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Mobile LiDAR-Based Roadway Mapping for Flyover Planning: A Case Study from Telibag, Lucknow

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1.0 INTRODUCTION:

In recent years, mobile LiDAR technology has emerged as an efficient and effective tool for surveying and mapping applications. This technology involves the use of a laser scanner mounted on a moving vehicle to collect high-precision 3D point cloud data of the surrounding environment. Mobile LiDAR surveys have numerous applications, including road design and maintenance, urban planning, and asset management.

In this report, we present the results of a mobile LiDAR survey that was conducted in Telibag, Lucknow on Raebareli Road. The survey was conducted with the goal of collecting detailed information on the road geometry and surrounding environment, in order to support road design and maintenance efforts.

The survey was conducted using state-of-the-art LiDAR equipment mounted on a vehicle, which was driven along the entire length of Raebareli Road in Telibag. The resulting data consisted of a dense 3D point cloud, which was processed using specialized software to create detailed maps and 3D models of the road and surrounding area.

The following sections of this report will describe the methodology used in the survey, the data processing techniques that were employed, and the results of the survey, including detailed maps and 3D models of the survey area. We will also discuss the implications of these findings for road design and maintenance in Telibag, and suggest areas for future research and survey efforts.

The Telibag area in Lucknow, India has experienced significant growth in recent years, resulting in increased traffic congestion on the Raebareli Road. In order to address this issue, a mobile LiDAR survey was conducted to gather detailed information on the road geometry and surrounding environment, with the goal of building a flyover for traffic control in the area.

Mobile LiDAR technology was selected as the most efficient and effective method for conducting this reconnaissance survey, based on research that has demonstrated its effectiveness in collecting accurate and detailed 3D data for transportation applications (Chen et al., 2017; Wang et al., 2019). A laser scanner was mounted on a moving vehicle to collect high-precision 3D point cloud data of the entire length of Raebareli Road in Telibag. The resulting data have been processed using specialized software to create detailed maps and 3D models of the survey area.

The proposed flyover project in Telibag is part of a larger trend of using LiDAR technology for transportation planning and infrastructure development (Liu et al., 2019). LiDAR surveys have been used for a range of transportation applications, including road design and maintenance, bridge inspections, and traffic flow analysis (Munoz et al., 2020; Wang et al., 2021). The use of LiDAR technology can help in significant cost savings and improved safety outcomes for transportation projects (Hu et al., 2019).

The purpose of this study is to present the results of the mobile LiDAR survey conducted in Telibag, Lucknow on Raebareli Road, as well as the methodology used in the survey, the data processing techniques that were employed, and the implications of the findings for the proposed flyover project. The report includes detailed maps and 3D models of the survey area, as well as suggestions for future research and survey efforts that could further support the construction of the flyover for traffic control in Telibag.

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2.0 STUDY AREA

Raebareli Road is also known as NH 24B, which is a national highway that connects Lucknow with Rae Bareli, Amethi, and other cities in Uttar Pradesh. It starts at the Kukrail Bridge in Lucknow and goes up to the city of Rae Bareli, a distance of approximately 83 kilometers. The road is an important arterial route in the region, with heavy traffic throughout the day.The Raebareli Road in Telibag is a major thoroughfare that connects the city of Lucknow with the neighboring town of Raebareli. Over the years, the road has become increasingly congested due to the rapid growth of residential and commercial areas in the Telibag vicinity. This has resulted in long travel times, increased air pollution, and a higher incidence of traffic accidents.

The traffic volume on the Raebareli Road varies throughout the day, with peak traffic typically occurring during the morning and evening rush hours. During these times, traffic can come to a standstill, leading to significant delays for commuters and commercial vehicles. In addition, the road is also used by heavy vehicles, such as trucks and buses, which contribute to the wear and tear of the road surface and can exacerbate traffic congestion.

To address these issues, the proposed flyover project aims to provide a more efficient and safer means of transportation for commuters and commercial vehicles. By separating local traffic from through traffic, the flyover will reduce congestion on the Raebareli Road and improve travel times for commuters. It will also provide a dedicated route for heavy vehicles, reducing wear and tear on the road surface and improving safety outcomes.

The mobile LiDAR survey conducted in Telibag provides detailed information about the current road geometry and traffic patterns, which will inform the design and construction of the flyover project. The data collected through the survey will enable engineers and planners to identify potential problem areas, such as intersections or bottlenecks, and develop appropriate solutions to address these issues. By using this data, the proposed flyover can be designed to maximize traffic flow and minimize congestion, improving the overall transportation infrastructure in Telibag.

