

Accident Analysis & Blackspot Identification from Chandani Chowk to KJEI Campus, Pune – A Case Study

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ABSTRACT: Transportation contributes to the economic, industrial, social and cultural development of any country. Transport is most important because it enables to trade between people, which is essential for the development of civilization. Road transport means transportation of good and personal from one place to the other on roads. The importance of roads in a vast country like India can scarcely be exaggerated. A system well designed, well-constructed & maintained roads are essential for the country's economic and cultural progress. The roads also have to play a vital role in the defence of our country. National highways are considered as main veins for the development of country. As per the 18th annual report "Crime in Maharashtra, 2015", released by Pune commissioner, in Maharashtra 37 peoples are died everyday across the state & five accidents were registered per hour. From 2014 to 2015 there is decrease of accidents but fatalities increase by 1.15% in Maharashtra. In road safety management, an accident Black spots is a place where road traffic accidents have been historically been concentrated. It may have occurred for a variety of reason, such as a sharp drop or corner in straight road, so oncoming traffic is concealed, a hidden junction on a fast road, poor or concealed warning signs at a cross roads. In past few years there is increase in causalities between the Chandani Chowk to Khadi Machine so by fixing Black Spot on this route we can reduce the causalities.

KEYWORDS: blackspot, accidental density method, accidental analysis, traffic, accident

I. INTRODUCTION

General:

India has a road network of over 54,72,144 kilometres as on 31 March 2015, the second largest road network in the world. According to official statistics 1,41,526 persons were killed and 4,77,731 injured in road traffic crashes in India in 2014 (NCRB, 2015). However, this is probably an underestimate, as not all injuries are reported to the police. The situation in India is worsening and road traffic injuries have been increasing over the past twenty years. This may be partly due to the increase in number of vehicles on the road but mainly due to the absence of coordinated evidence-based policy to control the problem. Accidents cause more deaths than any other disease in India.

Accident is an undesirable, incidental and unplanned event that could have been prevented. There are several reasons for fatalities on the roads, including Speeding, Drunk driving, Discarded for traffic rules, improper road or junction designs and mechanical defects in vehicles or ill-maintained vehicles. Driving with responsibility should become part of our culture. India is having less than 1% of the world's vehicles, the country accounts for 6% of total road accidents across the globe and 10% of total road fatalities. In the year of 2015 around 13,685 peoples were killed in road accidents out of which 5,632 people were died due to riding two wheelers (41.15%), 2,252 were travelling in trucks (16.45%), 1,429 died in hit and run cases (10.44%), remaining 4,372 died under other circumstances on the road (31%). It is sad that so many people die in road accidents.

Percentage wise distribution of road accident fatalities		
1.	Two Wheelers	42%
2.	Trucks	17%
3.	Hit & Run Case	10%
4.	Other	31%

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Intensive social awareness, campaigns should be conducted with the help of students, NGO's, other Government bodies like Regional Transport Office, traffic engineers and experts to reduce accidents and fatalities. So, Blackspot plays important role in reducing the road accidents. Recently our Union Transport Minister Mr. Nitin Gadkari spoke about Road Safety & its concerns at a two day national conference held at Vishakhapatnam during August 2016. He announced that nearly 800 BlackSpots or accident zones on national highway to be fixed soon. So we are also trying to identify the BlackSpots to reduce the accident rates. As in past few years there is increase in casualties between Chandani Chowk to KJEI Campus, so by fixing black spot on this route we can reduce the casualties.

Motivation and Problem Statement:

From last few years, it has been observed that from Chandani Chowk to KJEI Campus there is increase in accidents and due to accidents number of fatalities also increases. As there are various institutes on this route so that there is increase in traffic & unfortunately in accidents. Also it has been observed that between Chandani Chowk to Navale Bridge and between Katraj and KJEI Campus there are some spots where the accidents are frequently happened. So, we get motivated to identify the places where accidents are frequently happened i.e BlackSpots & give preventive measures for it.

Objective:

Identification of BlackSpots on the route of Chandani Chowk to KJEI Campus Pune.

