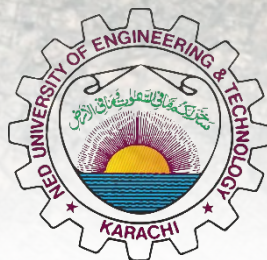




TOYOTA ROAD IMPROVEMENT PROJECT (TRIP)

Rashid Minhas Road



TOYOTA



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Executive Summary

Rashid Minhas Road is a major arterial road located in the city of Karachi, Pakistan. The road is approximately 14 kilometers long and runs from the intersection of University Road and Jauhar Road to National Highway and Shahrah-e-Faisal, connecting the city's eastern parts to the western parts.

For Toyota Road Improvement Project, approximately 10 km segment of the arterial is selected. It starts from the Millennium Mall and ends at Nagan Chowrangi. The part of arterial considered for the study is of utmost importance due to the presence of significant landmarks. The residential, commercial, and recreational land use on significant portion of the road depicts that the vehicle mix observed in this segment consists mostly of motorcycles, cars, and pick-up vans. A small proportion of heavy vehicles due to presence of few factories in the area.

Various data collection methods were employed to identify the road defects and arising road safety concerns on the Rashid Minhas Road. These included travel time surveys, traffic count surveys, drone surveys, road inventory surveys, and collecting accident data from the Sindh traffic police and RTIPC. The free flow travel time observed on the arterial ranges between 12.5 minutes through survey. Furthermore, it also provided the critical points where significant traffic congestion was observed which includes the segments present on Millennium Mall, Imtiaz Mega Market, and Lucky One Mall. It depicts that the traffic generated for these markets and mall is creating a contributing factor for congestion on the arterial. The primary objectives of the traffic count survey were to determine the current traffic volume of through traffic on the selected road segment. For this purpose, four locations were selected for traffic video count survey, including Millennium Mall, Aladdin Park, Shafiq Morr, and Dayar-e-Shereen. The maximum volume for both directions was obtained at Shafiq Morr.

A drone survey was conducted for data collection that is used to gather information on traffic conditions using a Drone Camera. The survey was conducted on 8th, 9th, 13th and 17th March 2023. The Pix4D application was used to perform flight scheduling for the survey. Compared to Google Earth, the drone survey method was more effective in identifying road defects such as pothole width, encroached land, illegal outside parking, and also provides a better understanding of the area's topography.



Problems including Pothole/Ditch, wrong-way movements, debris, and encroachment have been identified by going onsite and by using drone images as well. An open Nala has been observed near Dayar-e-Shereen Gujjar Nala, which is too dangerous for the residents as well as the road users. A significant amount of wrong-way movements are generated on the U-turn beneath the Nepa flyover. Sand debris is observed near Lucky One Mall on the fast lane. Parking and encroachment have been observed near Millennium Mall, Chase Value Supermarket in front of Aladdin Park, Imtiaz Mega Mall near Orangi Nala, and in front of Lucky One Mall. The entire data was used to perform traffic modelling for evaluating existing travel time which was obtained as 19.45 minutes from Drigh road to Nagan chowrangi while 19.4 minute for opposite direction. After conducting a detailed analysis, we evaluated the road defects and proposed solutions for both geometric and traffic improvements to reduce existing travel time delays.

One of the significant issues that was observed on the arterial was traffic congestion near the malls. It has been deduced that this congestion was primarily due to the design of existing u-turns and intersections on the road. Therefore, such u-turns must be provided with proper channelization, provision of island, and adequate length for weaving and merging movements to ensure smooth flow of traffic. One suggestion is also provided for the Millennium mall intersection that is to provide roundabout for reducing the conflicting points.

The traffic problem on Rashid Minhas Road is a pressing issue that requires immediate attention. The rise in traffic volume, land encroachments, on-street parking, geometric design defects, and lack of effective traffic management measures have led to significant traffic congestion and safety concerns for all road users. Furthermore, some comprehensive solutions are required to address these issues, which involves implementing various measures such as amending existing road facilities, modifying existing intersections, installing traffic signals, and removing encroachments. By implementing these measures, it is possible to alleviate the traffic problem on Rashid Minhas and improve the safety and efficiency of this critical arterial road that connects Shahrah-e-Faisal with University Road and Shahrah-e-USman.



Table 1 Problems at Critical Locations and their solutions

LOCATIONS	COORDINATES	PROBLEMS IDENTIFIED	SOLUTIONS PROPOSED
Millenium Mall	24.900701°, 67.116212°	<ul style="list-style-type: none"> •encroachment •illegal parking •improper bus stops •congestion 	<ul style="list-style-type: none"> • Police challan and enforcement •Designated parking places •Regulation of proper bus stops for public transport
Aladdin U-turn	24.909413°, 67.107989°	<ul style="list-style-type: none"> •encroachment •Wednesday, Thursday market parking on -road •wrong way movements 	<ul style="list-style-type: none"> • Police challan and enforcement •Designated parking places •Relocate the u-turn
English Learning Institutes	24.921039°, 67.094115°	<ul style="list-style-type: none"> •damaged roadway •potholes, ditches •on-road parking 	<ul style="list-style-type: none"> •surfacing and filling of potholes •Provide parking spaces
Moti Mehal U-turn and Imtiaz Mega	24.926418°, 67.089862°	<ul style="list-style-type: none"> •on-road parking •congestion •encroachment 	<ul style="list-style-type: none"> • Police challan and enforcement •Designated parking places specially for Imtiaz Mega
Lucky One Mall	24.9323574°, 67.0846889°	<ul style="list-style-type: none"> • No road crossing facilities for pedestrians 	<ul style="list-style-type: none"> • Provision of traffic calming devices and Pedestrian Bridge
Gujjar Nala	24.957738°, 67.075669°	<ul style="list-style-type: none"> •open walls of nala on some points 	<ul style="list-style-type: none"> •proper wall construction all along the nala to protect road users

Chapter 1: Introduction

1.1 Study Area

Rashid Minhas Road is a major arterial road located in the city of Karachi, Pakistan. The road is approximately 14 kilometers long and runs from the intersection of University Road and Jauhar Road to National Highway and Shahrah-e-Faisal, connecting the city's eastern parts to the western parts. The starting section of approximately 10.5 km of this road is considered for this study as shown in Figure 1.

