GP091

a world class African city

MERCHELLES COLLECTIVE

ZANDSPRUIT TRANSPORT MASTER PLAN & IMPLEMENTATION PLAN CONCEPT REPORT

REPORT NO : 07

20 OCTOBER 2022

Submitted to:

Zilungile Chonco

Johannesburg Development Agency

The Bus Factory

3 Helen Joseph Street

Newtown, Johannesburg

Address :

The Bus Factory

3 Helen Joseph Street

Newtown, Johannesburg

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS	
ADT	Average Daily Traffic
AH	Agricultural Holdings
BRT	Bus Rapid Transit
CBA	Critical Biodiversity Area
CBD	Central Business District
CoJ	City of Johannesburg Metropolitan Municipality
EMV	Electric Motor Vehicle
GFIP	Gauteng Freeway Improvement Project
GHG	Greenhouse Gas
GMA	Gautrain Management Agency
GMTC	Gauteng Metered Taxi Council
GRRIN	Gauteng Rapid Rail Integrated Network
JDA	Johannesburg Development Agency
JRA	Johannesburg Roads Agency
MBT	Minibus Taxi
NMT	Non-motorised Transport
LEDZ	Local Economic Development Zone
LoS	Level of Service
PEZ	Priority Economic Zone

PrDP	Professional Driving Permit
PSC	Project Steering Committee
PT	Public Transport
PUTCO	Public Utility Transport Corporation
PWV	Pretoria Witwatersrand Vereeniging
RAMS	Road Asset Management System
RDP	Reconstruction and Development Programme
RSDF	Regional Spatial Development Framework
RSI	Roadside Interview Survey
SDF	Spatial Development Framework
SITPF	Strategic Integrated Transport Plan Framework
SOV	Single Occupancy Vehicle
TAG	Transport Authority Gauteng
TMP	Transport Master Plan
UDB	Urban Development Boundary
ZTMP	Zandspruit and Surrounding Areas Transport Master Plan

EXECUTIVE SUMMARY

INTRODUCTION

The Johannesburg Development Agency has appointed Merchelles Collective (Pty) Ltd on behalf of the City of Johannesburg Transport Department to develop a Transport Master Plan and Implementation Plan (TMP) for Zandspruit and surrounding areas.

This document forms part of the Phase 3 project deliverables and presents the Draft TMP which succeeds previous project reports including the Data Survey Report, Status Quo Assessment Report, Transport Modelling Report and Transport Concept Report. These previous reports comprised important information pertaining to land use and transportation aspects for the study area and have thus served as key inputs to the transport planning process.

The work that has gone into preparing the Draft TMP included identifying transport concerns, problems, and opportunities from the status quo assessment and developing solutions with a critical focus on integrating solutions across transport modes and transport system components.

DEVELOPING THE TRANSPORT CONCEPT TOWARDS A TRANSPORT MASTER PLAN

The approach and methodology for developing the Draft TMP involved the following activities:

- Data collection, processing and analysis.
- Status quo assessment of historic and current transport data and land-use considerations.
- Numerous stakeholder engagement sessions.
- Transport visioning workshops.
- Development of land use scenarios and zones.
- Transport simulation modelling.

The following five (5) building blocks form the basis for developing this Draft TMP:

- Infrastructure considerations – development of road infrastructure, public transport infrastructure, and non-motorised transport infrastructure to connect people to economic opportunities and support economic growth.
- Governance considerations – issues related to policy frameworks and the regulation thereof.
- Sustainable transport services – development of a sustainable transport network that supports the provision of sustainable transport services.
- Land use integration – alignment of land use development with policy guidelines and the transport system.
- Integrated projects – identification of integrated projects that address efficiencies, infrastructure provision and maintenance, and environmental sustainability.

These building blocks ought to be supporting by the cross-cutting elements of safety, security, social and social inclusion, technology, energy and the environment and finance and economy.

TRANSPORT VISION AND OBJECTIVES

The visioning process for the Zandspruit and surrounding areas TMP involved a workshop held with Project Steering Committee (PSC) members and Internal CoJ authorities and entities. Participants of the visioning workshop were tasked with identifying and ranking their top four (4) development objectives for the project and the resulting Key Priority Objectives are as detailed in Table 1-1 below.

Table 1-1: Key Priority Objectives from Visioning Workshop

TABLE 1-1: KEY PRIORITY OBJECTIVES FROM VISIONING WORKSHOP

THEME	SUB THEME	DESCRIPTION OF THE OBJECTIVE
Road and Non-Motorised Transport Infrastructure and Traffic.	Public Road Safety.	The creation of a safe pedestrian environment to protect pedestrians and NMT users.
Developmental Considerations	Environmental Constraints	Take consideration of the existing environmental constraints
Transport Services (Freight, Public Transport and Scholar Transport	Public Transport	Develop an inclusive transport system, considering modes, social inclusion, affordability, role and function of high mobility routes.
Road and Non-Motorised Transport Infrastructure and Traffic.	Road Infrastructure	1. Maintain standards in the implementation of roads and NMT infrastructure. There needs to be proper stormwater and drainage. 2. Widen the main roads and public transport routes as there is high congestion. 3. Proper town planning and road planning is required in the process of formalising Zandspruit.

Emanating from various processes and assessments of the study area, the proposed Transport Vision for Zandspruit and surrounding areas is:

'An efficient and sustainable transport system that supports economic growth and social inclusion.'

In order to achieve the Transport Vision, nine "key objectives" have been developed to form the framework of the Transport Master Plan. The key objectives are:

1. To bring the road and street network up to a basic standard (maintenance and safety aspects), as movement from the current to the future ideal will take long and requires substantial engagement and funding.

2. To identify and prioritise future street links in line with nodal and corridor development. The spine of corridors is to be defined.

3. To improve Public Transport (PT) facilities and identify key PT corridors.

4. To improve safety aspects through the provision of appropriate Non-Motorised Transport (NMT) infrastructure and parking facilities.

5. To control land invasion and prevent new informal housing and trading (urban sprawl). Formalise existing informal housing.

6. To delay applications for new developments until the TMP is approved to ensure alignment with the Vision and Objectives for the study area.

7. To convert informal trading to formal market areas.

8. To identify areas where Social Infrastructure is required in line with siting and links to corridors and nodal development.

9. To ensure internal links are properly linked to external access corridors – ensuring links to developmental and labour opportunities.

LAND USE CONSIDERATIONS

The study area is generally a mixed-use area with different residential typologies ranging from single stand dwelling, medium residential, farm holdings, informal settlements, and economic activity areas, however they all have different densities. The study area has experienced significant inward (densification) and outward (expansion) growth over the last 10 years.

Based on the past trends and in response to the policy frameworks, it is envisaged that further growth of formal residential will occur with the development of townships such as Zandspruit Ext 84, Zandspruit Ext 67, Malibongwe Ridge, and Cosmo City Ext 34 north of the study area. It is also considered probable that the Zandspruit Informal Settlements will further encroach on protected land and further densification will occur unless a housing strategy is implemented. These envisaged developments will likely have a significant impact on transport infrastructure by increasing travel demand.

To address pertinent land use issues in the study area the following is recommended:

- Review of policy framework to address densification and demand for higher densities.
- Management of increasing backyard dwellings and their associated impacts to transport infrastructure and services.
- Development of a housing strategy to manage settlement growth and accommodate more sustainable forms of housing as well as facilitate the improvement of living conditions within the informal settlement areas.

INFORMAL TRADING

A three-pronged strategy is recommended for the accommodation of informal trading activity within the study area as follows:

- The provision of trader facilities on key movement spines.
- The provision of facilities for traders at all taxi ranks and other public transport facilities.
- The provision of trader facilities at key public spaces, community facilities and retail nodes.

TRANSPORT INFRASTRUCTURE

The proposed road network plan for the study area deals with the identified key road network concerns within the study area which is characterised by inadequate connectivity of minor and collector streets, poor road infrastructure conditions, low levels of service and inadequate geometric designs to ensure safe and appropriate levels of service. The network plan is informed by various management systems within the city and country, e.g., the JRA Code of Procedure, TRH 26 Guidelines well as the CoJ Complete Street Design Guidelines to provide an efficient road network.

The higher-order road network in the region seems to be well established to provide access to the study area and connect it to surrounding major economic nodes, the lower-order road network within the study area is poorly developed. To improve this, a more comprehensive and complete road network in the southern sector of the Zandspruit Study Area is proposed to alleviate congestion on the road network, improve accessibility and connectivity, and to enable the provision of expanded public transport services.

It should be noted that the proposed road network is intended to firstly improve mobility and accessibility in and out of the study area, and secondly to make the network viable to support commuter bus services.

PUBLIC TRANSPORT PLAN

Accessibility and integration are critical aspects of providing quality public transport that is attractive to road users. Public transport operations in Zandspruit and surrounding areas currently occur in isolation with no integration between different services.

The dominant mode of public transport in the study area is the minibus taxi service with the highest demand during peak being 270 veh/hour. This equates to approximately 15 195 passengers per day per direction and allows for the main public transport routes within the study area to be classified as moderate ridership corridors. These types of corridors require both bus and minibus taxi services.

Based on the public transport demand assessment and needs of the study area, primary and secondary public transport routes are identified and proposed for development. The primary routes are to be fully serviced by commuter buses and minibus taxis and are recommended for upgrades and improvements that prioritise public transport services. The primary public transport routes need to have the following PT facilities and NMT provision along Class 2 and 3 routes:

- Access to multi-modal public transport transfer facilities.
- Sheltered bus & taxi lay-bys at intervals that align with intersection spacing but not more than 1 m intervals, i.e., max 500 m walking distance to a bus / taxi stops.
- Exclusive public transport lanes (buses and taxis).
- Surfaced sidewalks considering universal access design principles on both sides. Where possible, the sidewalks need to be detached from the roadway.

Commuter bus services, such as PUTCO and Metrobus services should incrementally be expanded to service primary routes in accordance with the projected passenger demand, implementation of the required road network infrastructure upgrades and land use development. The secondary routes will serve as important public transport feeder routes. Interventions to upgrade and improvement existing public transport facilities are proposed to cater for the integration of minibus taxis, metered taxis and bus operations.

A detailed IPTN feasibility study for the proposed public transport interventions is required to confirm the viability of expanding existing Metrobus service routes into the study area.

NON-MOTORISED TRANSPORT PLAN

The objective of NMT within the Zandspruit TMP, is to ensure that there is sufficient NMT infrastructure linking the public transport nodes, schools, the trading facilities as well as adjacent community facilities and places of interest.

The following NMT interventions are proposed on strategic transport links within the study area in accordance with the CoJ Complete Streets Design Guideline:

- Separated sidewalks should be a minimum 1,5 m wide (all classifications).
- Sidewalks should be provided on both sides of all street classifications (including most residential and industrial areas)
- Wider (≥2,0 m) sidewalks should be provided along public transport routes and connections to public transport hubs.
- Wider (≥2,0 m) sidewalks should be provided for connections to schools, within activity centres and near major pedestrian generators (e.g., stadiums).
- Sidewalks should be wider (>2,0 m) to provide separation from traffic when:
  - Truck volumes are > 10% of total volume.
  - Design speed is >60 km/h.
  - Traffic volume is >20 000 vehicles per day (note: does not apply to industrial streets).
- Sidewalk width should be chosen based on surrounding land uses (higher density requires wider sidewalks).

SCHOLAR TRANSPORT PLAN

There is minimal provision for NMT facilities such as sidewalks leading up to most schools within the study area, however, they are of poor and inconsistent quality given their discontinued nature within a few meters of the school. Recommendations for improving scholar transport services in the study area are limited to the safety of scholars when travelling to schools. A more formal scholar transport assessment ought to be undertaken to assess existing operations and sufficiency thereof.

The recommended infrastructure interventions for scholar transport include:

- Public transport lay-by's: Laybys should be provided for pick-up/drop-off, but it should be a no parking zone and appropriate signage should be provided.
- Non-motorised transport infrastructure links: non-motorised transport infrastructure along the Class 4 roads that intersect with Class 3 routes.
- Traffic signals with a pedestrian phase: Traffic signals with a pedestrian push button should also be provided near senior schools on major roads and where there is a significant number of pedestrians and vehicles, and
- Pick up and drop off zones outside school premises: Providing off street pick-up/drop-off zones outside school premises.

GAUTRAIN PLAN – PASSENGER RAIL SERVICES

The planned Phase 1 Gautrain Rapid Rail Integrated Network (GRRIN) alignment and Cosmo City Gautrain Station are supported by this TMP because it will encourage economic development and growth in the study area, whilst providing a much-needed high quality and occupancy public transport mode. It is a recommendation of this TMP that a park-and-ride facility is developed at the future Cosmo City Station to encourage the use of the Gautrain by people from the study area and thus enable an increase in mode shift from single occupancy

vehicles to public transport services. The integration of the station in terms of ticketing, fares and routes is also recommended.

TRAVEL DEMAND MANAGEMENT

The aim of TDM in Zandspruit and the surrounding areas is to put into practice various behavoral-influential strategies that will encourage people to switch to sustainable transportation modes like walking, cycling, and public transportation while also maximizing the effectiveness of the transportation system. This is in line with the CoJ SITPF 2013 objectives to encourage a modal shift away from private car use.

Six (6) primary areas of TDM strategies have been identified and implemented for the study area in accordance with the transport and land use status quo and transport vision and objectives for the project as follows:

- Congestion Management Strategies – measures to reduce vehicle demand and thus mitigate against the impacts of traffic congestion which include high travel delays and costs, driver frustration and reckless behaviour, and increased greenhouse gas emissions.
- Public Transport and Non-motorised Transport Strategies – measures that prioritise public transport and non-motorised transport modes and encourage a mode shift from single-occupancy vehicles.
- Parking Management Strategies – measures that encourage more efficient use of existing parking facilities and reduced demand for parking.
- Transit Oriented Development Strategies – planning of land use development to be compact and mixed and centred around public transport use.
- Freight Transport Management Strategies – policy and legislation measures to reduce freight demand on residential and public transport roads.
- Education & Marketing Strategies – the use of effective marketing strategies to educate commuters and make them of alternative modes available to them as well as to educate them on the importance of sustainable transportation.

FREIGHT MANAGEMENT CONSIDERATIONS

The study area has one (1) existing freight route along Malibongwe Dr. that typically carries between 2 000 and 4 000 HV's per day. Such a road is required to have four lanes in each direction according to Typical Freight Route Classification and Standards and this is the case for Malibongwe Dr. Additional freight routes may develop over time with the development of the Kya Sands industrial zone which is identified as a Priority Economic Zone (PEZ) in the CoJ Freight Management Plan of 2013.

The recommended strategies to manage freight demand and travel patterns include:

- Revision of the regulations on recurrent freight vehicles on minor roads such as waste removal and deliveries to small businesses and neighbourhood shopping centres.
- Enforcement of vehicle load limitations within Zandspruit / Cosmo City due to the limitations on the Class 5 street network
- Enforcement of time regulations for loading and unloading on road kerbsides coupled with appropriate space provision and signage.

INTEGRATED PROJECTS

An integrated project matrix has been developed for the Transport Masterplan. This links all main public transport corridors with facilities to improve transportation services and infrastructure within Zandspruit and the surrounding areas.

Primary and Secondary Public Transport Corridors			Existing Infrastructure				Proposed Infrastructure Intervention											
							Roads & Streets				Public Transport		Non-motorised Transport		Urban Design			
Rank	Priority Transport Corridor	Motivation	Road Infrastructure	PT Services	PT Infrastructure and Facilities	Economic development (trading)	Road Safety Improvements	Intersection Capacity & Control Improvements	Link Capacity Improvements	New Road Link	PT Lay-bys	PT Sheltered Stops & Seats	Sidewalks incl. Universal Access	Road Crossings	Streetlighting	Waste bins	Information Boards / Wayfinding Signage	Trading Stalls
1	South Africa Drive	Important North-South Connector Public Transport Corridor High priority for Cosmo City community	Yes	Yes. Bus, MBT, Avanza, NMT	No	Yes	x	x			x	x	x	x	x	x	x	x
2	Aureole Avenue	Important East-West Connector Traffic congestion relief Improved network accessibility and connectivity	Yes, insufficient capacity		No NMT, PT infra		x	x	x		x	x	x	x	x		x	
3	Constantia Street	Public Transport Corridor Improved network accessibility and connectivity Planning/implementation has commenced Easy to fund through development approval	No. Gravel road	No	No	No				x	x		x	x	x			
4	Boundary Road	Public Transport Corridor Road safety improvements	Yes, insufficient capacity	Yes. MBT, NMT			x	x	x		x	x	x	x	x		x	
5	Noble Street	Improved network accessibility and connectivity Planning/implementation has commenced Easy to fund through development approval		MBT						x	x		x	x	x			
6	Beyers Naude Drive	Road safety improvements High pedestrian activity High informal trading activity Public Transport Corridor Planning has commenced	Yes	Yes. Bus, MBT, Avanza, NMT	Yes	Yes	x	x			x	x	x	x	x	x	x	x

1. INTRODUCTION

1.1 BACKGROUND

Merchelles Collective (Pty) Ltd is appointed by the Johannesburg Development Agency (JDA), on behalf of the City of Johannesburg's (CoJ) Transport Department, to provide transport planning, traffic engineering, urban planning, and community participation services to develop a Transport Master Plan (TMP) and Implementation Plan for Zandspruit and surrounding areas (the project) over a period of 18 months.

1.2 SCOPE OF THIS DOCUMENT

This report follows from the Data Report and the Status Quo Report, among other deliverables, previously submitted from which the relevant content has been assessed to develop a MasterPlan for the study area. The work in compiling this report, forms part of Phase 3 of the project plan. Following from a stakeholder workshop held on 8th July 2022, during which specific project "Objectives" have been identified, the work towards preparing this report identified concerns, problems and opportunities from the status quo assessment and has been critically assessed with a focus on integrating solutions across modes and transport system components. This implies, that the solution will not only be "infrastructure" or only "services" or only "land use".

This phase of the project considered the development of specific concepts and testing those to develop transport options. Inputs from the land use assessment form a critical part of this "Draft Transport MasterPlan". During this project phase, all identified issues, problems and opportunities from the status quo assessment have been considered to ensure integrated solutions are derived. The report therefore includes the development and testing of initial ideas or proposals for transport development options. Inputs from the land use assessment and all modes of transport, have formed key inputs into the transport planning process.

Part of this phase of the project, is to also perform scenario planning. This is done considering land use aspects that would have an impact on trip generation. From the data collection and status quo assessments, it has already been determined that many of the main routes surrounding the study area and most of the internal routes are at a level of congestion or close to being congested. Therefore, to determine the future scenarios, a transport simulation model has been developed and a Base Model developed to use in scenario planning for future growth periods, base year to 5 years and 5 years to 10 years. From the simulation model, infrastructure upgrades are proposed, and consideration is given to potential modal shift to alleviate congestion and provide more transport services to people.

2. DEVELOPING THE CONCEPT TOWARDS A TRANSPORT MASTER PLAN

2.1 APPROACH AND METHODOLOGY

The input work towards the development of a concept for the Transport Master Plan (TMP), has included the following reports prepared and / or activities previously performed:

- Data report containing traffic count surveys at intersections including all the data sources reported upon in the said report.
- Status quo assessment of transport data and land-use considerations.
- Numerous stakeholder sessions determining their concerns and reported in the status quo report.
- Objectives for the study area as derived from the stakeholder workshop held in July 2022.
- Creation of uniform land use zones responsible for growth in travel demand, to be used in the simulation model considering land use trends, in the past, in the immediate future and in the study period for the project, i.e., the forecasting methodology requires the development of land use scenarios for two horizon years (2027 and 2032). These land use scenarios incorporate changes to residential, industrial, commercial and other activities within the study area. The outputs are:
    - Key congested areas and simulation of the movement of people within and towards and leaving the study area.
    - Congested intersections and road links in the base year and horizon years and determine the levels of service based on delays.
    - Identify and prioritise the required improvement and upgrade interventions for implementation for the base year and two horizon years, thereby contributing to the development of the Transport Master Plan for the region.