Study Area of Project:

Route connecting the KJEI Campus to Chandani Chowk via Khadi Machine

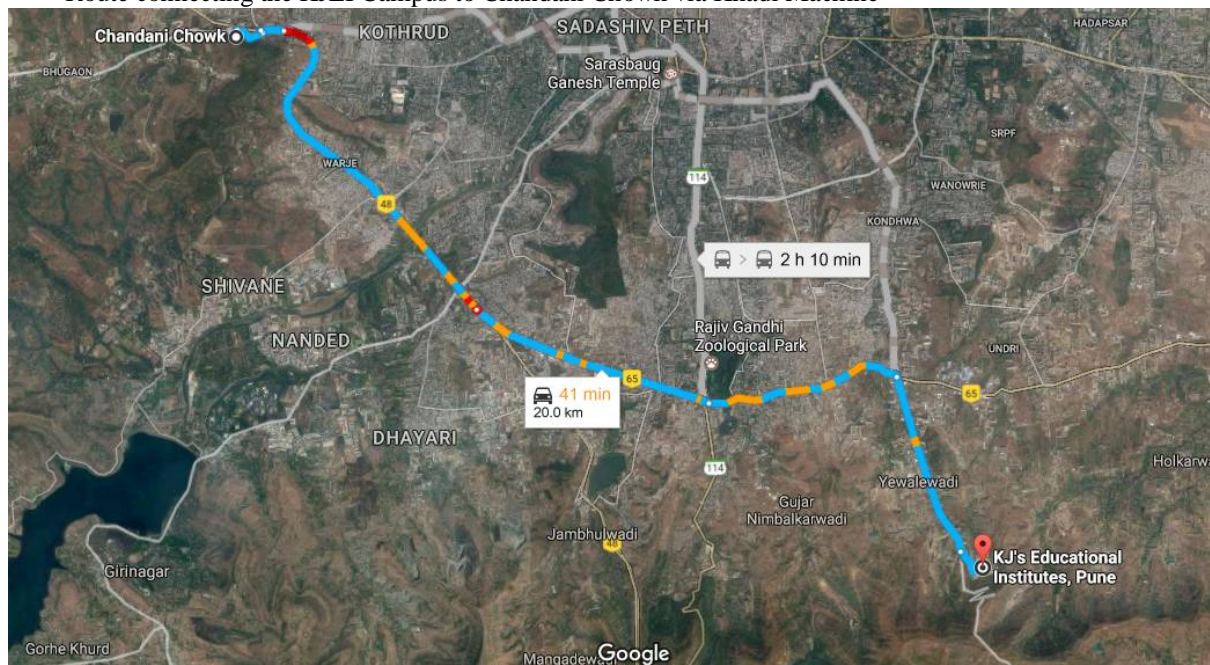


Figure 1 Satellite Imagery

The figure 1 portrays the satellite view of the selected route for the study and figure 2 displays route highlighted in blue colour.