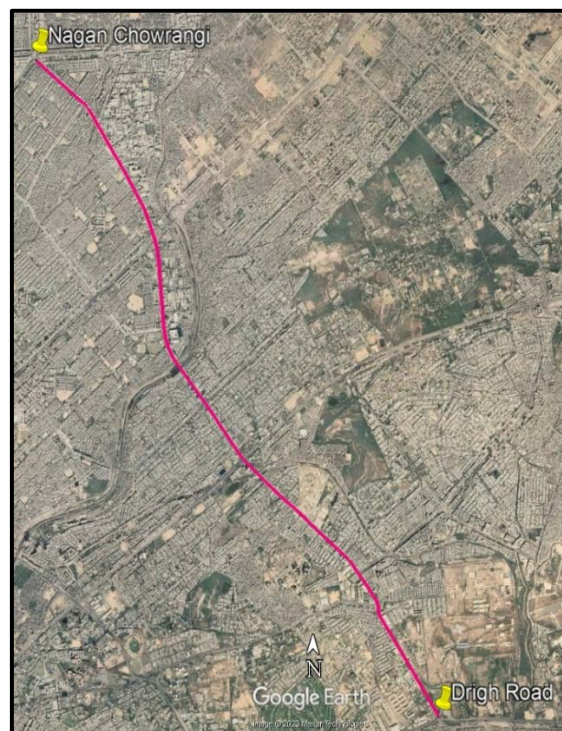


Figure 1 Selected Segment of Rashid Minhas Road

1.2 Surrounding Landuse

Rashid Minhas Road is a significant route for commuters travelling to and from various parts of the city, including Gulshan-e-Iqbal, Gulistan-e-Jauhar, Bahria Town, and DHA. The selected segment of the road is lined with commercial, military, and residential



areas, including shopping centers, restaurants, and hospitals making it a vibrant and bustling area. Some significant landmarks present on this road are as follows:

1. Banquets
2. Cantonment Area
3. Army Public School
4. Millennium Mall
5. Chase Value Center
6. Restaurants
7. Nueplex Cinemas
8. Banks
9. Mobile Malls
10. Imtiaz Mega
11. LuckyOne Mall
12. Car showrooms
13. Fazal Mill Industry
14. Sara Solar Pvt.
15. Premier Sales Ltd.
16. Indus Hospital

1.3 Traffic Mix

The traffic mix of Rashid Minhas Road primarily comprises light vehicles such as cars and motorbikes, with occasional heavy vehicles due to nearby small industries. Despite significant development efforts, including drainage system improvements to mitigate flooding during monsoon season, heavy traffic congestion persists, especially during peak hours. Despite being a crucial commuter route, Rashid Minhas Road faces challenges including congestion at major intersections and entry points, as well as deterioration in some areas due to heavy traffic, insufficient maintenance, and encroachments by street vendors and parked vehicles.

1.4 Elements Affecting Safety

The detailed characteristics and features of the N5 highway which are affecting road safety are presented in Table 2.

Table 2 Road Elements and features

Parameters	Details
Road Carriageway	The number of lanes maximum is 6. But the amount of traffic lanes varies throughout the road. But due to parking/ encroachment on some sections of the road the actual number of lanes have been reduced.
Geometry	The Median has uneven along the highway with sudden increase and decrease in width.
Parking Spaces	Most of the service road as well as a few sections of highway is used for



	parking vehicles
Bridge	Orangi Nala and Gujjar Nala
Pedestrian Bridge	Thirteen bridges found on the road segment
Flyovers	Five Flyovers near locations Millennium Mall, Johar Morr, Nepa Chowrangi, Sohrab Goth, Nagan Chowrangi
U-Turns	Twelve U-turns
Intersections	Five Major and Six Minor Intersections
Roundabout	None
Road Markings	Faded Lane Markings
Traffic Signage	Less amount of traffic signage
Signals	None
Landuse Type	Mixed Landuse Type includes a significant amount of Residential and commercial areas. It also includes Military, Industrial, and recreational areas

1.5 Types of Solutions

1.5.1 Short term

The term "short term" is used in this context to emphasize actions that can be implemented quickly to address immediate concerns. In the case of road defects, such as potholes, cracks, or damaged signs, prompt repairs are necessary to prevent accidents, injuries, and further deterioration of the infrastructure. These short-term solutions focus on addressing the most pressing issues to ensure the continued safety and usability of the road network in the immediate future. They are typically temporary fixes meant to provide immediate relief while more extensive repairs or long-term solutions are planned and executed.

1.5.2 Medium Term

In the context of road maintenance and infrastructure management, "medium term" refers to solutions and actions that are implemented over a somewhat longer timeframe compared to short-term measures but are still relatively prompt and actionable. Medium-term solutions typically involve more comprehensive repairs and upgrades that address underlying issues and contribute to the overall improvement and sustainability of the road network. This may include activities such as resurfacing worn-



out pavement, repairing or reconstructing damaged sections of the road, upgrading drainage systems, or replacing outdated infrastructure components. While medium-term solutions may require more time, resources, and planning compared to short-term fixes, they are essential for addressing persistent issues, improving road conditions, and extending the lifespan of the infrastructure. These measures are crucial for ensuring the continued functionality, safety, and efficiency of the road network over an intermediate period.

1.5.3 Long Term

In the context of road maintenance and infrastructure management, "long term" refers to solutions and strategies that are implemented over an extended period, typically spanning years or even decades. Long-term solutions focus on addressing fundamental challenges and improving the overall resilience, sustainability, and efficiency of the road network. These solutions often involve significant investments in infrastructure upgrades, comprehensive planning, and the implementation of proactive maintenance programs. Long-term measures may include activities such as redesigning road layouts for better traffic flow, implementing advanced materials and construction techniques for enhanced durability, integrating smart technologies for real-time monitoring and management, and establishing sustainable funding mechanisms for ongoing maintenance and improvements. While long-term solutions require substantial resources, coordination, and commitment, they are essential for ensuring the long-term viability and effectiveness of the road network, enhancing safety, reducing environmental impacts, and supporting economic growth and development.

Chapter 2: Critical Sites and their Solutions

2.1 Moti Mehal U-Turn:

The existing U-turn near Moti Mehal creates congestion as Intiaz Parkings reduce the width of the existing road. Additionally, rickshaw drivers from opposite road enter this U-turn in the wrong direction and merge into the through traffic.



Figure 2 Existing U-turn at moti mehal

2.1.1 Action Plan:

The action plan has been divided into short-, medium-, and long-term solutions.

Short Term: Not applicable.

Medium Term: Provide road safety studs to separate through traffic and turning traffic

Long Term: Intiaz Parking should be properly managed to ensure no parking on the main arterial / Relocate the U-turn.

