TRAFFIC IMPACT ASSESSMENT

INZOVU MALL

Attn: Mr Saul HLAMBELO
Vavaki Architects
M&M Plaza
KG8 Ave
5th Floor
GISHUSHU
KIGALI
Rwanda
Email: saul@vavaki.com
Mobile: +250 780 636 304

SUBMITTED BY:

DNMZ CONSULTING ENGINEERS
5th Floor, Kigali Heights
P O Box 5196
KIGALI
Rwanda

ENQUIRIES
Tendaivanhu MADZIKANDA
TEL. +250 783 304 967
TEL. +27 83 400 5645
Email: engineers@dnmzinternational.com
Website: www.dnmz.co.za

DOCUMENT CONTROL

INZOVU MALL: TRAFFIC STUDY	
Project No:	RW 103
Report For	VAVAKI ARCHITECS

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Prepared By:	Tapiwa Jokomo
Contact Details:	+250 783304 967
Email:	madzikandat@dnmz.co.za
Website:	www.dnmz.co.za

TABLE OF CONTENTS

1 PURPOSE

To assess the expected traffic related impacts that the proposed Inzovu Mall development will have on the surrounding road and transportation network.

This report documents the findings of this assessment.
Traffic impact studies are an important part of assessing the impacts of new and redevelopment projects.

The property under consideration is zoned appropriately to accommodate a Shopping Mall.
This Mall involves the creation of a multi-product property complex that includes a hotel and offices.

This Site Traffic Assessment has been prepared in accordance with the requirements of the South African Traffic Impact and Site Traffic Assessment Manuals (TMH 15, 16, 17 and 26). The purpose of the study is to ensure that all traffic related technical matters on the SDP are considered and are in accordance with the requirements. The initial SDP will be adjusted where necessary to accommodate the recommendations made in this study.

The scope of work included in this TIA covers the following Traffic engineering aspects:

- *Site observations*
- *Existing traffic flows in the vicinity of the proposed development*
- *Pedestrian facilities*
- *Trip generation for the proposed development*
- *Pick-up and drop-off facilities*
- *Parking demand (requirements) and layout*
- *Throat Lengths and Site distance*
- *Geometric design (Recommended road upgrades if necessary)*
- *Traffic flow analysis*
- *Non-motorised Transport (NMT) and Public transport*
- *Access assessment*

This transport impact assessment has been prepared by a suitable qualified and registered professional traffic engineer. Details of any of the calculations on which the results of this report are based will be made available on request.

2 DEVELOPMENT PARTICULARS

2.1 LOCATION

The proposed **Inzovu Mall Development** is located on the Western side of Kigali, in an area called ***Kimuhurura***. It is situated within the Central business District on the road to the airport. The property is bound by the following streets.

KN 5 to the North
KG 622 running round from the South to the West
KG 501/KCC on the western side

The site currently houses a lot of government facilities meaning it generates a fair amount of traffic. The property location has been highlighted with a green outline as seen in Figure 1.

Figure 1. Locality plan

2.2 DEVELOPMENT PARAMETERS

The property is currently composed of several Government offices which include the Supreme Court, some high-rise buildings and offices which will be consolidated into one stand.

The Mixed-Use Development is planned to constitute a total of **32330** m^2 comprising of:

Table 1: Development GLA Mix

Portion	**Use**	**GFA (sqm)**
A	Shops	13825
B	Residence Odalys	6931
C	Offices	6405
D	Hobbies	5169
Grand Total		**32330**

A 110 roomed four-star Business Tourism residence providing 118 beds

The proposed development has been subdivided into 4 portions (See Table 1):

A General Business zoning for all sites which permit the erection of business buildings, licensed hotel, offices, and hobbies has been applied for. Therefore, as a worst-case scenario, it has been assumed that all sites will be used to their highest possible usage i.e., trip generation and retail trip generation rate has been applied to all sites.

3 STUDY AREA INFORMATION

3.1 ROADS

The following figure indicates the roads and road names that will form part of this study.

Figure 2: Major Intersections around the proposed Mall

To the North of the proposed **Inzovu Mall Development**, there is road KN5 which is a Class 2 distributor and connects from KN 4 Road and KG 501 street. It runs from West towards East, in the Airport direction. It is still in a fairly good condition. KN5 is a major two (2) lane dual carriageway.

To the South and East, it is bound by Road KG 622 Street which is a two-lane single carriageway. It is a two-lane single carriageway with a speed limit of 60 km/h as it is within a built-up area. KG 622 St is a Class 4 Access Link.

To the West is extension of KG 501/KCC street running from North to South. This is a fairly busy road with a Class 3 classification.

These roads are asphalt surfaced with wide paved shoulders and walkways in some areas.