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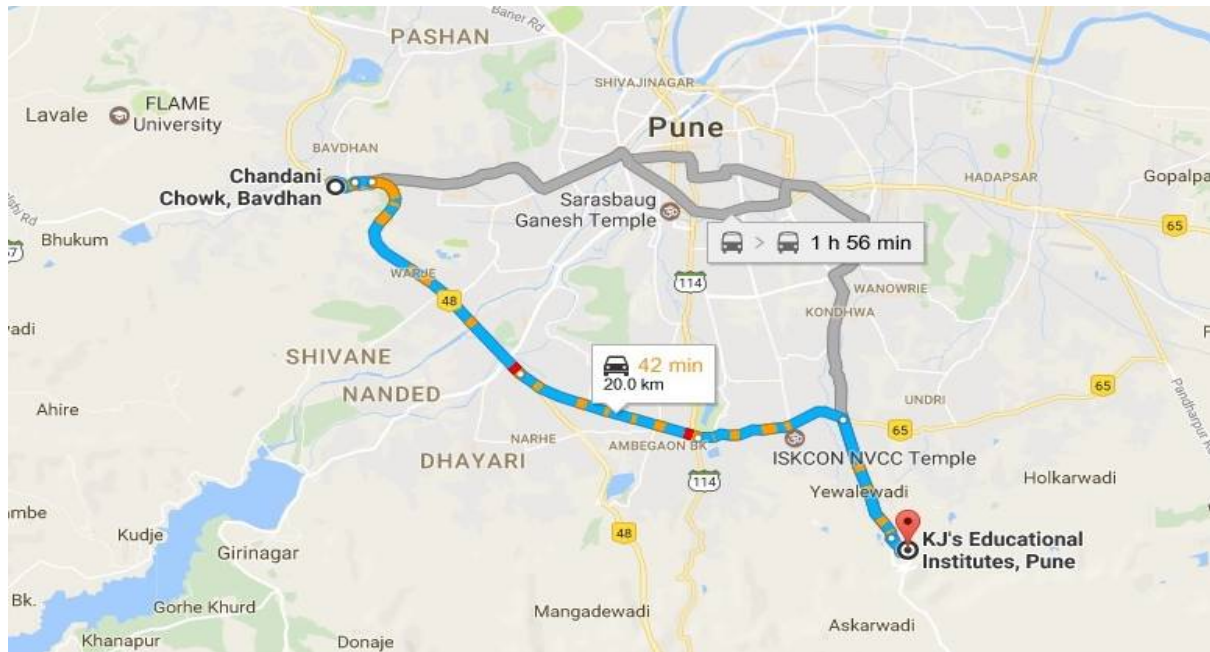


Figure 2 Route from Google Maps

II. RELATED WORK

There are many studies on the Blackspot identification in past few years. Government of India also focusing on the Blackspot identification, to reduce the accident rates. Previously it has been observed that by identifying BlackSpots there is decrease in rate of accidents upto 28%. Following are some of research papers.

[1]“Identification of Blackspots and junction improvements in Vishakhapatnam city”, studied about the city Vishakhapatnam in India in Andhra Pradesh. It is the second largest city in Andhra Pradesh with an area of 550 km², it is primarily an industrial city, apart from being a port city. The traffic volume of Visakhapatnam city is about 59% of the total traffic volume of the district (Gopala raju, 2011). The term BlackSpot is used to describe locations that have a higher average accident rate. The identification, analysis and treatment of road crash black spots are widely regarded as one of the most effective approaches to road crash prevention. Generally hazardous locations are selected on the basis of formal road safety audits.

[2]“Identification of Accident Black Spots for National Highway Using GIS”, in this they were studied about traffic in Muzaffarnagar and Meerut. Muzaffarnagar District is bounded by Meerut District to the south and Haridwar District to the north. The data were collected from police stations and survey of topographical map has been studied. After that the Ground Control Points with the help of Global Position System has been found out & then the black spots has been identified by using Critical Crash Rate Factor Method.

[3]“Black Spots Analysis On Pune - Bangalore National Highway”, identified accidental Black Spots on a section (820 km-830 km) of NH-4 by studying the accidental data provided by National Highway Authority of India (NHAI) during year 2014-2015. They used Weighted Severity Index (WSI) and Accidental Density Method (ADM) for identification of Black Spots. By considering all the parameters of Accidental Density Method (ADM) they found black spots at chainage 821.2 km, 823 km, 824.1 km, 825.3 km and 829.1 km.

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III. RESEARCH METHODOLOGY



Figure 3 Process Chart for Methodology

Methodology adopted mainly includes collection of existing data, experimental investigation and analysis of existing data.

Existing Data Collection:

There are two methods to identify accident black spots. One is by conducting physical survey considering predominant causes of accidents and other is to analyse the existing accident data of a particular stretch. Methodology for this research includes identification of black spots by correlating the physical survey with existing accident data. Existing data was collected from police station.

1) Data Collection:

The data which is shown below is collected from the respected police stations from their FIR (First Investigation Report). As our project area is from Chandani Chowk to Trinity college of Engg. College, Pune. The data is collected from last two years i.e 2015 & 2016. The data includes number of deaths, No. of Critical Injuries, No. of Minor Injuries and Damages also. The stretch of 22km comes under following four different police stations i.e.

