

MITIGATORY MEASURES TO DECONGEST AND IMPROVE TRAFFIC CONDITION AT HEBBAL JUNCTION

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Abstract

Bangalore city has seen an abnormal increase in vehicular population of over 10.2% in last ten years while the population is increased by 65% during the same period. The present day vehicular population is 52 lakhs. Hebbal Junction, situated on the Airport road is the major connecting road to International Airport Road, which is one among many traffic congestion zones in the city. With about 19157 PCU/hr (6917 PCU/hr at grade), It is also one of the busiest junction along ORR in Bangalore today. In order to make ORR through traffic Signal free, Grade Separation is essential at the junction. Further, there has been manifold increase in passenger car and bus traffic in perpendicular direction (along Bellary road) due to shift in Bangalore airport from HAL to Devanahali (KIAL). Considering the increase in traffic, NHAI has built 6 lane elevated road beyond Hebbal flyover leading to airport. The surface level road has been upgraded to 6 lane main carriageway with 2 lane service road both sides. Presently the traffic from these 16 lanes is converging to 4 lane flyover at existing Hebbal flyover which is bottleneck. In opposite direction the city bound traffic from Bellary road is converging from 10 lanes to existing 4 lane flyover resulting in traffic congestion. Hence there is a necessity to increase the capacity of existing flyover to cater for airport traffic and future traffic demand.

Various objectives of the study includes to improve the geometrics of traffic parameters in terms of conflict points, to improve the speed flow characteristics, to prepare Mitigatory proposals plan for signal free vehicular movement, to work out the cost economics for Mitigatory proposal plan.

As part of this study, The Topographical Survey and the traffic details including turning movements at various arms of the junction have been collected and analyzed and the Capacity of all the roads running through the junction have been calculated. Traffic Volume surveys were carried out to find out the peak and off peak hour traffic volume. The max peak hour traffic volume we found in the junction along a single road is 6200 PCU/hr.

Proposals or Alternatives have to be planned to reduce congestion. Widening the roads will be complicated due to major commercial establishments developed along the edge of the road and removal of these establishments will be necessary in case of expansion of road to accumulate the future traffic.

1. INTRODUCTION

Bangalore is the fastest-growing Indian metropolis. Bangalore is the 3rd most populous city in India and 18th most populous city in the world. After New Delhi between 1991 and 2001, with a growth rate of 38% during the decade. Bangalore is known for its pleasant climate throughout the year. The city is amongst the top ten preferred entrepreneurial locations in the world. Bangalore which is also referred as the "Silicon Valley" of India has evolved as a global competitive city in the recent years in IT field.

The majority of the city of Bangalore lies in the Bangalore Urban district and the surrounding rural areas are a part of Bangalore Rural district, together covers an area of about

741 sq.kms. The population has increased from 5.1 million in 2001 to 8.4 million in 2011 with about 65% growth in a decade [1]. Over 60% of the Bangalore population comes from natural growth, while the migrant population constitutes about 25%.

In the recent past there has been an appreciable increase in the volume of personalized and public modes of vehicles plying on city roads. The vehicular growth rate in Bangalore city between 1980 and 2001 is about 11%. The number of registered vehicles in Bangalore has increased rapidly from 400,000 (1987) to more than 5.2 million (2015)[2]. The number of 2-wheelers in particular constitutes to nearly 74 % of the total vehicles. In view of above, there has been a huge increase in volume of vehicles on the city roads. The lack of need based public transport system with mass rapid

transport system like metro train still under construction stage amplified traffic congestion problem. Hence, there is an urgent necessity to decongest the over congested intersections.

Due to the shift in Bangalore Airport from HAL to Devanahalli, there has been tremendous increase in traffic on this section of road. Hebbal junction is one of the important junction on ORR formed with intersection of two major roads namely, Outer Ring Road which is an arterial road and Bellary road which is a National Highway (NH-7). In order to provide adequate roadway capacity in this stretch for present traffic and increased traffic at future, National Highway Authority of India (NHAI) has constructed 6 lane elevated road after Hebbal flyover towards KIAL with provision of 6 lane surface road and 4 lane slip road (2 on either side). The traffic from KIAL towards city will suddenly converge from 8 lanes at existing 2-lane Hebbal flyover. In perpendicular direction Bellary road is one of the important road of the city connecting Central Business District and National Highway No 7 leading to Hyderabad.