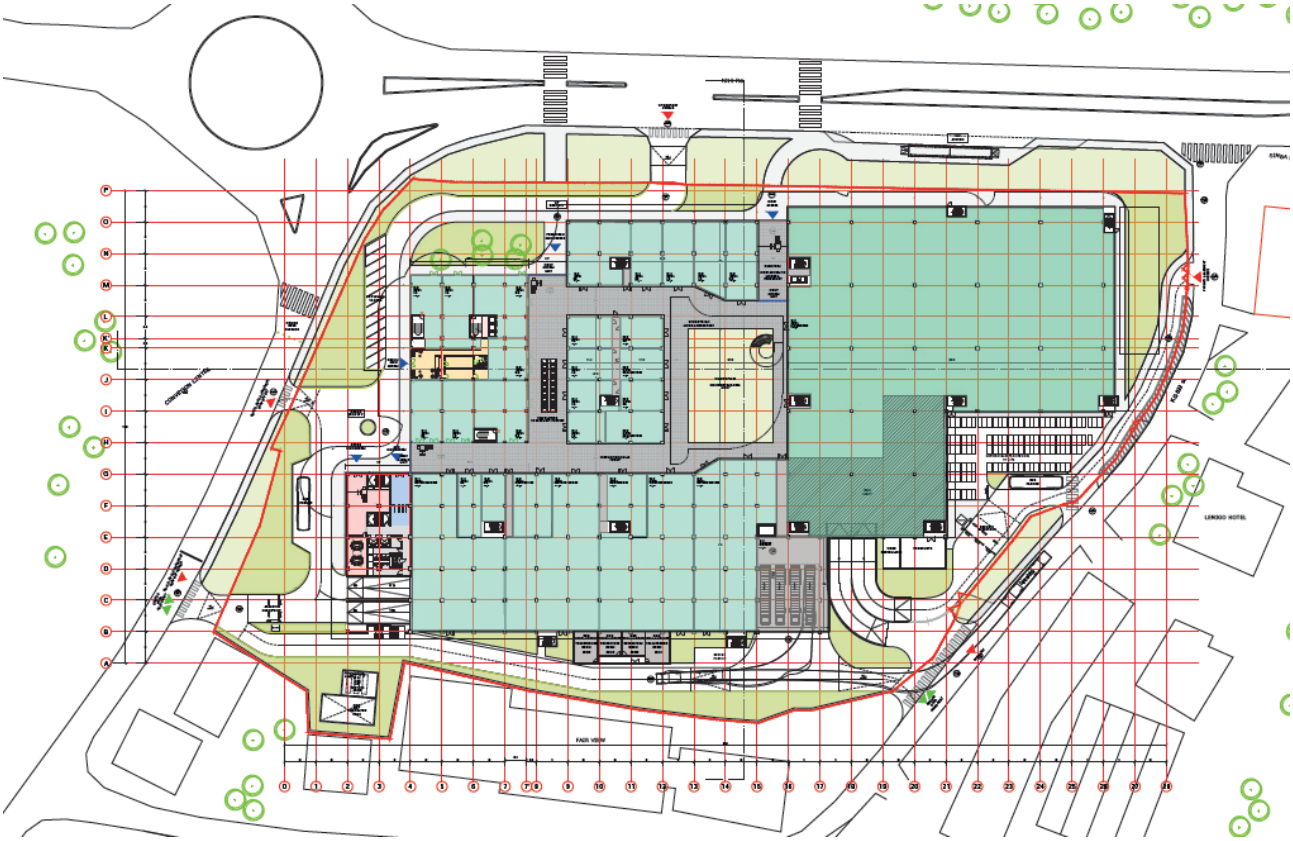


Figure 3.1. Proposed Inzovu Mixed Use Development

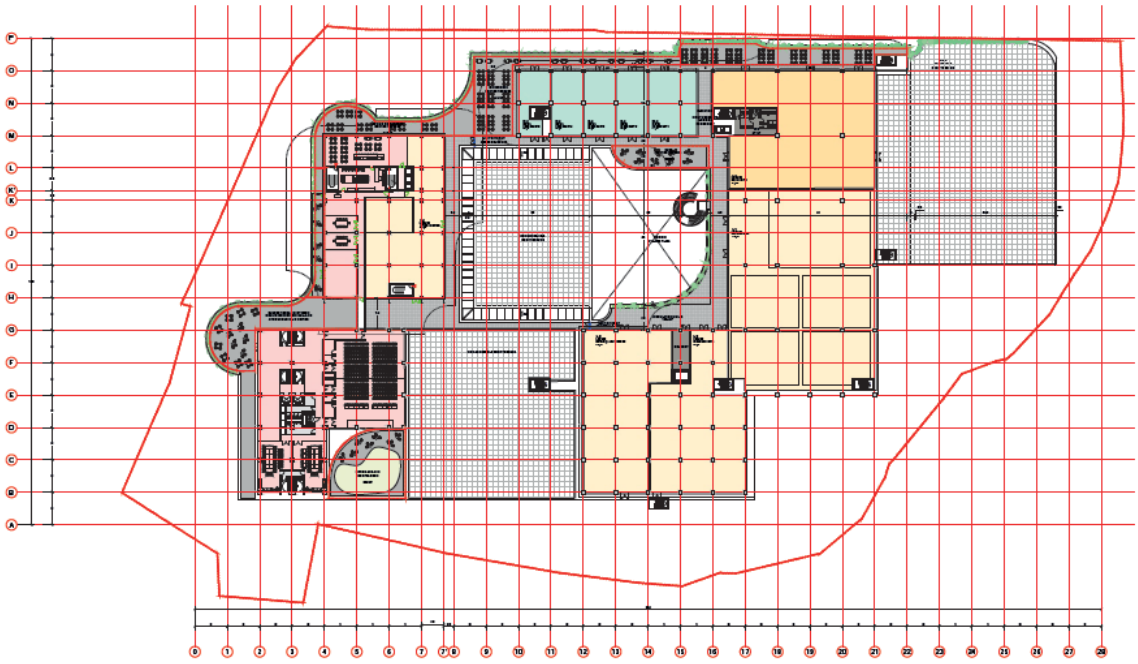


Figure 3.2. Proposed Inzovu Mixed Use Development

3.2 INTERSECTIONS AND ACCESS POINTS

Currently the site has several activities taking place in the form of the Country's Supreme Court and other Government buildings. These will be demolished to make room for the proposed ***Inzovu Mall*** project.

Figure 4. Current Activities on the Land for the Proposed Development

Currently there are three (3) accesses into the proposed ***Inzovu Mall*** site. Two (2) are off KG 622 Street with the third access in road KN5. In KG 501/KCC, there are no entrances leading into this site.

These are shown/indicated in the photos below numbered numerically from 1 to 3

Figure 5. Current Entrances into the Site of the Proposed Development

3.3 PUBLIC TRANSPORT

The main mode of transport in the area is taxis, motorcycles and buses. A drop off terminus has been proposed within the Mall so that commuters will be well protected from traffic danger. This is very good although we are worried about the traffic build-up along the KCC road due to the delays emanating from the security checks on the traffic dropping off people. The existing bus stop along the KN 5 might also not be adequate to handle all the people being dropped off from through public transport. Besides, it will definitely generate a huge traffic congestion on this main road which is already congested especially during peak times. We would therefore recommend another drop off terminus along the KG 622 outside the mall wherein the traffic does not go through the security checks.

3.4 PEDESTRIAN FACILITIES

The roads within the study have been constructed with paved pedestrian walkways. There is one (1) formal Zebra pedestrian crossing on KN 5 Road next to the existing entrance into the proposed Mall site.

3.5 SENSITIVE AREAS

According to the TMH documents a residential street is considered a sensitive area if the environmental load capacity of these roads is 1000 vph during the peak hour. Fortunately, the proposed site is outside a residential area though carrying in excess of 1000 vph and therefore is considered non-sensitive.

4 SITE INVESTIGATION

A site investigation was carried out on the 22nd of November 2020 by Eng. Tendai Madzikanda. The Site visit was for the following purposes.