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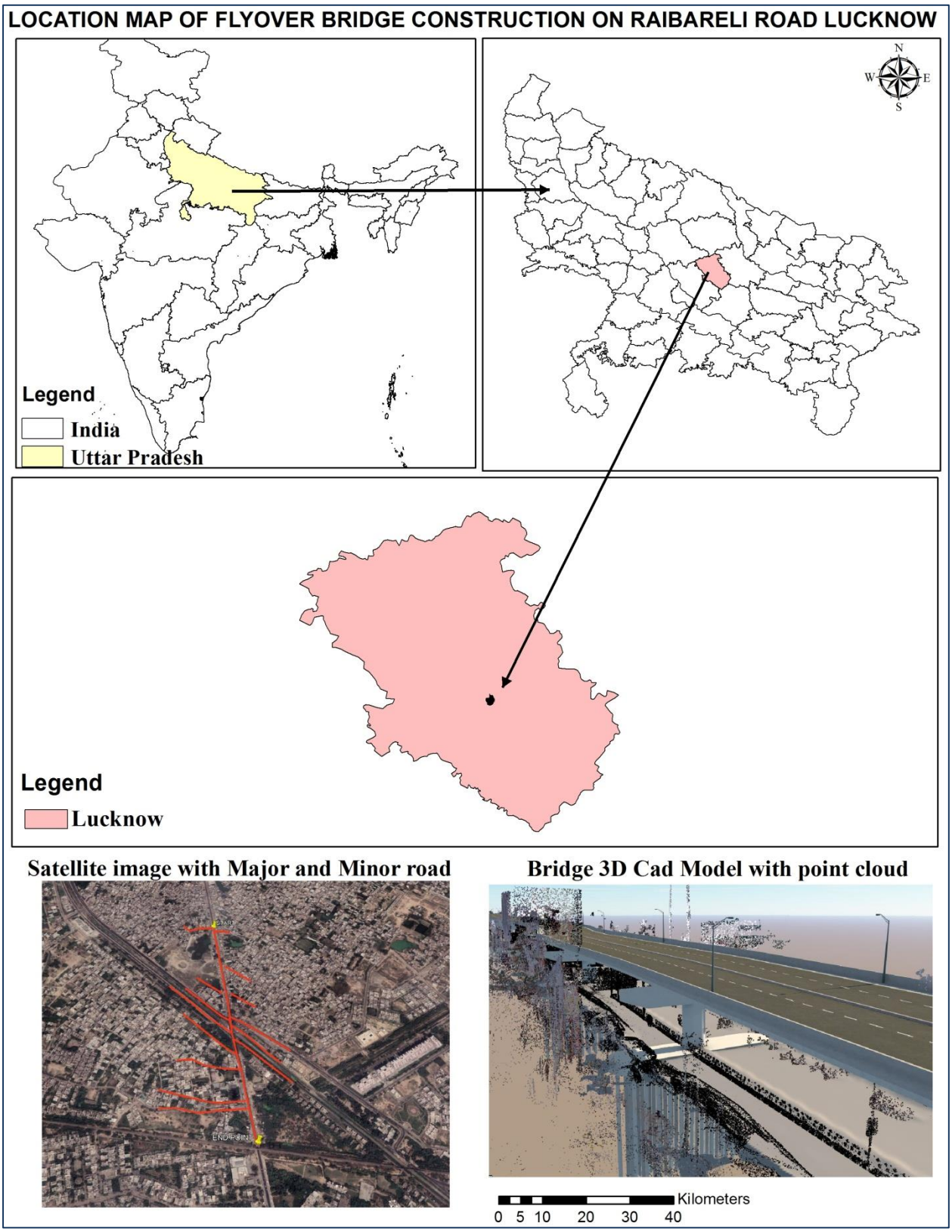

Map: 1 Location map study area.

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3.0 OBJECTIVES

1. To collect accurate and high-quality data on the road network and surrounding infrastructure using mobile LiDAR technology.

2. To generate a detailed and comprehensive digital terrain model (DTM) of the survey area, including road surfaces, curbs, and other features.

3. To create a 3D point cloud dataset that captures the precise location, elevation, and orientation of all objects within the survey area, including buildings, trees, and other infrastructure.

4. To produce Maps of the survey area, which are based on high-resolution and geometrically corrected data produced after removal of distortions caused by camera and terrain variations.

5. To provide accurate and up-to-date information on the road network and surrounding infrastructure, this can be used for planning, design, and maintenance purposes afterwards.

6. To create 3D visualization and measurable virtual database.

4.0 HARDWARE USED

Mobile LiDAR Vehicle with Trimble MX2 mobile mapping system is a LiDAR technology that has been used in the present work and various road survey projects have been conducted using this hardware worldwide, including in India. One notable project that used the Trimble MX2 was a road survey conducted by the Wyoming Department of Transportation (WYDOT) in the United States. The survey used the Trimble MX2 to capture data on a 24-mile stretch of Interstate 80 to gather information on the current condition of the roadway and identify potential safety hazards, such as potholes or cracks in the pavement. The resulting dataset was processed using Trimble's Trident software, which enabled the WYDOT team to analyze the data and identify potential safety hazards (Bessemer and Jarboe, 2016).

In India, the Trimble MX2 has been used in various road survey projects, including a project carried out by the Indian Institute of Technology (IIT) Madras. The IIT Madras team used the Trimble MX2 to collect data on a stretch of the Chennai Bypass road to analyze the road geometry, pavement condition, and traffic flow. The survey data was used to develop a pavement management system that can be used to plan and schedule maintenance and repairs on the Chennai Bypass road (Krishnaiah et al., 2018).

Another study conducted by researchers at the Indian Institute of Technology (IIT) Kharagpur used the Trimble MX2 to collect data on a stretch of National Highway 34, which connects the cities of Kolkata and Siliguri. The survey data was used to assess the pavement condition of the road and develop appropriate maintenance strategies (Bhattacharjee et al., 2017).

Mobile LiDAR Mapping Survey is being done by Remote Sensing Applications Centre-Uttar Pradesh (RSAC-UP), India for Lucknow Kanpur Highway, U.P, India (2016), Chak GanjariaGanj-IT City and Lucknow – Hardoi, U.P, India (2017), Barajod (Kanpur Dehat) to Kalpi (Jalaun), Hardoi-Sandi, Dhakerwa to Shrdanagar, Maholi to Hargaon, Malihabad to Mohan, Unchahar to Ishwar Daspur, Shadila to Gausganj, Tambaur to Mehmoodabad, Gorakhpur to Badauli, Saharanpur to Yamunotri Road (2018) in Uttarakhand & U.P, India and Chaurasi Kosi Parikrama Marg, Ayodhya, Uttar Pradesh, India(2021)

Overall, the Trimble MX2 has been shown to be an effective tool for conducting road survey and collecting highly accurate and detailed data on roadways and other transportation infrastructure. By using this data, transportation agencies can identify potential safety hazards and develop appropriate maintenance and repair strategies, ultimately improving the safety and efficiency of our transportation infrastructure.