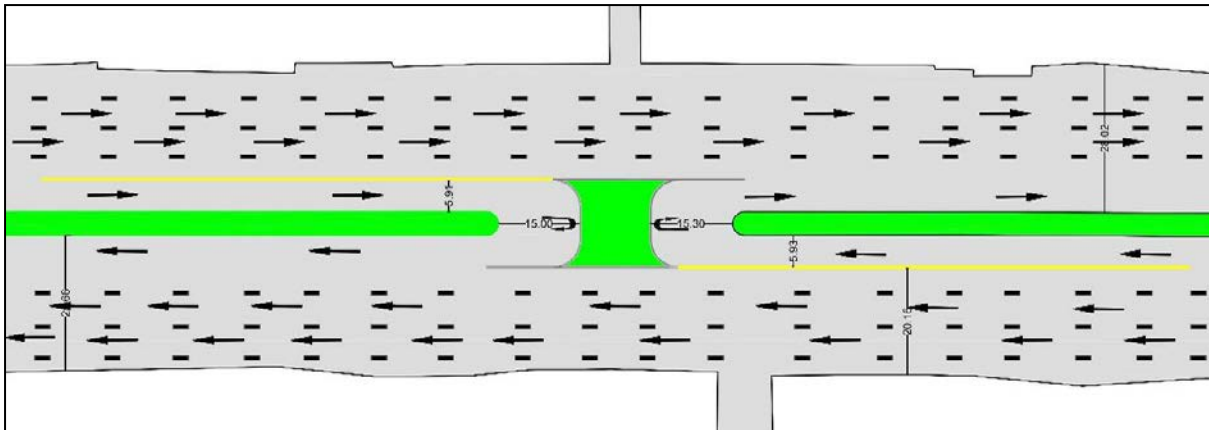


Figure 3 Proposed U-turn at moti mehal

2.2 Broken Wall Of Nala

Open Nala has been observed near Dayar-e-Shereen gujjar nala. The serious hazard in fast lane track of that location is that there is no protection wall present which can cause accident. Furthermore, some parts of footpath on the service road present from Nagan to Gujjar Nala are not properly covered and no street lightning is provided therefore it causing potential of accident.

2.2.1 Action Plan:

Short term: Not applicable.

Medium term: The medium-term solution for broken wall of Nala is to pace NJ barriers to cover the opening.

Long term: The long-term solution is to construct a protective wall.



2.3 Millenium Mall:

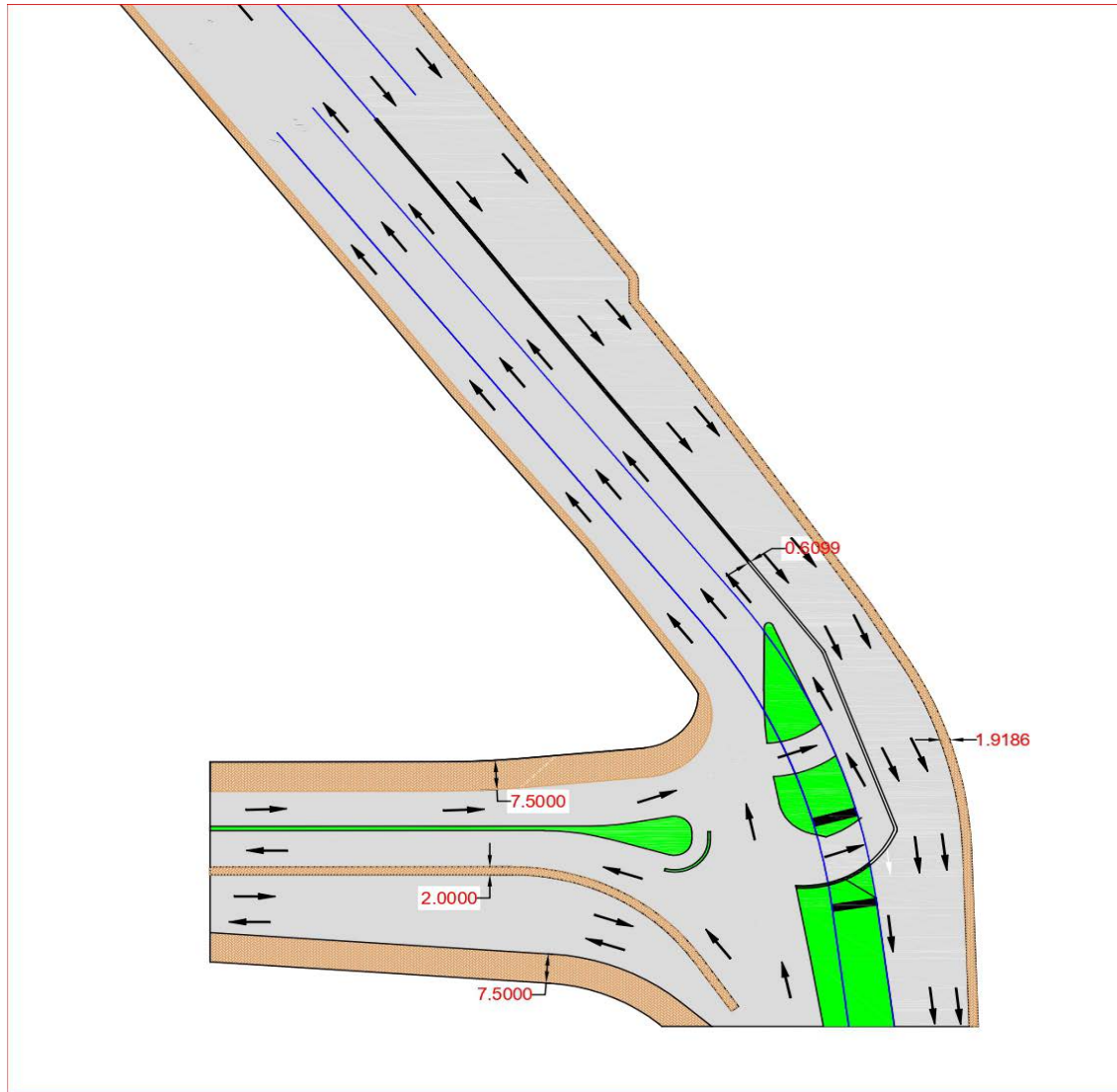
An intersection, referred to as a crossroad, is a location where two or more roads meet or intersect. Rashid Minhas has five primary and six minor intersections. These intersections are one of the factors that add to traffic congestion. The T - intersection present at millennium mall connects the Stadium road with Rashid Minhas Road serving a significant amount of traffic volume. There are various redundant movements present without presence of any signage, signal, or traffic facility, therefore increasing the conflicting points for the intersection as shown in **Error! Reference source not found..** These turning movements require additional time and space, which can cause congestion and delays, particularly during peak traffic times. Furthermore, it allows unsafe pedestrian movements, wrong way movements, and increases potential risk of collisions on the road.

2.3.1 Action Plan:

Short term: Removal of parking by Rickshaw/Chingchi and encroachment.

Medium term: Not applicable.

Long term: Not applicable.



Figure

5

Existing

Millennium

Mall

Plan



2.4 Johar Mor Intersection:

The Johar intersection at Rashid Minhas is a critical spot concerning pedestrian safety. Most vehicles passing through the Johar intersection are traveling at high speeds. Nearby, there are numerous shops where pedestrians frequent, as well as many residential buildings where people live and travel daily. Vehicles utilizing the intersection and those bypassing it tend to maintain high speeds, posing a significant risk to pedestrian safety.