2.2 GUIDING PRINCIPLES

From the assessment of the prior work, it became profoundly clear that the Transport Master Plan cannot only focus on the improvement of infrastructure. Numerous non-infrastructure aspects are required to ensure a future sustainable environment. The main building blocks are presented in Figure 2-1, below and the following bullets as also indicated in the basic definition of Transport, viz:

"Transport is the provision of Infrastructure and Services to allow the sustainable movement of People and Goods (freight) from an Origin to a Destination."

Sustainable transport can enhance economic growth, promote trade opportunities and improve accessibility. Sustainable, reliable and safe transportation achieves better integration of the economy, while respecting the environment [1].

The mobility of passengers and freight is fundamental to economic and social activities such as commuting, manufacturing, distributing goods, or supplying energy. Each movement has a purpose, an origin, a potential set of intermediate locations and a destination. Mobility is supported and driven by transport systems composed of infrastructures, modes, and terminals. These enable individuals, institutions, corporations and regions to interact and undertake economic, social, cultural, or other activities [2]. It is therefore important that transport should be one of the components of a

city that is physically and functionally integrated with other activities and services [3].

Road transport, as is the case in the study area, has average operational flexibility as vehicles can serve several purposes but cannot operate outside roads. The services need to be provided with consideration of the infrastructure provision. Road transport systems have low barriers of entry, but high maintenance costs [4].

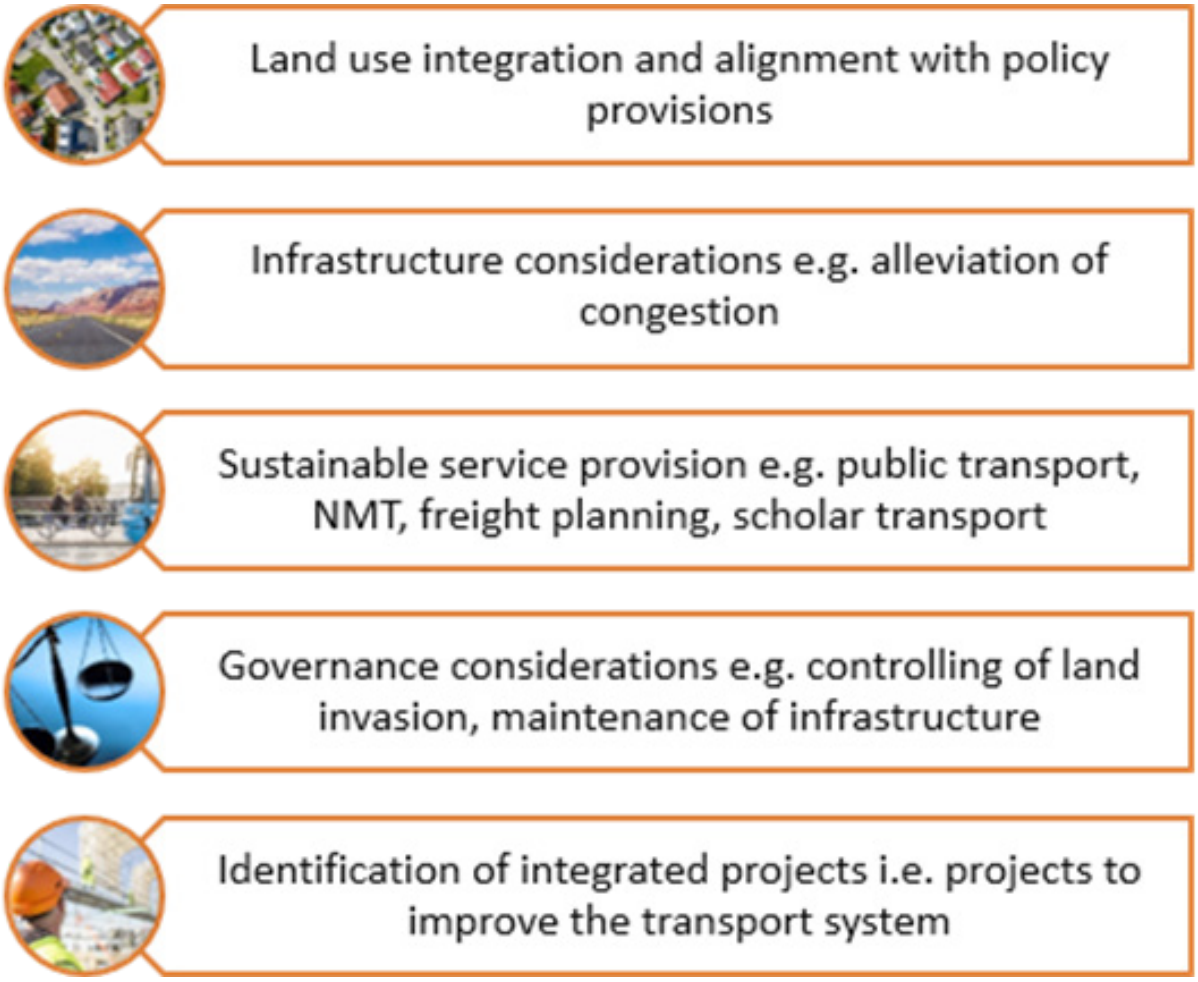


Figure 2-1 : Main Building Blocks of the Transport Master Plan

2.3 BUILDING BLOCKS OF THE TRANSPORT MASTER PLAN

The main building blocks of the Transport Master Plan are:

- Land use integration.
- Infrastructure considerations.
- Governance considerations.
- Sustainable transport services.
- Integrated projects.

The above building blocks are explained in the following sub sections.

The building blocks of the Transport Masterplan are discussed in hereunder, while the cross-cutting elements are discussed in Section 2.4 Cross-Cutting Elements Required in the Transport Master Plan. These matters are to be considered along with the development of integrated projects as part of the Draft TMP.

2.3.1 LAND USE INTEGRATION

Land use integration deals with the alignment of land use with policy provisions. Urban areas are characterized by social, cultural and economic activities taking place at separate locations forming an activity system varying from routine activities as these occur regularly and are thus predictable, such as commuting and shopping, to irregular activities, which are shaped by lifestyle, e.g., sports and leisure or by specific needs, e.g., healthcare. All activities are related to the mobility of people. In addition, there are production activities that are related to manufacturing and distribution, whose linkages may be local or regional. These activities are usually associated with the mobility of freight. Since activities have a different location, their separation is a generator of movements of passengers and freight, which are supported by transport. Therefore, transport and land use are interrelated because of the locational and interactional nature of urban activities [2].

2.3.2 INFRASTRUCTURE CONSIDERATIONS

Road infrastructure plays a critical role in South Africa's economy. It makes it possible to transport goods and services, but it also enables movement for people, enhancing productivity within the economy. People can seek employment without the obstacle of poor road infrastructure, a major problem in underdeveloped areas, such as the study area. Road infrastructure will aid in connecting the under privileged population to the economic mainstream [3]. Inadequate infrastructure planning and poor project execution are main challenges that prevent infrastructure and economic development in emerging societies. Without proper infrastructure planning and management, all infrastructure will fail in meeting its purpose and it will continue to negatively affect and disrupt people's daily lives. e.g., alleviation of congestion and improving the road hierarchy. Infrastructure should not only focus on the road, but also consider public transport infrastructure and facilities as well as Non-Motorised Transport (NMT) infrastructure that is of particular importance and plays a vital role as it further enhances/compliments existing public transport systems by providing secure access to public transport through walking or cycling [5].

2.3.3 SUSTAINABLE TRANSPORT SERVICES

The provision of among other, public transport, non-motorized transport allowance, freight planning and control, scholar transport, metered taxis and e-hailing. Developing a sustainable transport network to serve a city in an under-developed areas, such as the study area, might seem insurmountable, but with a combination of Bus Rapid Transport (BRT), local bus services and informal microbuses, i.e., Mini Bus Taxi (MBT), will allow the system to serve a larger region and more residential areas, than if only a BRT system is considered [6].

2.3.4 GOVERNANCE CONSIDERATIONS

In the context of the TMP, governance deals with policies and the enforcement thereof, e.g., controlling of land invasion or maintenance of infrastructure as well as the approval process related to new developments. While the goal of traditional transport policy (improving accessibility) is still important, it must be considered in the context of other desirable goals. For instance, improving safety and health, reducing vehicle emissions, improving equity, enhancing economic opportunities, improving community liveability, promoting mobility are all valid. Increasingly, goals have turned to consider managing demand, rather than trying to build capacity [2].

2.3.5 INTEGRATED PROJECTS

To implement proposals from a master plan, the plan needs to deal with projects that will improve the Transport System. The development objective of an Integrated Transport Project is to enhance the efficiency of the transport system by improving the strategic planning aspects of critical transport infrastructure. Additionally, the projects shall address the lack of infrastructure investment and the management of new and existing infrastructure. Finally, projects need to consider the long-term sustainability of the urban environment as well as land use aspects. In short, integrated projects shall not have one outcome, but need to solve multiple concerns in an integrated process and manner.

2.4 CROSS-CUTTING ELEMENTS REQUIRED IN THE TRANSPORT MASTER PLAN

The above five key aspects need to function as a unit to ensure sustainable development. However, on their own, even these key aspects still do not ensure or guarantee sustainability. The following cross-cutting elements to the key aspects need to be considered as illustrated in Figure 2-2, namely:

- Safety, security and social inclusion.
- Technology (in Transport).
- Energy and the environment.
- Finance and economy.

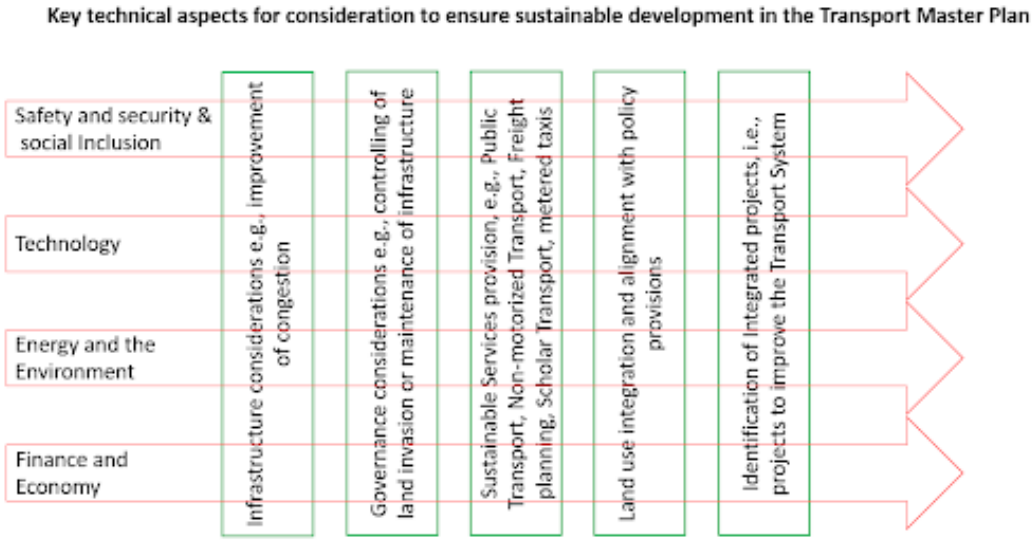


Figure 2-2: Cross-Cutting Elements Required in the Transport Master Plan

The above cross-cutting considerations are explained in the following sub sections.

2.4.1 SAFETY, SECURITY AND SOCIAL INCLUSION

In Cosmo City, a high concentration of pedestrians were recorded at Central African Republic Street, Cosmo Primary School as well as Zandspruit Primary and Cosmo Secondary schools – these being the dominant land uses linked to pedestrian movement during the AM- and PM-peak. Due to the demographics in the study area, the predominant pedestrian activity happens during peak hours and are scholars moving between home and school.

Safe and inclusive transport and mobility is key to enabling participation in society, by providing access to socioeconomic and life-enhancing opportunities. It is broadly defined as the ability to access a preferred destination safely and reliably by navigating in an environment considerate of individual needs. Safe and inclusive transport and mobility can, therefore, have a domino effect towards enhancing an inclusive society that leaves no one behind. The availability of safe and reliable transport infrastructure and services that enable people and goods to reach a range of destinations at reasonable costs and within reasonable time frames is essential for economic growth and indispensable for a balanced distribution of economic and social benefits, as is ensuring proper management of the environmental impact of human development.

The above safety and social inclusion factors such as ablutions at PT facilities shall be considered in all projects in the study area. Basic aspects of appropriate street lighting at high density pedestrian movements will attract investment in the area.

Accessibility is an important aspect of safety, security and inclusivity, necessitating vehicles routes, pedestrian walkways, intersections, interchanges, and transport stops to be designed in a way that promote safe and easy access to all the transport infrastructure.

2.4.2 TECHNOLOGY (IN TRANSPORT)

Smart City transport applications cover a wide range of system improvements each designed to move people and goods more quickly and efficiently. Research areas in the Smart City environment include parking applications for improved vehicle distribution, bicycle sharing initiatives, traffic planning platforms for Transport Planning Authorities, information services to commuters and real time traffic and transport operations control systems.

The above concepts aspects may need to be considered in improving PT ticketing and multi-mode ticketing systems. Not only are the above important, but basic mapping available for integration of layers of important information, considering land use and environmental aspects.

Safety applications considering CCTV cameras at PT facilities may need to be considered in new facility development.

Additionally:

- Traffic Management Systems – technology-based systems that utilizes detectors, cameras, and communication systems to monitor traffic, optimize signal timings, and control the flow of traffic.
- Autonomous and Connected Vehicles – focused on wireless communication linking to other vehicles, pedestrians, and infrastructure to promote safety and awareness.
- Electric Vehicles – Support of electric vehicles through investments in infrastructure and programs related to it.
- Driving Data – Collection of data through traffic management systems to guide the planning and implementation of transportation infrastructure. Additionally, the data can be used to analyse traffic patterns.
- On-Demand Ride Services – Establishment of policies to guide e-hailing services such as uber, and bolt.

2.4.3 ENERGY AND THE ENVIRONMENT

Megacities suffer from serious traffic congestion, high levels of greenhouse gas (GHG) emissions and heavy air pollution. These urban areas face a stark dilemma: economic expansion attracts more people and vehicles; but the resulting traffic and pollution hinder further growth while reducing the quality of life for their citizens. A changed course of action is required to make a transition to green urban transport. **It should shift from supply-side policies focused on expanding roadways to green demand-side policies focused on creating public-transport oriented cities.** Factors on how to increase ridership in PT services are complex but need to be considered in parallel with infrastructure planning. Substantial funds need to be invested in

integrated planning, rather than Infrastructure planning against public transport planning. Additionally, the following aspects need to be considered with all new developments, infrastructure and services:

- Biodiversity – Protection of biodiversity by properly enforcing biodiversity protection policies/programs to limit deforestation, wetland reductions, and protect endangered plant and animal species.
- Land Occupation (by transport infrastructure) – adoption of policies that address, physical barriers created by transport infrastructure, built heritage, noise levels, odour generation to promote better quality of life.

2.4.4 FINANCE AND ECONOMY

Central to investing in transport infrastructure, delivering services and promoting economic growth, is the financing and funding of infrastructure. The prioritised projects must be elaborated upon to achieve the lowest and most sustainable lifetime costs. Trade-offs between design (up-front cost) and operations (ongoing cost) stages should be considered, as well as the implications for reinvestment and recapitalisation. Projects must, therefore, be efficient. Part of the efficiency considerations also includes who should develop and operate the project. A critical activity is the approval of the projects and acceptance by CoJ that these projects require urgent funding to meet the objectives set out for the study area.

Additionally, consideration needs to be given to:

- Funding Sources – Urban Settlement Development Grant (USDG), Public Transport Network Grant (PTNG), Integrated City Development Grant, Public-Private-Partnerships (PPPs).
- Efficient and connected transport infrastructure to provide the opportunity to expand and acquire raw materials or spread economic activities.
- Accessibility of labour and reduced access costs through improved local scale commuting.
- Increased land value of properties located along a good transport service routes.
- Attraction of increased competition due to accessibility to a wider market.

3. TRANSPORT VISION AND OBJECTIVES

3.1 APPROACH FOLLOWED

On the 8th of July 2022, a workshop was held with Project Steering Committee (PSC) members and Internal CoJ authorities and entities. The purpose of the workshop was to get input from relevant officials concerning key objectives that the project team should address in the Zandspruit and surrounding areas TMP. The expertise, knowledge and insight of officials in their respective fields was required for the co-production of a far more holistic vision for the area than the project team could achieve on its own.

The workshop was attended by thirty-two officials along with nine project team members. During the visioning process, participants were tasked with identifying their top four (4) development objectives for the project out of 15 proposed objectives and ranked them from highest to lowest priority. More than 80% of all votes went to four distinct objectives as detailed in Table 3-1.

TABLE 3-1: PRIORITISE KEY OBJECTIVES FROM OFFICIALS

THEME	SUB THEME	DESCRIPTION OF THE OBJECTIVE
Road and Non-Motorised Transport Infrastructure and Traffic.	Public Road Safety.	The creation of a safe pedestrian environment to protect pedestrians and NMT users.
Developmental Considerations	Environmental Constraints	Take consideration of the existing environmental constraints
Transport Services (Freight, Public Transport and Scholar Transport	Public Transport	Develop an inclusive transport system, considering modes, social inclusion, affordability, role and function of high mobility routes.
Road and Non-Motorised Transport Infrastructure and Traffic.	Road Infrastructure	1. Maintain standards in the implementation of roads and NMT infrastructure. There needs to be proper stormwater and drainage. 2. Widen the main roads and public transport routes as there is high congestion. 3. Proper town planning and road planning is required in the process of formalising Zandspruit.

3.2 TRANSPORT VISION

Emanating from various processes and assessments of the study area, the proposed Transport Vision for Zandspruit and surrounding areas is:

'An efficient and sustainable transport system that supports economic growth and social inclusion.'

This vision is built upon the objectives for the study area as proposed in Section 3.3. The proposed vision is envisioned to have the following outcomes:

- Improved transport infrastructure planning and delivery.
- Improved service delivery capacity within the transportation sector.
- Improved public transport services.
- Increased investment levels in transport infrastructure, both from maintenance and capital investment perspectives.
- A more efficient and accessible transport network that supports economic growth in the study area and neighbouring areas.
- Linking the study area to economic opportunities and the creation of internal links and public transport services.

3.3 KEY TRANSPORT OBJECTIVES

In order to achieve the Transport Vision, nine "key objectives" have been developed which are:

- To bring the road and street network up to a basic standard (maintenance and safety aspects), as movement from the current to the future ideal will take long and requires substantial engagement and funding.
- To identify and prioritise future street links in line with nodal and corridor development. Spine of corridors to be defined.
- To improve Public Transport (PT) facilities and identify key PT corridors.
- To improve safety aspects through the provision of appropriate Non-Motorised Transport (NMT) infrastructure and parking facilities.
- To control land invasion and prevent new informal housing and trading (urban sprawl). Formalise existing informal housing.
- To delay applications for new developments until the TMP is approved to ensure alignment with the Vision and Objectives for the study area.
- To convert informal trading to formal market areas.
- To identify areas where Social Infrastructure is required in line with siting and links to corridors and nodal development.
- To ensure internal links are properly linked to external access corridors – ensuring links to developmental and labour opportunities.

