committee of the Columbia Area Transportation Study Organization has adopted Level of Service C as the goal for traffic movement in the community. This is a commonly accepted goal in most communities. Level of Service D is acceptable at certain critical locations during the peak hour of flow at certain locations, but is not considered a design goal for new facilities. The Level of Service at signalized intersections was evaluated using the observed stopped delay method described in the Highway Capacity Manual.

Congestion “hot spots” in the Metro area include the I-70/MO 740 interchange area; MO 740/MO 163 intersection; Broadway/Route WW-US 63 interchange/Keene Avenue intersection area; and the US 63/Route PP intersection. Several traffic studies have been performed since the last transportation plan that identify existing and proposed conditions and recommended improvements.

Option 1

\$180,000



Property line (Typ)

St. Charles Road

Add "minimal" impact right turn lane

Three-phase underground electric and 16" water line on east side of the Keene

Keene Street



Location



City of Columbia, Missouri
Department of Public Works

Keene & St. Charles
Minimal impact right-turn lane addition

Scale: 1"=40'

Dwn: RLS

Date: 06/13/2013

Cost Estimate:

Keene & St. Charles "minimal" right turn lane addition/upgrade

By: R. Stone, Columbia Public Works

Item	Units	Number of Units	Cost per unit	Cost
Utility relocation	LS	1	\$33,000	\$33,000
Modify signal equipment	LS	1	\$3,000	\$3,000
Bicycle markings	LS	1	\$1,000	\$1,000
Symbols	EA	4	\$330	\$1,320
Marking	LS	1	\$2,500	\$2,500
Adjust poles and guys - signal	EA	1	\$2,000	\$2,000
Cable and connections	LS	1	\$1,800	\$1,800
Street light relocation	LS	1	\$3,500	\$3,500
Traffic control	LS	1	\$6,500	\$6,500
Signs	EA	2	\$180	\$360
New Pavement (base+surface)	Sq Yd	294	\$100	\$29,444
Excavation	LS	1	\$7,000	\$7,000
Backfill slope control and <4' block retaining all	LS	1	\$4,500	\$4,500
Erosion control	LS	1	\$2,500	\$2,500
Sidewalk (6' at back of curb)	Sq Ft	285	\$6	\$1,710
Mobilization (10%)	LS	1	\$10,013	\$10,013
Contractor profit and overhead (20%)	LS	1	\$22,030	\$22,030
Subtotal				\$132,177
10% Contingency				\$13,218
Total anticipated cost for minimal approach right turn lane				\$145,395
Minimal right turn island and <u>add pedestrian</u> <u>crosswalks and signals</u>				
Cable connections - installed on span wire	LS	1	\$2,700	\$2,700
Pedestrian poles and bases and conduit to span-wire poles	ea	4	\$2,500	\$10,000
Crosswalk markings	ea	4	\$1,500	\$6,000
Modify ramps and landings and sidewalk repair	ea	3	\$2,500	\$7,500
Contractor profit and overhead (20%)	LS	1	\$5,240	\$5,240
Subtotal				\$31,440
10% Contingency				\$3,144
Anticipated additional cost for minimal approach right turn lane with pedestrian signals				\$34,584
Total anticipated cost for minimal approach right turn lane				\$179,979

Option 2

\$420,000



Additional ROW

Add NB right turn lane -
WB LT lane - St. Charles
Construction to the south



City of Columbia, Missouri
Department of Public Works

Keene & St. Charles
Right-turn and left-turn lane addition

Scale: 1"=40'

Dwn: RLS

Date: 06/19/2013

Cost Estimate:**Keene & St. Charles NB right turn and WB left turn St. Charles construction to the south**

By: R. Stone, Columbia Public Works

Item	Units	Number of Units	Cost per unit	Cost
Utility relocation	LS	1	\$68,000	\$68,000
Modify signal equipment	LS	1	\$15,000	\$15,000
Bicycle markings	LS	1	\$1,000	\$1,000
Symbols	EA	4	\$330	\$1,320
Marking	LS	1	\$5,000	\$5,000
Adjust poles and guys - signal	EA	3	\$4,000	\$12,000
Cable and connections	LS	1	\$3,500	\$3,500
Street light relocation	LS	1	\$3,500	\$3,500
Traffic control	LS	1	\$13,000	\$13,000
Signs	EA	4	\$180	\$720
New Pavement (base+surface)	Sq Yd	1167	\$80	\$93,333
Excavation	LS	1	\$10,000	\$10,000
Backfill slope control and <4' block retaining all	LS	1	\$4,500	\$4,500
Erosion control	LS	1	\$2,500	\$2,500
Sidewalk (6' at back of curb)	Sq Ft	693	\$6	\$4,158
Right of way	Sq Ft	2100	\$15	\$31,500
Mobilization (10%)	LS	1	\$23,753	\$23,753
Contractor profit and overhead (20%)	LS	1	\$58,557	\$58,557
Subtotal				\$351,341
10% Contingency				\$35,134
Total anticipated cost for NB right turn lane and WB left turn lane - St. Charles construction to the south				\$386,475
<u>Pedestrian crosswalks and signals</u>				
Cable connections - installed on span wire	LS	1	\$2,700	\$2,700
Pedestrian poles and bases and conduit to span-wire poles	ea	4	\$2,500	\$10,000
Crosswalk markings	ea	4	\$1,500	\$6,000
Modify ramps and landings and sidewalk repair	ea	3	\$2,500	\$7,500
Contractor profit and overhead (20%)	LS	1	\$5,240	\$5,240
Subtotal				\$31,440
10% Contingency				\$3,144
Anticipated additional cost for pedestrian signals				\$34,584
Total anticipated cost for NB right turn lane and WB left turn lane - St. Charles construction to the south including pedestrian signals				\$421,059