1. *To observe relevant road and traffic conditions*
2. *Investigation to ensure that all transport modes and facilities that are currently available can be assessed.*
3. *Investigation to assess whether the plans submitted can be practically executable.*

4.1 OBSERVATIONS:

Besides Kigali being generally hilly, the proposed site is reasonably flat with no special geographic features within the area. This therefore offers no challenges on site distances.

It was noted that Street KG 622 can offer appropriate access points as it is a Class 4 road specifically for access services though it will need minor upgrading to cater for the anticipated increased traffic to be generated by the Mall.

At the corner of KG 622 Street and KN 5 road, there is a supermarket (Simba supermarket) which attracts pedestrians and will have to be dealt with in the analysis.

Opposed the proposed ***Inzovu Mall Development***, there is situated the national Parliament buildings which are a major traffic generator on their own.

Motorcycles constitute the majority of the transport mode passing through this site.

4.2 MEETING WITH DEVELOPERS AND CITY OFFICIALS

A meeting was held with the Kigali City officials to get an in-depth understanding and possible applicable solutions to traffic challenges in the event the Mall is built.

The proposed development was discussed at depth with bias towards the traffic management once the Mixed-Use Development is operational taking into account the expected changes in traffic modes in the next few years to come.

5 SITE TRAFFIC ASSESSMENT

5.1 METHODOLOGY

The Site Traffic Assessment was carried out manually during the period 5 December 2020 through 11 December 2020.
Traffic counts were conducted from 06:00 (morning) to 19:00 (evening) for a period of a week starting on a Saturday and ending on a Friday.
We also had to comply with the curfew to deal with Covid-19, currently in place in Kigali.

5.2 ANALYSIS HOURS

Weekday AM peak period ***(Surveyed peak time 07:00 to 09:00)***
Weekday Lunch peak period ***(Surveyed peak time 12:00 to 14:00)***
Weekday PM peak period ***(Surveyed peak timer 16:00 to 18:00)***

5.3 SCENARIOS ANALYSED

a. 2020 Existing Traffic conditions
b. 2025 Background Traffic conditions (2020 traffic volumes escalated with a growth rate, as discussed in Section 5 of this report)
c. 2023 Total Traffic conditions (Background Traffic volumes plus latent and development trips)

Intersection analyses were done using SIDRA 6.1 Intersection software.

5.4 STUDY INTERSECTIONS

The anticipated traffic impact on the surrounding network and its location within the wider road network, the following study intersections were included in the scope of this study:

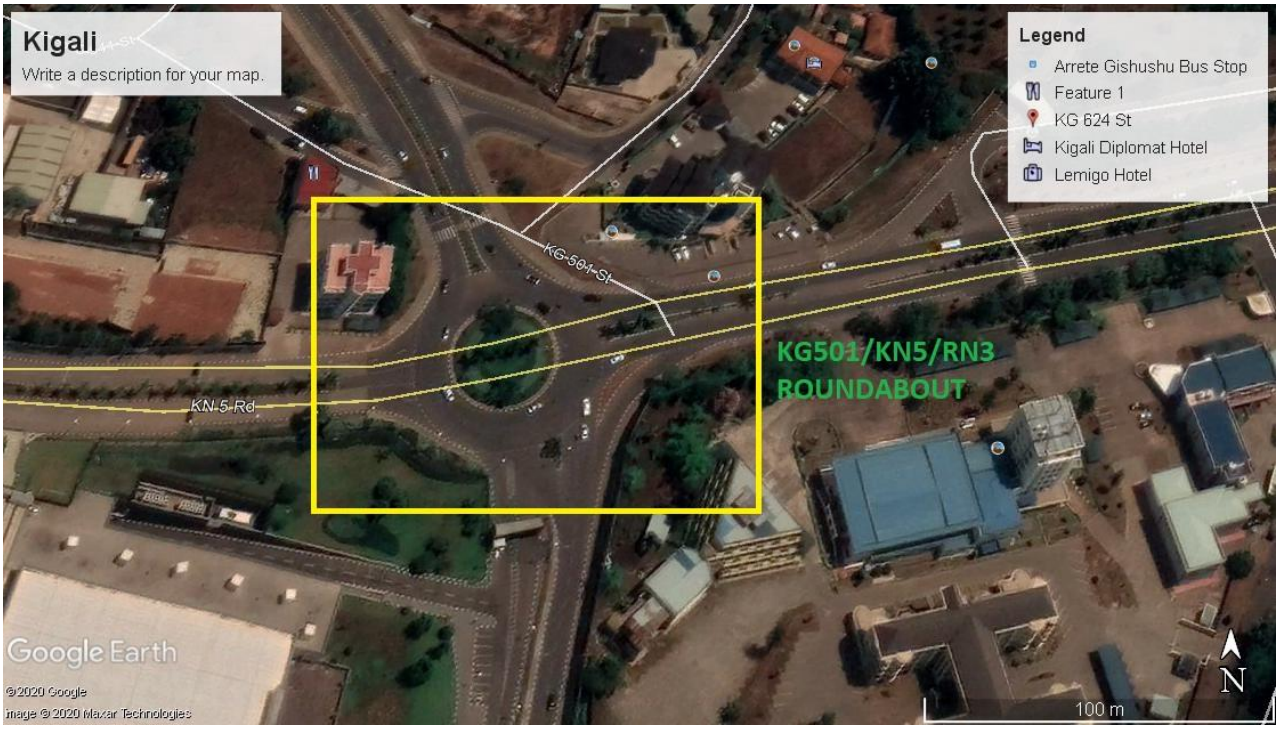


Figure 6: The Roundabout

Figure 7: KN 5 Traffic Count Station

Figure 8. KG 622 Street and KN 5 Road Intersection

Figure 9: KG 622 Street and KG 501 Street Intersection

5.5 EXISTING OPERATIONS

Peak period traffic volumes were derived from the conducted counts at the above-mentioned intersections from Saturday 05 December 2020 to Friday 11 December 2020 between 07:00 and 19:00. This ensured that the morning peak (07:00 - 08:00), the noon peak (12:00 - 14:00) during lunch period and the late afternoon peak (16:00 to 18:00) are correctly determined.

It must be noted that the high volumes of traffic were recorded as a result of a high number of motorcycles that traverse the roads.