The MX2 Mobile LiDAR system is a cutting-edge surveying tool that utilizes advanced hardware components to capture high-precision, high-resolution data of the survey area.

Here's a brief description of the hardware components of the MX2 Mobile LiDAR system, along with the Ladybug camera:

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1. LiDAR Sensor: The MX2 Mobile LiDAR system is equipped with a high-precision LiDAR sensor that uses laser pulses to measure the distance between the sensor and surrounding objects. The LiDAR sensor can capture up to 1.3 million points per second, which enables the system to create a detailed 3D model of the survey area.
2. Inertial Measurement Unit (IMU): The MX2 Mobile LiDAR system also includes an IMU, which is used to measure the system's acceleration, velocity, and orientation. The IMU data is used to correct for any movement or vibrations of the system during the survey, which helps to ensure the accuracy of the LiDAR data.
3. Ladybug Camera: The Ladybug camera is a high-resolution 360-degree camera that is used to capture high-resolution panoramic images of the survey area. The camera has six individual lenses, which enables it to capture a complete view of the surroundings. The Ladybug camera is synchronized with the LiDAR sensor, which enables the system to overlay the LiDAR data onto the Ladybug images, creating a seamless 3D model of the survey area.
4. DGPS Receiver: The MX2 Mobile LiDAR system is also equipped with a DGPS receiver, which is used to measure the location of the system during the survey. The GPS data is used to 5eoreferenced the LiDAR data, which enables it to be accurately positioned in the survey area.

   Overall, the hardware components of the MX2 Mobile LiDAR system and the Ladybug camera work together to capture accurate, high-resolution data of the survey area. The combination of LiDAR data, panoramic images, and GPS information creates a detailed and precise 3D model of the survey area that can be used for a wide range of applications, including transportation planning, construction, and asset management.

4.1 SOFTWARE USED:

The software used in the Mobile Lidar survey and processing were carefully chosen to provide accurate and precise data for the construction of the flyover project.

For data capturing, LV POS view Appalanix was used, which is a powerful mobile mapping software that provides a real-time view of the Lidar data as it is being captured. This allows the user to ensure that the data is being collected accurately and provides the ability to make adjustments as needed. In addition, Trident capture was used for data recording, which is an advanced data collection software that provides accurate and precise data recording.

Furthermore, Ladybug 5 camera was used to capture high-resolution images and videos of the surrounding area. These images were used to create a 3D model and fly-through simulation of the project, which allowed the stakeholders to visualize the final output before construction began.

For data processing, Autodesk Recap was used to process the captured data and to create a 3D point cloud. The point cloud is a dense set of points that represent the surface of the objects in the scanned area. It is an essential component in the Lidar data processing workflow, as it is used to generate digital elevation models, contours, and 3D models.

The processed data was then imported into Trident Factory, which is a software tool designed to process and clean Lidar data. This software helps to remove noise and unwanted data points, ensuring that the final output is accurate and precise.

Finally, the cleaned data was imported into Autodesk Infraworks for CAD modeling and fly-through simulations. This software allows the user to create a 3D model of the proposed project and simulate how it would look in real life. The software provides a range of features, including roadway design, terrain modeling, and analysis tools.

Overall, the software used in the Mobile Lidar survey and processing played a critical role in the success of the project, providing accurate and precise data for the construction of the flyover project.

5.0 METHODOLOGY:

1. Planning: The first step in conducting a survey using the Trimble MX2 is to plan the survey. This involves selecting the survey area, determining the survey objectives, and establishing the survey parameters such as the speed at which the survey vehicle will travel and the desired point density.
2. Instrument set up: The next step is to set up the Trimble MX2 instrument. This involves mounting the instrument on a survey vehicle and ensuring that it is calibrated and configured correctly.
3. Data collection: Once the instrument is set up, the survey vehicle can begin data collection. The Trimble MX2 uses a combination of LiDAR sensors, cameras, and GPS receivers to capture data on the roadway and surrounding terrain. The LiDAR sensors emit laser pulses that bounce off objects and return to the sensors, allowing the instrument to create a 3D point cloud of the survey area. The cameras capture high-resolution images that are used to supplement the LiDAR data, while the GPS receivers provide accurate location data.

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4. Post-processing: After data collection is complete, the survey data must be post-processed. This involves removing noise and artifacts from the data and aligning the LiDAR and camera data to create a unified point cloud. The resulting dataset is then filtered, classified, and transformed into a usable format.
5. Analysis: Once the data has been processed, it can be analyzed to extract useful information. This may include identifying potential safety hazards, assessing the condition of the roadway, or analyzing traffic flow.
6. Reporting: The final step in the survey process is to report the findings. This may involve creating maps or other visualizations of the data and providing recommendations for maintenance and repair strategies.

6.0 RESULTS

To prepare for the construction of a flyover, a Mobile Lidar survey was carried out on a specific section of road as per the requirements of Uttar Pradesh Bridge Corporation Ltd. (UPBCL). The surveyed road runs in a NNW-SSE direction and is a four-lane State Highway no 30, with a width of 7.5 meters X 2 and due to its location, the road is under heavy traffic pressure, as there are eight intersections on the west and six on the east. (Plates 1 & Map 3)

To establish a precise reference point for the survey, DGPS was set up at the northern end of the road stretch. Overlapping surveys were continuously conducted for a 1.059 km stretch, which were used to create a 3D model and a fly-through simulation.