Option 3

\$420,000

Additional ROW

Add NB right turn lane -
WB LT lane - St. Charles
Construction to the north



City of Columbia, Missouri
Department of Public Works

Keene & St. Charles
Right-turn and left-turn lane addition

Scale: 1"=40'

Dwn: RLS

Date: 06/13/2013

Cost Estimate:

Keene & St. Charles NB right turn and WB left turn St. Charles construction to the north

By: R. Stone, Columbia Public Works

Item	Units	Number of Units	Cost per unit	Cost
Utility relocation	LS	1	\$42,000	\$42,000
Modify signal equipment	LS	1	\$15,000	\$15,000
Bicycle markings	LS	1	\$1,000	\$1,000
Symbols	EA	5	\$330	\$1,650
Marking	LS	1	\$6,000	\$6,000
Adjust poles and guys - signal	EA	3	\$4,000	\$12,000
Cable and connections	LS	1	\$3,500	\$3,500
Street light relocation	LS	1	\$3,500	\$3,500
Traffic control	LS	1	\$13,000	\$13,000
Signs	EA	4	\$180	\$720
New Pavement (base+surface)	Sq Yd	1380	\$80	\$110,400
Excavation	LS	1	\$18,000	\$18,000
Backfill slope control and <4' block retaining all	LS	1	\$4,500	\$4,500
Erosion control	LS	1	\$3,000	\$3,000
Sidewalk (6' at back of curb)	Sq Ft	939	\$6	\$5,634
Right of way	Sq Ft	2030	\$15	\$30,450
Mobilization (10%)	LS	1	\$23,990	\$23,990
Contractor profit and overhead (20%)	LS	1	\$58,869	\$58,869
			Subtotal	\$353,213
			10% Contingency	\$35,321
Total anticipated cost for NB right turn lane and WB left turn lane - St. Charles construction to the north				\$388,535
<u>Pedestrian crosswalks and signals</u>				
Cable connections - installed on span wire	LS	1	\$2,700	\$2,700
Pedestrian poles and bases and conduit to span-wire poles	ea	4	\$2,500	\$10,000
Crosswalk markings	ea	4	\$1,500	\$6,000
Modify ramps and landings and sidewalk repair	ea	2	\$2,500	\$5,000
Contractor profit and overhead (20%)	LS	1	\$4,740	\$4,740
			Subtotal	\$28,440
			10% Contingency	\$2,844
Anticipated additional cost for pedestrian signals				\$31,284
Total anticipated cost for NB right turn lane and WB left turn lane - St. Charles construction to the north with pedestrian signals				\$419,819



Option 4
\$510,320

Roundabout concept



City of Columbia, Missouri
Department of Public Works

Keene & St. Charles
Roundabout Concept

Scale: 1"=40'

Dwn: RLS

Date: 06/13/2013

Preliminary Cost Estimate: Keene Street/St. Charles Road Roundabout

2/18/2013

BY: R. Kaufmann, Columbia Public Works

The approx. cost of a single-lane roundabout at the intersection of Keene Street & St. Charles Road is based on a pro-rated per-square-yard-of-pavement cost from 2 recent roundabout projects:

	<u>Clark/Ballenger</u>	<u>St Charles/Lake of the Woods</u>		
Roundabout pavement area (sq. yds.):	3476	4066		
Roundabout construction cost:	\$367,714	\$453,711		
Roundabout cost per sq. yd. pavement (construction only):	\$105.79	\$111.59		
Pavement area of conceptual Keene/St. Charles roundabout (in sq. yds.): <u>3110</u>				
(Single-lane approach from all directions; ICD - 110')				
Approx. Construction Cost		(3110 SY x \$112/SY)	\$	348,320
Approx. Design/Admin Costs (15% of Const. Cost)			\$	55,000
Approx. Right of Way Costs:	PSE	\$300k / acre	0.15 acre	\$ 45,000
	TCE	\$80k / acre	0.15 acre	\$ 12,000
Ballpark Utility Relocation Costs			\$	50,000

APPROX. COST OF A SINGLE-LANE ROUNDABOUT AT KEENE/ST. CHARLES: **\$510,320**