- 1) Warje Police Station
- 2) Sinhagad Police Station
- 3) Bharati Vidhyapith Police Station
- 4) Kondhwa Police Station

2) Experimental Investigation:

Selecting Parameters for Ground Survey:

There are many parameters that can cause accidents on highways but only the parameters that are more predominant in the study area had to be selected. These factors will be finalized on the basis of following factors

(i) International Journal Papers (ii) Reconnaissance Survey (iii) Interviewing Local Commuters

Analysis of Existing Data:

Existing data collected from Police station was to be correlated with the data collected from physical survey to identify accident black spots. It will be analysed by following methods.

1. Accident Density Method
2. Weighted Severity Index

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IV. OBSERVATIONS AND ANALYSIS

The data collected reflects the view of the reporting Police Officer. Accidental data collected from the Police Station from their FIR (First information report). Following table (Table 1) shows the summary of the all four police station FIR reports.

Police Station	Year	Death Sheet		Critical Injured		Injured		Damage	Total
WARJE	2015	12		16		17		14	45
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	DAMAGE	
		11	1	12	4	13	4	14	
	2016	14		11		7		11	32
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	DAMAGE	
	10	4	9	2	5	2	11		
SINHGAD	2015	14		13		8		0	35
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	DAMAGE	
		11	3	11	2	8	0	0	
	2016	13		17		0		0	30
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	DAMAGE	
	9	4	14	3	0	0	0		
BHARTI VIDHYAPITH	2015	12		0		15		0	27
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	DAMAGE	
		10	2	0	0	3	2	0	
	2016	9		10		14		0	33
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	DAMAGE	
	8	1	6	4	13	1	0		
KONDHAWA	2015	5		5		0		0	10
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	DAMAGE	
		2	3	4	1	0	0	0	
	2016	4		4		0		0	8
		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	DAMAGE	
	3	1	2	2	0	0	0		

Table 1 Summary of Data from Police Stations

Analysis of Data:

1) Accidental Density Method:

- i. The accident density is calculated from the number of accidents per unit length for a section of highway. Sections with more than a predetermined number of accidents are classified as high accident locations.

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- ii. Unit length is taken as 500m.
- iii. Predetermined no. of accidents is calculated as average number of accidents that have occurred per unit length.
- iv. Average no. of accidents = (Total no. of accidents) / 24.5
- v. Sample calculation,
Average no. of accidents = (110) / (24.5) = 4.48
- vi. Every 500m length of the stretch where no. accidents is more than 5 is termed as “Accidental Blackspot”. So, by using this method we analyses the data and identified the BlackSpots. Following table shows the identified BlackSpots by marking as ‘TRUE’.