The following Vehicle Conversion Factors were adopted for input into Sidra 6.1:

Table 2: Vehicle Conversion Factor

Item	Vehicle Type	Conversion Factor
a	Motorcycles	0.75
b	Cars	1
c	Pickups	1
d	Buses	2
e	Trucks	3

Traffic Counts Obtained at the Respective Intersections

Table 3: Traffic along (KN 5) East Bound

Time Zone	Unit	Total Peak hour volume	Highest daily Total
AM	Veh/hr	2 955	**28 493**
NOON	Veh/hr	2 694	
PM	Veh/hr	2 248	

Table 4: Traffic along (KN5) West Bound

Time Zone	Unit	Total Peak hour volume	Highest daily Total
AM	Veh/hr	8 644	**32 183**
NOON	Veh/hr	2 383	
PM	Veh/hr	2 540	

Table 5: Traffic Along KG 622 Street

Time Zone	Unit	Total Peak hour volume	Highest daily Total
AM	Veh/hr	522	**4000**
NOON	Veh/hr	421	
PM	Veh/hr	353	

Table 6: Traffic Along KCC Street. North Bound

Time Zone	Unit	Total Peak hour volume	Highest daily Total
AM	Veh/hr	689	**6547**
NOON	Veh/hr	516	
PM	Veh/hr	754	

Table 7: Traffic Along KCC Street. South Bound

Time Zone	Unit	Total Peak hour volume	Highest daily Total
AM	Veh/hr	561	**4563**
NOON	Veh/hr	350	
PM	Veh/hr	674	

Based on the capacity analyses of the existing traffic operations, using Sidra Intersection 6.1 software, all study road sections currently operate at above normal levels of service during peak periods and fairly good Loss of Service (LOS) with minimal delays during off peak hours with the exception of junctions in road KN 5.

The main composition of Traffic observed is composed of motorcycles which also was seen to flout traffic regulations.

6 BACKGROUND TRAFFIC CONDITIONS

6.1 TRAFFIC COUNTS

The background traffic growth has been assumed at 2.5% per annum. The planning horizon year's (2025) background traffic was determined by escalating the existing background traffic by 2.5% per annum for 5 years. For details of the traffic counts please refer to ***Appendix B.***

The highest traffic volume recorded during the peak 15 min period along KN 5 Road was **2161** vehicles on the West bound Traffic. Escalated by 2.5% per annum for 5 years the peak hour traffic during the planning horizon year is expected to be **2445** vehicles.

The expected operations at the study intersections during the AM, NOON and PM peak hours were computed and from the background analysis it is clear that all study intersections will operate at below acceptable levels of service and need modifications during the 2025 background conditions for all three peaks to cope.

6.2 TRIP GENERATION RATES

The specific land use for the area is zoned for offices (Government Offices). However, it is proposed that there will be a mix of land uses stemming from shops, offices, and residential (hotel).
The additional vehicle trips that will be generated by the proposed development were calculated using the trip generation rates as provided in the *THM17 South African Trip Data Manual (Volume 1, September 2012)* published by the Committee of Transport Officials (COTO).
Therefore, a trip rate from the COTO Trip Data Manual document for "Shopping Centre" has been used for the entire site which states: *A shopping centre is an integrated (mixed-use) group of commercial establishments that operate as a unit. May include small components of other land uses, such as restaurants, hardware, and paint shops, etc.*
This assumption has been made so that all sites will be used to their highest possible usage i.e., trip generation thereby applying a retail trip rate to all sites.
The recommended peak hour trip generation rates for Shopping Centres are 0.60 trips/100m^2 GLA with a directional split of 65% inbound and 35% outbound in the AM peak hour, 3.40 trips/100m^2 GLA with a directional split of 50% inbound and 50% outbound in the PM peak hour and 4.50 trips/100m^2 GLA with a directional split of 50:50 during the Saturday peak hour.

Table 8: Trip generation rates

	Period	Generation Rate Per 100m^2	Directional Split	
			Inbound	Outbound
1	AM peak	0.6 trips	65%	35%
2	PM peak	3.40 trips	50%	50%
3	Saturday peak	4.50 trips	50%	50%

6.3 TRIP DEVELOPMENT

The total estimated peak hour trips likely to be generated by the proposed development in the AM, PM and SATURDAY peak hours are:

Table 9: Trip Generation

Time Zone	Trips Generated	Inbound	Outbound
AM	159	103	56
PM	898	449	449
SATURDAY	1188	594	594

The above trip generation estimate is regarded as a worst-case scenario and a conservative estimate for the development.

6.4 LATENT DEVELOPMENT

At present there are no other (approved) developments proposed in the vicinity of the site as it is currently fully utilised for Government offices and the Supreme court

6.5 ACCESS

Number of Accesses: ***Six***

There is a total of Six Accesses into the proposed Inzovu Mall Development. The VIP and offices access proposed off KN 5 Road close to the main roundabout. The other three (3) accesses are from KG 622 Street which will be the main access. Two other accesses are proposed for services for goods delivery vehicles into the Mall.
The other remaining accesses are proposed from KG 501 (KCC) Street where there is a main service road that connects to KG 622 street at the back.

The access to the Hotel part, which provides for a drop off and pick-up point as well as an access to the Hotel parking is also off KG 501 (KCC) street.
No spacing or sight distance issues are expected here although there is no physical barrier separating opposing traffic movements. This is aided by the flat gradient around the area.
The accesses through KG 622 Street also do not offer any issues with regards to spacing or sight distance.

