Investigation of Road Accident FIR Number 64, dated 03rd June, 2014 at the Signalised Intersection of Tughlak Road - Safdarjung Road - Aurobindo Marg and Prithviraj Road

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1. PREAMBLE

According to the request made by the Delhi Police vide DO letter No.145 dated 4.7.2014 to investigate the accident spot at the signalized intersection of Tughlak Road, Safdarjung Road, Aurobindo Marg and Prithviraj Road, the CSIR-CRRI team consisting of Dr. S Velmurugan, Dr Neelima Chakrabarty and Dr Kayitha Ravinder visited the site on 10th June 2014 *(Afternoon)* and thereafter subsequent visit was made on 14th June 2014 *(early morning between 6:15 am - 07:00 am)* consisting of Dr S Gangopadhyay, Director, Dr S Velmurugan and Dr Kayitha Ravinder visited the site

This report basically highlights the existing geometric design deficiencies at the above referred intersection. This is followed by the concept plan of roundabout design coupled with the geometric design improvements devised for this intersection. However, it may be noted that this concept plan has been suggested in this report based on the approximate dimensioning in the absence of data on the detailed physical survey map of the intersection and the data on the classified turning flows at this intersection and hence the above concept proposal cannot be treated as final.

2. SITE VISIT

During the first visit, the team made a critical inspection of the road crash site and also made a visual assessment of the two vehicles stationed at the Tughlak Road Police station which were involved in the above mentioned road crash. It emerged during the course of the discussion with the Delhi Police officials on 10 June, 2014 that they also intend to send the drivers of both the vehicles involved in the road crash to CSIR-CRRI for the assessment tests of their driving skills and this proposal was readily agreed by the CSIR-CRRI study team. Eventually, the driver of the Tata Indica (DL-7CE-4549) reported to this institute on 11.6.2014 and the related test reports in respect of his driving skills was submitted by CSIR-CRRI on 12.6.2014 vide letter no.2 *(233)* TTP/14. The driver of the Maruti Sx4 reported to the institute for testing on 11.8.2014 and the related test results of his report was submitted by CSIR-CRRI on 22.8.2014 vide letter no.2*(233)* TTP/14.

Moreover, it may be noted that the second reconnaissance visit to the road crash site was specifically carried out in the early morning hours to understand the prevailing traffic scene at the time of the road crash.

The salient observations derived from the above two reconnaissance visits are presented along with a brief on the photos captured is presented in Figure 2.1 to 2.6.

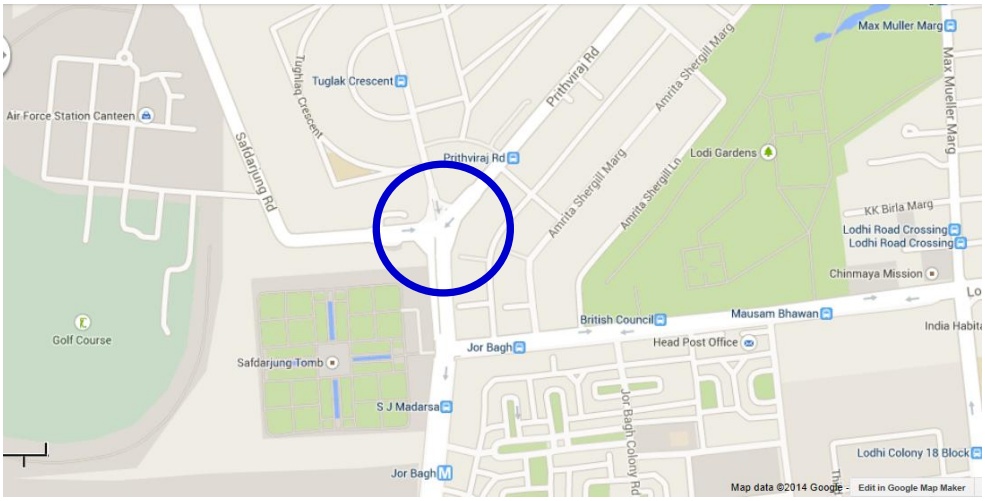

Figure 2.1: Location Map showing Road Crash Site on the Tughlak Road - Safdarjung Road - Aurobindo Marg - Prithiviraj Road Intersection