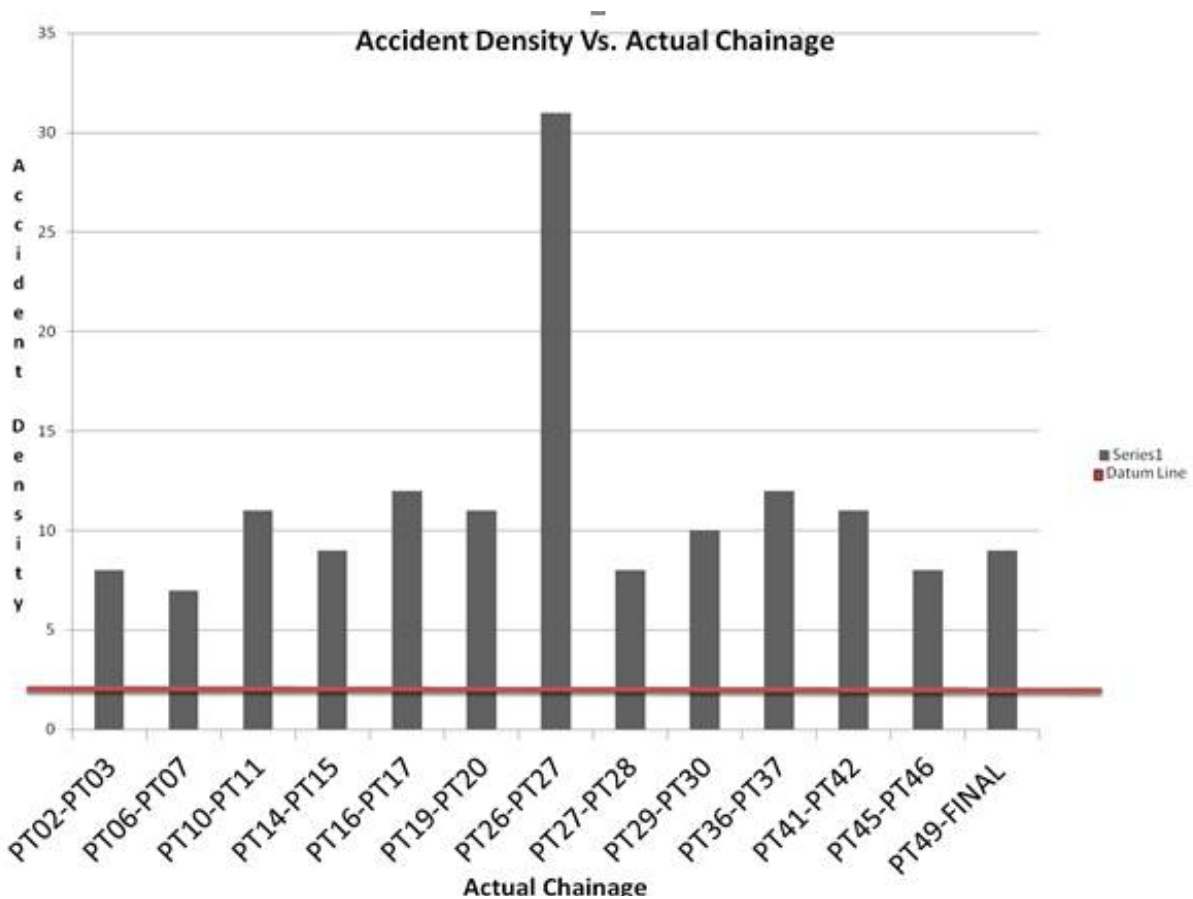


Figure 4 Comparison between accident densities at different chainages

From Accidental Density Method twelve number of BlackSpots and by Weighted Severity Index 26 numbers of BlackSpots are identified. After co-relating the analysis from both methods, we selected the spots which are common in both as a BlackSpots. These are mentioned in following table.

Sr. No.	Section	Place
1	PT02-PT03	Yewalewadi
2	PT06-PT07	Khadi Machine
3	PT10-PT11	Gokul Nagar

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4	PT14-PT15	Katraj Chowk
5	PT16-PT17	Datta Nagar
6	PT19-PT20	Beldare Petrol Pump
7	PT26-PT27	Vadgaon bridge
8	PT27-PT28	End of Vadgaon Bridge
9	PT36-PT37	Mai Mangeshkar Hospital
10	PT41-PT42	opp. RMD college
11	PT45-PT46	Dhukkar Khind
12	PT49- Final	Chandani Chowk