4. LAND USE CONSIDERATIONS

In order to determine the potential development of the study area, to support the Transport Scenario Planning phase of the study, a series of land use projections have been undertaken. The methodology to determine these projections is firstly based on an understanding of the existing densities and land uses within the study area. These were largely unpacked in the Zandspruit Transport Master Plan Status Quo Report dated 14 August 2022 and further analysed in comparison to The City of Joburg Nodal Review Policy (NRP) 2020 [7] prescribed densities in this section of the report. Following on from this analysis, a study was undertaken to understand historic land use trends over the last ten years to assist with projecting land use scenarios over a 5- and 10- year horizon.

4.1 LAND USE GAP ANALYSIS

Based on desktop assessment of the land use situation, site investigations, data collected and analysed and stakeholder engagement workshops, the land use gap analysis is detailed in Table 4-1.

Table 4-1: Study Area Land Use Concerns

	STUDY AREA LAND USE CONCERNS
Developmental Considerations	1. Need to understand the various initiatives and plans underway as well as the conditions and constraints in the area. 2. Focus development on existing nodes. Decide on nodes as development must follow the nodal policy. 3. Densification of land use. Identify and highlight how spatial planning can be applied to develop and formalise Zandspruit. Proper town planning and road planning is required in the process of formalising Zandspruit. 4. Link formal developments to informal trading to alleviate informal trading. 5. Huge gap in the provision of social infrastructure: Schools, Sporting facilities and Parks. 6. Safety Considerations: • Community safety within the NMT/pedestrian environment; crime prevention strategies and the establishment of community policing forums. • Road safety measures, which focus on women and children and conduct road safety audits. • Identify and prioritise NMT infrastructure, e.g., promoting cycling for scholars. • Traffic calming considerations. 7. Four major themes need to be considered in the development of the TMP: • Social inclusion. • Economic development. • Policy framework considerations (see below). • Safety (See 6 above).

Governance Aspects	1. Take consideration of the existing environmental constraints as there are nodes in environmentally sensitive areas. Natural streams defined and protected (wetlands) as well as Critical Biodiversity Areas (CBA). 2. Zandspruit, Cosmo City and Northriding Agricultural Holdings are different character areas. Therefore, its critical to note that there cannot be a single instrument of development for these areas as they differ in character. The formalisation process should consider the policies when developing the study area. 3. Densification of land use. Identify and highlight how spatial planning can be applied to developing and formalising Zandspruit. 4. Encroachment prevention and enforcement. 5. Link formal developments to informal trading alleviation.

4.2 DEVELOPABILITY: POLICY PERSPECTIVE – NODAL REVIEW POLICY – LAND USE OBJECTIVES

The City of Joburg Nodal Review Policy (NRP) 2020 [7] is the most recent city-wide policy that is an extension of the Spatial Development Framework (SDF) 2040 [8]. It follows the SDF process and considers nodal boundary changes and additions. Nodes defined in the SDF 2040 or any existing Regional SDF (RSDF), Precinct Plan or Urban Development Framework, are replaced by the nodes and urban development zones defined in the NRP 2020. A set of development guidelines have been developed through the SDF and the NRP guide development within the city. The identified development zones applicable to the study area include:

- Beyond Urban Development Boundary (UDB).
- Local Economic Development Zone (LEDZ).
- Peri-Urban Zone.
- Regional Node.
- Sub Urban Zone.

The city established the Urban Development Boundary (UDB) as a tool to manage the urban footprint, limit sprawl and the protection of the city's environmental resources. Development consideration within this zone will be taken for uses that comply with the following land uses:

- Agriculture.
- Conservation areas and nature reserves.
- Tourism and recreational related facilities.
- Social amenities.
- Farm stalls.
- Rural residential uses.
- Agricultural holdings.

Moreover, the city's policy framework suggests that there should be no residential densification permitted beyond the UDB. However, it is a recommendation from this study that the farm holdings west of Zandspruit should be considered for housing opportunities for the Zandspruit settlement.

The LEDZ promotes mixed use development on a neighbourhood scale with an emphasis on economic land uses. Additionally, the focus is predominantly on the movement spines as mixed use, active pedestrian streets, neighbourhood nodes and around public transport stations/stops. This includes streets such as South Africa Drive within Cosmo City and Marina Street within Zandspruit. When new corridors are being developed, these spines need to be considered in an integrated developmental approach.

The policy framework supports agricultural or low intensity residential uses within the Peri Urban Zone. The general character of areas within this zone are low density and intensity residential or agricultural. Similar to the areas Beyond the UDB, the protection of environmentally sensitive areas remains a priority in this zone.

The Regional Nodes Zone is characterized by highest mix and intensity of land uses and is mainly focused on tertiary mixed-use nodes of the city. Moreover, emphasis is on mixed use buildings. Northgate towards Kya Sands forms part of the regional node along Beyers Naude Drive as one of the regional activity spines.

4.3 NODAL REVIEW POLICY (NRP): DENSITIES COMPARED TO EXISTING DENSITIES

Urban density, land use and subsequently transport planning have a direct correlation. As part of this land use study the existing densities within the study area were compared to the NRP proposed densities in order to understand if the densities within the study area are aligned to city policy and if not, what recommendations can be made.

The Nodal Review Densities map, Figure 4-1, shows the prescribed densities according to the identified development zones with the intention of curbing sprawl and ensuring that development takes place in a sustainable manner. Areas within the Northgate Regional Economic Node are earmarked for 80 du/Ha. A minimum of 60 du/Ha is proposed for properties bordering the stretch of South Africa Drive that falls within Cosmo City and Zandspruit along Marina Street. The internal townships have low densities ranging from 5-10 du/Ha to 30 – 40 du/Ha.

The study area is generally a mixed-use area with different residential typologies ranging from single stand dwelling, medium residential, farm holdings, informal settlements, and economic activity areas, however they all have different densities. This can be evidenced when assessing aerial photography over time where processes of densification through the emergence of 'back-yard dwellings and secondary structures can be seen and intensification of informal settlements.

Figure 4-1 shows also the NRP densities with environmental sensitivity overlaid. Figure 4-2 shows the 2021 average densities mapped using aerial photography. In most cases the existing densities are higher than the policy, especially in Zandspruit and Cosmo City. These higher densities have land use and transport implications, such as the existing roads infrastructure not being able to support the higher densities.

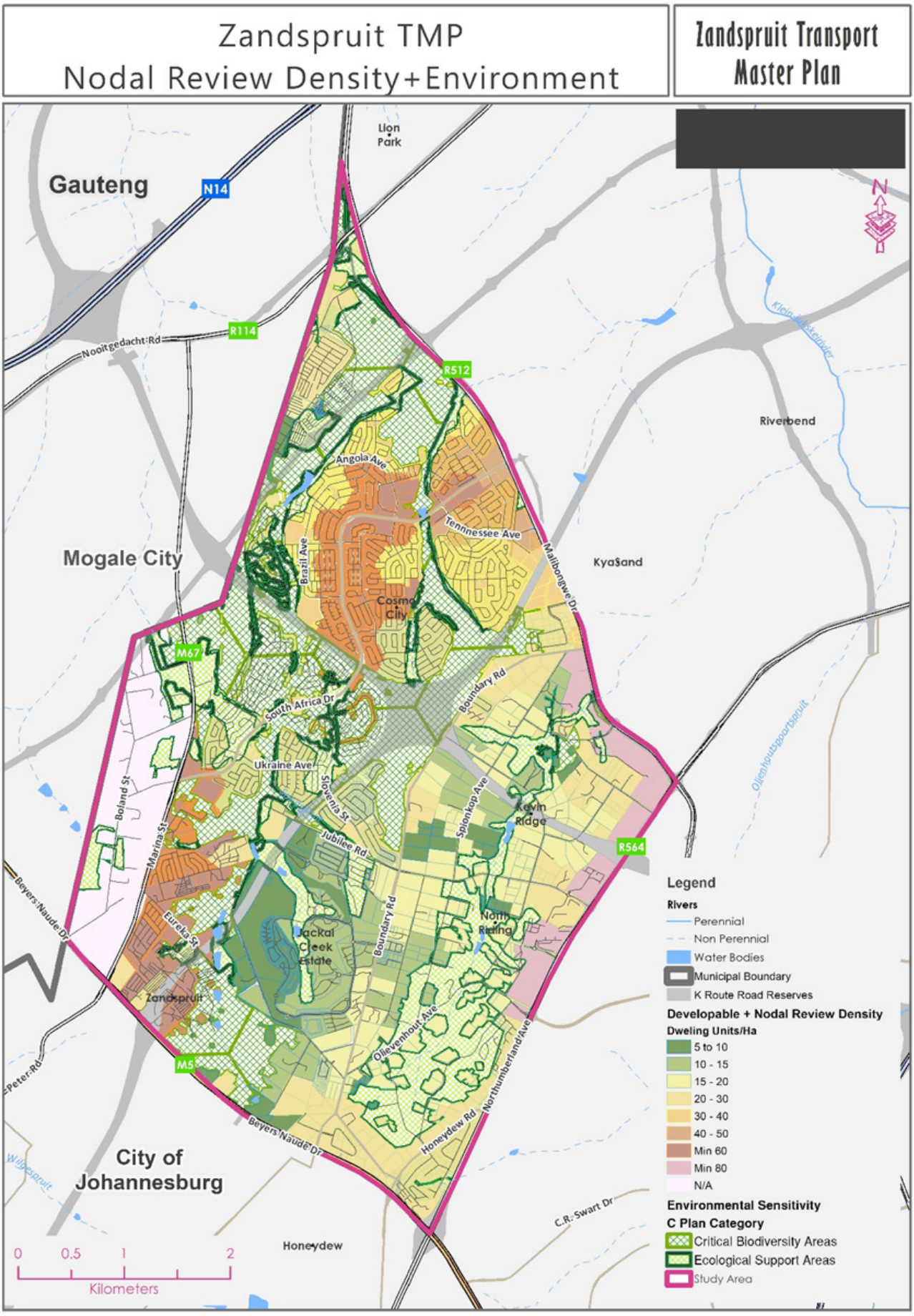


Figure 4-1: Nodal Review Policy Map

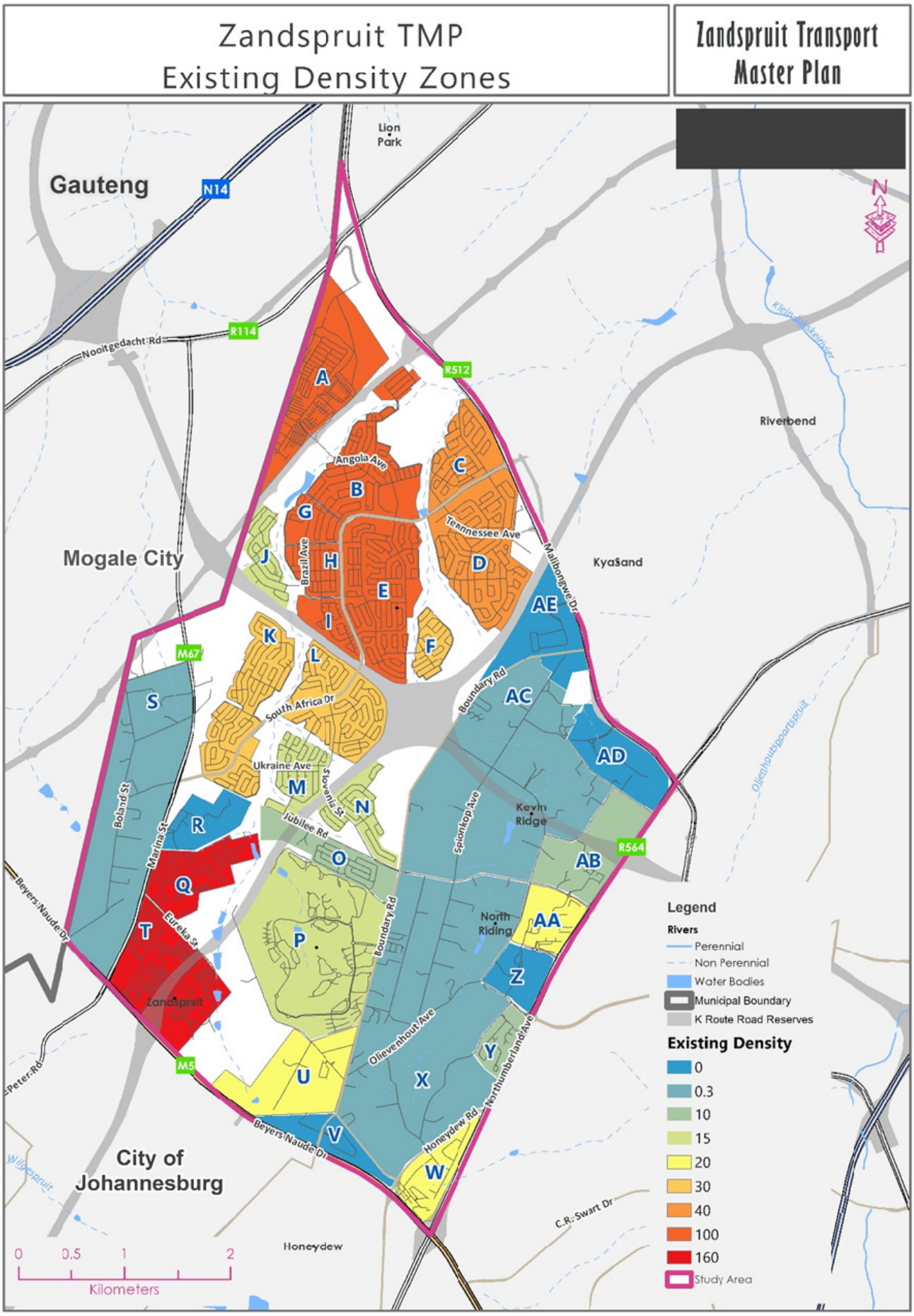


Figure 4-2: Existing 2021 Average Density Zones (Units are Dwelling units/hectare)

4.3.1 HISTORIC URBAN GROWTH AND PROJECTED URBAN GROWTH

A study was undertaken to understand historic land use trends over the last ten years to assist with projecting land use scenarios over a 5- and 10-year horizon. This study was undertaken using historic aerial photography from Google Earth with the resultant growth patterns illustrated in Figure 4-3 to Figure 4-6. The overall growth is indicated in red, and the associated land uses in relevant colours. The study area has experienced significant inward (densification) and outward (expansion) growth over the last 10 years and is indicated in sections 4.3.1.1 and 4.3.1.2.

4.3.1.1 HISTORIC URBAN GROWTH 2012 TO 2017

The historical growth patterns of the study area between 2012 to 2017, as indicated in Figure 4-3, display several patterns including the growth of informal settlements occupying vacant farm portions in and around the study area. The predominance of formal residential developments has also occurred and is also evident. The steady increase in density within Cosmo City due to backyard dwellings shows an inward densification trend. The establishment of Cosmo City Mall and Cosmo City Business Park has increased the nodal and economic activity along Malibongwe Drive.

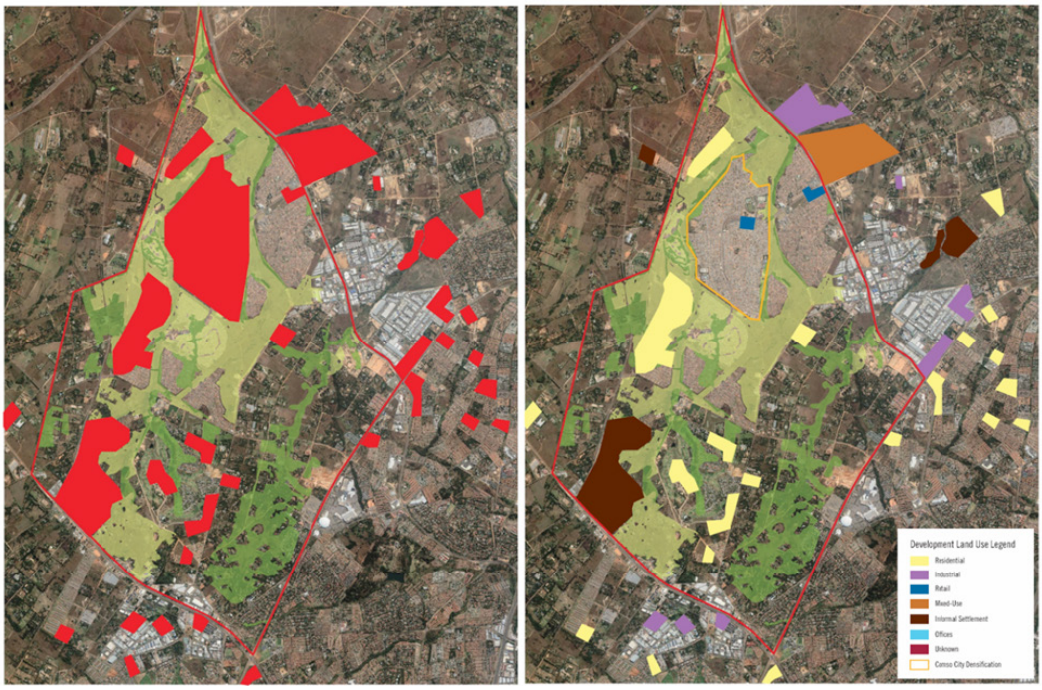


Figure 4-3: Historic Urban Growth in the Study Area: 2012-2017

4.3.1.2 HISTORIC URBAN GROWTH: 2017 TO 2022

Based on the past trends and in response to the policy frameworks certain patterns are likely to continue. The further growth of formal residential as is evidenced through the construction of new projects such as Zandspruit Ext 84, Zandspruit Ext 67, Malibongwe Ridge and Cosmo City Ext 34 north of the study area.

Without any clear housing strategies in place, as well as any protection of environmental and green spaces, it is probable that the Zandspruit informal settlements will further encroach on protected land and further densification will occur. The envisaged developments will likely have a significant impact on transport infrastructure due to an increase in trip generation, as presented in Figure 4-4.