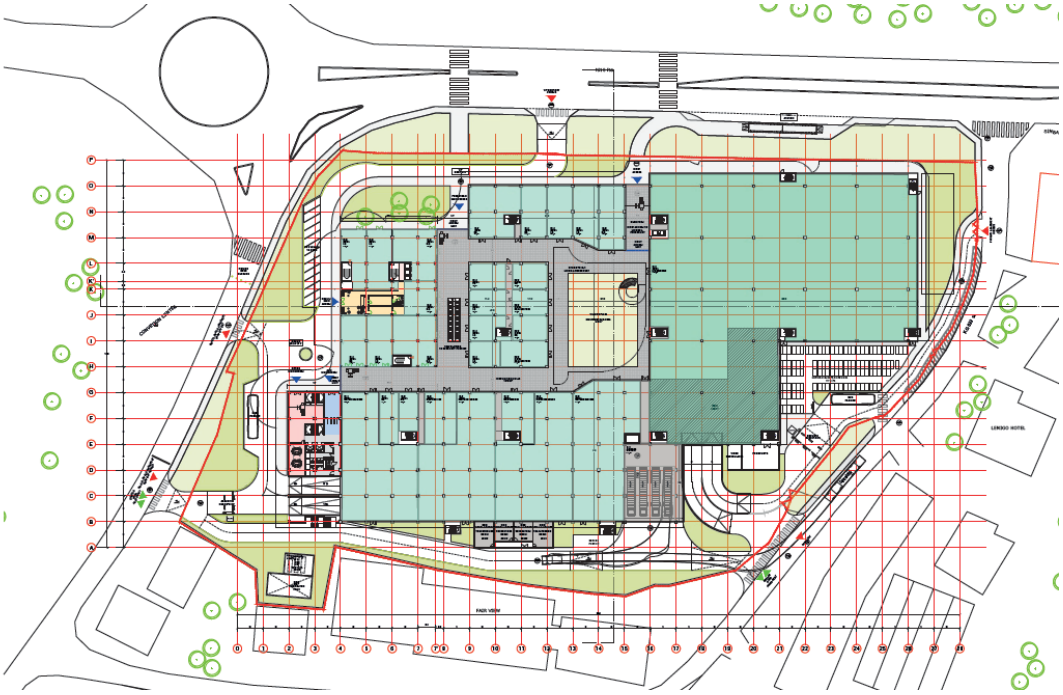


Figure 10: VIP & Offices Access

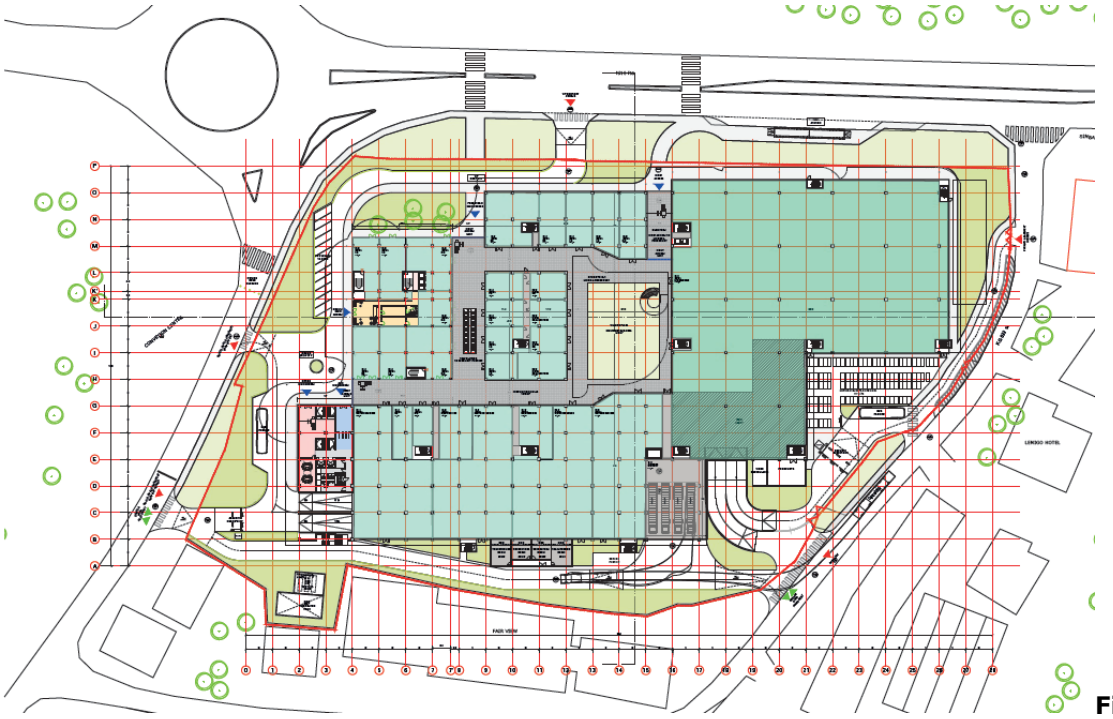


Figure 11: Accesses off KG 622 Street

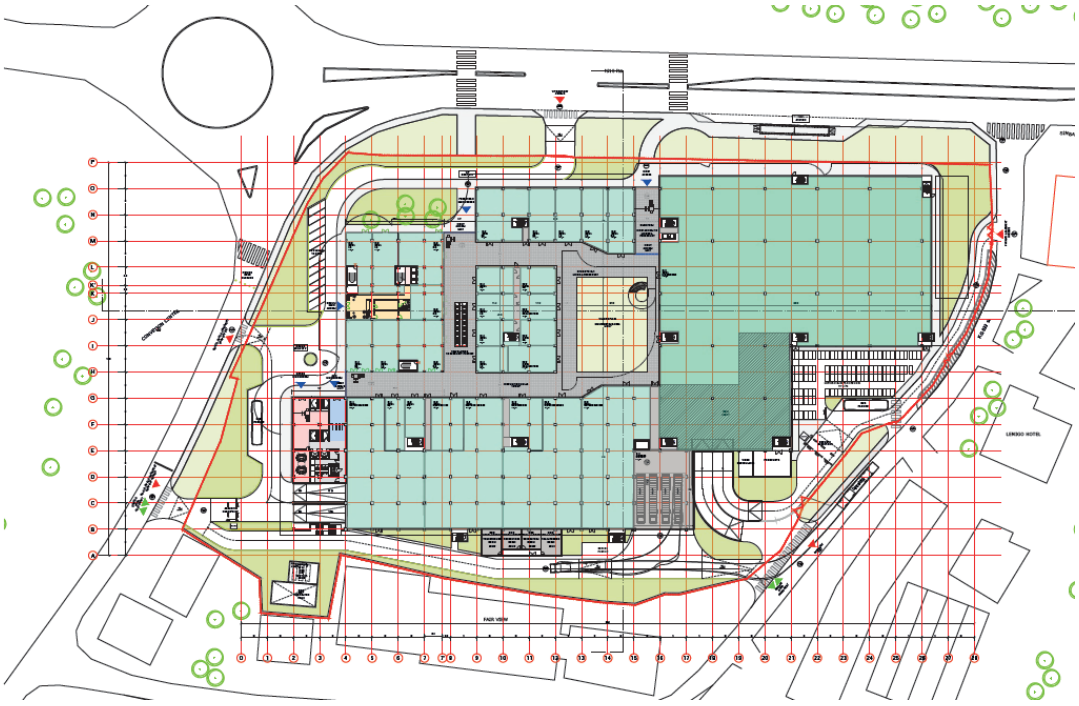


Figure 12: Drop Off & Pick-Up Zone Accesses

7 IMPACT OF DEVELOPMENT TRAFFIC

The development trips (including latent trips) were added to the 2025 Background traffic to determine the expected 2025 Total Traffic conditions.