In addition to DGPS, MX2 was utilized to generate 3D point cloud of the road and surrounding structures. Furthermore, Ladybug 5 camera was used to capture high-resolution images and videos of the surrounding area, which proved crucial in creating an accurate 3D model and fly-through simulation. Overall, the successful implementation of these technologies and equipment highlights their importance in future surveys for construction and infrastructure projects. (Plates 2-27)

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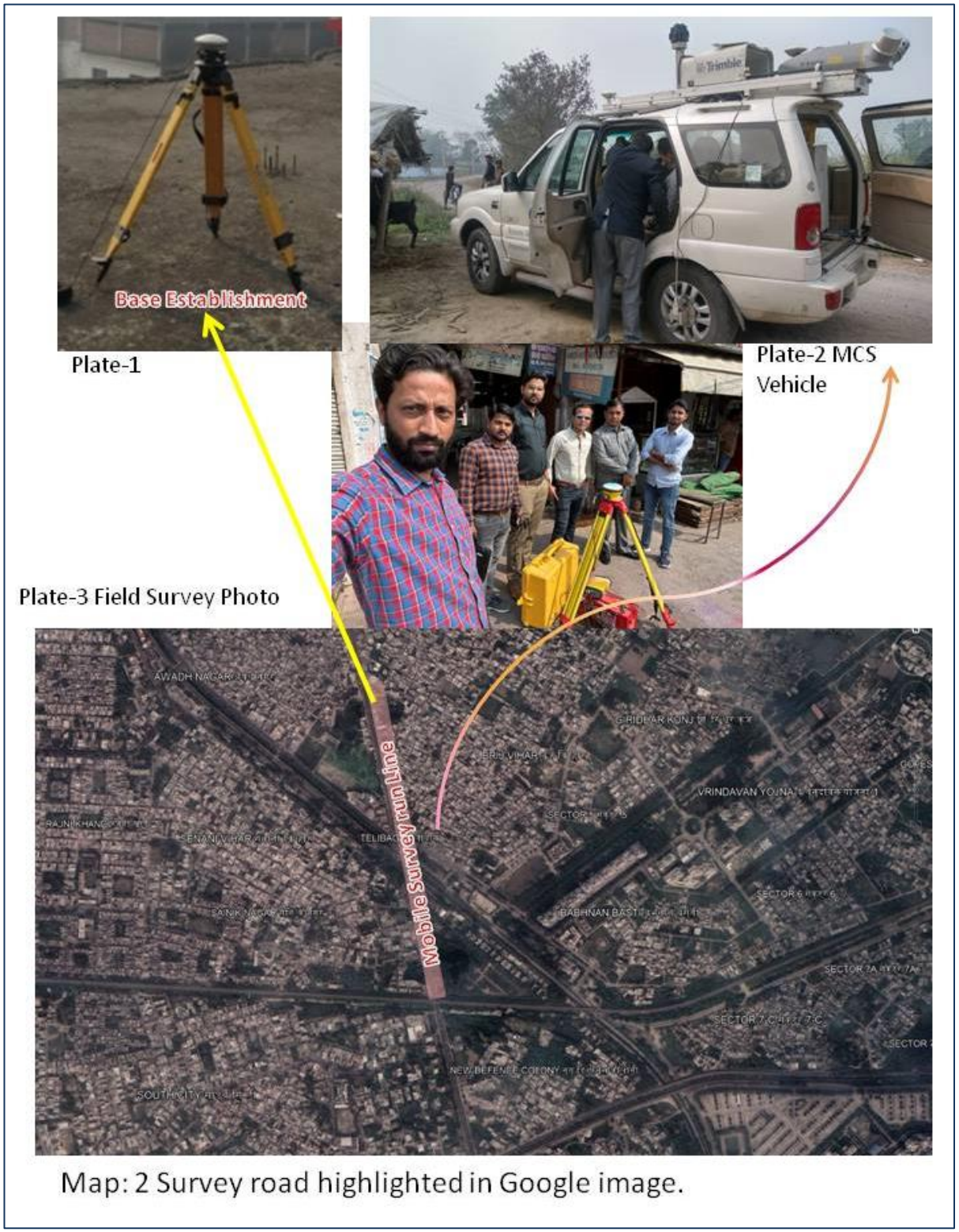

Map: 2 Survey road highlighted in Google image.

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Road Intersections present in Study Area of Telibagh

Map: 3 Connected road to survey road.

Map: 4 Image showing canal/Railways line on survey road.

Map: 5 Overview of Traffic Congestion in Telibagh Area, Lucknow, U.P

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Plate 4- Laser view from camera.

Plate 5- Starting Point from Shaheed Path

Plate 6- Railway Bridge

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Plate 7- Recreation in western side building Multiplex south of Railway Bridge.

Plate 8- East view of Temporary Indigenous shops in front of Multiplex

Plate 9- 360 Camera view before Railway bridge.

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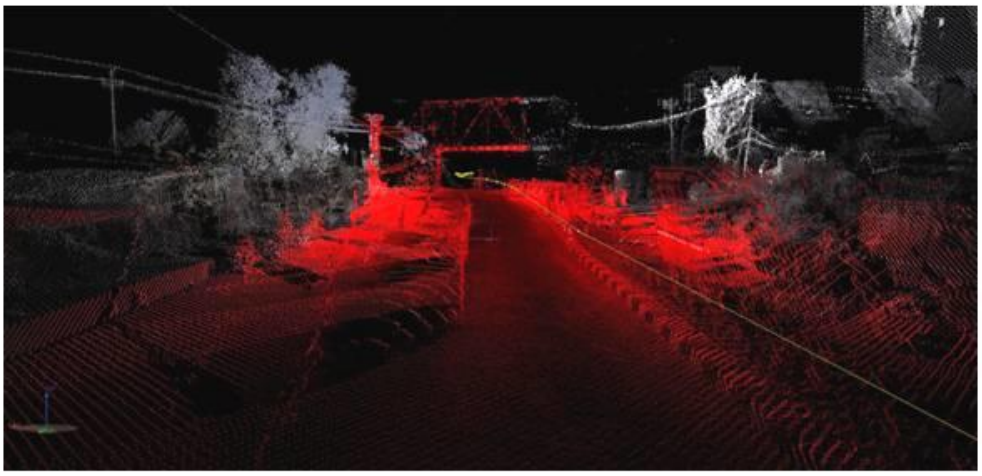