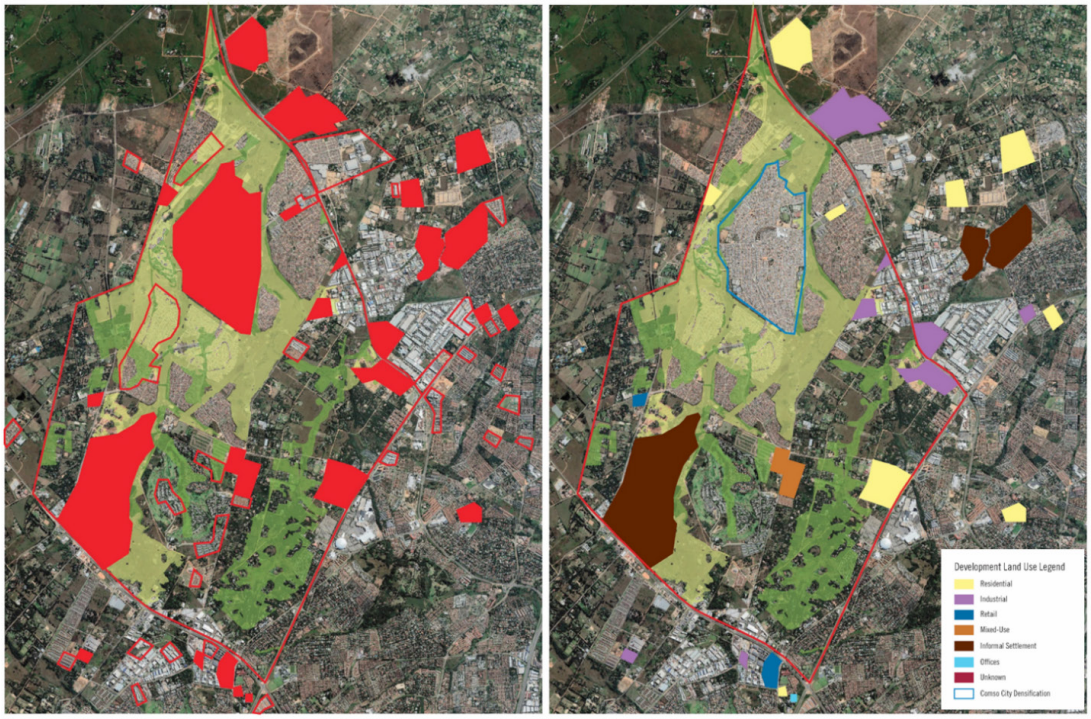


Figure 4-4: Historic Urban Growth in the Study Area: 2017-2022

4.3.1.3 PROJECTED URBAN GROWTH: 2022-2027

The analysis of the historic development trends provide a basis into realising projected development patterns. Based on the past trends and in response to the policy frameworks certain patterns are likely to continue. These include, the further growth of formal residential as can be evidenced through the construction of new projects such as Zandspruit Ext 84, Zandspruit Ext 67, Malibongwe Ridge, and Cosmo City Ext 34 north of the study area. Without any clear housing strategies in place, as well as any protection of environmental and green spaces, it is probable that the Zandspruit Informal Settlements will further encroach on protected land and further densification will occur. The envisaged developments will likely have a significant impact on transport infrastructure by additional traffic. See Figure 4-5.

4.3.1.4 PROJECTED URBAN GROWTH: 2027 TO 2032

Within the 10-year horizon, key assumptions would be the implementation of three critical spatial structuring devices. These include:

1. The implementation of regional transport infrastructure such as the PWV 3 and PWV 5 routes.

2. The study area is largely affected by environmental constraints, consequently, these areas will likely remain under a threat, therefore the establishment of protected environmental zones is considered a key priority within this horizon.

3. The implementation of a targeted housing strategy to provide for formal housing to address backlogs and facilitate a process of informal settlement upgrading.

The likely impacts of these structuring elements would be the changes to the expansion of informal settlements due to the establishment of the new Zandspruit Ext 83, 84 and 85 townships. The decanting of informal settlements through the implementation of the K – Routes as the informal settlement is located on a PWV 5 alignment. The provision of additional formal low-cost or affordable housing, but with marginal increases in the current densities as this would form part of accommodating existing needs within a formal housing relocation strategy. See Figure 4-6.

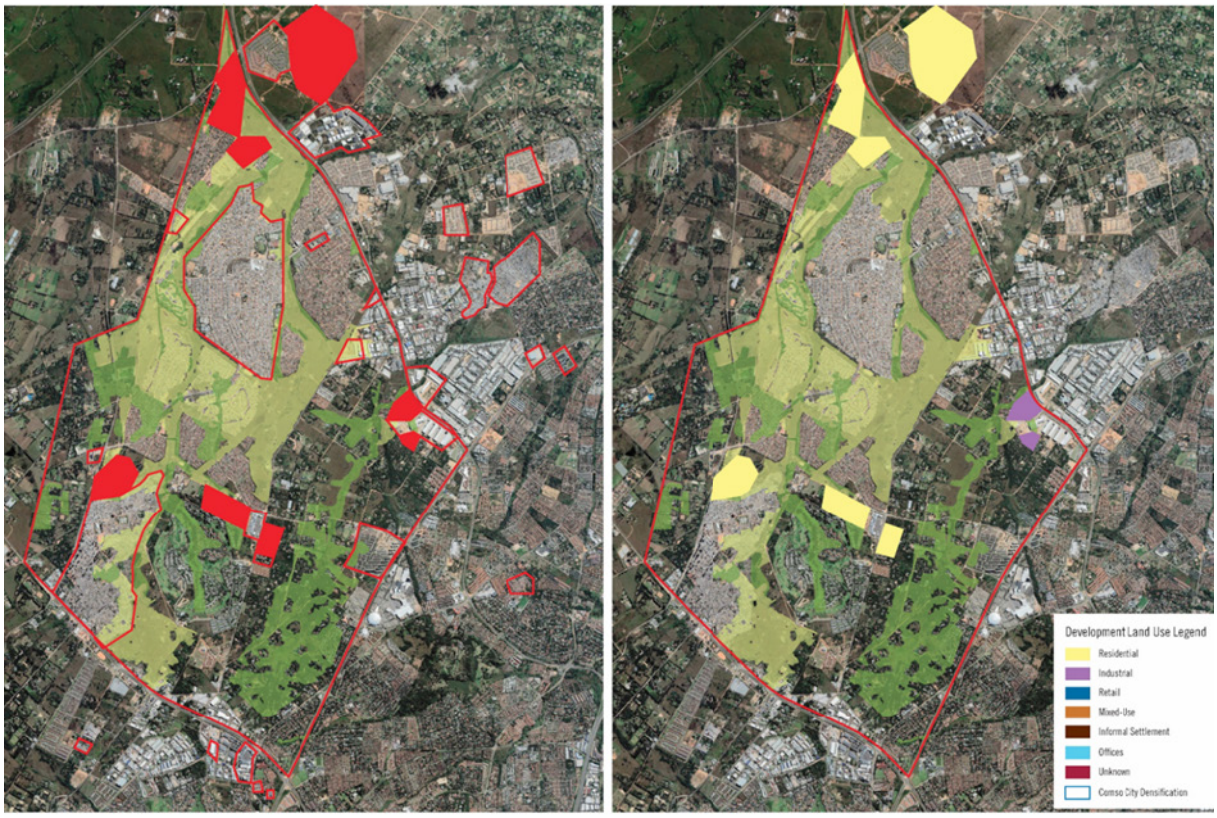


Figure 4-5: Projected Urban Growth: 2022-2027

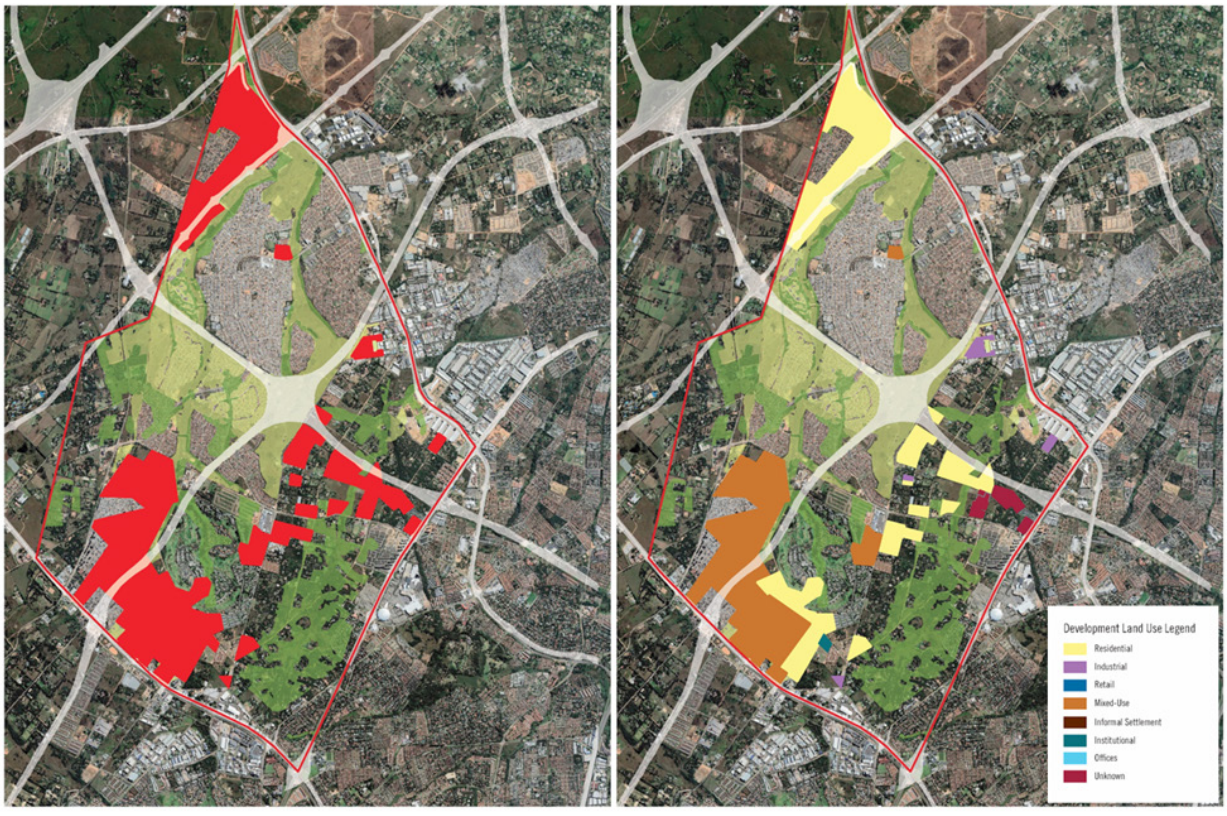


Figure 4-6: Projected Urban Growth: 2027-2032

4.3.2 COSMO CITY DENSIFICATION AS A CASE STUDY 2012 TO 2022

Densification as a result of backyard dwellings has proliferated in South Africa, consequently, the population density of many low-income areas has increased significantly. A primary reason for the increase in backyard dwellings within formal townships are a result of owners using these dwellings to generate income. In addition, the lack of access to formal low-cost housing opportunities have contributed to backyard dwellings which have catered for this gap in housing provision. This trend is evident in Cosmo City which was originally planned as a 40 du/Ha settlement and in many areas now measures at 100 du/Ha. Figure 4-7 shows this densification from 2012 to 2022.

Figure 4-7: Cosmo City Densification between 2012 and 2022

The average annual densification rate between different assessment periods are:

- 2012 – 2017: 13,4% per annum.
- 2017 – 2022: 5,9% per annum.
- 2012 – 2022: 9,6% per annum.

In 2012, the density of the township was at a relatively low density of 40 du/ha with most properties only occupied by the main dwelling unit. However, by 2017, the density has almost doubled due to the proliferation of backyard dwellings. The density has more than doubled in the last 10 years.

The increase in density through backyard dwelling within Cosmo City has numerous impacts in terms of infrastructure, especially transport infrastructure. The overall impact of increased density ranges from: greater access to services, reduce land consumption, natural ecosystems protection and overcrowding. In relation to transportation, the positive impacts realized from the increased densities are: encourages the use of public and non-motorised transport, limited demands in infrastructure and servicing, and reduced natural land consumption. Despite the positive effects identified, the negative impacts include: traffic congestion, increase informal activities along sidewalks, increased number of cars parked on the street, and inefficient public transport system.

There is greater need for policy intervention from local authorities in order to address the challenges associated with backyard dwellings to ascertain whether income can be generated to support the associated demand on infrastructure and service provision in the township.

4.3.3 LAND USE PROPOSALS

The policy framework needs to be reviewed to address densification and demand for higher densities. Additionally, future developments should take density into consideration, through the design of engineering services to accommodate further densification. The expansion of settlements within environmentally sensitive area, remains a key threat to sustainability and there is urgent need for the formalization of protected environment and green spaces.

There is a need for CoJ to acknowledge that backyard dwellings are a growing sector of housing and contribute economically. They have a significant role in influencing the shape of settlements and providing access to affordable housing, basic services, and economic opportunities. The residential densification and increase in economic activity have a direct impact on transport infrastructure and these need addressing and management.

A housing strategy is required to manage settlement growth and accommodate more sustainable forms of housing as well as facilitate the improvement of living conditions within the informal settlement areas. The several strategies include the upgrade of informal settlements, backyard dwelling management, as well as formal affordable housing opportunities provision. The provision of new formal housing may require a review of the urban development boundary to enable formal expansion in addressing the backlog of housing within the adjacent farm or agricultural zones / areas.

4.4 INFORMAL TRADING

4.4.1 INFORMAL TRADING: STATUS QUO

The TMP Status Quo Report, dated 14th August 2022, provides a detailed status quo of informal trading in the study area. The key conclusions from that report are:

- Street trade is concentrated in Zandspruit and Cosmo City and is less prevalent in the remainder of the study area.
- It is mostly concentrated at the entrance of key community facilities such as parks and schools, and along busy routes leading to formal retail establishments that act as anchors.
- Traders are mostly concentrated towards the north and east of the Beyers Naudé Drive and Marina Street intersection.
- There is a need for formal trader facilities and markets in the study area close to high pedestrian volumes.
- The public environment around these areas where is there a concentration of traders should support this important local economic activity.

4.4.2 INFORMAL TRADING: CONCEPT

The concept to accommodate informal traders in the study area, is a three-pronged requirement:

- The provision of trader facilities on key movement spines.
- The provision of facilities for traders at all taxi ranks and other public transport facilities.
- The provision of trader facilities at key public spaces, community facilities and retail nodes.

4.4.3 TRADER FACILITIES ON KEY MOVEMENT SPINES

The provision of trader facilities on streets or roads is guided by the CoJ Complete Streets Design Guideline [9]. The guideline considers how on-street trading can be incorporated as the demand for on-street trading space in the City of Johannesburg has gradually increased over the years. The guideline acknowledges that on-street trading creates an opportunity for small business development, however if unregulated, it meets many challenges particularly with regards to road safety. The emphasis in the guideline is on road safety issues for pedestrians, motorist and cyclists to avoid any potential accidents which may be caused by on-street trading. The guideline recommends the following criteria should be considered when proposing on-street trade facilities:

- Road safety.
- Pedestrian safety.

- Accessibility for pedestrians (sidewalk congestion).
- Attractiveness of streets from a road user and adjacent property owner perspectives.
- Criminality/Security of road users.
- Sidewalk congestion.

See example of complete street integration in Figure 4-8.

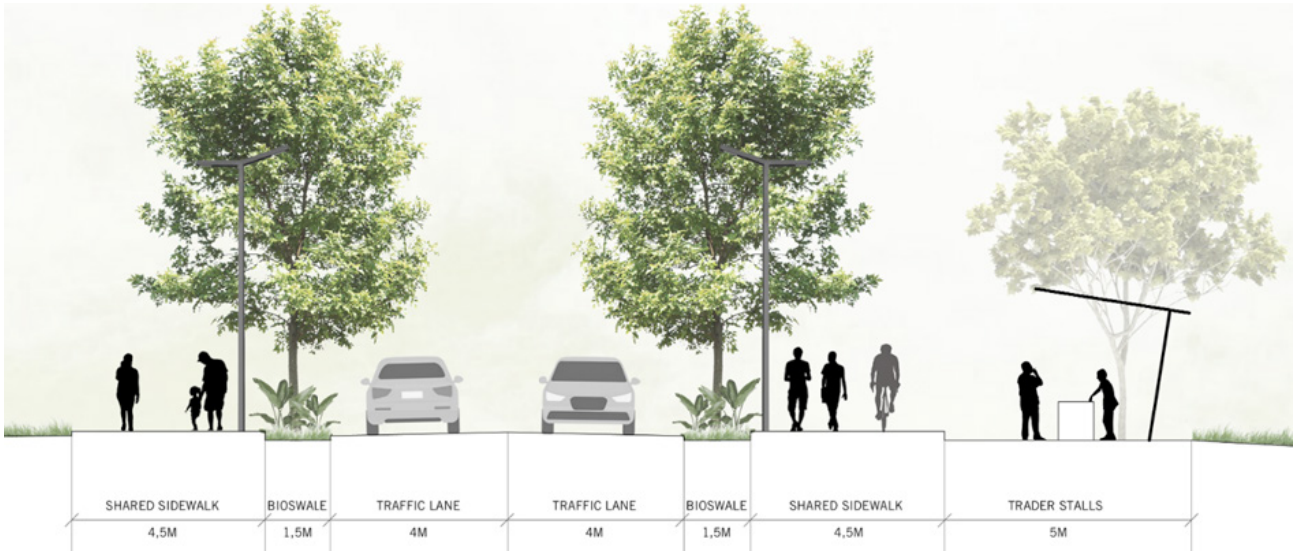


Figure 4-8: A 25 m Complete Street with Trader Facilities (Example)

From the above, the following situations will disqualify the position from being approved for on-street trading:

- Within 50 m from an intersection, slip lane, on/off ramp or interchange.
- Where sidewalks are narrower than 1,5 m.
- On any road with a design speed higher than 70 km/h.
- On any median less than 10 m wide.

4.4.4 FORMALISING INFORMAL TRADING

Taxi Ranks and public transport facilities are essential components to a well-functioning public transport network and attract significant foot traffic, which in turn attracts traders. Rather than traders informally occupying the outskirts of these facilities, traders should be accommodated within and on the edges of the facilities in a dignified way. An example of how facilities can be incorporated into is shown in the Figure 4-9 and Figure 4-10 below.

Figure 4-9: An Example of Trader Facilities at Bree Street Taxi Rank CoJ

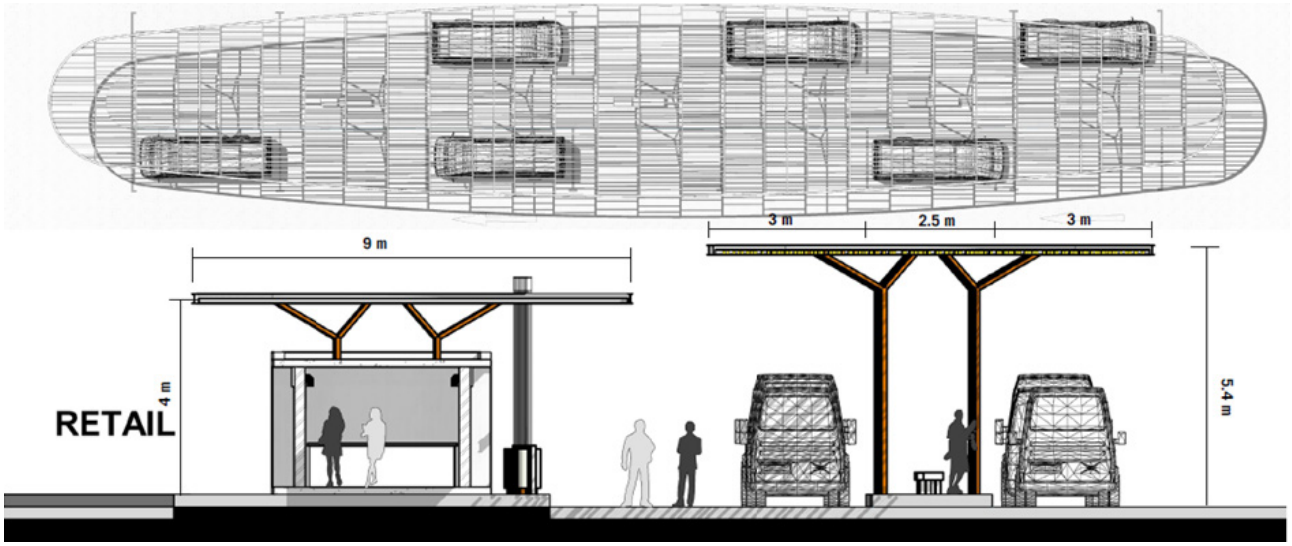


Figure 4-10: An Example of a Proposed Trader Facility incorporated at the Sunninghill Taxi Rank (As per IYER)

Considering that traders currently concentrate at the entrances of key community facilities such as parks and schools and along busy routes leading to formal retail establishments, it is logical to locate formalised trade facilities at or close to these places. CoJ allowed previously for the inclusion of traders into parks and publics spaces. Considering that retail is usually privately owned and managed, it would be required to stipulate to developers that trading to be incorporated as part of their developments. There are good examples, such as at Southgate Mall, Figure 4-11, were both a taxi rank and small-scale trader shops have been provided in this retail centre. Another concept example of integrated development is shown in Figure 4-12.