2.4.1 Action Plan:

Short term: Traffic calming devices and provision of a constable during peak hours to help pedestrians cross the road.

Medium term: Not applicable.

Long term: Not applicable

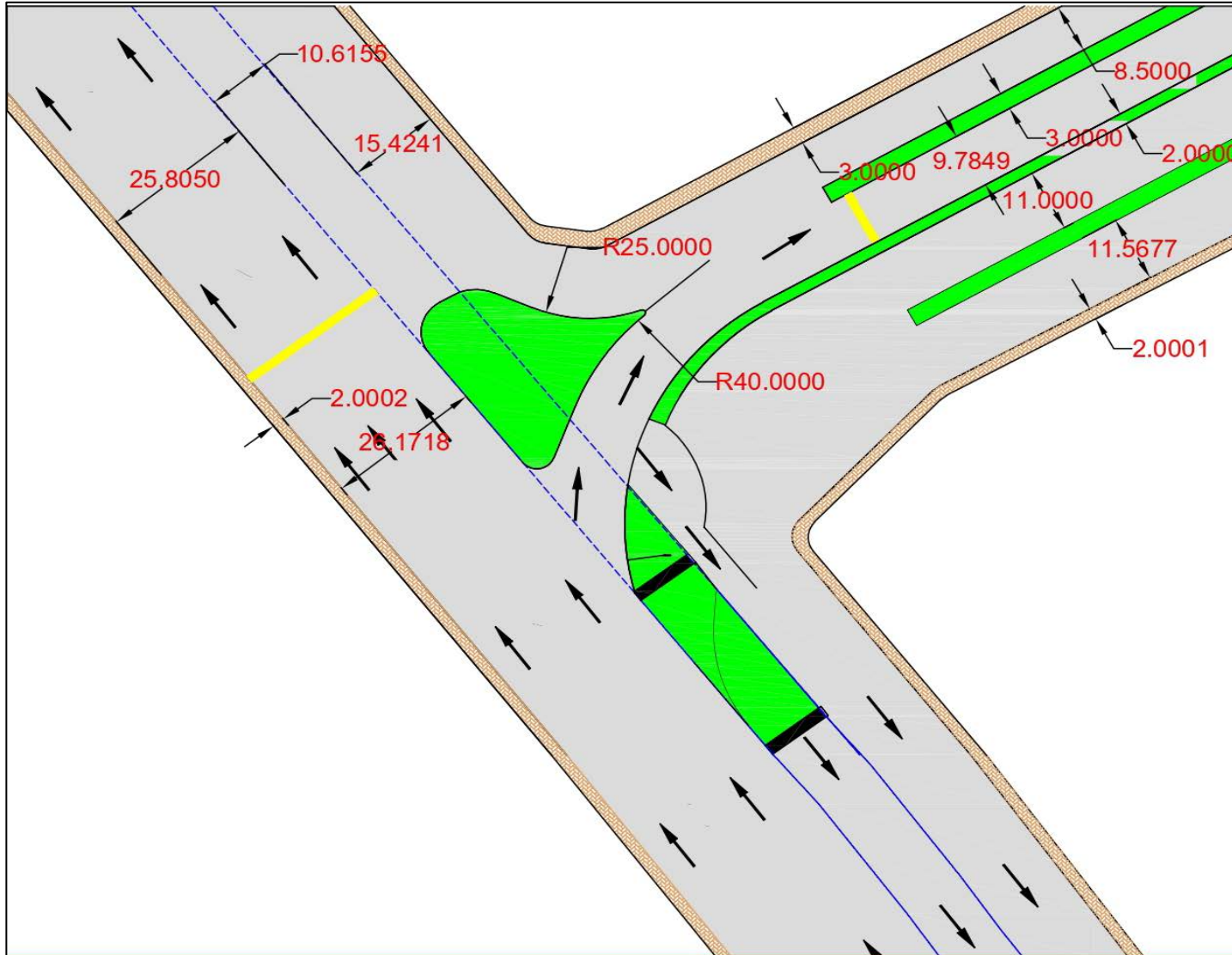


Figure 6 Johar Morr

2.5 Lucky One Mall:

The pedestrian issues at Lucky One Mall present a significant risk to road users due to several factors. Firstly, the mall's location likely attracts a high volume of pedestrian traffic, leading to congestion and potential conflicts between pedestrians and vehicles on surrounding roads. Secondly, inadequate pedestrian infrastructure such as crosswalks, sidewalks, and pedestrian signals can further exacerbate safety concerns, increasing the likelihood of accidents and injuries. Additionally, if pedestrians are not provided with safe and designated crossing points, they may resort to crossing the road at unsafe locations, putting themselves and drivers at risk. Addressing these pedestrian issues is crucial to ensuring the safety and smooth flow of traffic in the vicinity of Lucky One Mall. This may involve implementing improved pedestrian facilities, enhancing traffic management measures, and raising awareness among both pedestrians and motorists about the importance of road safety.



Figure 7 Lucky one Mall Proposed

2.5.1 Action Plan:

Short term: Traffic calming devices and provision of a constable during peak hours to help pedestrians cross the road.

Medium term: Not applicable.

Long term: Pedestrian Bridge

Chapter 3: Road Safety Audit

3.1 Road Defects per Kilometer

3.1.1 Millennium to Nagan Chowrangi

3.1.1.1 Chainage 0+000 to 1+000

Defect	Number of Defect
On road parking	4
Wrong way Movement	2

Defects Identified: On road Parking



Action Plan:

Short term: Police challan.

Medium term: Not applicable

Long term: Providing proper parking for vehicle.

Defects Identified: Wrongway Movement



Action Plan:

Short term: Strong Enforcement.

Medium term: The medium-term solution for wrong-way movement is to place U-turns at important locations.

Long term: Not Applicable

3.1.1.2 Chainage 1+000 to 2+000

Defect	Number of Defect
On road parking	1

Defects Identified: On road Parking



Action Plan:

Short term: Police challan.

Medium term: Not applicable

Long term: Providing proper parking for vehicle.

3.1.1.3 Chainage 2+000 to 3+000

No defects Found

3.1.1.4 Chainage 3+000 to 4+000

Defect	Number of Defect
Damaged Pavement	2
Illegal Parking	1
Wrong way Movement	1

Defects Identified: Damaged Pavement



Action Plan:

The action plan has been divided based on short-term, medium-term, and long-term solutions.

Short term: The short-term solution for potholes is to fill them.

Medium term: Not applicable

Long term: The long-term solution is provision of a proper drainage system so that water does not remain stagnant (which is the main cause of potholes/ditches/pavement failure).

Defects Identified: Illegal Parking



Action Plan:

Short term: Police challan.