Figure 2.2: CSIR-CRRI team inspecting the Road Crash Site along with Delhi Police Official on 10/06/2014

Figure 2.3: CSIR-CRRI team inspecting the Road Crash Site along with Delhi Traffic Police Official on 14/06/2014

Figure 2.4: Overgrown Suburbs at the Median Portion on the Aurobindo Marg Approach obscuring the visibility of the traffic emanating from Prithiviraj Road Approach until it reaches the mouth of the intersection *(a)*
(i.e. Oblique Angle of meeting of the Prithiviraj Road Approach)

Figure 2.5: : Overgrown Suburbs at the Median Portion on the Aurobindo Marg Approach obscuring the visibility of the traffic emanating from Prithiviraj Road Approach until it reaches the mouth of the intersection *(b)*

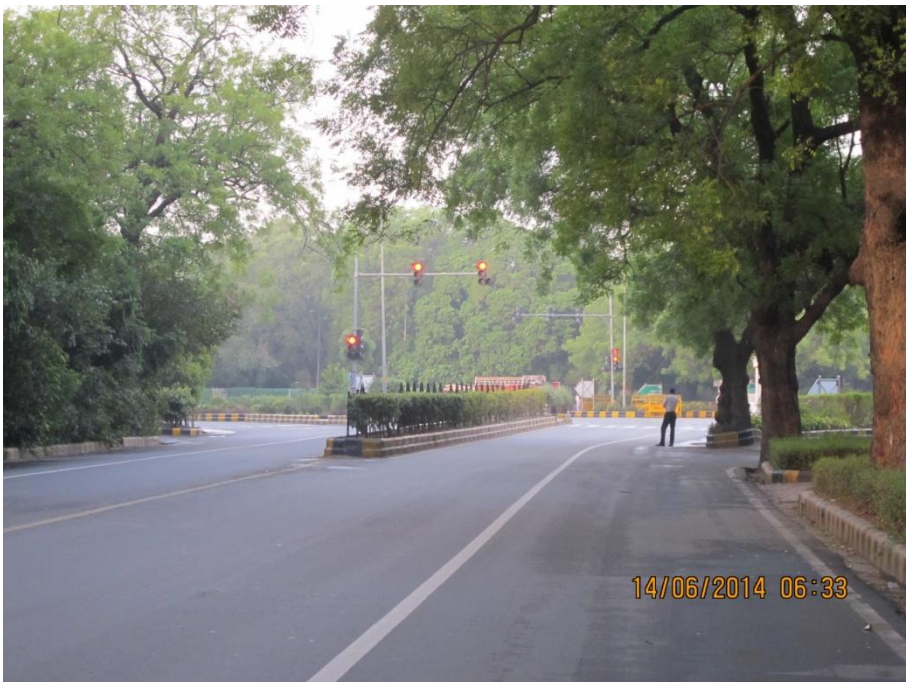

Figure 2.6: Photo showing the Absence of the Intersection Sight Distance on the Prithiviraj Road Approach due to the Boulevard of Trees and Poor Geometrics at the Junction Approach

3. FINDINGS AND RECOMMENDATIONS

Based on the above site visits, the follwing inferences have been drawn and subsequently, an improvement plan has been conceived for converting the intersection into a roundabout by closing the direct access presently available from the Service Road at each of the intersection approaches to the main road. It is expected that the closure of the direct access for the Service Road traffic to merge with the main stream traffic to the would help in removing the direct conflict of traffic. The inferences drawn from the two reconnaissance visits has been discussed followed by the discussion on the saient aspects of the geometric design improvments conceived for the candidate intersection in the succeeding section