The KN 5 Road [A] will operate at an unacceptable level of service (LOS) during the AM (LOS F), NOON (LOS E) and PM (LOS E) peak hours.
The Saturday peak will actually be worse off at LOS F as most shoppers are expected to visit the mall.

The Tee-junction of KG 622 Street and KG 501 (KCC Street) [C] will continue to operate at reasonably good levels of service (LOS D) for all three peak hours.

The Tee-junction of KG 622 Street and KN 5 Road will operate at a LOS E during AM peak, LOS D during NOON and LOS F at PM peak hours.

As a result, Upgrades are expected at the two most affected intersections.

7.1 PARKING REQUIREMENTS

Parking is a very important and integral part of the total transportation system in any development area.
Parking minimums are requirements, as dictated by a municipality's zoning ordinance, for all new developments to provide a set number of off-street parking bays. These minimums look to cover the demand for parking generated by the said development at the peak times.

Inzovu Mall Development
The proposed Inzovu Mall development will comprise of the following:

a. shops
b. offices
c. hobbies
d. residence (hotel)

and all parking shall be provided within the site of the development.

Off-Street Parking Requirements
In order to safeguard traffic flow on adjacent arterials, ensure effective access, and protect the transportation system's general functioning, a **sufficient number of off-street parking spaces will have to be provided around the Inzovu Mall development**.

Factors which affect Parking Requirements

i. *Size and nature of the development.*
ii. *2. Urban character, socio-economic structure of the population, and residential density in the market or influence area.*
iii. *3. Availability of public transport.*
iv. *4. Availability of other on-street or off-street parking in the vicinity; and*
v. *5. Certain combinations of land uses, such as offices or theatres in shopping centres that may reduce the total combined parking requirement where the peak parking demand for the different land uses do not occur at the same time.*

The ***Inzovu Mall*** will be located in an area where we have to apply minimum parking provisions. A proposed parking provision as shown in the table below has been provided for the Mall.

Table 10: Summary of recommended minimum standards for non-residential parking.

Land Use	Minimum Parking Requirement	Maximum Parking Requirement
Restaurants, pubs, cafes, bakeries,	0.75 parking space/150 m2 GFA	1 parking space/150 m2 GFA
Shops,	0.75 loading/unloading space/1000 m2 GFA	1 loading/unloading space/1000 m2 GFA
Hotels	0.75 parking space/5 beds	1 parking space/5 beds
Offices	0.75 loading/unloading space/100 m2 GFA. 1.5 motorcycle space/100 m2 GFA	1.0 car parking space/100 m^2 GFA
Theatres, Cinemas, other entertainment areas	0.75 parking space per seat	1 parking space per seat

Table 11: Recommended Parking Provision

Item	Description	Area GFA (sqm)	Minimum Parking Bays	Maximum Parking Bays
1	Restaurants, pubs, cafes, etc	18 994	Cars: 95 Delivery: 14 Motorcycle: 190	Cars: 127 Delivery: 19 Motorcycle: 253
2	Hotels	6931 (110 beds)	Cars: 17 Motorcycle: 69	Cars: 22 Motorcycle: 69
3	Offices	6405	Cars: 48 Motorcycle: 64	Cars: 64 Motorcycle: 64
4	Theatres, Cinema other entertainment	350 Seats	Cars: 26	Cars: 35
	Total		**Cars: 186** **Delivery: 14** **Motorcycle: 323**	**Cars: 248** **Delivery: 19** **Motorcycle: 386**

Vehicles must be parked in such a way that each vehicle can be freely moved in and out of its parking bay in a single manoeuvre.

The parking layout should be so designed that structural members such as columns, beams, walls, etc shall not obstruct the free manoeuvring of vehicles into and out of parking bays.

Care must be taken for shoppers walking distance tolerances from parking to a primary destination which are typically 60 m to 100 m,

7.2 PUBLIC AND NON-MOTORISED TRANSPORT

This development will generate public transport and Non-motorised Traffic (NMT) trips. The main public transport routes (taxis & motorcycles) run along KN 5 Road which is a dual carriageway with two lanes in each direction separated by a median.

There is an existing bus top along KN 5 as shown on the drawing below. This will still be used as a drop off and pickup terminus for the people visiting the proposed site.