2. OBJECTIVES OF STUDY

- To conduct Traffic studies for assessment of capacity and lane requirement.
- To Carry out Topographic surveys at existing junction
- To improve the level of service on the road
- To reduce the number of conflicts at various arms of the junction
- To provide signal free movement at grade and faster and smooth movement on the grade Separator
- To working out the economics for extension of lanes at existing flyover.
- To develop visual model of Hebbal junction using Google sketch up software.

2.1 Scope of Work

Due to the presence of the airport at Devanahalli, further boom in traffic through this junction is expected and the level of service to be improved on these roads.

Separation in grades helps in elimination of the traffic signals present in the junction and makes the junction signal free.

The best possible proposal that can be adopted may serve the junction up to a span of 10 – 15 years. If further life span is required, Re-construction of the entire junction has to be adopted.

3. METHODOLOGY

The activities that are involved for the present assignment are highlighted in the following section. Proposed methodology for carrying out various tasks of the project is as shown below. The exact sequence is likely to vary during the course of the study, however a general guideline is proposed in the form of flow chart.

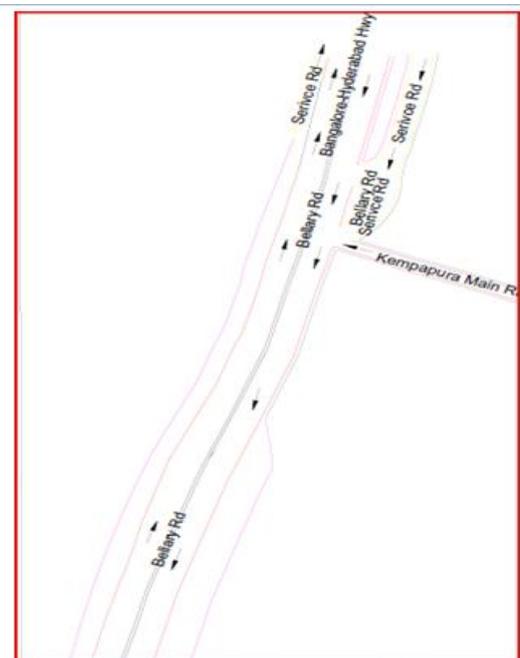
Work methodology would be as follows:

1. Formulation of Objectives and scope of work
2. Data Collection
 - a. Topographical Survey
 - Road Width and ROW details
 - Surface Utility Line
 - Junction Details
 - Levels / Existing ground profile
 - b. Traffic Studies
 - Classified turning traffic count.
3. Formulation of Design Standards
4. Analysis and feasibility
 - Review of Topographical Survey data
 - Traffic survey data analysis
 - Alignment Design
 - Grade Separator Design
5. Preparation of Design and drawings
 - Alignment Design
 - Concept Plan options
 - Typical Cross sections
 - Alignment plan and profile drawing
6. Final Proposal

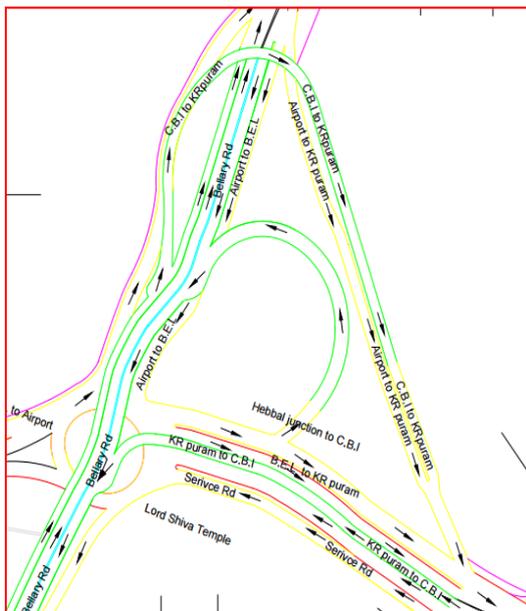
3.1 Study Area

The study area is very vast which made us divide the study area into 5 sections. The sections are helpful in analysis of the entire junction. The flow diagrams of the junction have been shown below. The junction is very congested with a whopping 40000 PCU/hr (Peak Hour) in all the directions.