Table 2 Identified Blackspots

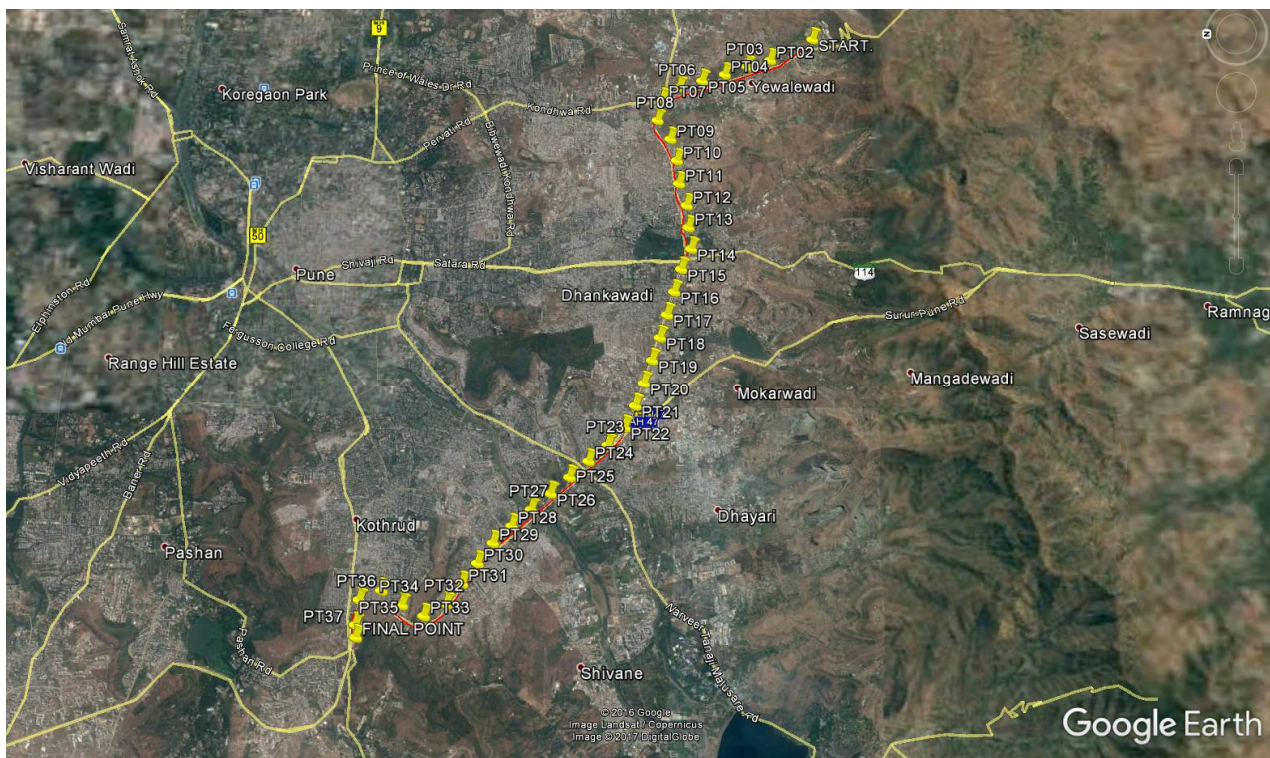


Figure 5 Chainage Points

Figure 5 includes the chainage points with a chainage of 500 meter developed using Google Earth. Starting from KJEI Campus to Chandni Chowk the entire route was divided into sections of 500 meter for the study and analysis. Table 2 provides details on the chainage locations.

2) Physical Survey

We identified twelve numbers of BlackSpots by co-relating the Accidental Density Method and Weighted Severity Index. We had visited those BlackSpots physically and try to find out the exact reasons of accidents. So, we studied the BlackSpots which are which are more dangerous.

a) Yewalewadi: Following are the few reasons which are responsible for accidents at Yewalewadi.

- 1) There is no footpath is constructed, therefore people use the road for walking.
- 2) Width of road is narrow.

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- 3) No speed breaker is provided as there is cross intersection of road which is connected to Yewalewadi village.
- 4) Large path holes are formed on the road.

b) Khadi Machine:

- 1) There is huge traffic jam during the 8.30am to 9.30am in the morning and after 4.30pm in the evening everyday because traffic increases due to college students. So, there is a need of traffic signals. Signals are installed but not started yet.
- 2) The vehicles coming from Undri are not able to take turn towards Yewalewadi due to rise in the road level.
- 3) Main cause of accident is people are not following traffic rules. There is only single road for college going students and heavy vehicles.

c) Gokul Nagar:

- 1) Maximum number of accidents is occurred due to the narrow width of road. This is the only road which is used by college students as well as heavy vehicles.
- 2) PMPML bus stops are not fixed.
- 3) Already road width is narrow and people are used this road to dump the garbage. Therefore only single vehicles can pass through at that site.
- 4) Road median is not continuous and there is opening in the median for vehicles.
- 5) The road level is not horizontal. There is steep slope at the Sagar Sweet Mart and people are use this spot road crossing, therefore accidents are occurred.

d) Katraj Chowk:

- 1) The bus depot for PMPML is located at wrong place. It is located at the junction where vehicles are coming from Khadi Machine. The buses are travel on this route by wrong side towards Kondhwa therefore traffic gets jam there is possibility of head on collision.
- 2) Vehicles traveling from Kondhwa towards Kondhwa by using flyover there is sharp turn just after the end of bridge & steep rise. Therefore it's a major challenge to all vehicles to take turn towards left side.
- 3) There is no straight BRT route for PMPML bus, so they travelling from left side towards right side for BRT route. Therefore when signal is green for vehicles for going towards Swargate there is big possibility of occurring of accidents

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Figure 6 Satellite view of Katraj Junction

e) Datta Nagar:

- 1) There is opening is provided on the route towards Katraj near Datta Nagar. At that point signal is also installed having continuously blinking of Red light. It means vehicles should complete stop, then proceed when you can. But vehicles can't follow this rather they travel at greater speed.
- 2) Poor road infrastructure at that points, therefore there is chances of skidding of vehicles.

f) Trimurti Mangal Karyalaya & Beldare Petrol Pump:

- 1) Vehicles are coming from Ambegaon Pathar and travels from wrong side towards petrol pump for filling fuels in their vehicles.
- 2) There is no opening for vehicles for U-turn of left or right turn, but people takes turn for D'Mart store, i.e. they are not following the traffic rules.

g) Navale Bridge and Vadgaon Bridge:

- 1) Below the Navale Bridge there is huge traffic gets jammed because people are not follow the traffic rules.
- 2) Vehicles coming from Katraj and going towards Warje are merging with wrong way. Therefore there are chances of accidents as vehicles coming from Bangalore and going towards Warje comes with high speed due to slope.
- 3) At the Junction of Navale Bridge & Vadgaon Bridge there is PMPML bus stop & unauthorized six seater vehicles are also stops for passengers. This is major reason of accidents at that point.
- 4) At the junction there is no speed breaker is constructed.

h) Chandani Chowk:

- 1) At the junction of vehicles coming from Kothrud and Pune-Mumbai Highway there is no single is working.
- 2) People are not following the traffic rules.

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3) No speed breaker is constructed at this junction.

V. RESULT AND CONCLUSIONS

As our main focus of this project is accident analysis and identification of BlackSpots on the route of Chandani Chowk to KJ's Educational Institute, Pune. This route is having 20.0 KM length. This route includes Mumbai-Bangalore Highway (NH-48), Pune-Machilipatanam (NH-65) Highway. Number of educational institutes, temples, stops for construction workers are also exists on this route. We had collected accidental data from police stations for last two years and by using Accidental Density Method and Weighted Severity Index method. After analysing this data by these methods we find out different BlackSpots. After co-relating the analysis from both methods, we selected the spots which are common in both as a BlackSpots.

These are the following:

- 1) Yewalewadi
- 2) Khadi Machine
- 3) Gokul Nagar
- 4) Katraj Chowk
- 5) Datta Nagar
- 6) Beldare Petrol Pump
- 7) Vadgaon Bridge
- 8) End of Vadgaon Bridge
- 9) Mai Mangeshkar Hospital
- 10) RMD college
- 11) Dhukkar Khind
- 12) Chandani Chowk.

Most common reasons observed by physically are following:

- 1) People are not following the traffic rules.
- 2) Faulty Road Geometric design such as improper super elevation, horizontal curve design etc.
- 3) Improper Signal System.
- 4) Rash Driving of heavy vehicles.
- 5) It is also observed that this National Highway is under construction and after construction these deficiencies may be reduce.

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In the following image (figure 7) we had marked the BlackSpots by red pins.