Figure 4-11: Southgate Mall Taxi Rank and Trader Facilities

Figure 4-12: An Example of the Incorporation of Traders into Public Space

4.5 CONCLUSION

A housing strategy is required to manage settlement growth and accommodate more sustainable forms of housing as well as facilitate the improvement of living conditions within the informal settlement areas. The several strategies include:

- The upgrade of informal settlements, backyard dwelling management, as well as formal affordable housing opportunities provision.
- The provision of new formal housing may require a review of the urban development boundary to enable formal expansion in addressing the backlog of housing within the adjacent farm or agricultural zones areas.

5. TRANSPORT INFRASTRUCTURE

The proposed road network plan for the study area deals with the identified key road network concerns within the study area which is characterised by inadequate connectivity of minor and collector streets, poor road infrastructure conditions, low levels of service and inadequate geometric designs to ensure safe and appropriate levels of service. The assessment and proposals of infrastructure are described hereafter in accordance with the Traffic Forecasting Model Report.

5.1 STATUS QUO OF ROAD INFRASTRUCTURE

The road network in Zandspruit study area is characterised by:

- Few internal high-capacity roads. The capacity of these roads is constrained by frequent road intersections that are, in most cases, four way stops and less frequently controlled by working traffic signals. Many of these signals do not operate reliably.
- A limited number of access points from these internal roads to the surrounding road network. This results in traffic generated and attracted to the study area being funnelled into few intersections with the consequential congestion effects.
- Limited north-south and east-west road corridors through the study area, resulting in the internal roads having poor access to the external road network
- High-capacity roads on the periphery of the study area that carry high volumes of through traffic and study area traffic. The capacity of these peripheral roads is constrained by regular intersections that are controlled by traffic signals. These intersections are congested during peak periods.
- In the weekday morning peak period, the general direction of travel is eastward, i.e., towards Johannesburg and the surrounding employment nodes such as Fourways, Sandton, Randburg, Strydom Park and Johannesburg itself. This pattern is reversed in the afternoon peak period when the general direction of travel is westward.

5.2 TRANSPORT INFRASTRUCTURE GAP ANALYSIS

Although the higher order road network in the region seems to be well established to provide access to the study area and connect it to surrounding major economic nodes, the lower order road network within the study area is poorly developed. Based on desktop assessment of the road and street network, site investigations, data collected and analysed and stakeholder engagement workshops, the gap analysis is detailed in Table 5-1.

Table 5-1: Study Area Infrastructure Gaps

STUDY AREA INFRASTRUCTURE GAPS	
Mobility and Accessibility Infrastructure	1. The existing arterial or higher order road network is not well developed for the movement of goods, people and services. 2. Although the arterial roads are supplied, high levels of congestion indicate capacity problems with the network. 3. There is poor connectivity of minor arterials and collector streets for both the east-west and north-south movements within the study area. The network stifles mobility, making it difficult to enter and exit the study area. This is largely due to a limited supply of minor arterials to allow for through movement between various activity nodes and increase connectivity to major and principal arterial roads. 4. The existing minor arterial routes, such as Boundary Road, Aureole Avenue and Olievenhout Avenue have poor geometric design characteristics, which limits the increased future functional purpose. These roads most likely require a full re-design, not just repairs (issues of increased rainfall amounts and increased flood events that can be anticipated by City's climate models, which should inform re-design). 5. The overall road network, at regional and study area scale, does not accommodate the different transport users in a universally accessible and integrated manner. 6. Poor maintenance of road verges and pavement structures. 7. Existing roads' infrastructure cannot accommodate developments under construction or any new developments. 8. Traffic signals are in a bad state of repair and not operable to support existing or future traffic demand. 9. Timing of the construction of both PWV 3 and 5 and the impact on the study areas.
Public Transport Network and Facilities	1. Lack of well designed and developed PT facilities, inclusive of ranking facilities and passenger facilities such as shelters, benches, ablutions and lighting. 2. Sheltered public transport stops and taxi laybys along roads. 3. Inadequate supply of formalised multi-modal public transport facilities. 4. Most PT routes roads have narrow road cross-sections with no paved shoulders. 5. Road and street geometry do not support the introduction of bus services into the study area. 6. No bus transport facilities in the study area. 7. Timing of Gautrain extension to Cosmo City.
NMT	1. Insufficient NMT infrastructure in the vicinity of and routes leading towards schools. 2. 90% of the streets within the study area have no pedestrian sidewalks. 3. No cycle lanes or paths to support or stimulate cycle movement. 4. Most street crossings are unsafe. 5. Insufficient links to social infrastructure.
Metered Taxi	1. No metered taxi holding areas

5.3 INFRASTRUCTURE OBJECTIVES

A desirable road network aims to provide commuters with enhanced access to economic nodes, reduced travel journey times and high riding comfortability. The road network plan is informed by various management systems within the city and country, e.g., the JRA Code of Procedure, TRH 26 Guideline [11] as well as the CoJ Complete Street Design Guidelines [9] to provide an efficient road network. The CoJ built upon the Road Infrastructure Strategic Framework for South Africa (RISFSA) Road Classification System and further categorized streets into broader typologies that take into account pedestrians, cyclists, public transport and land use and environmental factors.

The JRA Code of Procedure [12] prescribes Standard Operating Procedures (SOPs) to analyse, mitigate and monitor issues pertaining to road network connectivity and mobility, while TRH 26 stipulates criteria for road classes and their respective acceptable vehicle volumes. The Complete Street Design Guideline [9] encompasses global strategies needed to ensure an integrated harmonic road network.

In terms of road networks, the guidelines have the following collective objectives:

- Enhance the flow of transportation on roads and improve the capacity.
- Integrate land use and transport.
- Augment and maintain the safety of all road users.
- Provide equality for all road users (pedestrians, cyclists and motorists).
- Provide efficient use of scarce resources.
- Ensure planning certainty for property developers.
- Increase social benefits.
- Conserve environmental quality.
- Provide economic benefits.

5.4 EXISTING ROAD HIERARCHY

The detailed road network hierarchy and associated issues was provided in the Status Quo Report. The roads supporting the internal road network and bordering mobility for the study area, are summarised in Table 5-2 below

TABLE 5-2: EXISTING ROAD HIERARCHY AND LANE CONFIGURATIONS

Road Name	Current Road Class	Current Configuration
R114	2 Major Arterial	2-Lane Single Carriageway
Beyers Naude Drive (M5)	2 Major Arterial	4-Lane Dual Carriageway
Malibongwe Drive (R512)	2 Major Arterial	4-Lane Dual Carriageway
Marina Street (M67)	2 Major Arterial	2-Lane Single Carriageway
Northumberland Avenue (R564)	2 Major Arterial	4-Lane Dual Carriageway
Aureole Avenue	3 Minor Arterial	2-Lane Single Carriageway

Boundary Road	3 Minor Arterial	2-Lane Single Carriageway
South Africa Drive	3 Minor Arterial	4-Lane Dual Carriageway
Angola Avenue	4 Collector Street	2-Lane Single Carriageway
Brazil Avenue	4 Collector Street	2-Lane Single Carriageway
Central African Republic Avenue	4 Collector Street	2-Lane Single Carriageway
Constantia Street	4 Collector Street	2-Lane Single Carriageway- Gravel Road
Eureka Street Inclusive of future extension to Constantia Street I	4 Collector Street	2-Lane Single Carriageway
Honeydew Road	4 Collector Street	2-Lane Single Carriageway
Jubilee Road and linked to South Africa Drive and Marina Street	4 Collector Street	2-Lane Single Carriageway
Juice Street	4 Collector Street	2-Lane Single Carriageway
Northgate Street	4 Collector Street	2-Lane Single Carriageway
Olievenhout Avenue	4 Collector Street	2-Lane Single Carriageway- Gravel Road
Russia Avenue	4 Collector Street	2-Lane Single Carriageway
Slovenia Street	4 Collector Street	2-Lane Single Carriageway
Spionkop Ave	4 Collector Street	2-Lane Single Carriageway - Gravel Road
Tanzania Ave	4 Collector Street	2-Lane Single Carriageway
Tennessee Avenue	4 Collector Street	2-Lane Single Carriageway
Ukraine Street	4 Collector Street	2-Lane Single Carriageway
United States of America Ave	4 Collector Street	2-Lane Single Carriageway
Valley Road	4 Collector Street	2-Lane Single Carriageway - Gravel Road

The road network described above is shown spatially in Figure 5-1 below.

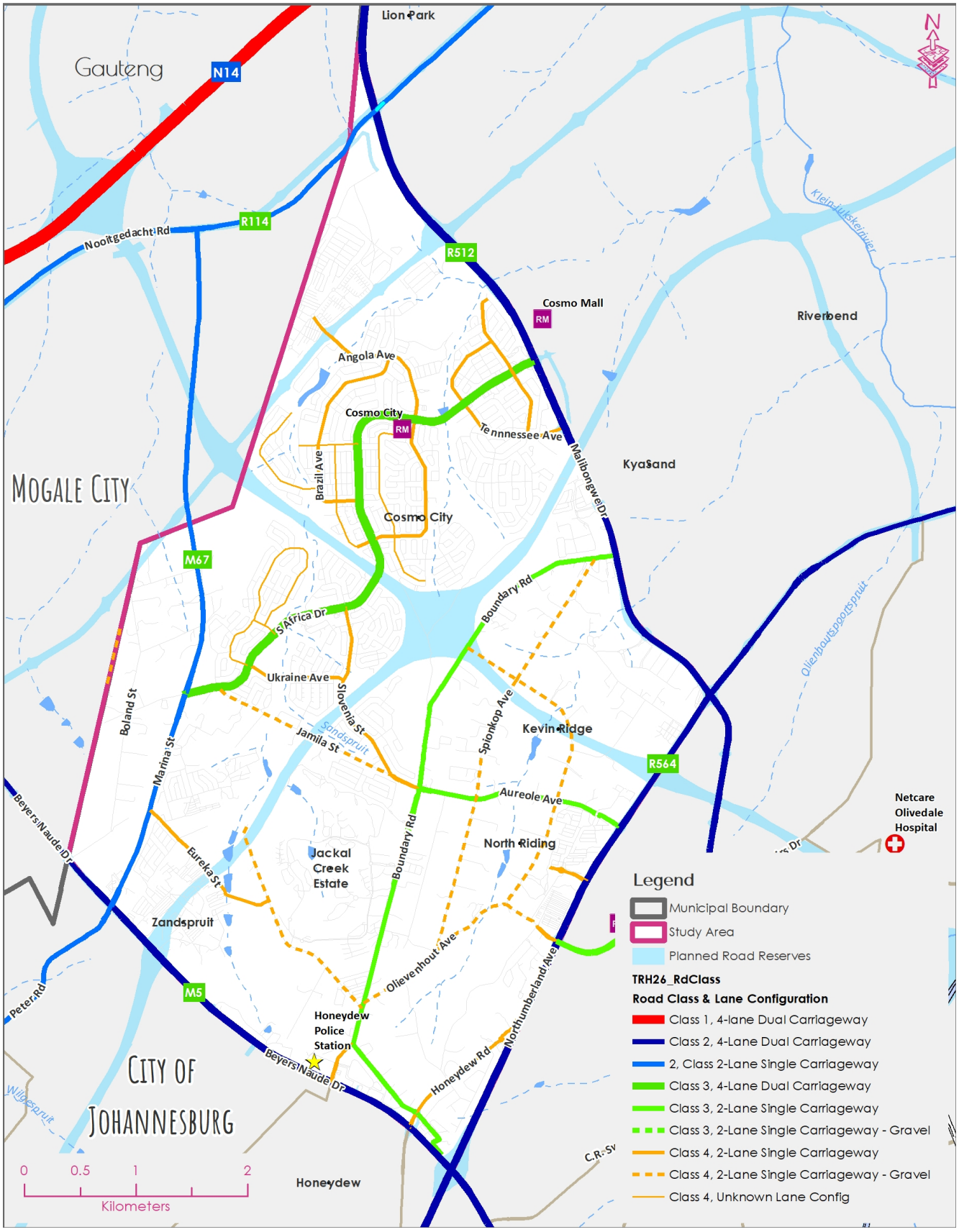


Figure 5-1: Existing Road Network Hierarchy

5.5 PROPOSED INFRASTRUCTURE PROVISION TO ALLEVIATE CONGESTION MOVING INTO THE FUTURE

A more comprehensive and complete road network in the southern sector of the Zandspruit Study Area is proposed as shown in Figure 5-2.

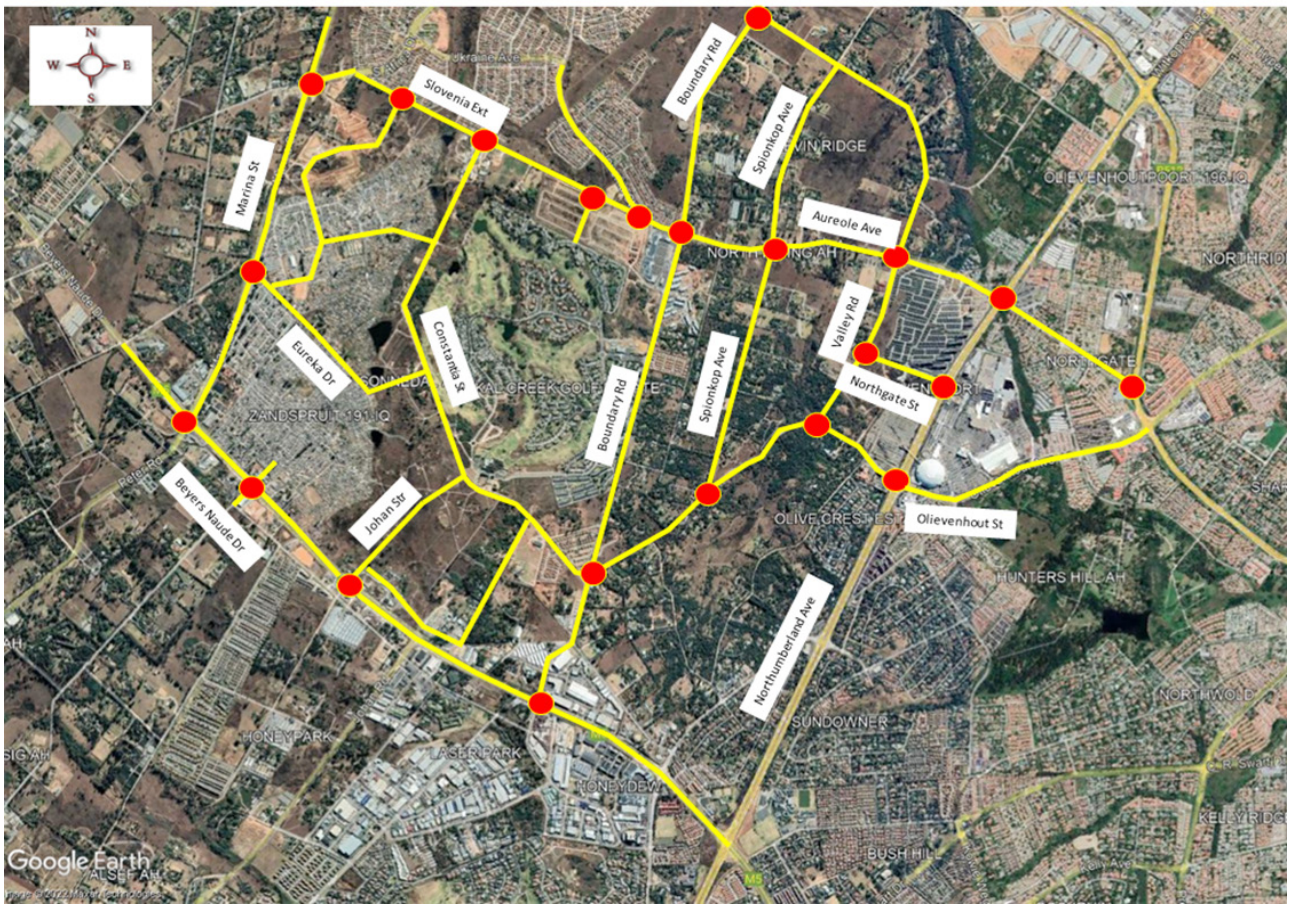


Figure 5-2: Proposed Road Network for Zandspruit Southern Sector

The three key characteristics of the proposed southern sector road network are:

1. The development of Constantia Street as a spine road between Boundary Road in the south and the extension of Slovenia Avenue. The motivation for this link is that it provides much needed north-south connectivity within the study area, especially for the Zandspruit Phase II Township. Constantia Street is an existing gravel roadway that runs from Boundary Road along the western edge of the Jackal Creek Golf Estate. It is proposed that this road is upgraded and would run adjacent to the PWV 5. This may introduce design considerations that need to be addressed. It is also known that the Gautrain track alignment in this area also need to be taken into consideration.
2. Aureole Avenue is extended westward along Jamilia Street to intersect with South Africa Drive in the vicinity of Marina Street. This would provide critical east-west linkage across the study area. However, it would require the upgrading of Aureole Avenue and Slovenia Street from Northumberland to the Ukraine Street intersection. All the intersections along Aureole Avenue would require upgrading to allow for left slip lanes and right turn lanes. It is important to note that the proposed Gautrain Cosmo City Station is located close to the Aureole / Northumberland intersection (on the western side of Northumberland Ave).

3. The upgrading of Boundary Road between Beyers Naude Drive in the south and Malibongwe Drive in the north, including the intersection with Aureole Avenue. This link would provide a continuous north-south link across the study area. This road corridor is also necessary for the anticipated developments in the Kevin Ridge area, i.e., in the area to the east of Boundary Road between Aureole Avenue and Malibongwe Drive.

Access into the new township from Constantia Street would be provided via Eureka Drive and Amanzi Street. The design of these links would also need to be considered in the context of the PWV 5 and Gautrain track.

Other key features of the proposed road network are:

1. The connection of Aureole Avenue (east of Northumberland) to Malibongwe Drive (as described in the Do Minimum network). Aureole Avenue currently is a cul-de-sac east of Northumberland Avenue. Creating a new intersection with Aureole Avenue and Malibongwe Drive would create a continuous east-west corridor between Marina Street in the west and Malibongwe Drive and more evenly distribute current trips using Beyers Naude and Malibongwe Drives.

2. The upgrading of Spionkop and Valley Streets between Boundary Street in the south and Boundary Road in the north. These links currently exist as low-capacity gravel roads providing access to individual properties. However, the proposed development of Kevin Ridge requires these roads to be upgraded and provide alternative north-south linkages. They would also provide access onto Northumberland Avenue and act as alternative access routes to the Aureole connection. The linkage from Valley Street to Olievenhout Avenue creates a further connectivity from the study area to Malibongwe Drive.

3. The upgrading of all the four way stops along South Africa Drive be replaced by traffic signals to increase their capacity and increase the flows along this important corridor.

5.6 PROPOSED NEW CORRIDOR DESCRIPTIONS AND CROSS-SECTIONS AS WELL AS INTERSECTION LAYOUTS

This section provides the details of the cross sections and intersection layouts on the two main corridors in the study area, i.e., the Aureole Avenue corridor and the Boundary Road corridor. These are the two key corridors that require the most urgent implementation to improve efficiencies in the network, with the Aureole Avenue corridor being the more important, especially the sections between Malibongwe Drive in the east and Boundary Road in the west.