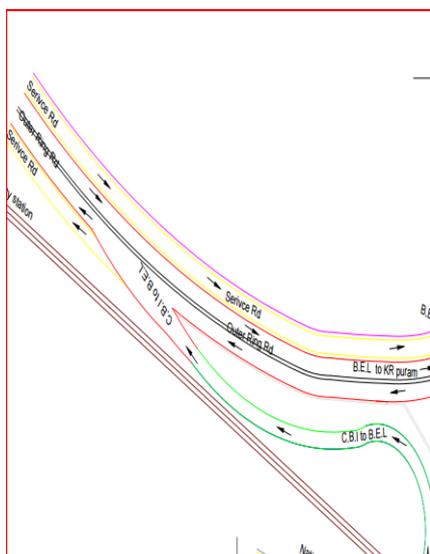
4. FLOW DIAGRAMS



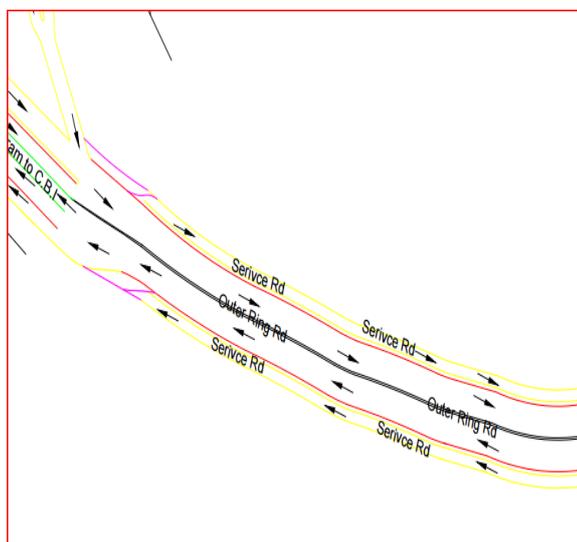
Segment 1



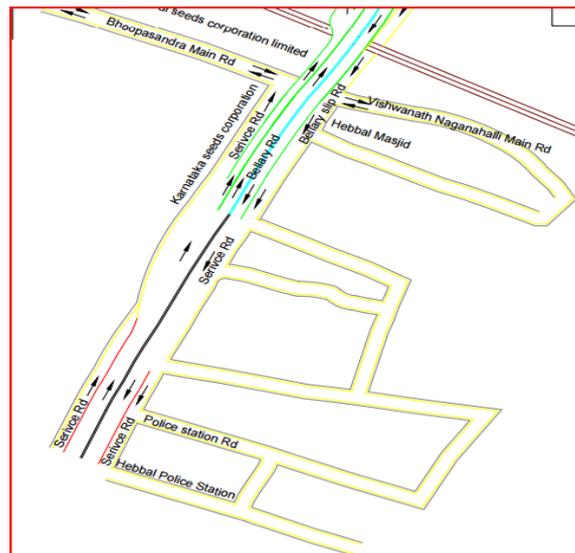
Segment 2



Segment 3



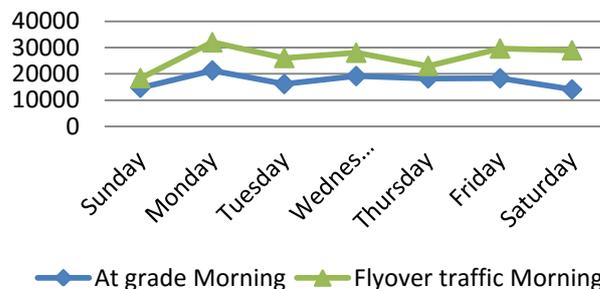
Segment 4



Segment 5

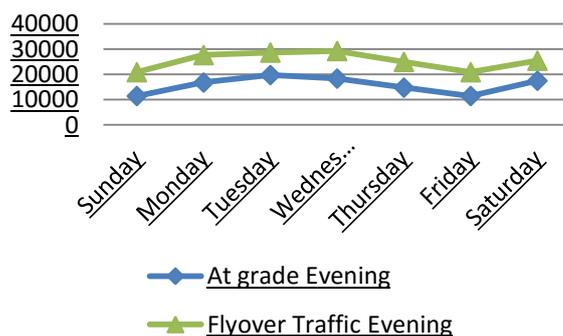
5. TRAFFIC VARIATION: (PCU/hr) – MORNING PEAK

Morning Peak Hour Traffic



6. TRAFFIC VARIATION: (PCU/hr) – EVENING PEAK HOUR

Evening Peak Hour Traffic



7. SPEED STUDIES

Spot speed studies have been carried out in finding out the capacity of the road at present and the future speed is estimated based on the number of lanes and volume to capacity ratio to calculate the capacity of the roads in future. Assuming a traffic stream speed of about 50 kmph at the end of design life, the capacity and v/c ratio has been calculated and LOS is justified.

The Current Free flow speed at the junction in normal traffic condition is found to be
Maximum – 60 kmph
Minimum – 18 kmph.

In worst conditions like peak hours vehicular speed less than 10 kmph.

8. PROPOSALS

Option 1: In this option two separate 2-lane underpasses are proposed along Outer Ring Road. The proposed underpass caters for ORR through traffic which will become signal free. Rotary type intersection is proposed for surface level traffic movement which will be signalized.

- Underpass for traffic from K.R.Puram towards Tumkur road
- Underpass for traffic from Tumkur road towards K.R.Puram

Option 2: LHS underpass was made 3-lane and RHS underpass was removed in this option. RHS through traffic i.e. From K.R.Puram towards Tumkur road was channelized towards left and made signal free.

- Underpass for traffic from Tumkur road towards K.R.Puram

Option 3: LHS underpass carriageway width was reduced to 2-lanes and continuous reverse curves were eliminated by providing smooth curve. Adequate headlight sight distance is available in this option. RHS through traffic was channelized towards left and made signal free in this option also.