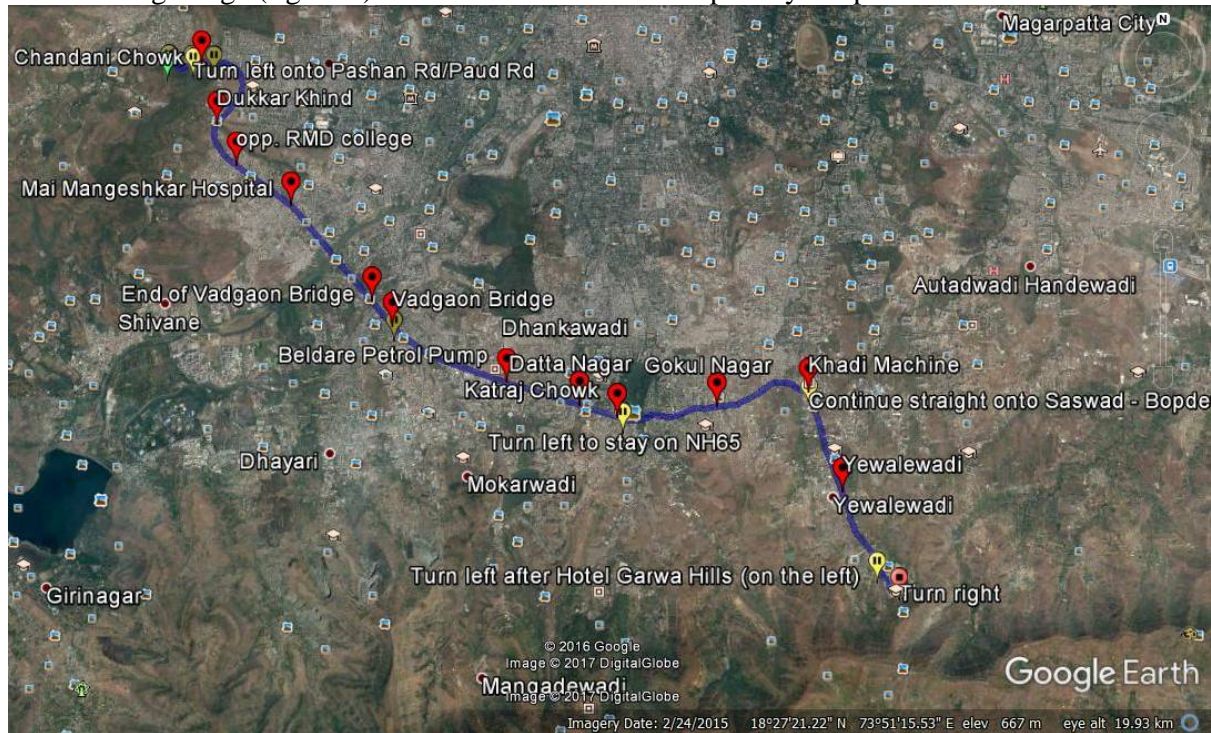


Figure 7 Location of Black spots

VI. FUTURE SCOPES

With the advent of technology and advanced algorithms to manage the traffic flows and integrate the analysis of the work it is possible. It would be possible to apply machine learning algorithms to determine the most probable black spots by analysing the real-time traffic conditions and provide the safest and most comfortable traffic environment. As the population is rising, there will be a corresponding rise in the traffic related issues, to counter the evil effects of the black spots. The currently used traffic calming agents could be modified to suit the real-time analysis of black-spots.

VII. ACKNOWLEDGEMENT

Sincere gratitude to our project guide Prof. Jitesh Dhule, (Civil Department) Trinity College of Engineering and Research, Pune and Dr. Jayant Sangole, (Traffic Engineer, Walter P Moore) for their valuable time, support and guidance during the course of the paper. We take this opportunity to convey our sincere thanks to all the individuals who have assisted and helped us in carrying and bringing out this paper. Last but not the least, the support and help of all the teachers and staff members of Dept. of Civil Engineering of Trinity College of Engineering and Research is gratefully acknowledged.

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