Medium term: Not applicable

Long term: Providing proper parking for vehicle.

Defects Identified: Wrongway Movement



Action Plan:

Short term: Strong Enforcement.

Medium term: The medium-term solution for wrong-way movement is to place U-turns at important locations.

Long term: Not Applicable

3.1.1.5 Chainage 4+000 to 5+000

Defect	Number of Defect
Illegal Parking	1
Wrong way Movement	1

Defects Identified: Wrongway Movement



Action Plan:

Short term: Strong Enforcement.

Medium term: The medium-term solution for wrong-way movement is to place U-turns at important locations.

Long term: Not Applicable

Defects Identified: Illegal Parking



Action Plan:

Short term: Police challan.

Medium term: Not applicable

Long term: Providing proper parking for vehicle.

3.1.1.6 Chainage 5+000 to 6+000

Defect	Number of Defect
Sudden U-turn	1
Stolen guard rails of Flyover	1

Defects Identified: Sudden U-turn



Action Plan:

Short term: Provide traffic signage indicating u-turn ahead

Medium term: provide road safety studs to separate the turning traffic and through traffic

Long term: Not Applicable

Defects Identified: Stolen guard rails of Flyover



Action Plan:

Short term: Immediate action of police required to ensure infrastructure safety

Medium term: provide not sellable item for guard rails instead of using steel

Long term: Not Applicable

3.1.1.7 Chainage 6+000 to 7+000

Defect	Number of Defect
sand and debris on footpath	1

Defects Identified: sand and debris on footpath



Action Plan:

Short term: remove the sand and garbage to make it usable for pedestrians

Medium term: install pavers for easy movement

Long term: Not Applicable

3.1.1.8 Chainage 7+000 to 8+900

Defect	Number of Defect
Wrong way Movement	1
Encroachment	1
Pothole/Ditches	2

Defects Identified: Wrongway Movement



Action Plan:

Short term: Strong Enforcement.

Medium term: The medium-term solution for wrong-way movement is to place U-turns at important locations.

Long term: Not Applicable

Defects Identified: Encroachment



Action Plan:

Short term: Immediate removal of encroachments through enforcement actions, such as Police challan or eviction notices, to clear the affected areas.

Medium term: Not applicable

Long term: Not applicable.

Defects Identified: Pothole/Ditches



Action Plan:

The action plan has been divided based on short-term, medium-term, and long-term solutions.

Short term: The short-term solution for potholes is to fill them.

Medium term: Not applicable

Long term: The long-term solution for potholes is to perform surfacing or overlay of the road surface.

3.1.2 Nagan Chowrangi to Millennium

3.1.2.1 Chainage 0+000 to 1+000

No defects found

3.1.2.2 Chainage 1+000 to 2+000

Defect	Number of Defect
Broken wall of nala	1
Inadequate turning radii of u-turn	1
Pothole/Ditches	2

Defects Identified: Broken wall of nala



Action Plan:

Short term: Not applicable.

Medium term: The medium-term solution for broken wall of Nala is to pace NJ barriers to cover the opening.

Long term: The long-term solution is to construct a protective wall.

Defects Identified: Inadequate turning radii of u-turn



Action Plan:

Short term: Not applicable.

Medium term: Not Applicable

Long term: Provide protected u-turn with proper widening to ensure movement of heavy traffic

3.1.2.3 Chainage 2+000 to 3+000

Defect	Number of Defect
Damaged Footpath/ Ditches	1
Wrongway Movement	1

Defects Identified: Damaged Footpath/ Ditches



Action Plan:

Short term: Remove the debris.

Medium term: Not Applicable

Long term: provide proper walkway with pavers

Defects Identified: Wrongway Movement



Short term: Strong Enforcement.

Medium term: The medium-term solution for wrong-way movement is to place U-turns at important locations.

Long term: Not Applicable

3.1.2.4 Chainage 3+000 to 4+000

Defect	Number of Defect
--------	------------------

On road Parking	2
-----------------	---

Defects Identified: On road Parking



Action Plan:

Short term: Police challan.

Medium term: Not applicable

Long term: Providing proper parking for vehicle.

3.1.2.5 Chainage 4+000 to 5+000

Defect	Number of Defect
Pothole/Ditches	2

Defects Identified: Pothole/ Ditches



Action Plan:

The action plan has been divided based on short-term, medium-term, and long-term solutions.

Short term: The short-term solution for potholes is to fill them.

Medium term: Not applicable

Long term: The long-term solution for potholes is to perform surfacing or overlay of the road surface.

3.1.2.6 Chainage 5+000 to 6+000

Defect	Number of Defect
On-road parking	1
Wrongway Movement	3

Defects Identified: Wrongway Movement



Action Plan:

Short term: Strong Enforcement.

Medium term: The medium-term solution for wrong-way movement is to place U-turns at important locations.

Long term: Not Applicable

Defects Identified: On-road parking



Gulshan Chowrangi

Action Plan:

Short term: Police challan.

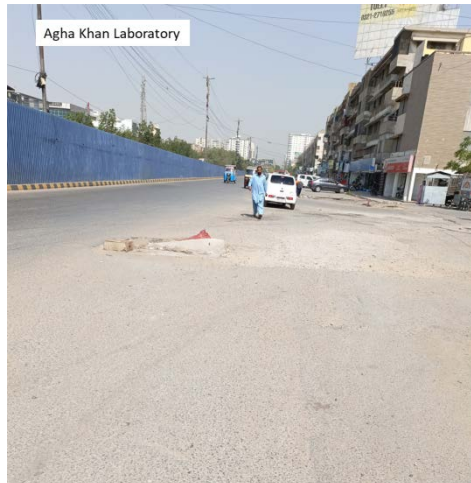
Medium term: Not applicable

Long term: Providing proper parking for public transport.

3.1.2.7 Chainage 6+000 to 7+000

Defects Identified: Pothole/ Ditches

Defect	Number of Defect
Pothole/Ditches	2



Action Plan:

The action plan has been divided based on short-term, medium-term, and long-term solutions.

Short term: The short-term solution for potholes is to fill them.

Medium term: Not applicable

Long term: The long-term solution for potholes is to perform surfacing or overlay of the road surface.

3.1.2.8 Chainage 7+000 to 8+900

Defect	Number of Defect
Encroachment	4
Wrongway Movement	1
Improper Bus Stop	2

Defects Identified: Encroachment



Action Plan:

Short term: Immediate removal of encroachments through enforcement actions, such as Police challan or eviction notices, to clear the affected areas.

Medium term: Not applicable

Long term: Not applicable.

Defects Identified: Wrongway Movement



Action Plan:

Short term: Strong Enforcement.

Medium term: The medium-term solution for wrong-way movement is to place U-turns at important locations.

Long term: Not Applicable

Defects Identified: Improper bus stops/ On road parking



Action Plan:

The action plan has been divided based on short-term, medium-term, and long-term solutions.