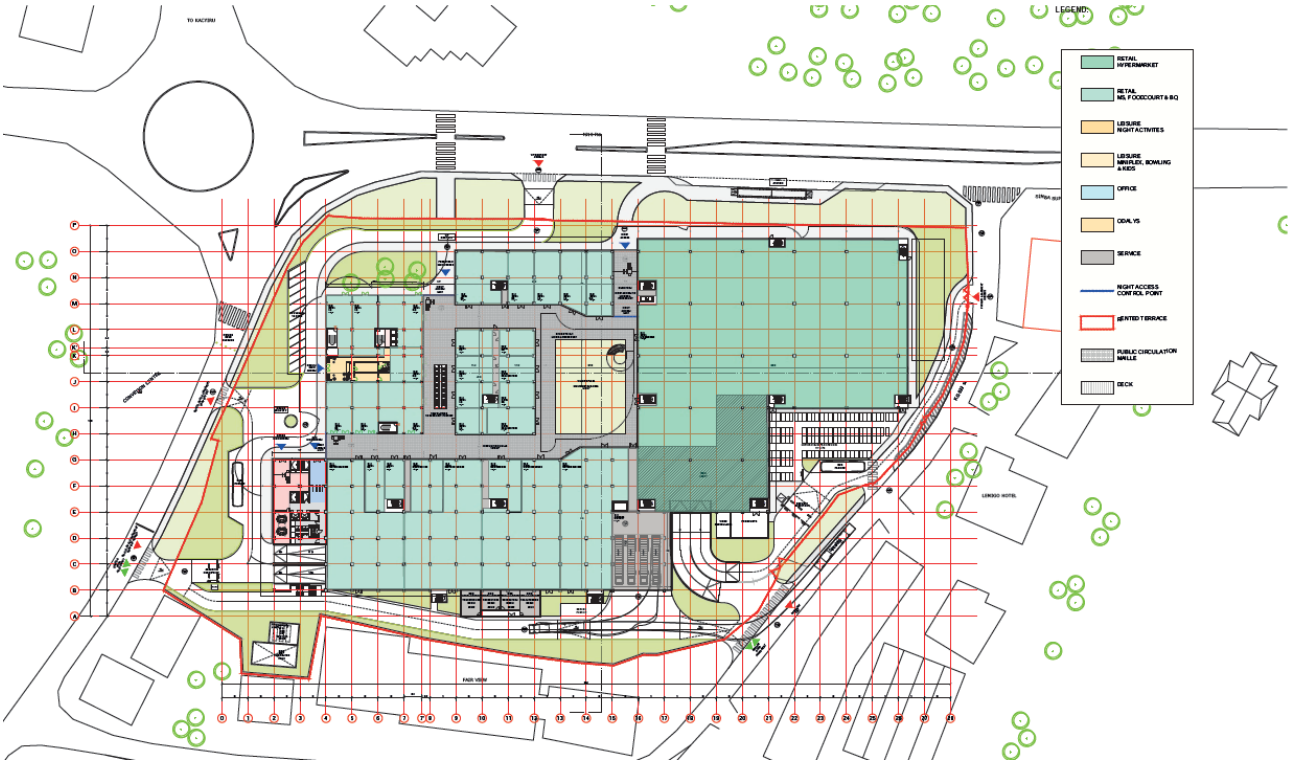


Figure 13: Inzovu Mall Bus Stop

A taxi embayment as well as a drop off terminus is highly recommended along KG 622 Street on the eastern side of the Development in the vicinity of the site.

The accommodation of pedestrians on the sidewalks surrounding the site as well as defined pedestrian routes on site is important and these should be indicated on the final site development plan (SDP) besides the ones connecting to the roundabout.
In order to safely accommodate the pedestrian movements to/from the proposed development, the following infrastructure is required:

- *A restricted design on the boundary of the site to prevent people accessing the site at any points other than the designated accesses.*
- *Bicycle facilities such as adequate lock up and end user facilities are required.*
- *Motorcycle holding facilities as they save as the main transportation mode for the public wanting a quick ride.*

- *Sidewalks should be constructed along the site frontages (where necessary) on KN 5 Street and KG 501 (KCC) Street for continuity.*
- *Safe pedestrian crossing facilities (Zebra crossing) across KN 5 Road to be moved closer to the new proposed bus stop, And also at KN 5/KG 622 Street intersection and at the access from KG 501 (KCC) Street into the proposed Mixed-Use Development and other areas where necessary.*
- *An internal non-motorised transport network plan to facilitate NMT movement once the final SDP must be decided on.*

7.3 SIGHT DISTANCE

There are no sight distance issues pertaining to the development. However due to the mall development, it is recommended that speed reduction and pedestrian warning signs be erected along KN 5 Road, KG 501 (KCC) and KG 622 Street:

No rapid changes in gradient, horizontal geometry or major visual obstructions are evident for the remainder of the property pertaining to accesses.

7.4 DELIVERIES, REFUSE COLLECTION AND HEAVY VEHICLES

Waste collections and deliveries will take place on site by using the two accesses on KG 622 Street and the one access off the main service road connecting Street KG 501 (KCC) to KG 622. The remaining delivery accesses are off KG 501 (Access 6) as shown on the drawings.

The SDP makes provision for heavy vehicles to enter through the access in KG 622 Street and not obstruct any traffic flow. The space provided must be sufficient to ensure that heavy vehicles enter and exit the property nose first as standard specifications require. So, the access in KG 622 will have to be at 90 degrees to KG 622 to enable meeting this condition for heavy vehicles.

8 CONCLUSION AND RECOMMENDATIONS

This report has investigated the transport implications of the proposed ***Inzovu Mall Development*** and summarises the existing transportation conditions within the site vicinity and provides an assessment of the transportation impacts of the proposed development on the surrounding road network. The findings and recommendations of this report can be summarised as follows:

- *Based on the application of the assumed and prescribed trip rate, the pass-by, diverted, mixed-use, internal trips and public transport trip assumptions, the entire development will generate 159 new external vehicle trips during the AM peak hour, 898 new external vehicle trips during the PM peak hour and 1188 new external vehicle trips during the Saturday peak hour.*
- *A large portion of the workers/shoppers attracted to the proposed development will access the site by non-motorised transport (NMT) modes i.e., on foot or by bicycle. The perimeter of the site will need full restriction to prevent people accessing the site at any points other than the four access intersections. The accommodation of pedestrians on the sidewalks surrounding the site as well as defined pedestrian routes on site is important.*
- *The study intersections are expected to operate at acceptable levels of service for the 2025 Total traffic conditions during the AM, NOON and PM peak hours if the below recommendations are implemented.*

- ***We would strongly recommend a new drop off terminus along KG622 so that some people are dropped off by traffic which does not necessarily enter the mall.***