Plate 10- RGB Point Cloud data-(Railway Bridge)

Plate 11- 360 Camera video picture-(Railway Bridge)

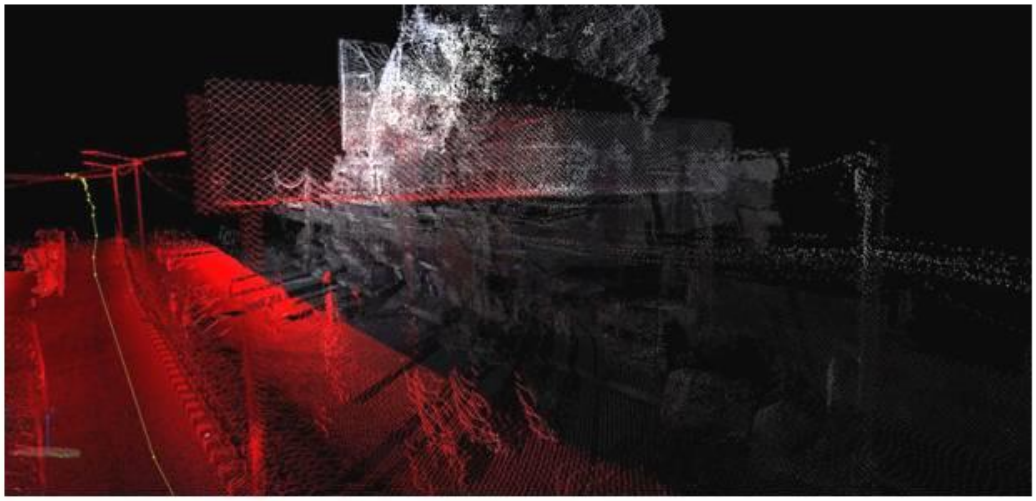

Plate 12- High altitude view of stagnant point in point cloud data record.

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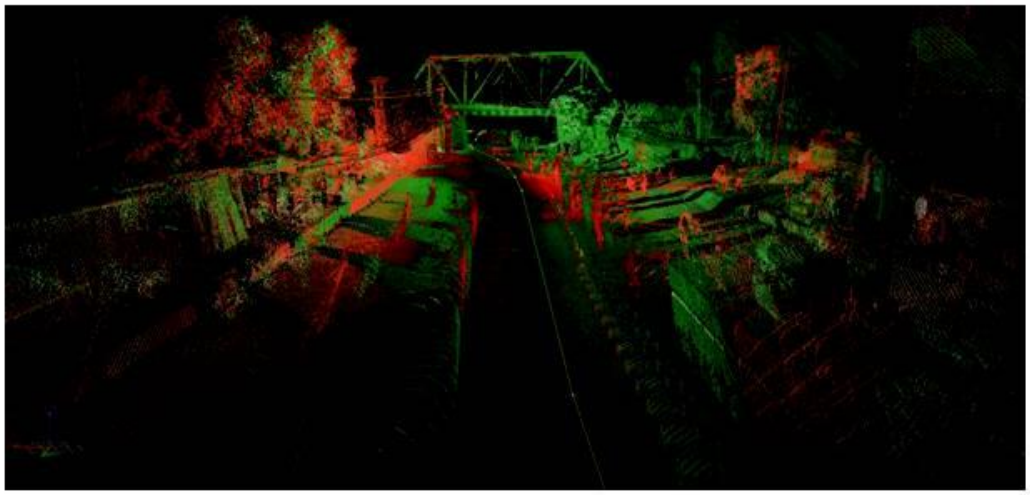

Plate 13- Point Intensity view of Point Cloud data of the survey road (Railway bridge in south).

Plate 14- Rear Camera view in south direction from Railway bridge.

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Plate 16- Diagnostic centre Building in western side of Proposed over bridge.

Plate 17- High traffic (Chauraha) conjection point Telibagh.

Plate 18- Western view of Road above canal.

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Plate 19- Eastern view of Road above Canal.

Plate 20- Commercial Buildings that will lie below proposed Flyover.

Plate 21- Proposed Flyover pass over temple in west that lies just sought of Canal on the Raebareli road.

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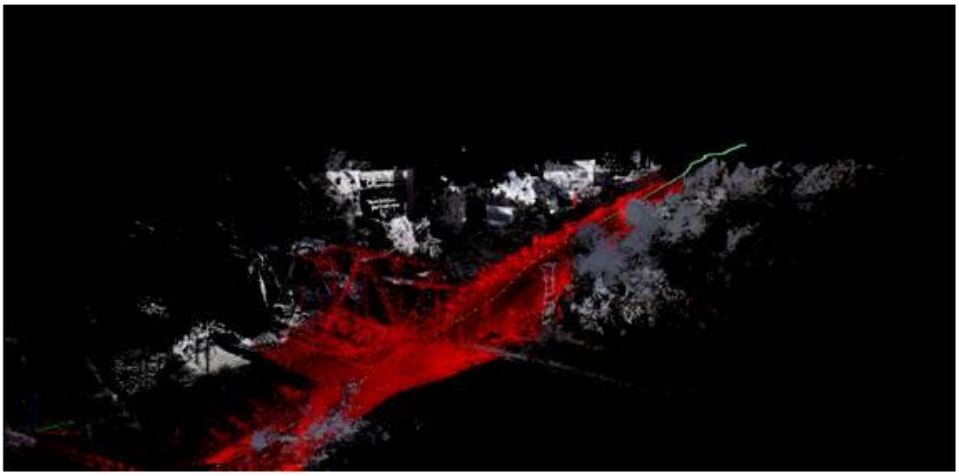

Plate 22- High angle oblique view of buffered point cloud data visible Railway Bridge.