Short term: Install seating for bus stops

Medium term: Not applicable



Long term: Not Applicable

3.2 Road Defects Table

Figure 8 represents the defects of the Rashid Minhas Road with respect to the chainage. For entire route journey in both directions from Millennium Mall to the Nagan Chowrangi, the road is divided into 32 stations. All the segments were not equipped with proper lane markings. Pavement marking helps drivers and pedestrians be aware of their respective lanes and directions of travel, reducing the likelihood of accidents and congestion. Crosswalks and other pavement markings can provide important tactile cues that help pedestrians to navigate the roadway more safely and confidently. In the other 53% of the locations, the corner lanes are either encroached or not in suitable condition, reducing the route segment's capacity, which in turn causes traffic congestion. No signage can be seen throughout the route. Signage provides critical safety information, such as warning signs for road conditions, speed limit signs, U-turns, and stop signs. This helps to ensure that drivers are aware of potential dangers on the road and can take appropriate action to avoid any mishap. Potholes and open manholes are present at more than half of the total route segment, and some potholes are deteriorated severely and formed ditches. These potholes, open manholes, and ditches are hazardous for drivers because they can cause the vehicle to lose control, especially at high speeds. Potholes can damage the vehicle's tires, wheels, and suspension, leading to costly repairs and potentially dangerous accidents. They can also cause drivers to swerve suddenly, potentially colliding with other vehicles or pedestrians.

S.NO	Location	Station	Signage	Marking	Calming	Pedestrian Crossing	Road Defects					
							Pothole	Ditch	Manhole	Encroachment	Rut	Other
Towards Nagan Chowrangi												
1	Millennium Mall	0+000	N/A	N/A	N/A	✓	✗	✗	✗	✓	✗	N/A
2	Johar Morr	0+520	N/A	N/A	N/A	✓	✗	✗	✗	✓	✗	N/A
3	Oxford Uni Book shop	1+080	N/A	N/A	N/A	✓	✗	✗	✗	✗	✗	N/A
4	Aladin	1+580	N/A	N/A	N/A	✓	✗	✗	✓	✓	✗	N/A
5	Nepa Flyover Starting	2+080	N/A	N/A	N/A	✗	✗	✗	✗	✗	✗	Expansion Joints Damaged
6	Nepa Flyover Ending	3+160	N/A	N/A	N/A	✓	✓	✗	✗	✓	✗	Loose Boulders along median in fast lane
7	Gulshan Chowrangi	3+660	N/A	N/A	N/A	✓	✗	✗	✗	✓	✗	N/A
8	Imitiaz Mall	4+180	N/A	N/A	N/A	✗	✓	✗	✓	✗	✗	N/A
9	Luckyone	4+760	N/A	N/A	N/A	✗	✓	✗	✗	✓	✓	Uneven Pavement
10	Super service station PSO	5+400	N/A	N/A	N/A	✗	✗	✗	✗	✓	✗	N/A
11	Soharb Goth Floyover S	5+680	N/A	N/A	N/A	✗	✓	✗	✗	✗	✗	Expansion Joints Damaged
12	Soharb Goth Floyover e	6+250	N/A	N/A	N/A	✓	✗	✗	✗	✓	✗	Expansion Joints Damaged
13	football ground	6+850	N/A	N/A	N/A	✗	✗	✗	✗	✓	✗	N/A
14	Shafiq morr u-turn	7+390	N/A	N/A	N/A	✓	✓	✗	✗	✓	✗	Concrete Barrier in fast lane
15	dayar-e-shereen	7+890	N/A	N/A	N/A	✓	✓	✓	✗	✓	✓	N/A
16	Nagan Chowrangi	8+760	N/A	N/A	N/A	✓	✓	✓	✓	✗	✓	N/A
Towards Drigh Road												
17	Nagan Chowrangi	0+000	N/A	N/A	N/A	✗	✓	✗	✓	✗	✗	N/A
18	dayar-e-shereen	0+870	N/A	N/A	N/A	✓	✓	✗	✗	✗	✗	N/A
19	Shafiq morr u-turn	1+370	N/A	N/A	N/A	✓	✓	✓	✗	✗	✗	No protection present in fast lane gujjar nala
20	football ground	1+910	N/A	N/A	N/A	✓	✗	✗	✗	✗	✗	N/A
21	Soharb Goth Floyover e	2+510	N/A	N/A	N/A	✗	✓	✓	✗	✗	✗	Expansion Joints Damaged
22	Soharb Goth Floyover S	3+080	N/A	N/A	N/A	✗	✓	✓	✗	✗	✗	N/A
23	Super service station PSO	3+360	N/A	N/A	N/A	✗	✗	✗	✗	✓	✗	N/A
24	Luckyone	4+000	N/A	N/A	N/A	✗	✗	✗	✗	✓	✗	N/A
25	Imitiaz Mall	4+580	N/A	N/A	N/A	✗	✓	✓	✗	✓	✗	N/A
26	Gulshan Chowrangi	5+100	N/A	N/A	N/A	✗	✗	✓	✗	✗	✗	N/A
27	Nepa Flyover Ending	5+600	N/A	N/A	N/A	✗	✓	✓	✗	✗	✗	Expansion Joints Damaged
28	Nepa Flyover Starting	6+680	N/A	N/A	N/A	✗	✓	✓	✗	✓	✗	N/A
29	Aladin	7+180	N/A	N/A	N/A	✓	✓	✓	✗	✗	✗	N/A
30	Oxford Uni Book shop	7+680	N/A	N/A	N/A	✓	✗	✗	✗	✓	✗	N/A
31	Johar Morr	8+240	N/A	N/A	N/A	✗	✓	✓	✗	✓	✗	N/A
32	Millennium Mall	8+760	N/A	N/A	N/A	✗	✗	✗	✗	✗	✗	N/A

Figure 8 Detail Defects of Rashid Minhas Road with respect to chainage



3.3 Road Defect Map

A "Road Defect Map" is a visual representation of road conditions, highlighting areas with various types of defects such as potholes, cracks, pavement deterioration, and other issues. This map provides valuable information for transportation authorities, road maintenance teams, and the general public to identify areas in need of repair or improvement. By pinpointing specific locations and types of defects, the Road Defect Map helps prioritize maintenance efforts and allocate resources efficiently to address road infrastructure challenges. It is characterized with respect to the number of defects found on the road segment which is divided into one kilometer of road section.

3.3.1 Major defective Road Segment:

Major defective sections have been observed on Rashid Minhas, indicating the presence of road defects along segments divided into 1.0 kilometers. Several sections are affected, including the segment from the Masjid Anwar ul Islam to the KE Power House, the stretch from La Grande Marquee to Dacca Sweets, and the portion from Aladin Park to the Nuplex Cinema.