- All the intersecting arms are not meeting at right angles *(Figure 3.1)* and moreover, there is complete absence of the minimum required Intersection Sight Distance *(ISD)* espcially on the Prithiviraj Road Approach due to the boulevard of trees on the shoulder side, overgrown suburbs at the median side and more importantly , poor geometrics at the junction approach *(i.e. Prithiviraj Road Approach intersection at an Oblique Angle instead of a conventional right angle)* aggravating the ISD problems. Similarly, the overgrown suburbs at the median portion on the Aurobindo Marg approach is again obscuring the visibility in terms of approaching vehicles to the intersection from the Prithiviraj Road approach and vice versa which is again serious cause of concern
- Moreover, as compared to other three approach arms *(i.e. Aurobindo Marg, Safdarjung Road and Tughlak Road)* Prithiviraj Road is located at a slightly lower level. The above design deficiencies and over grown suburbs / trees are acting as major deterrents in this signalized intersection and these aspects severely impact the vision of the driver on the Prithiviraj Road approach both in terms of overall visibility as well as Stopping Sight Distance *(SSD)*

- Further, if the traffic emanating either from Prithiviraj Road or from Aurobindo Marg tend to violate the assigned signal phase by travelling at high speeds *(60 Kmph and above)* while negotiating the intersection, the impact of the above design deficiencies will be severely felt and there is every likelihood of incidence of road crash. This is because normally at speeds ranging between 30 to 60 kmph, the required SSD should be provided / available for a distance of around 40 to 120 meters which would allow clear vision for the drivers to make the appropriate maneuver *i.e. bringing the vehicle to Stop* in case of any emergency. This aspect is absent at these approaches due to the aforesaid reasons and hence the probability of road crash occurrence is much higher if the motorists tend to violate the assigned signal phase and travel at high speeds. This sort of signal violation at high speeds during the early morning hours is quite rampant on most of the Delhi roads which is contemplated to be one of the major reasons for the occurrence of this road crash as per the First Information Report *(FIR)*.
- **First and foremosst, it is essential to go in for the immediate pruning of the over grown suburbs and protrudcing branches of the big trees on to the main intersection on all the intersection approaches which will help in improving the sight distance at this intersection to a large extent.**
- Moreover, in the absence of detailed physical plan for the above intersection, a tentative key plan prepared by the Delhi Police *(refer Figure 3.1)* has been further augmented by the CSIR – CRRI team based on the approximate assessment of the road features and measurement of road dimensions using the Measuring Wheel on all the intersecting arms.
- Having modified approximate base plan available for the intersection, a proposal has been conceived to convert the candidate intersection into a roundabout by closing the direct acces available from the Service Road at each of the intersection approaches to the main road as this measure would help in removing the direct conflict of the Service Road traffic with the main stream traffic occurring at the mouth of the intersection as shown in Figure 3.2

- In addition, the analogy behind converting the existing Signalized Intersection to Roundabout Intersection stems from the fact that the traffic plying in the New Delhi Municipal Council *(NDMC)* are very much tuned to the roundabout concept due to their shear presence at many locations in the NDMC area. More importantly, a roundabout by its mere presence will help in the automatic regulation as well as reduction of speed due to the channelized traffic movement possible during all times of the day irrespective whether it is peak period or lean period traffic. However, the above evolved improvement plan by CSIR- CRRI team is not to scale and hence has to be taken with caution.
- Therefore, to develop the implementable geometric design plan of the roundabout design, it is essential to prepare the base physical map for a distance of at least 100 m from the centre of the intersection on each of the intersecting approaches using the **Total Station instrumentation** system. Prior to this base plan preparation, it is required to obtain the Right of Way *(RoW)* details of each of the intersection approaches from NDMC. Moreover, the conduct of the Classified Turning Volume *(CVC)* at this intersection for a period of 16 hours on a typical working day is essential to understand the major direction of flow occurring during the peak and lean hours of traffic. The collection of the above referred parameters would eventually help in the finalization of the roundabout shape in conformity with the direction of flow and the available RoW at each approach.
- Based on the above collected data, the geometric design improvement plan of the roundabout shall be prepared to Scale on the physical plan developed using the Total Station and the above conceived proposals shall be implemented on the ground by NDMC in consultation with Delhi Traffic Police. The implementation of the roundabout design is expected to certainly help in the safe movement of straight and turning traffic at this intersection.