5.6.1 AUREOLE AVENUE CORRIDOR: REQUIRED ROAD CROSS SECTIONS AND INTERSECTION LAYOUTS

In Figure 5-3 to Figure 5-5, the required road cross-sections of the Aureole Avenue corridor upgrade as per the required 2027 network are presented. The cross sections and intersection upgrades are shown in three sections as follows:

Malibongwe Drive to Northumberland Avenue (eastern section).

- Northumberland Avenue to Boundary Road (central section).
- Boundary Road – Marina Road (western section).

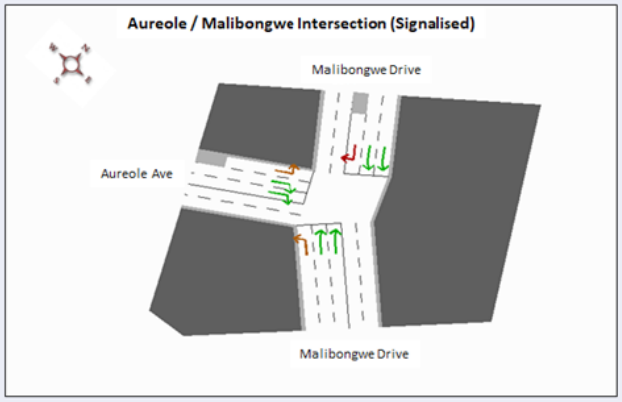
5.6.1.1 MALIBONGWE DRIVE TO NORTHUMBERLAND AVENUE (EASTERN SECTION).

The eastern section of the corridor lies between Malibongwe Drive and Northumberland Avenue. The section is 900 m in length. At the moment, Aureole Avenue is a single lane per direction on this eastern section and is a cul-de-sac before Malibongwe Drive. While a single lane per direction is adequate to accommodate the anticipated demand, widening is required at the intersection to allow for two through lanes and turning lanes as per the diagrams in Figure 5-3.

Creating an alternative access point from the study area onto Malibongwe Drive would divert some traffic from the congested intersection of Malibongwe Drive and Northumberland Avenue. Several issues would need to be addressed in the detailed feasibility assessment of this section:

- Several properties on this section of Aureole Avenue have direct access onto the roadway. This section of roadway is expected to carry about 900 PCU's per hour in the peak direction during the weekday morning peak hour in 2027, and approximately 1 600 PCU's per hour in both directions. This is a significant volume of traffic, and the safety and accessibility issues should be carefully considered.
- The proposed new signalised intersection of Aureole Avenue and Malibongwe Drive is only 200 m from the existing Olievenhout Avenue / Malibongwe intersection. The suitability of this short spacing will require special attention as the traffic volumes on this section of Malibongwe Drive are very high during peak periods.
- There are two minor traffic circle intersections on Aureole Avenue in this section (Montrose Avenue and Profit Road crossroads) and both will require a capacity investigation. Widening may be required at these intersections to allow for right turning lanes on Aureole Avenue.

Route: Aureole Avenue Corridor	Eastern Section	Description and Comment
Aureole Avenue (East)	Malibongwe Drive – Northumberland Ave	**Existing cul-de-sac single lane link between Malibongwe and Northumberland Avenue upgraded to accommodate two through lanes and turning lanes at the intersections**. Design required for Aureole / Malibongwe intersection as per diagram and revised intersection at Aureole and Northumberland Ave.



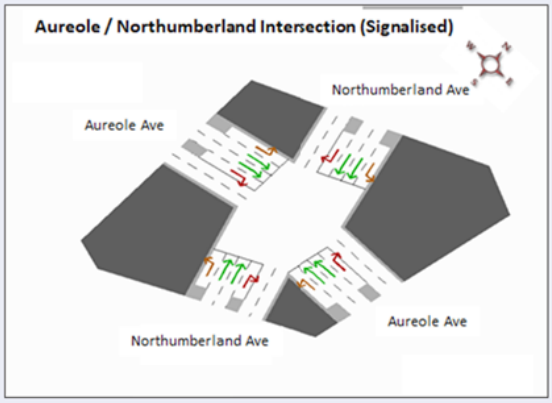
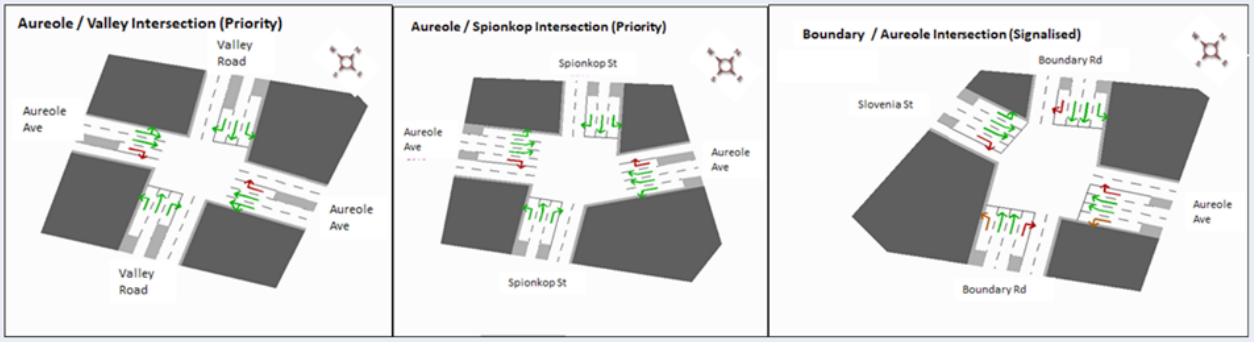


Figure 5-3: Cross-Section Upgrade Descriptions of Aureole Avenue between Malibongwe Drive and Northumberland Avenue (Eastern Section)

5.6.1.2 NORTHUMBERLAND AVENUE TO BOUNDARY ROAD (CENTRAL SECTION).

The central section of the Aureole corridor runs between Northumberland Avenue and Boundary Road and is approximately 1,90 km in length. Currently it is a low-capacity surfaced road with a single narrow lane per direction. It also has a low-level small river crossing and steep gradients. It is anticipated to carry 1 900 PCU's per hour in the peak direction in the weekday morning peak hour in 2027, which requires two traffic lanes and widening at the intersections to accommodate right turning lanes and left slip lanes as shown in Figure 5-4. The 2027 AM peak hour two-way traffic demand on the roadway is approximately 3 600 PCU's per hour indicating high two-way demand on this section of the roadway and the four-lane cross-section configuration.

Route: Aureole Avenue Corridor	Central Section	Description and Comment
Aureole Avenue (East)	Northumberland Ave – Boundary Road	**Existing narrow single lane roadway upgraded to two lanes per direction between Northumberland and Boundary Road.** Intersections at Valley, Spionkop and Boundary Roads upgraded to allow for right turning lanes and left slip lanes as per following diagrams



Note: Proposed Cosmo City Gautrain station is located close to the Aureole / Valley Intersection. Consideration of station location and access requirements is required.

Figure 5-4: Cross-Section Upgrade Descriptions of Aureole Avenue between Northumberland Avenue and Boundary Road (Central Section)

The road reserve along its length appears to be approximately 25 m wide, although this needs to be confirmed in a feasibility study. The upgrading requirement for two lanes per direction may require a wider road reserve (especially at the Valley and Spionkop intersections) and the feasibility study will have to investigate this.

5.6.1.3 BOUNDARY ROAD – MARINA ROAD (WESTERN SECTION).

The cross-section of the western section of the Aureole Avenue corridor between Boundary Road and Marina Street is summarised in Figure 5-5. The section includes Slovenia Avenue and Jamila Road. Slovenia Avenue is a surfaced single lane per direction roadway that provides access for traffic from the Cosmo City residential extensions into the Aureole Avenue corridor. The section of Slovenia Avenue on the Aureole corridor to the west of the Boundary Road intersection is short (275 m) and it is this section that will require upgrading to two lanes per direction, with widening at the Boundary Road intersection to allow for two through lanes, a right turn and a left slip lane. The 2027 AM peak hour traffic demand on this section of Slovenia Avenue is 1 300 PCU's per hour, with similar volumes in the off-peak direction.

Route: Aureole Avenue Corridor	Western Section	Description and Comment
Slovenia Avenue (West) (including Jamila Roads)	Boundary Road – South Africa Drive	**Existing single lane roadway between Boundary and Slovenia Roads upgraded to two lanes per direction.** Jamila Road, currently a single lane gravel road upgraded to two lanes per direction to South Africa Drive. Intersection at Slovenia / Jamila Road and Jamila / South Africa Drive upgraded as per diagrams

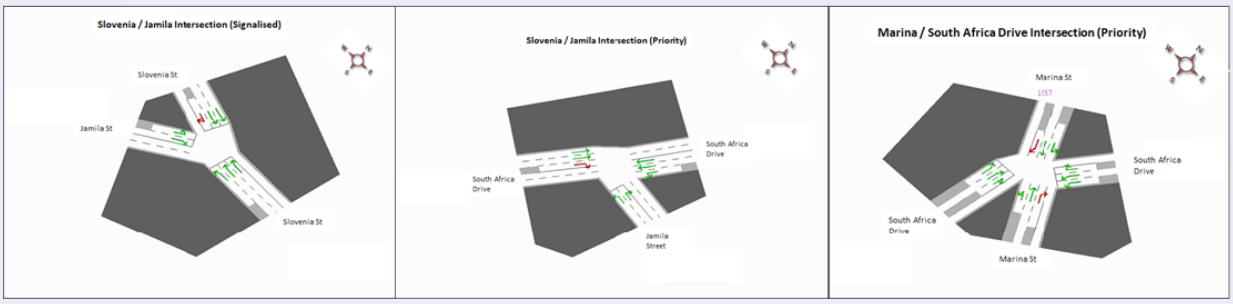


Figure 5-5: Cross-Section Upgrade Descriptions of Slovenia Avenue and Jamila Road between Boundary Road and South Africa Drive and Marina Street (Western Section

The intersection of Jamila Road and Slovenia Avenue is currently a priority junction with priority given to the Slovenia Avenue movements. Jamila Road is a low-capacity gravel road with a single lane per direction. This requires upgrading to a paved roadway with a single lane per direction. The 2027 AM peak hour peak direction traffic demand on this section is anticipated to be 500 PCU's per hour, with a similar volume in the off-peak direction. The intersection of Slovenia / Jamila will need to be signalised and widened to allow for right turn and left slip lanes as per the layout shown in Figure 5-5

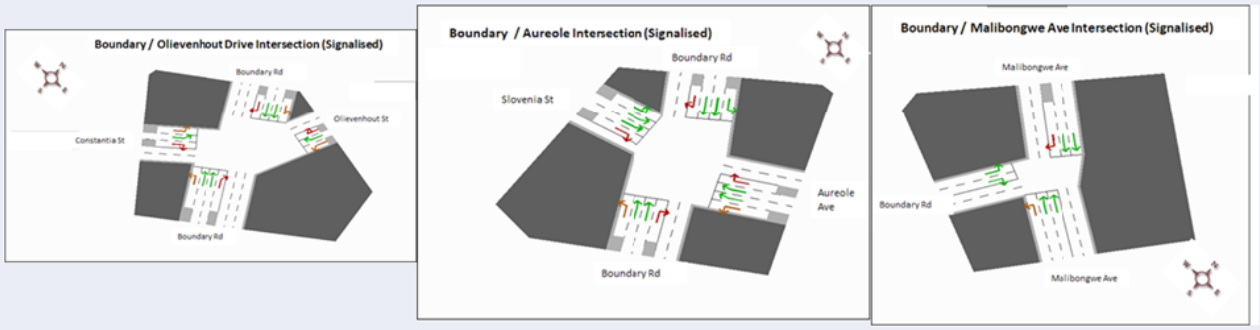
The intersection locations and layouts of Jamila Road / South Africa Drive and Marina Street / South Africa Drive will need investigation in the feasibility study or the corridor.

5.6.2 BOUNDARY ROAD CORRIDOR: REQUIRED ROAD CROSS SECTIONS AND INTERSECTION LAYOUTS

Boundary Road as a north-south corridor through the study area is a key component of the transport master plan. There are currently significant residential and retail land uses along its length (e.g., Jackal Creek Estate), and the development of the Kevin Ridge area that is anticipated over the next 10 years will add significantly to the traffic demand on the corridor. Boundary Road is required to have a cross-section of four traffic lanes along its total length as well as widening of the main intersections to allow for right turning lanes and left slip lanes as shown in Figure 5-6.

Boundary Road is currently an important north-south corridor through the study area, especially the section between Beyers Naude Drive in the south to Aureole Avenue. This section is paved with a single lane per direction with widening at the access intersections to Jackal Creek Estate and the neighbouring shopping mall (Jackal Creek Corner) at the intersection of Aureole Avenue and Boundary Road.

Route: Boundary Road Corridor	Section	Description and Comment
Boundary Road	Boundary Road between Beyers Naude and Malibongwe Avenue	**Existing single carriageway road upgraded to 2 lanes per direction between Beyers Naude Drive and Malibongwe Ave**. Revised intersection layout needed at Olievenhout Street, Aureole Avenue and Malibongwe Drive as per figures below.



Note: New developments alongside Boundary Road (north) in Kevin Ridge area will require careful consideration of property access locations.

Figure 5-6: Cross-Section Upgrade Descriptions of Boundary Road Corridor between Beyers Naude Drive and Malibongwe Drive

An important new intersection that will be required at the southern end of Boundary Road is with Constantia Street and Olievenhout Avenue (see Figure 5-6). Constantia Street will provide access from the new Zandspruit Phase II Township and Olievenhout Avenue will provide access for this traffic to the Aureole Avenue corridor and Northumberland Avenue via Spionkop Avenue and Valley Road. The current road links to Northumberland Avenue from Olievenhout Avenue (at the Dome Development) and Valley Road (at the Northgate Mall intersection) should be provided. Constantia, Olievenhout and Spionkop Roads are currently single lane (low capacity) gravel roads that will require upgrading to paved roads with a two-lane cross-section.

The northern section of Boundary Road between Aureole Avenue and Malibongwe Drive is also a paved roadway with a single lane per direction. Access into residential developments is provided off the roadway and no intersection widening, and right turn and left slip lanes have not been provided. The road reserve in this section appears to be very narrow (approximately 20 m), and the feasibility study would be required to investigate this with a view to providing a cross-section of four lanes as well as widening at access intersections for left slip and right turn lanes.

On its northern extent, Boundary Road passes through the light industrial area of Kya Sand that is located on the western side of Malibongwe Drive. The road reserve on this section is also narrow, putting into the question the requirements for a cross-section of four lanes. The widening of the Boundary Road approach to the Malibongwe Drive intersection is required to accommodate two right turn lanes and a left slip lane.

5.6.3 OTHER ROAD AND INTERSECTION UPGRADE

Several other intersections require upgrading by 2027 to accommodate the weekday AM and PM peak hour traffic demand. These are as follows:

- The Tennessee / Malibongwe Drive intersection requires signalisation and the layout as per the figure shown in Figure 5-7. This intersection currently operates as a three-way stop. This results in excessive delays for traffic on Malibongwe Avenue.

- The signalised intersection of Beyers Naude Drive / Marina Street intersection should be upgraded as per the configuration shown in Figure 5-8.
- Several key four way stop intersections along the South Africa Drive should be converted to signalised intersections. These are:
    - South Africa Drive / United States Avenue.
    - South Africa Drive / Tennessee Avenue.
    - South Africa Drive / Russia Avenue.
    - South Africa Drive / Ukraine Avenue.
- The R114 / Malibongwe Drive intersection that currently operates as a four-way stop should be signalised. This intersection was previously signalised and the existing lane configuration is adequate as shown in Figure 5-9.
- Even though the intersection spacing along Malibongwe Drive is considerable, the modelling process indicates that it will be worthwhile coordinating the signal offsets along the corridor to ensure the progression of the traffic along the corridor.
- The intersection of Rietvallei Road and Malibongwe Drive in the northern part of the study area. Rietvallei Road provides access into the Cosmo Industrial Park and new residential areas (north of Malibongwe Drive) as well as the new residential areas (south of Malibongwe Drive). The intersection requires signalisation and the layout is shown in Figure 5-10. The extension of Rietvallei road into the Cosmo City area, runs along the proposed K 56 future provincial road and engagements with the Gauteng province need to be commenced soonest.

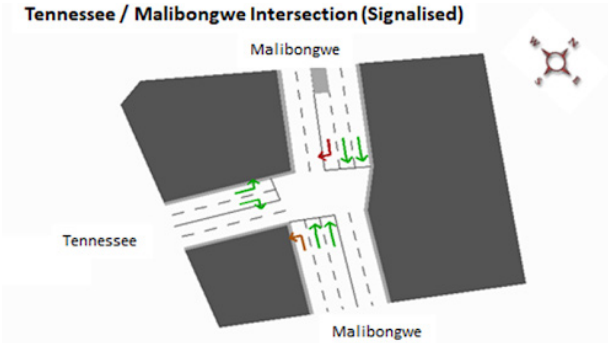


Figure 5-7: Lane Configuration of Signalised Intersection of Tennessee Avenue and Malibongwe Drive

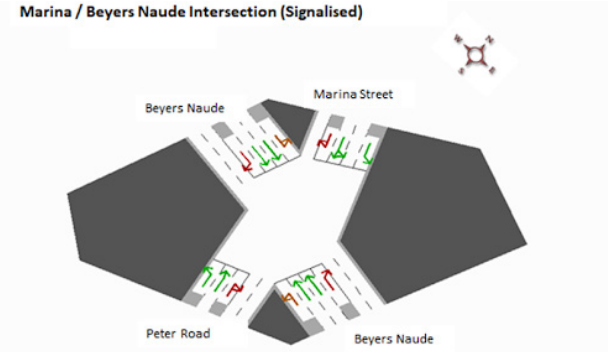


Figure 5-8: Lane Configuration of Signalised Intersection of Beyers Naude Drive and Marina Street

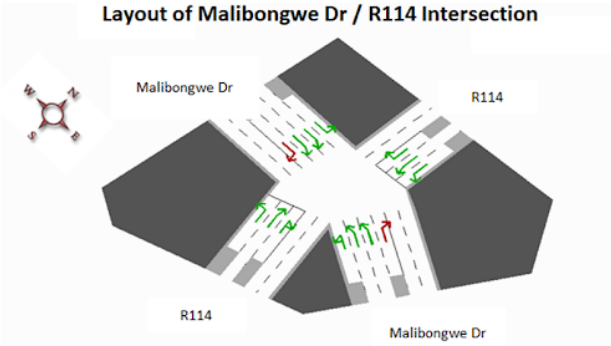


Figure 5-9: Lane Configuration of Signalised Intersection of Malibongwe Drive and R114

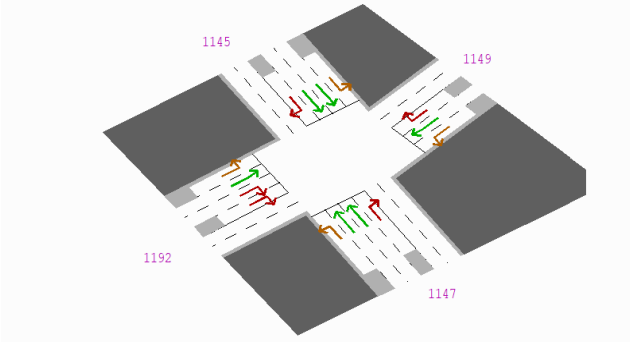


Figure 5-10: Lane Configuration of Signalised Intersection of Malibongwe Drive and Rietvallei Road

5.7 PROPOSED 2027 AND BEYOND CORRIDOR NETWORK AND LIMITATIONS IN TERMS OF PROPOSALS

The increases in roadway demand within the study area, are network wide, with pronounced increases on Constantia Street, Aureole Avenue, Boundary Road and South Africa Drive. The importance of these internal roads is made clear from Figure 5-11: Difference in Average AM Peak Hour Intersection Delays between 2027 and 2032, with all the main internal roads experiencing material increases in demand. There are also pronounced increases on the external roads, i.e., Malibongwe Drive, Beyers Naude Drive and Marina Street. Only Northumberland Avenue experiences small demand increases, and on some sections there are demand decreases.