3.3.2 Minor defective Road Segment:

Minor defective sections have been observed on Rashid Minhas, indicating the presence of road defects along segments divided into 1.0 kilometers. Several sections are affected, including the segment from the Drigh road to Nuplex Cinema, from Aladin Park to Sinbad, from La Grande Marquee to KE Power House, from Masjid Anwar ul Islam to Nagan.

3.3.3 Critical Road Segment:

Critically defective sections have been observed on Rashid Minhas, indicating the presence of road defects along segments divided into 1.0 kilometers. Several sections are affected, including the segment from the Dacca Sweets to Sinbad.

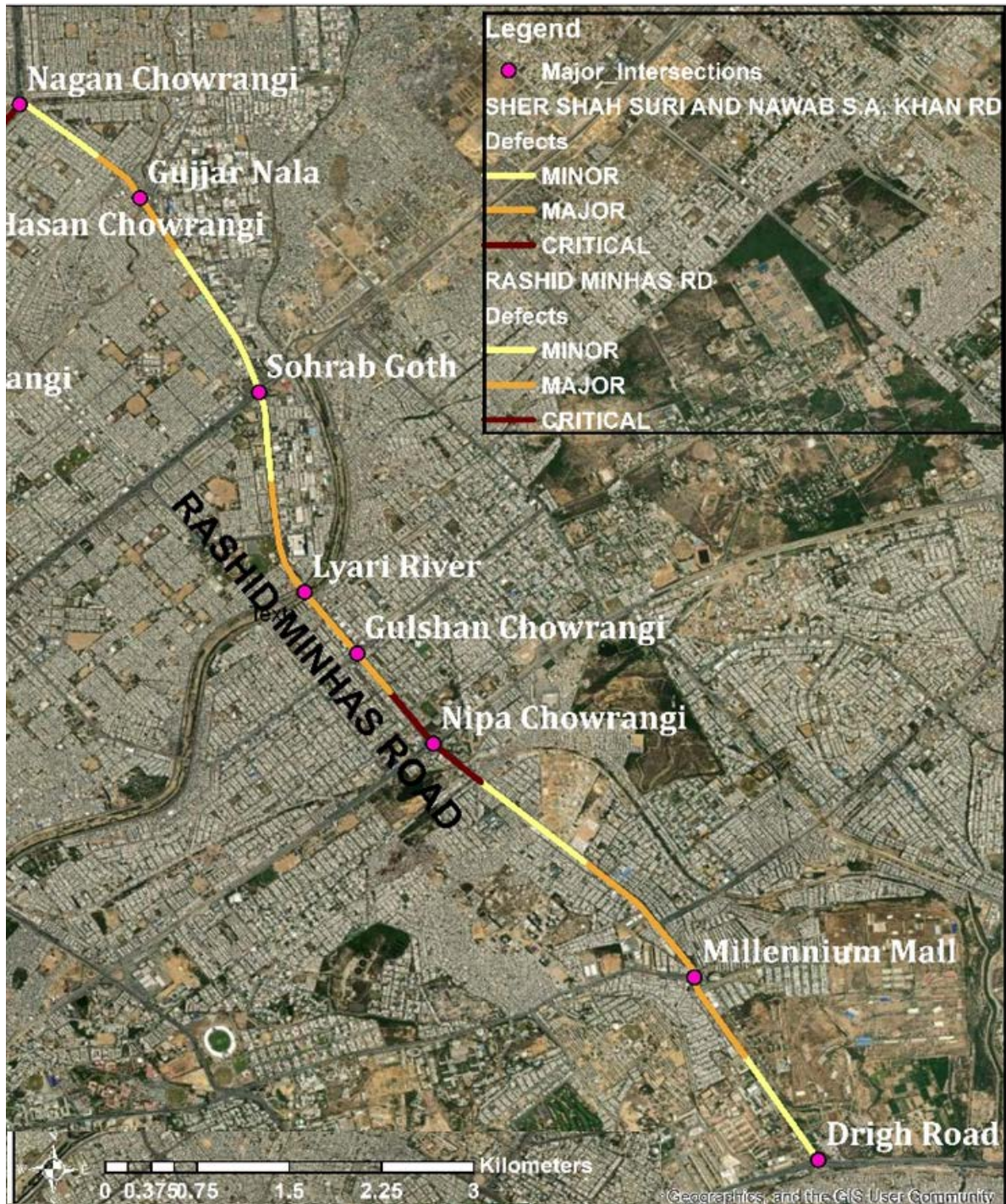


Figure 9 Road Defect Map



Chapter 4: Traffic Analysis

4.1 Classified Volume Count:

Traffic count survey is conducted on major corridors which provides the midblock or through traffic volumes and at intersections, it provides the delays and capacity. The main objectives of the traffic count survey are to obtain the existing traffic volume on the major corridors, to analyze the existing traffic condition, to calibrate the existing Origin Destination matrices, and to obtain the turning movement of vehicles at major intersections and squares.

This survey was conducted on Thursday, March 9th, 2023, from 7 am in the morning to 8 pm in the evening. The obtained data were analyzed for two peak periods with each having 3 hours of traffic data i.e. morning period (7:00 am to 10:00 am) and the evening period (5:00 pm to 8:00 pm). For this project, traffic cameras were used to obtain the data for traffic volumes, and speed of the road. Only through movement was critically observed to determine the congestion points, volume, and speed of the road. Four pedestrian bridges were selected to mount the camera including Millennium Mall, Aladdin Park, Shafiq Morr, and Dayar-e-Shereen. These locations were selected based on the analysis performed in the travel time survey. The vehicles are divided into seven categories including cars, motorcycles, rickshaws, pickup vans, buses, minibuses, and trucks. Table 3 represents the data of Traffic volume count of 4 different locations during morning and evening peaks towards Nagan and away from Nagan, respectively.

Table 3 Traffic Count

Location	Direction	Motorcycle	Car	Rickshaw	Pickup	Minibus	Bus	Truck	Total
Millenium mall	Morning Peak	12815	2580	4515	839	172	194	280	21502
	Evening Peak	13370	1972	7911	216	240	192	96	24046
Aladin Park	Evening Peak	10679	7658	1468	234	638	213	213	21272
	Evening Peak	13401	1869	9611	774	561	240	160	26696
Five Star Chowrangi	Morning Peak	12354	1965	3089	618	562	168	197	28078
	Evening Peak	19434	5606	7849	2766	374	187	149	37374
Erum Shopping	Morning Peak	9870	2710	2258	1004	234	167	184	16729



Mall	Evening Peak	30682	4703	4554	4184	592	267	185	25026
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4.2 Traffic Modelling:

Traffic modelling is performed to evaluate and predict the existing and proposed scenarios for the road of Rashid Minhas Road. 3D models of traffic flow are used to evaluate the existing travel time and compare it with the travel time after proposed solutions. This process of traffic modelling is a highly effective method for evaluating the impact of various transportation infrastructure options and identifying the transportation system's expected future performance.