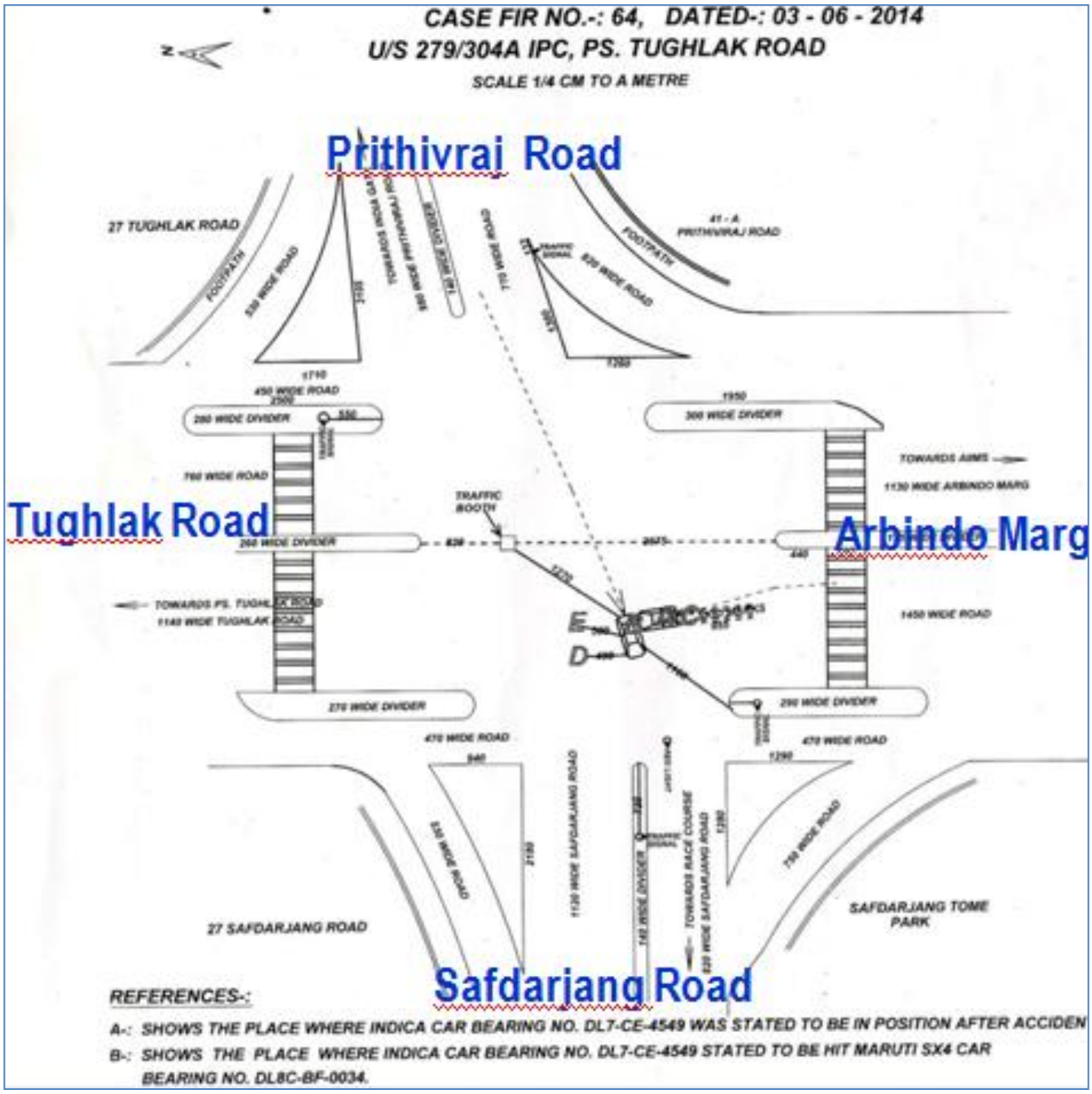

Figure 3.1: Map Showing the Road Crash Spot Location *(Map not to Scale)* **illustrating the poor geometrics at the Approach Arms**