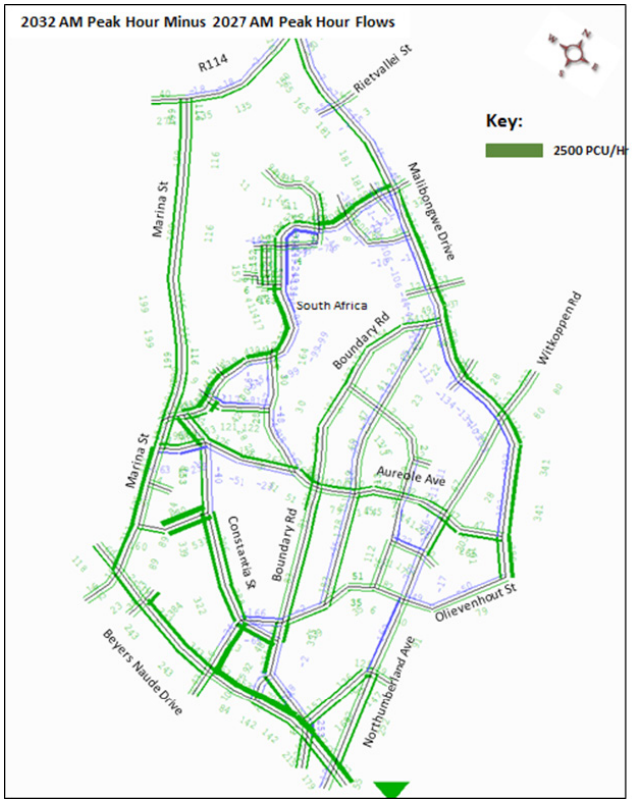


Figure 5-11: Difference in Average AM Peak Hour Intersection Delays between 2027 and 2032

At this concept stage, it is proposed that detailed feasibility studies be conducted to establish and quantify the details of integration (most importantly) and applying the CoJ Complete Street Guidelines, in developing the new corridors. Similarly, South Africa Drive will require substantial consideration of PT facilities and NMT infrastructure.

During the feasibility studies, the integration and additional requirements in terms of PT would need to be added to provide a sustainable transport system rather than just improvements of the street network.

Based on the modelling process performed, these corridor developments proposed are critical and have to be implemented within the next 10-years, as a minimum, to prevent stagnation of economic development and integration of public transport modes in the study area. Developments in the study area has a significant impact on the surround important movement corridors. The impact of the growth in trip and public transport needs, would result in a total assessment of the Malibongwe and Beyers Naudé corridors between the N14 and the N1 interchanges.

Substantial urgent engagements are required with all stakeholders responsible for the different national, provincial and metropolitan movement corridors and public transport operators.

The city would need to consider the outcome of the TMP when potential costs of these corridor developments provided to ensure timeous provision the in budgets of the city.

It should be noted that these proposed corridors are firstly to improve the mobility and accessibility in and to the study area. The implementation of the proposed corridors would enable the provision of public transport services in future.

5.8 MODE SHARE CONSIDERATIONS

Mode share variation has not been directly modelled by the SATURN model. The trip generation rates used in the various development traffic impact assessments (TIA's) have indirectly taken mode share into account. The vehicle trip generation rates used in these TIA's show a significant bias toward trips made by public transport. Mini-bus taxi services are the main public transport service providers to and from the study area.

To influence the car mode share in the study area toward the use of public transport will require significant public transport infrastructure and service interventions. Providing new bus services from the study area to the major nodes of employment to the east of the study area such as Randburg, Sandton and Johannesburg is unlikely to result in significant shifts from private car use to public transport.

Mode share studies that consider model shifts between the car and bus (including BRT) modes have shown that car users emphasise the importance of the travel time and transfer components of overall trip utility (and less so travel cost.) The provision of reduced public transport travel times to the employment areas of Randburg and Sandton that are attractive to car users is likely to be the Gautrain, and not BRT and bus services. The users of new bus and BRT services from the study area are likely to be current taxi users. A reduction in the number of minibus taxis on the road network will marginally improve congestion levels.

6. PUBLIC TRANSPORT CONSIDERATIONS AND OTHER SERVICES

Public Transport (PT) includes various transport services that are made available to the public such as commuter buses, passenger rail and taxis. In Zandspruit and the surrounding areas, the existing public transport modes comprise walking, cycling, minibus taxis, buses, metered taxis and e-hailing, with the minibus taxis being the dominant mode in terms of passenger volumes.

The existing public transport services and modes within the study area have several limitations and challenges with the key issues summarised as follows:

- Lack of integration across modes.
- Unsafe public transport practices (e.g., aggressive driver behaviour).
- Poor road network service levels resulting in travel delays.
- Limited public transport routes (IPTN network).
- Narrow road cross-sections along key public transport routes.
- Inadequate service design for scholars.
- Inadequate non-motorised transport infrastructure.

6.1 PUBLIC TRANSPORT SUMMARY OF STATUS QUO

Private car usage still dominates in the formal settlements, and the satisfaction rating with public transport and NMT facilities are significantly low. About 94% of the Jackal Creek and surrounding areas stakeholder group attendees use private cars as their main mode of transport. For Como City, 72% use their private cars, with the majority of the remaining share, belonging to minibus taxis 22% and only about 6% to walking. Zandspruit residents relied more on taxis as their main mode of transport (80%) and the remaining percentage was split equally between walking (10%) and private car (10%) usage. The taxi ridership in Cosmo City and Zandspruit is split between two types of vehicles, i.e., the typical MBT 15-seater and a 7-seater Avanza. The Avanzas are typically used within the study area, and therefore form a small percentage of the taxi share, which is just below 6% in both Cosmo City and Zandspruit. The MBTs, on the other hand, are used both within the study area and to access other parts of the Metro. There was no indication of a modal share for buses as a primary transport service in all three stakeholder groups. An expected outcome given the expressed concerns about the study area being underserved or not served at all by commuter buses. Of all the transport mode ratings, buses had the lower satisfactory ratings as a community service provider – metered taxis and e-hailing services were considered expensive.

6.1.1 PUBLIC TRANSPORT GAP ANALYSIS

It is evident that the prevalent public transport offerings in the study area do not present a viable alternative for private car trips, which are the single most significant contributor to traffic congestion and mobility issues in the area. Stakeholder engagement with the local community members also suggests a low satisfaction level with the public transport offerings and issues of quality public transport not being available where they live, or the available options being considered unsafe and unreliable.

Table 6-1: Study Area Transport Services Gaps

STUDY AREA TRANSPORT SERVICES GAPS	
Minibus Taxi and Facilities	1. Unsafe public transport practices (e.g., aggressive driver behaviour). 2. The existing road and streets networks are operating over capacity and affects passenger travel time. 3. Positive integration with other modes of transport such as BRT, Metrobus, and/or rail systems as opposed to seeking to replace them. 4. Lack of well designed and developed PT facilities, inclusive of ranking facilities and passenger facilities such as shelters, benches, ablutions and lighting. 5. Sheltered public transport stops and taxi laybys along roads.
Commuter Bus Service	1. The IPTN secondary network to be considered to reach into study area. 2. Inadequate supply of formalised multi-modal public transport facilities. 3. Road and street geometry do not support the introduction of bus services into the study area. No public transport routes (IPTN network). 4. No bus transport facilities in the study area.
Scholar Transport	1. In appropriate provision of drop-off and pick-up zones. 2. Unsafe practices with pupils being boarding and alighting in the traffic lanes. 3. No detailed route descriptions and schedules. 4. Inappropriate provision for NMT infrastructure. 5. No consideration for NMT transport, i.e., bicycles.

6.1.2 POLICY AND OBJECTIVES

CoJ Transport Department being responsible for transport planning, policy development, project implementation and transport services within the City, is mandated to address Outcome No. 2 of the Growth and Development Strategy (GDS) 2040 [16], quoted below:

"Provide a resilient, liveable, sustainable urban environment – underpinned by infrastructure supportive of a low-carbon economy."

The primary output defined under this outcome is "eco-mobility", which refers to environmentally sustainable and socially inclusive ways of local mobility, which combine the use of non-motorised transport with the use of public transport and light electric vehicles from renewable energy resources.

The CoJ SITPF 2013 [14] developed various transport strategies and programmes which are organised into nine thrusts, of which trust no. 2 is of importance:

"Thrust no. 2: Improve and expand provision of quality public transport and use of non-motorised transport."

6.2 INTEGRATION OF PUBLIC TRANSPORT

Accessibility (convenience) and integration are critical aspects of providing quality public transport that is attractive to road users. Public transport operations in Zandspruit and surrounding areas currently occur in isolation with no integration between different services.

Planning for integrated public transport provision needs to consider the coverage to extend the reach of public transport services as far as possible. It is recognised that uniform geographic coverage cannot always be achieved due to topography and land use considerations. Service coverage considers ease of access, proximity to households, consideration of the walking component of travel and the percentage of the households covered within a defined distance (Integrated Public Transport Service Planning Guidelines, 2013) [21].

6.2.1 POLICY FRAMEWORK

In the Final Report: Detailed Operational Plan for Metrobus [15], CoJ agreed on a growth and development strategy that aims to make walking, cycling and public transport the preferred choice by 2040. The Metrobus turnaround business plan completed in July 2013 sets out how the municipal bus system can play a role in the development of an integrated mass transport system. The plan outlines operational and contractual changes that will see Metrobus offering scheduled services under the management of the Scheduled Services Management Agency (SSMA). One of the key objectives is to provide new routes in areas that were in 2013 being dominated by minibus taxis that may be better suited for Metrobus.

Figure 6-1: The CoJ High-Level PT Network 2040 overleaf, illustrates the study area and the two bus routes that may be applicable in achieving the CoJ objectives, viz, route 12 and 15. However, from the status quo assessment, the O-D paired of the Cosmo – City is not towards Woodmead, but to Randburg and Jo'burg CBD. Route 15 will support the O-D pair for the Zandspruit area. The concern is that both these routes are not likely to attract the demand from passengers inside the study area as people may be against the transfer from the first mode of any trip to the bus mode as the last part of a trip. Also, turning movements need to be considered, particularly for route 15.

From the above and the findings from Section 5, the bus operational plan has to be urgently revised to accommodate options to enter the study area rather only a bus stop outside the study area. It is acknowledged that in 2013, Zandspruit and Cosmo City was largely underdeveloped, i.e., the demand on route 15 was between 5 000 and 8 500 passengers per hour per day (pphpd) and that for route 15 below 5 000 pphpd [15]. Route 12 is ranked 12th and route 15 is ranked 23rd from 26 routes in 2040, indicating low priority in serving the areas.

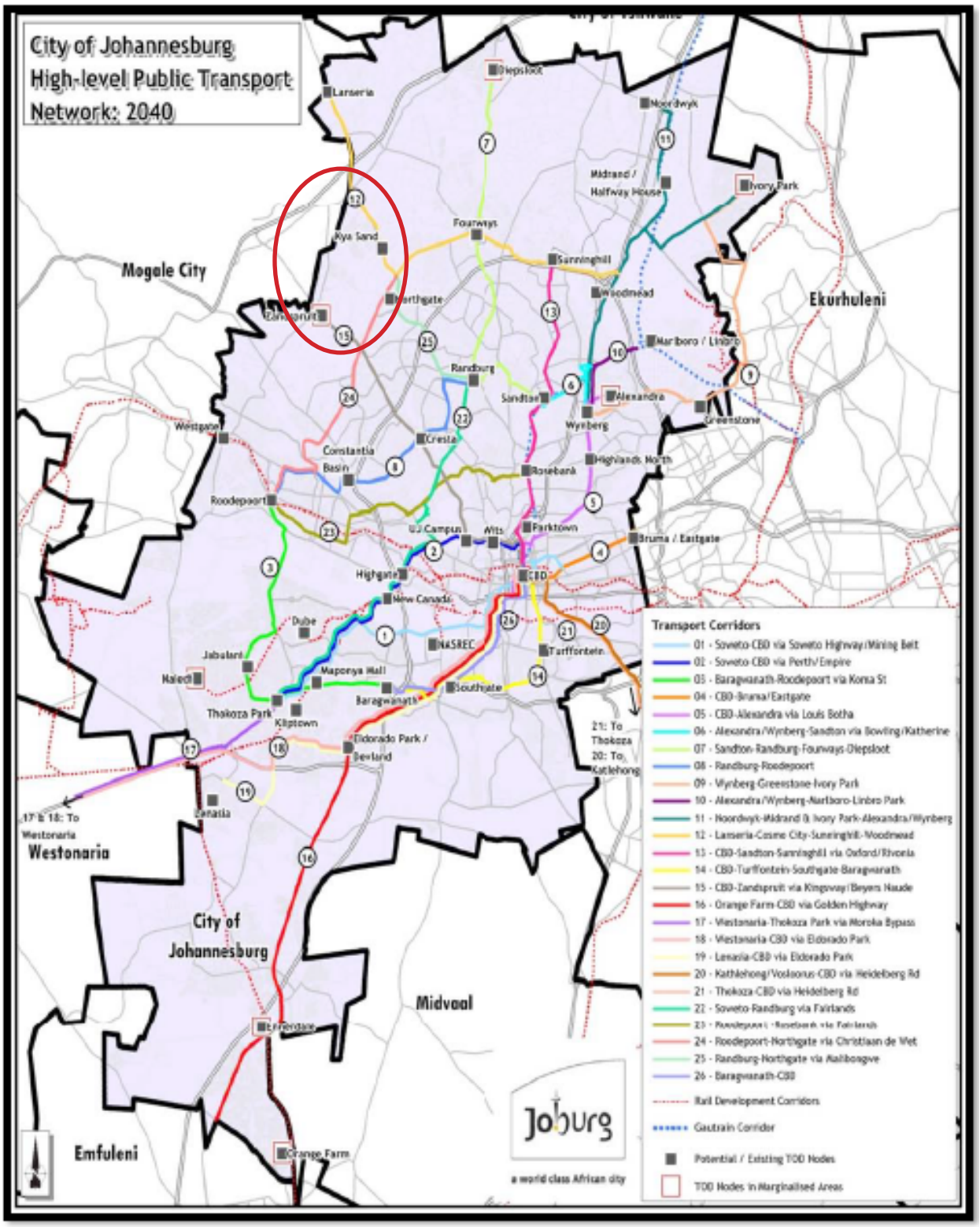


Figure 6-1: The CoJ High-Level PT Network 2040

6.2.2 INTEGRATED PUBLIC TRANSPORT NETWORK PLAN

Based on the status quo assessment and road network improvements as per Section 5, the following existing and future roads are identified as having moderate to high ridership potential based on current and projected traffic volumes. The highest demand for minibus taxi vehicle trips in the peak direction is observed on Slovenia St at 270 veh/hour. Research undertaken by Sampson (2017) [19] indicates that a multiplier factor of 3,75 may be used to estimate average daily traffic (ADT) using the AM peak traffic data. The highest daily minibus taxi trip demand is estimated at 1 013 veh/day. If it is assumed that each taxi trip travelling the peak hour direction is a 15-seater taxi, fully loaded, then the maximum daily passenger demand along Slovenia St is approximately 15 195 passengers per day per direction. This value indicates that for Base Year 2022, the main public transport corridors can be classified as moderate ridership corridors and require buses and minibus taxis as modes with public transport priority systems. None of the existing corridors have high ridership.

Based on this assessment, the following key public transport corridors where MBT and bus services are proposed, see Figure 6-2, are indicated as red routes:

1. Malibongwe Dr. (Class 2).
2. Beyers Naude Dr. (Class 2).
3. Northumberland Ave. (Class 2).
4. Marina St. (Class 2).
5. Proposed K56 Road (Class 2) (to be constructed in the future).
6. South Africa Dr. (Class 3).
7. Boundary Rd. (Class 3).
8. Aureole Ave. (and future extension along Jubilee St linking to Marina St.) (Class 3).

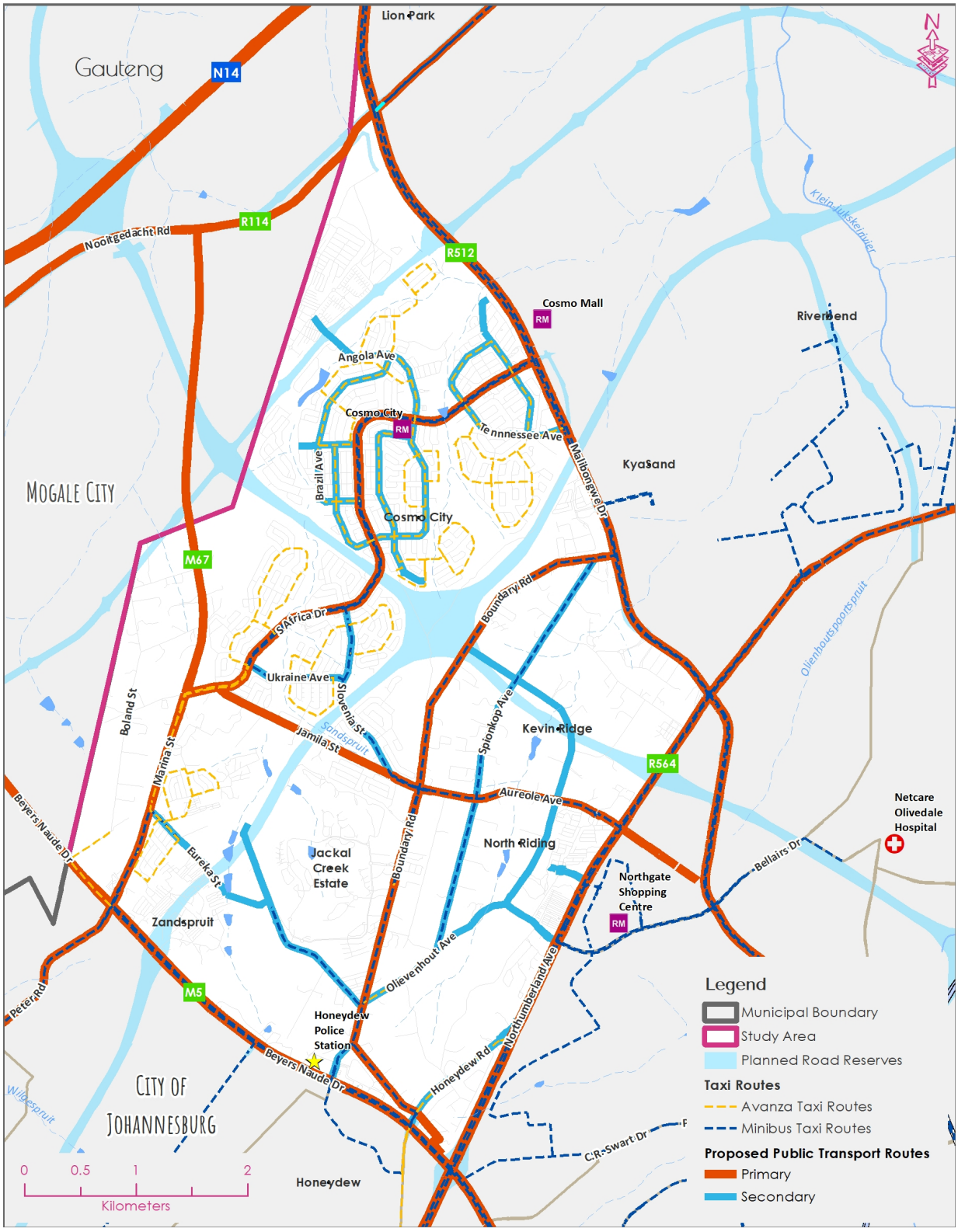


Figure 6-2: Proposed Primary and Secondary Public Transport Routes

The above-mentioned roads are recommended for upgrades and improvements that prioritise public transport services. These routes need to be considered in line with route upgrading to alleviate congestion, as presented in Section 4.2. These "main corridors", need to have the following PT facilities and NMT provision along Class 2 and 3 routes:

- Access to multi-modal public transport transfer facilities.
- Sheltered bus & taxi lay-bys at intervals that align with intersection spacing but not more than 1 000 m intervals, i.e., max 500 m walking distance to a bus / taxi stops.
- Exclusive public transport lanes (buses and taxis).
- Surfaced sidewalks considering universal access design principles on both sides. Where possible, the sidewalks need to be detached from the roadway.