4.2.1 Current Travel Time:

Table 4 illustrates the travel time from Millennium Mall to Nagan Chowrangi, divided into four segments for a detailed analysis of travel time for each segment. Initially, the travel time under free flow conditions was calculated, and then the current travel time was determined using VISSIM software. The difference between the current travel time is 3.5, 5.44, 0.96, and 3.78 minutes more than their respective free-flow times for segments 1, 2, 3, and 4, respectively. This table indicates that the current travel time deviates by an average of 13.70 minutes more than the free-flow time for all segments.

Table 4 also represents the travel time from Nagan Chowrangi to Drigh Road, and this route is also divided into four segments, each with the same free flow speed. The current travel time is then calculated, which averages 13.65 minutes more than the free-flow time for all segments. The current travel time of 2.30, 5.64, 1.84, and 3.87 minutes more than their respective free-flow times for each segment.



Figure 10 Rashid Minhas Road 3D traffic model

Table 4 Existing Travel Time obtained from Traffic Modelling

	From	To	Number of Lanes	Distance (km)	Posted Speed Limit (kmph)	Free Flow Travel Time (min)	Current Travel Time (min)
Towards Nagan Chowrangi							
Segment 1	Millennium Mall	Aladdin Park	4	1.304	60	1.304	4.82
Segment 2	Aladdin Park	Lucky One Mall	4	2.925	60	2.925	8.36
Segment 3	Shafiq Morr	Dayar-e-Sheeren	4	0.8	60	0.8	1.76
Segment 4	Dayar-e-Sheeren	Nagan Chowrangi	3	0.73	60	0.73	4.51
Towards Drigh Road							
Segment 4	Nagan Chowrangi	Dayar-e-Sheeren	3	0.73	60	0.73	4.60
Segment 3	Dayar-e-Sheeren	Shafiq Morr	4	0.8	60	0.8	2.64
Segment 2	Lucky One Mall	Aladdin Park	4	2.925	60	2.925	8.56
Segment 1	Aladdin Park	Millennium Mall	4	1.304	60	1.304	3.60

4.2.2 Improved Travel time

Table 5 presents the results of traffic modelling after implementing the proposed solution. It compares the current and travel times after implementing the proposed solution. The results indicate an overall reduction of 7% in travel time across all four route segments. And for the segment 1 from Aladdin Park to Millennium Mall, the



reduction in travel time is observed maximum i.e, 20% for both directions. The table provides quantitative evidence that the proposed solution effectively reduces travel time and improves traffic flow along the route. Further analysis and evaluation may be necessary to determine the proposed solution's long-term impact and identify any potential limitations or challenges that may arise.

Table 5 Proposed Traffic Modelling (Travel Time Reduction)

	From	To	Number of lanes	Distance (km)	Current Travel Time (min)	Travel Time After Proposed Solutions (min)	Percentage of Travel Time Reduced
Towards Nagan Chowrangi							
Segment 1	Millennium Mall	Aladdin Park	4	2.472	4.82	3.97	18%
Segment 2	Aladdin Park	Lucky One Mall	4	1.03	8.36	8.15	3%
Segment 3	Shafiq Morr	Dayar-e-Sheeren	4	4.478	1.76	1.53	13%
Segment 4	Dayar-e-Sheeren	Nagan Chowrangi	3	4.478	4.51	4.45	1%
Towards Drigh Road							
Segment 4	Nagan Chowrangi	Dayar-e-Sheeren	3	4.478	4.6	4.5	2%
Segment 3	Dayar-e-Sheeren	Shafiq Morr	4	4.478	2.64	2.5	5%
Segment 2	Lucky One Mall	Aladdin Park	4	1.03	8.56	8.4	2%
Segment 1	Aladdin Park	Millennium Mall	4	2.472	3.6	2.79	23%



Chapter 5 Conclusion

5.1 Most Critical Safety Issues:

On national highways, pedestrian safety emerges as a paramount concern due to the absence of designated crossings or pedestrian bridges, particularly in areas with high foot traffic like MDA Flats and FAST University. This lack of infrastructure forces pedestrians to risk crossing the road amidst fast-moving traffic, significantly heightening the danger to their safety. Additionally, speeding and reckless driving behaviors compound the risks, as drivers often ignore speed limits and engage in hazardous maneuvers such as overtaking inappropriately or tailgating. Moreover, poor road conditions, including uneven surfaces and inadequate lighting, exacerbate the safety hazards, particularly during adverse weather conditions or at night. Barrier systems are often insufficient, failing to prevent head-on collisions or mitigate the consequences of vehicles veering off the road. Furthermore, inadequate signage and road markings contribute to confusion among drivers, increasing the likelihood of accidents, especially at junctions or diversions. Driver fatigue, induced by long stretches of monotonous highway driving, further compromises safety, particularly during late-night or early-morning hours. Moreover, the lack of effective enforcement of traffic laws, coupled with encroachments and obstructions along the roadside, exacerbates the safety challenges on national highways. To address these critical safety issues comprehensively, concerted efforts are needed, including infrastructure enhancements, strict enforcement of traffic regulations, public awareness campaigns, and the establishment of robust emergency response systems.

5.2 Recommendations:

The recommendations after detailed survey of Rashid Minhas Road are provided below.

- Provision of traffic calming devices at major pedestrian crossing locations.
- Amend existing road facilities.
- Modify existing intersections.
- Remove encroachments and illegal parking.

5.3 Benefits Of Implementing Solutions:

Implementing solutions on national highways yields a plethora of benefits across various domains. Foremost among these advantages is the enhancement of safety for all



road users, a pivotal outcome of measures such as constructing pedestrian bridges, installing barrier systems, and enforcing traffic laws. By mitigating accidents and injuries, these interventions not only save lives but also alleviate the societal and economic burdens associated with road traffic incidents. Moreover, improved traffic flow resulting from better signage, road markings, and junction design not only reduces congestion and travel times but also fosters economic development by facilitating the movement of goods and services. This, in turn, stimulates local and regional economies, attracting investment and promoting tourism. Additionally, investments in infrastructure for pedestrian safety promote inclusivity and accessibility, benefiting individuals of all abilities and socioeconomic backgrounds. From an environmental standpoint, measures aimed at reducing congestion and vehicle emissions contribute to sustainability efforts, enhancing air quality and mitigating the environmental impact of transportation. Furthermore, by prioritizing safety and accessibility, these solutions promote social equity and well-being, ensuring equitable access to transportation infrastructure and fostering active, healthy lifestyles. In summary, the implementation of solutions on national highways not only improves safety and efficiency but also catalyzes economic development, fosters social inclusion, and enhances environmental sustainability, ultimately contributing to the overall prosperity and well-being of society.