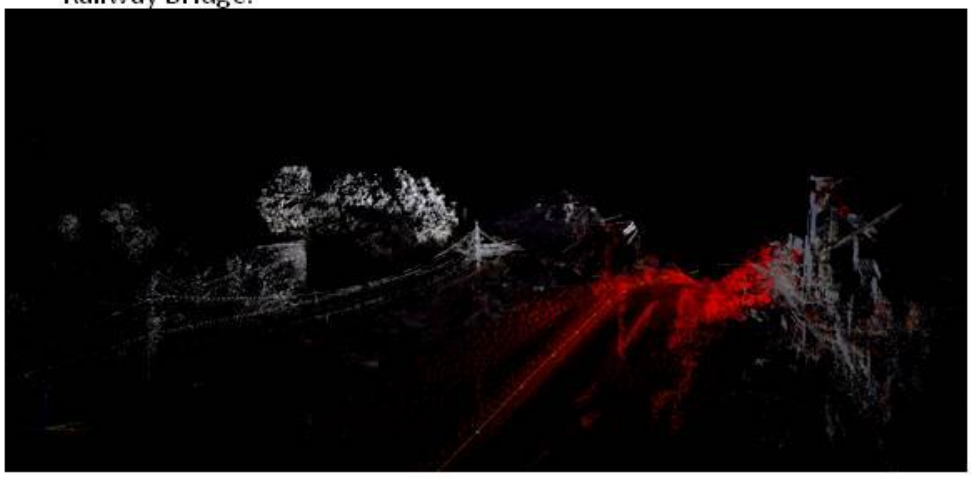

Plate 23- Stagnant Point with Buffered point cloud data.

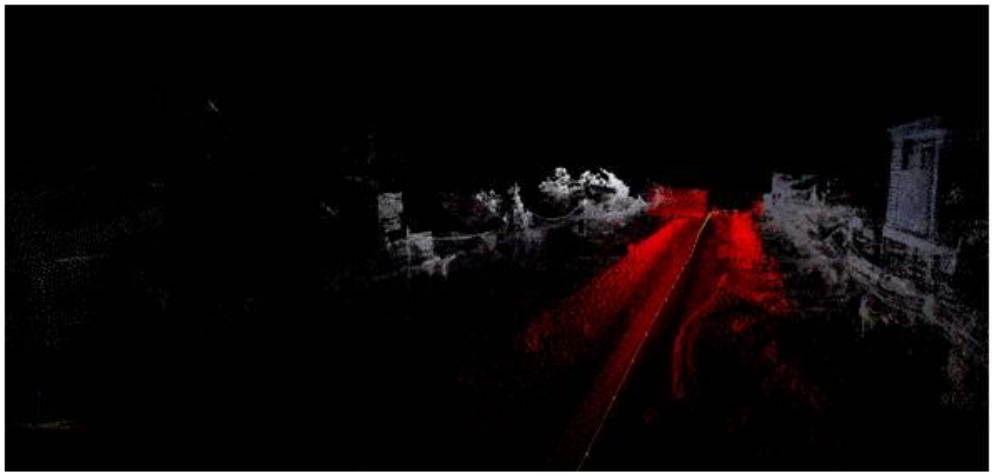

Plate 24- Right side Hotel found in survey.

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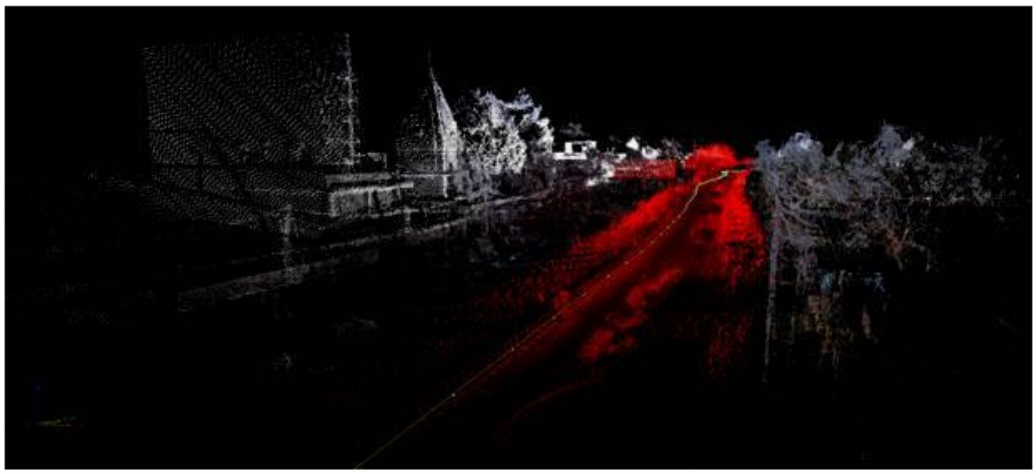

Plate 25- Temple showing in Point cloud data.

Plate 26- Image showing buffered road for Bridge.

Plate 27- Side view of Buffered for Bridge.

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7.0 DISCUSSION

Mobile LiDAR pre-road survey can be incredibly useful in planning a flyover bridge in several ways:

1. Detailed Topographical Data: Mobile LiDAR surveys can capture detailed topographical data on the surrounding terrain, including the elevation and slope of the land. This data can help engineers determine the optimal location for the flyover bridge and the necessary grade of the road.