- Underpass for traffic from Tumkur road towards K.R.Puram

Option 4: Flyover construction from ORR (K.R Puram) to Airport before the loop 1, passing over the entrance of Hebbal flyover from esteem mall side. A 3 lane unidirectional underpass shall be constructed from K R Puram side towards BEL for through traffic, an underpass to be constructed for traffic from Airport to BEL which joins the 3 lane underpass below the ground and exits towards Tumkur road simultaneously. The traffic from BEL to K R Puram moves at grade. Flyover widening at of the carriage way from Airport towards City is to be done. The additionally built flyover from Hebbal to K R Puram i.e (single lane flyover) should be brought in level with the Main deck, removal of barrier between those two lanes must be done.

1. Underpass for traffic from K.R. Puram to Tumkur

2. Connection to the previous underpass, underpass for traffic from Airport to BEL.
3. Flyover Widening by two lanes for traffic from Airport towards city and vice versa.
4. Flyover Construction for traffic from K.R.Puram to BEL before they enter the Junction which passes over the entrance of the main flyover from esteem mall side.
5. Service road to be changed in front of the mosque to around the mosque exiting near the point of touchdown of flyover.

Considering all the proposals, we were able to choose the **Option 4** as the best suitable proposal

9. CONCLUSION

The Construction of unidirectional flyover along Bellary road and unidirectional underpass along ORR coupled with the traffic management will have the following additional benefits.

- Reduced junction delays and environmental pollution
- Reduction in idle fuel consumption
- Improved level of service at the Junction
- Substantial savings in travel time of road users
- Reduces the number of conflicts.

ACKNOWLEDGEMENT

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