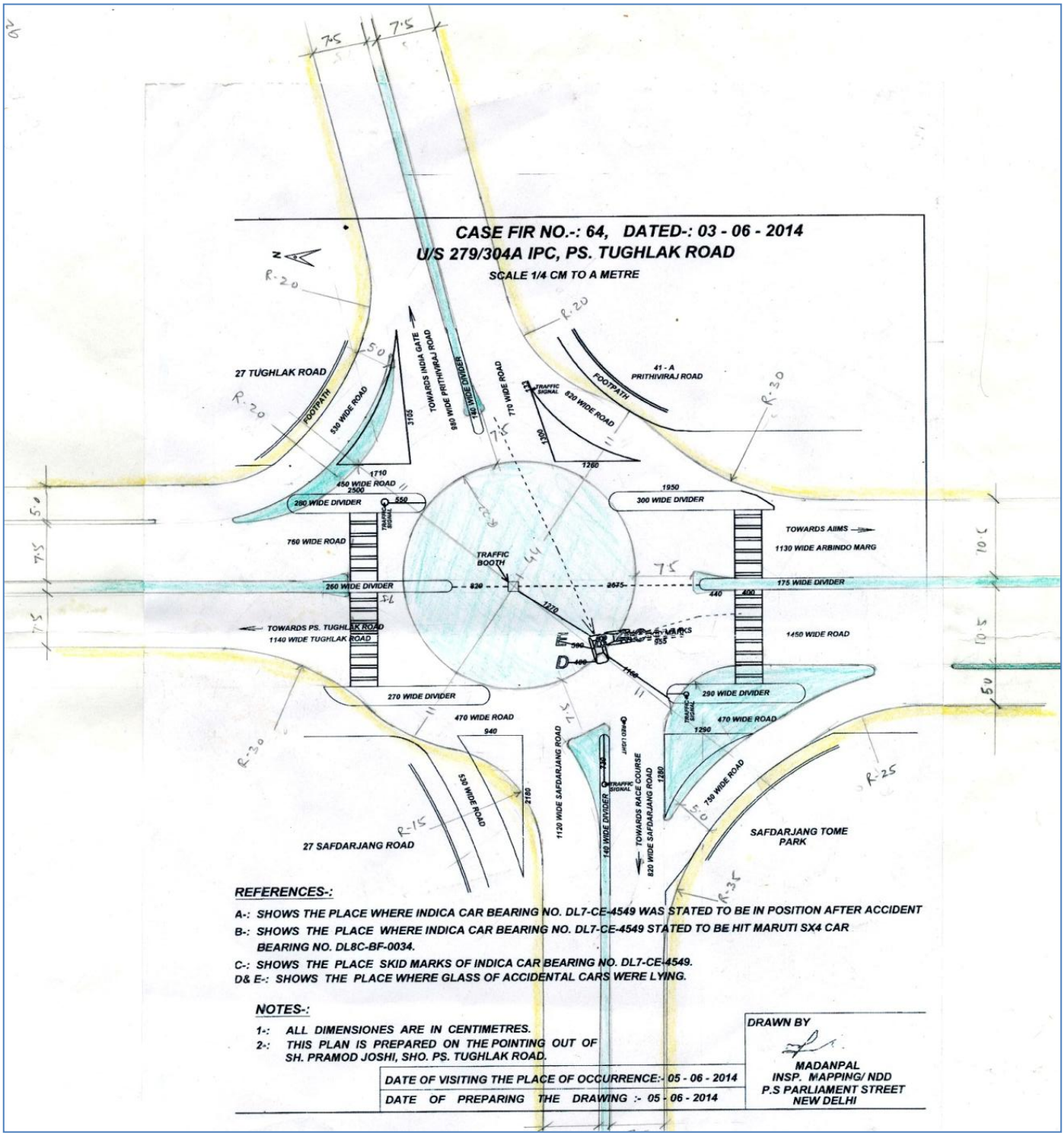

Figure 3.2: Re-Design of the Candidate Intersection
(Map not to Scale)

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