2. Accurate Measurements: Mobile LiDAR surveys can provide highly accurate measurements of the roadway and surrounding terrain, which is critical for the design of the flyover bridge. This includes the width of the road, the height of existing structures, and the clearance required for the bridge.

3. Identification of Potential Hazards: Mobile LiDAR surveys can identify potential hazards on the road, such as trees, power lines, and buildings that could impede the construction of the flyover bridge. This information can help engineers plan the bridge design and construction sequence to avoid potential hazards.

4. Traffic Flow Analysis: Mobile LiDAR surveys can provide data on traffic flow, including the number of vehicles, their speed, and their direction of travel. This data can help engineers plan the location and design of access ramps for the flyover bridge, ensuring that traffic flow is optimized.

Overall, Mobile LiDAR pre-road survey can provide critical data for the planning and design of a flyover bridge. By using this data, engineers can optimize the location and design of the bridge, reduce potential hazards, and ensure that traffic flow is optimized, ultimately improving safety and efficiency of the transportation system.

The Telibagh area of Lucknow, India is known for its heavy traffic during peak hours. To alleviate this issue, the implementation of a rotary traffic system has been proposed, based on the Telibagh Rotary Traffic Survey Report. The benefits of a rotary system are numerous, as detailed in the survey report. Firstly, the rotary system eliminates serious conflicts between crossing movements by restricting traffic flow to one direction of travel. This will significantly reduce the number of accidents and their severity. Secondly, the speed of every vehicle entering the rotary is gradually reduced, and it continues to drive at a lesser speed, which means that no vehicle needs to be halted, as is the case in a signalised intersection.

Moreover, rotaries are self-governing and hardly ever require police or traffic controls. They are best used in crossroads with moderate traffic, especially those with uneven geometry or more than three or four approaches. In the case of Telibagh, where heavy traffic is a problem, it is recommended to install multiple rotaries at different intersections to ensure smooth flow. However, it is also important to note the limitations of rotaries. For example, every car is compelled to slow down and cross the crossing, which increases the total latency compared to a channelized intersection. Rotaries are also expensive in metropolitan cities as they require a lot of relatively flat land. Additionally, vehicles often do not stop at rotaries and quicken their pace as they leave the rotary, which makes them unsuitable for areas with heavy traffic.

The three traffic manoeuvres in a rotary are diverging, merging, and weaving. Diverging is a traffic manoeuvre in which a single stream of moving cars is divided into multiple streams according to the destinations of each stream. Merging, on the other hand, is the practice of combining traffic entering from several approaches and travelling to the same destination into one stream. Finally, weaving is a movement that combines diverging and merging motions that are all moving in the same direction.

In conclusion, the implementation of a rotary traffic system in Telibagh, Lucknow, can greatly alleviate the traffic congestion issues in the area. While the system has several benefits, it is important to consider the limitations and traffic manoeuvres associated with it. By taking these into account, the traffic management in Telibagh can be improved significantly, resulting in a safer and more efficient transport system. (Annexure 1)

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7.1 Scope of Further Work

1. To identify the main traffic problems in the Telibagh area of Lucknow, including the intersections.
2. To determine the opinions of local residents, businesses, and commuters about the current traffic situation in the area and the proposed flyover.
3. To gather information on the potential benefits and demerits of constructing a flyover in Telibagh, Lucknow, on Raebareli Road.
4. To assess the potential impact of the flyover on the local economy, including its effect on businesses and employment opportunities.
5. To evaluate the environmental impact of the flyover construction and assess ways to mitigate any negative effects.
6. To estimate the cost of constructing the flyover and maintaining it in the long term, and evaluate the economic feasibility of the project.
7. To provide recommendations and suggestions for improving traffic flow and managing the potential negative impacts of the flyover construction.

Overall, the scope can be increased to a comprehensive analysis of the proposed flyover construction in Telibagh, Lucknow, and to assess its potential impact on the local community, environment, and economy. By gathering information from various stakeholders and conducting a thorough analysis, the work can provide valuable insights and recommendations to help decision-makers make informed decisions about the project.

8.0 OBSERVATIONS

Raebareli Road is one of the major arterial roads in Lucknow and connects the city with the town of Rae Bareli, located about 80 km to the south. The road is known for its heavy traffic, especially during peak hours, due to its strategic location and the presence of several important landmarks along the way. (Map 6 to 23)

Telibag is a densely populated locality located on Raebareli Road, and is a major transit point for commuters traveling to and from the nearby areas. The traffic on this road is a mix of private vehicles, public transport buses, and commercial vehicles such as trucks and lorries.

During peak hours, the traffic on Raebareli Road can be quite heavy, with long queues of vehicles seen at various intersections and junctions. The traffic congestion is often compounded by the presence of several traffic bottlenecks and inadequate infrastructure, such as narrow roads and poorly designed intersections.

Apart from peak hours, the traffic on Raebareli Road is relatively lighter, with fewer vehicles on the road. However, even during off-peak hours, the road can be congested in some areas, especially near major landmarks such as the SGPGI hospital and the Amul dairy.

Overall, the traffic on Raebareli Road in Telibag, Lucknow, can be quite heavy and congested at times, especially during peak hours. However, the traffic conditions may vary depending on the time of day and other factors, such as weather and roadworks.

9.0 CONCLUSIONS

Raebareli Road is a major thoroughfare located in the Telibagh area of Lucknow. This road is a bustling commercial and residential hub, which connects the city with the district of Rae Bareli and other nearby towns and cities.