8.1 KN 5/KG 501 ROUNDABOUT

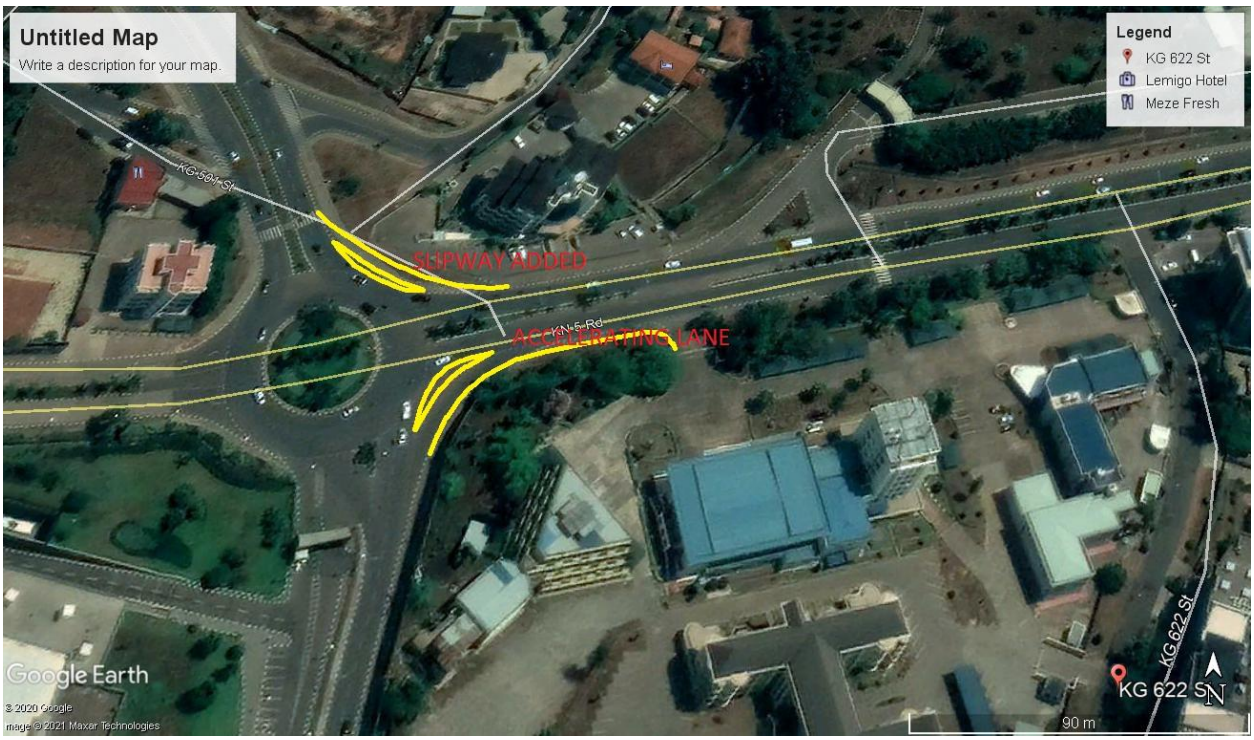
The KN 5/KN 4/KG 501 Street Roundabout will be highly impacted on as most of the traffic attracted to the proposed Inzovu Mall Development will pass through this junction. In order to accommodate this additional traffic, modifications to the existing layout will be required.

The suggested geometric improvements will have to incorporate slipways where space allows to avoid unnecessary hold up of traffic filtering to the right.

There is currently a blind spot experienced by the drivers turning right from KCC street because of the skewed orientation of the merging lane. This creates problems for drivers turning from KCC and merging into the main road and driving towards the traffic lights (KG6 Road). An accelerating lane which continues up to the mall entrance

in KN5 is proposed. This will then act as both acceleration and deceleration lane and thereby avoid delaying straight through traffic.

<u>Investigations should be made to see if it's feasible to have an additional lane along the KN 5. This will help alleviate the delays particularly for through traffic</u>.



8.2 ACCESS ON KN5 ROAD

To reduce the build-up of traffic exiting the proposed site at this access, an accelerating lane which will end just before the bus stop is proposed.
A physical barrier will have to separate the lane merging into KN5 from the bus stop. The general operation of the VIP and Offices access will remain the same with no left turn traffic from the Mall as it increases conflicts and results in traffic delays. All traffic must only turn right from the mall.

8.3 BUS STOP

This is an existing bus stop closer to KG 622 Street. This enables dropping of passengers to walk shorter distances into the mall as their main access is in KG 622 Street.

Provided these improvements are in place, conditions at this roundabout are indicated as acceptable.

8.4 KN 5 /KG 622 JUNCTION

KG 622 Street is a 12 m wide single carriageway which enters road KN 5 but in one direction only. This junction will be largely left as is with the median still intact preventing traffic intending to turn left from KG 622 street.
Traffic from the airport direction intending to access the Mall will have to proceed to the Roundabout and make a U-turn back onto KN 5 road to the KN 5/KG 622 junction before turning left there.

A slipway for traffic turning to the right into KN 5 from KG 622 street will be needed to aid in reducing congestion. This is to minimize stops on the main road and also cater for the traffic generated by the Mall.

With these improvements, the junction is expected to operate at an acceptable level of service despite the high volumes of traffic in KN 5 road.

8.5 ACCESS TO THE DEVELOPMENT OFF KG 622 STREET

At the KG 622 Street/Inzovu Mall entrance junctions, conditions will worsen with the additional traffic accessing and exiting the Mall. Note the accesses marked X, Y and Z, in **Figure 11** above.

It is preferable to signalize junction Y so as to provide a controlled outlet of traffic from the Mall.

Junction X will have to operate as a give-way to allow traffic entering the Mall to do so safely with minimal conflict.

Since the current traffic along this road was observed to be the least from the traffic investigations, we recommend a Terminus Drop-off to be constructed along this road so that some people can be dropped off by public transport not intending to enter into the mall.

8.6 WAITING TIME DUE TO TICKETING AND SECURITY CONTROL.

To minimize traffic, build up along KG 622 street and road KN 5, we recommend an Access Control Management System that is very fast and efficient. An efficient Parking Management System (PMS) can include a parking guidance System to avoid delays by motorist looking for unoccupied parking spaces and even helping drivers when they return back to their cars. We also recommend a system which also displays visible lights above the parking bays: "**Red**" signifying the bay is occupied, and "**Green**" for available bay. In addition, a **signage before the entry gate indicating the number of bays available or a "Full Parking Sign**".
A minimum of four (4) entry gates to issue parking tickets must be installed at the main entrance to the parking to enable quick ticketing. The number of security personnel at the checking point should also be increased in order to minimise the delays.

The service road connecting from Street KG 501 (KCC) to KG 622 will be give-way controlled at its junction with street KG 622 as indicated on Junction Z. (See Fig below).
The junction with street KG 501 will be controlled as a give-way junction.
For the access road within the property, we recommend one lane in and one lane out be provided within the development. This needs to be developed in more detail as the planning for the development progresses.

8.7 ACCESS TO THE DEVELOPMENT OFF KG 501 (KCC) STREET

KG 501 Street to the West of the proposed development is a two-lane road without a middle island to separate traffic. It is recommended that a right turn refuge lane be provided for the proposed access by construction of a new decelerating lane.
In addition, a right turn slip (accelerating lane) from the development back into KG 501 is also recommended so as not to delay Northbound traffic.

8.8 KG 501 STREET/KG 622 TEE-JUNCTION

This is the junction that will be used by delivery, refuse collection and heavy vehicles. This Tee-junction will have to be a give-way with a right turn slip lane. The give-way is to control the conflict between traffic coming out of the Mall and straight through traffic.
Failure to that, a Traffic Signal is recommended.

This report has shown that the proposed development can be accommodated by the adjacent transport network, provided the recommendations presented in this report are implemented.

Yours faithfully,

Knowledge Kwari
For **DNMZ CONSULTING ENGINEERS**

DNMZ CONSULTING ENGINEERS Ltd
P.O Box 5196
Kigali - Rwanda

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