The road is lined with a plethora of shops, restaurants, hospitals, and educational institutions, making it a hub of activity throughout the day. The area is a popular destination for shopping, especially for those looking for

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traditional Indian attire, jewelry, and handicrafts. Several shopping malls and markets can be found along the road, including the Telibagh Market and Sahara Ganj Mall.

Apart from shopping, Raebareli Road is also home to several hospitals and medical facilities. These institutions cater to the healthcare needs of the city's residents and those from nearby areas.

The educational institutions located along Raebareli Road are some of the most renowned in the city. These institutions attract students from all over the country, and their presence has helped put Lucknow on the map as a center of education.

Overall, Raebareli Road is a vital part of Lucknow's infrastructure, connecting the city with the rest of the state and providing its residents with access to essential services and amenities. Whether you're a resident of the city or a visitor, a trip to this vibrant area is sure to be an enjoyable and memorable experience.

The creation of a flyover in Telibagh, Lucknow, will have a significant impact on how traffic is managed in the area. The flyover is planned to be constructed just after Railway line in south intersection of that pass over Raebareli Road in East-West direction, and go over busy junctions that sees a large volume of traffic on a daily basis. (Annexure-1)

With the construction of the flyover, traffic flow will be improved, and congestion at the intersection will be reduced. The flyover will provide a dedicated lane for vehicles moving towards the airport and the city center, allowing for smoother traffic movement. This will also reduce the travel time for commuters, making it easier for them to get to their destinations.

In addition to improving traffic flow, the flyover will also increase road safety. The intersection over canal are notorious accident spots, with many accidents occurring due to the heavy traffic volume and lack of proper traffic management. The flyover will separate the traffic and reduce the risk of accidents, making the intersection safer for commuters.

The construction of the flyover will also have a positive impact on the local economy. With smoother traffic flow, businesses along the route will see an increase in foot traffic and customers. This, in turn, will help boost the local economy and create more job opportunities.

Overall, the creation of a flyover in Telibagh, Lucknow, will have a significant impact on how traffic is managed in the area. It will improve traffic flow, reduce congestion, increase road safety, and boost the local economy, making it a win-win situation for everyone involved and While the construction of a flyover in Telibagh, Lucknow, will have several benefits for traffic management and the local economy, there are also some potential demerits that may arise from its construction. Here are some of the possible negative impacts of the flyover:

1. Environmental concerns: Construction of the flyover may have negative environmental impacts, such as air pollution, noise pollution, and increased traffic congestion during construction. The use of heavy machinery and excavation work may also cause soil erosion and disruption to local habitats.
2. Disruption to businesses: The construction of the flyover may cause disruption to businesses along the route, including access to their stores, increased noise, and dust pollution. This may lead to a decrease in foot traffic, and some businesses may need to temporarily shut down or relocate during the construction period.
3. Cost: Construction of a flyover is a significant investment, and the cost of construction may be high. The cost of the flyover project may exceed the allocated budget, leading to a delay in its completion or an increase in the cost of the project.
4. Maintenance: The flyover will require regular maintenance and repairs to ensure it is safe for commuters. This may cause disruption to traffic flow, and the cost of maintenance may be high, which may lead to increased taxes or toll charges for commuters.
5. Increased traffic on surrounding roads: While the flyover will improve traffic flow on Raebareli Road, it may lead to increased traffic on surrounding roads as drivers try to avoid the toll charges or the flyover itself, leading to congestion on other routes.

In summary, while the construction of a flyover in Telibagh, Lucknow, will have several benefits for traffic management, there are also some potential demerits that should be considered. It is essential to weigh the costs and benefits carefully and to mitigate any negative impacts as much as possible.

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Map: 6 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2003)

Map: 7 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2005)

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Map: 8 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2006)

Map: 9 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2008)

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Map: 10 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2009)

Map: 11 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2010)

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Map: 12 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2011)

Map: 13 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2012)

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Map: 14 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2013)

Map: 15 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2014)

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Map: 16 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2015)

Map: 17 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2016)

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Map: 18 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2017)

Map: 19 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2018)

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Map: 20 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2019)

Map: 21 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2020)

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Map: 22 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2021)

Map: 23 FLYOVER BRIDGE CONSTRUCTION ON RAIBARELI ROAD LUCKNO9W(2022)

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10.0 RECOMMENDATIONS

Recommendations that can help improve traffic conditions on Raebareli Road in Telibag, Lucknow:

1. Develop infrastructure: The local authorities can invest in developing the infrastructure on Raebareli Road, including widening the road, constructing flyovers, improving intersections, and building new roads to ease the traffic congestion.
2. Encourage public transportation: Encouraging the use of public transport can help reduce the number of private vehicles on the road. The authorities can introduce more buses and offer incentives for people to use public transport, such as reduced fares and improved services.
3. Promote carpooling: Carpooling is another effective way to reduce the number of vehicles on the road, especially during peak hours. The local authorities can encourage people to carpool by providing dedicated carpool lanes and offering incentives such as reduced parking fees.
4. Introduce traffic management measures: Implementing traffic management measures such as traffic signals, speed limits, and roundabouts can help regulate the flow of traffic and reduce congestion.
5. Improve pedestrian infrastructure: Improving pedestrian infrastructure, such as footpaths and pedestrian crossings, can help reduce the number of accidents involving pedestrians and improve the overall safety of the road.
6. Use technology: The authorities can use technology such as traffic cameras and real-time traffic monitoring systems to identify traffic bottlenecks and respond to them quickly.
7. Raise awareness: The authorities can also raise awareness among the public about the importance of following traffic rules and regulations, such as not parking on the road and not driving under the influence of alcohol.

Overall, a combination of these measures can help improve traffic conditions on Raebareli Road in Telibag, Lucknow, and create a safer and more efficient road network for commuters.

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