Commuter bus services, such as PUTCO and Metrobus services should incrementally be expanded to service PT routes in accordance with the projected passenger demand, implementation of the required road network infrastructure upgrades and land use development. The following existing and future streets are identified as key public transport feeder routes to existing and future public transport routes and facilities (all these roads are Class 4 Collector Streets):

1. United States of America Ave.
2. Tennessee Ave.
3. Angola Ave.
4. Tanzania Ave.
5. Liberia St.
6. Brazil Ave.
7. Central African Republic Ave.
8. Russia Ave.
9. Slovenia St.
10. Spionkop Ave.
11. Valley Rd.
12. Olievenhout Ave.
13. Juice St.
14. Honeydew Rd. West.
15. Ukraine Ave.
16. Eureka St (and future extension to Constantia St linking to Boundary Rd).
17. Proposed New Street linking Marina St. to Ukraine Ave.
18. Proposed New Street linking Ukraine Ave to Eureka St.

Proposed New Street linking Eureka St. to Beyers Naude Ave (Mobius Rd). These "supplementary routes", need to have the following PT facilities along Class 3 routes) see Figure 6-2:

- Access to multi-modal public transport transfer facilities.
- Sheltered bus & taxi lay-bys at intervals that align with intersection spacing but not more than 1 000 m intervals, i.e., max 500 m walking distance to a bus / taxi stops.
- Surfaced sidewalks considering universal access principles on both sides. Due to limited road reserve of the above streets, the sidewalks may need to be attached to the roadway.

Some of the above-mentioned streets may require formalisation of informal trading stalls to encourage true mixed-use and inclusive activity corridors. It is recommended that these routes continue to be serviced by minibus taxis, metered taxis and e-hailing modes.

6.2.3 INTEGRATED PUBLIC TRANSPORT NETWORK PROJECTS

Based on the proposed road infrastructure and public transport network for the study area, several projects to develop the network to be at an adequate standard for the expansion of public transport services to serve the study area have been identified and prioritised as detailed in Table 6-2 below. A spatial representation of the projects is shown in Figure 6-3.

PROJECT NUMBER	PROJECT TYPE	PROJECT DESCRIPTION	PRIORITY / TIMEFRAME
PTN 001	Design & Implementation	Upgrading of intersection controls to signalized and coordinated with pedestrian phases on South Africa Drive.	0 – 3 years
PTN 002	Feasibility Study	Detailed feasibility assessment on proposed road upgrades for Aureole Avenue	0 – 3 years
PTN 003	Feasibility Study	Detailed feasibility assessment on proposed road upgrades for Boundary Road	5 – 10 years
PTN 004	Design & Implementation	Detailed Feasibility study on the IPTN and buses being the anchor of the primary public transport corridors.	0 – 3 years
PTN 005	Feasibility Study	Detailed feasibility assessment for provision of exclusive public transport lanes on Malibongwe Drive	> 10 years
PTN 006	Feasibility Study	Detailed feasibility assessment for provision of exclusive public transport lanes on Beyers Naude Drive	> 10 years

Zandspruit TMP
Public Transport Corridors

Zandspruit Transport Master Plan

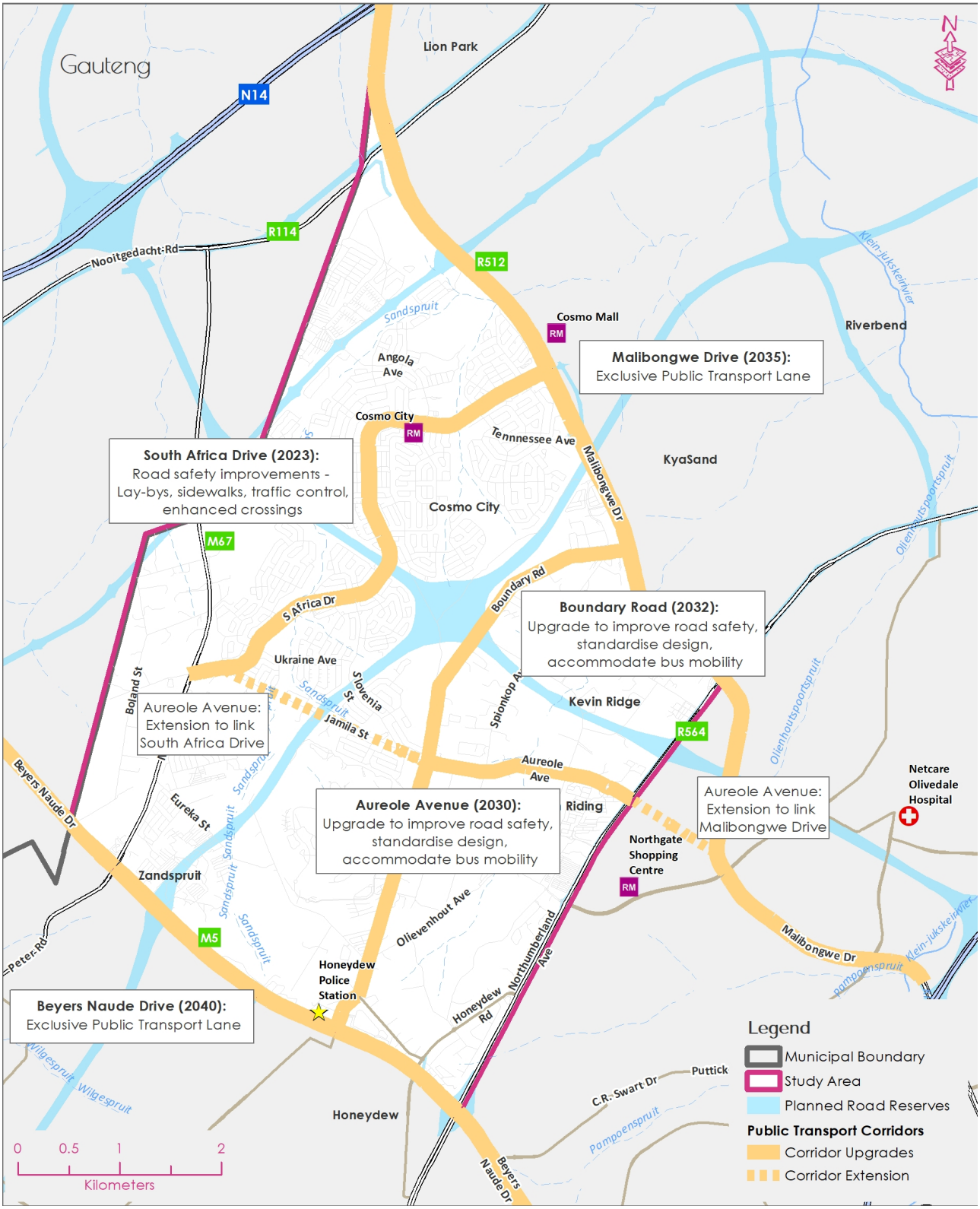


Figure 6-3: Proposed IPTN Projects

6.3 MINIBUS TAXI (MBT) PUBLIC TRANSPORT FACILITIES

6.3.1 POLICY FRAMEWORK

There are several formal and informal taxi rank facilities within the study area as detailed in the Status Quo report and although detailed taxi ranks surveys were not undertaken as part of data collection. So recommendations for improving the existing facilities have been undertaken based on satellite imagery, public transport trip demand and patterns and proposed strategies by the CoJ SITPF 2013 [14]. All proposed upgrades and improvements for public transport facilities will require detailed capacity assessments to inform the number of loading bays as well as additional space required to accommodate different transport modes including MBT, buses, metered taxi and scholar transport.

6.3.2 PUBLIC TRANSPORT FACILITIES PLAN

Improving the public transport facilities will make these more accessible, safe and attractive. Research has found that people tend to be sensitive to the general condition of PT waiting areas such as at ranks and stops (TDM Encyclopedia, 2021) [22]. This means poor quality ranks and stops deter people from using public transport. The following measures are proposed to improve public transport stops and facilities in the study area:

- Create / upgrade ranks and stops that are comfortable, clean, attractive and safe, with seating.
- Provide sheltered stops to protect against adverse weather (rain, hot weather, dust, splashes).
- Provide convenient user information, including route, frequency and fare information at ranks and stops.
- Provide local wayfinding to help passengers travel through ranks (particularly at the larger public transport facilities).
- Provide appropriate and safe pedestrian access, including convenient and safe crossing of busy roads, and pedestrian shortcuts where appropriate. Ensure that ranks and stops incorporate Universal Access design principles.
- Where appropriate, provide formal trading stalls and create public street markets to encourage recreational walking and socialising.
- Providing security visibility and emergency response. This may be achieved by strategically locating stops close to other services and activities where security personnel are often provided such as shopping centres, schools and commercial and social facilities.

6.3.3 Public Transport Facilities Projects

The following projects presented in Table 6-3: Informal PT Facilities to be Upgraded, are proposed concerning informal ranks in the study area.

It is important to note that all the identified potential sites for development into formal public transport facilities will require further investigations to determine their environmental and economic viability.

Table 6-3: Informal PT Facilities to be Upgraded

FACILITY NAME AND CURRENT PURPOSE AND CONFIGURATION	SURROUNDING LAND USE ACTIVITIES	IMPROVEMENT STRATEGY
Ukraine Informal Rank (Cnr South Africa Dr and Ukraine Ave) Holding, off street	• Residential • Education • Intuitional (Church) • Recreational • Informal Trading	Upgrade to formal scholar transport and MBT holding facilities with adequate parking bays, signage and universal access.
Brazil Informal Rank (Cnr South Africa Dr and Brazil Ave) Holding, on-street	• Residential • Commercial & Retail • Informal trading	Consolidate the informal facilities along Brazil Ave into one facility and upgrade to formal scholar transport and MBT holding facilities on the vacant land near Cosmo City West Primary School and Tirisano Mmogo Primary School.
Australia Informal Rank (Cnr Brazil Ave and Australia Ave) Holding & Loading	• Residential • Commercial & Retail • Informal trading	Consolidate the informal facilities along Brazil Ave into one facility and upgrade to formal scholar transport and MBT holding facilities on the vacant land near Cosmo City West Primary School and Tirisano Mmogo Primary School.
Angola Informal Rank (Cnr Angola Ave and S. Africa Dr) Holding and Loading, on-street	• Education (near three public schools) • Social • Commercial & Retail • Residential • Informal trading	Upgrade to formal scholar transport and MBT holding facilities with adequate parking bays, signage and universal access.

FACILITY NAME AND CURRENT PURPOSE AND CONFIGURATION	SURROUNDING LAND USE ACTIVITIES	IMPROVEMENT STRATEGY
Malibongwe Informal Rank (Cnr S. Africa Dr and Malibongwe Dr) Holding & Loading, off-street	• Residential • Education • Commercial & Retail • Services • Informal trading	Migrate operations to the existing Cosmo City Public Transport Facility by improving access to the facility. New direct access off South Africa Dr. recommended. Upgrade facility to multi-modal facility that facilitates transfer between MBT, Metrobus, PUTCO and future Rea Vaya/ BRT Lite services.
Honeydew Informal Taxi Rank (Cnr Honeydew Rd W and Beyers Naude Dr) Holding, off-street	• Commercial & Retail • Business and Offices • Industrial • Institutional • Residential • Recreational	Consolidate the Honeydew and Northumberland informal facilities and operations. Identify suitable land nearby and upgrade to formal multi-modal public transport facilities that facilitates transfer between MBT, Metrobus and PUTCO services.
Northumberland Informal Rank (Cnr Beyers Naude Dr and Northumberland Ave) Holding and Loading, off-street		

The upgrade proposals for the current formal public transport facilities are presented in Table 6-3.

Table 6-4: Formal PT Facilities Upgrade Proposals

FACILITY NAME	SURROUNDING LAND USE ACTIVITIES	IMPROVEMENT STRATEGY
Zandspruit Public Transport Facility	• Residential • Education • Informal Trading	Retain facility and upgrade the surrounding network to cater improved access by pedestrians. Integrate with informal trading activity and provide formal trading stalls. Make allowance for metered taxi holding facilities.

FACILITY NAME	SURROUNDING LAND USE ACTIVITIES	IMPROVEMENT STRATEGY
Cosmo City Public Transport Facility	• Education (near three public schools) • Social • Commercial & Retail • Residential • Informal trading	Migrate operations to the existing Cosmo City Public Transport Facility by improving access to the facility. New direct access off South Africa Dr. recommended. Upgrade facility to multi-modal facility that facilitates transfer between MBT, Metrobus, PUTCO and future Rea Vaya/BRT Lite services.
Cosmo Mall Taxi Rank	• Residential • Education • Commercial & Retail • Services • Informal trading	Retain facility and encourage additional space to be allocated as holding facilities for metered taxis.
Northgate Taxi Rank	• Commercial & Retail • Business and Offices • Industrial • Institutional • Residential • Recreational	Retain facility and encourage additional space to be allocated as holding facilities for metered taxis.

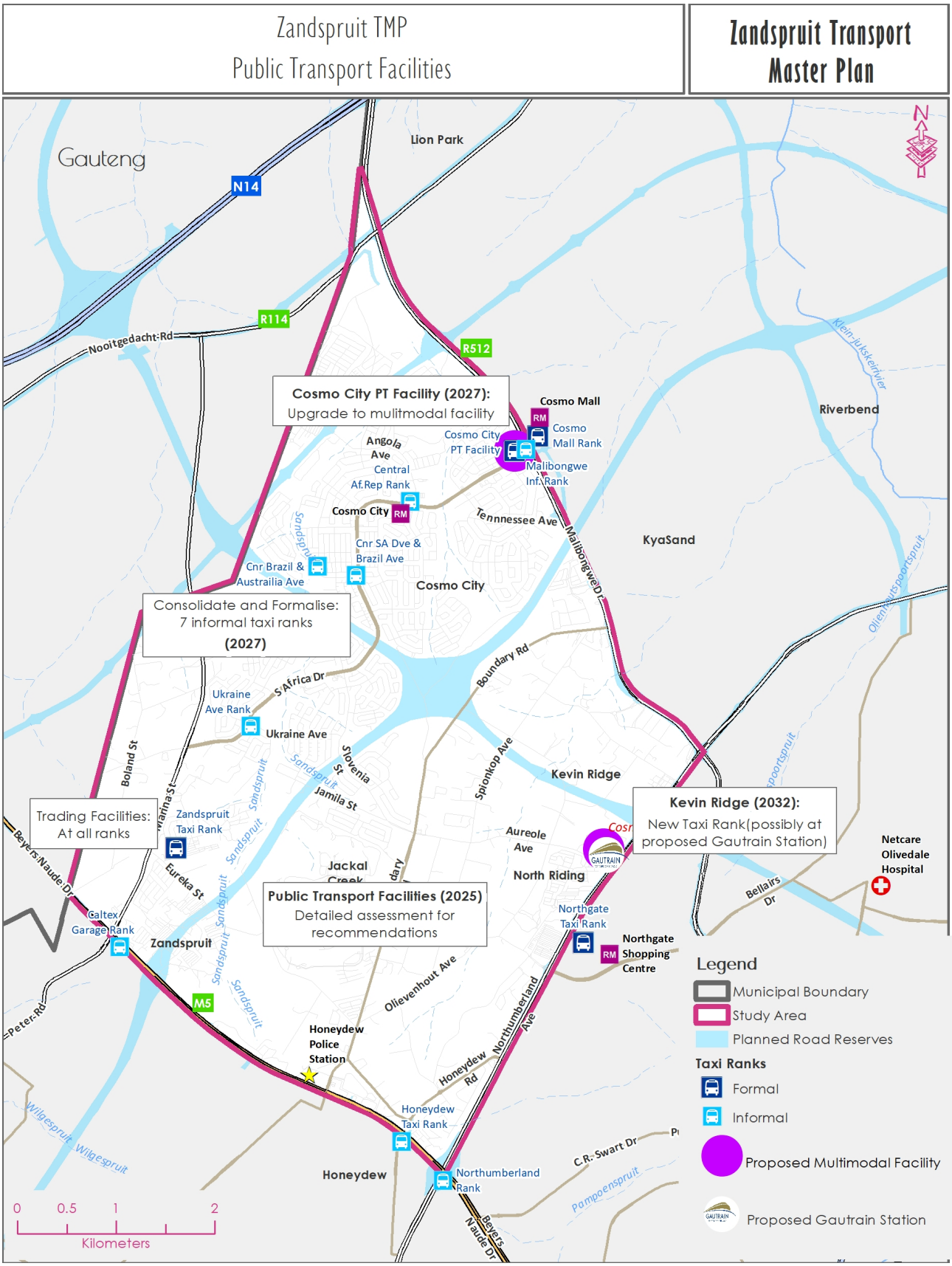


Figure 6-4: Proposed Public Transport Facilities Projects

6.4 METERED TAXI SERVICE AND E-HAILING

6.4.1 POLICY FRAMEWORK

Metered taxi and e-hailing transport modes provide an alternative mode choice to Single Occupancy Vehicles (SOV's) and are important for the operation of 'last-mile' travel for road users and provide a direct and convenient mode to connect people to their end destinations from public transport facilities. The primary objective for supporting these modes is to provide road users with various mode choices. There is a currently a lack of facilities that support e-hailing and metered taxi operations within the study area, with the closest metered taxi ranks servicing the area located at the Lanseria International Airport and North Gate Mall, which are both privately own facilities. Operators are faced with the challenge of having to negotiate for operational space with private property owners, particularly at shopping malls. It is understood that a new metered taxi rank can only be established through a formal application and approval process overseen by the CoJ and JRA. The existing system for metered taxi operations is summarised as follows:

- Metered taxi companies or associations operating in the study area are affiliated to the Johannesburg Metered Taxi Council, which in turn is affiliated to the Gauteng Metered Taxi Council (GMTC) which falls under the South African Metered Taxi Council.
- A metered taxi operator must first register with a company or association affiliated with the Johannesburg Metered Taxi Council prior to applying for a public transport operating permit from the GDRT. There must be an operating permit for each vehicle which contains an annexure setting out the rules, regulations and conditions of operation for the designated rank
- The driver of a metered taxi must have a professional driving permit (PrDP). The driver or operator is required to always carry a copy of the operating permit and annexure.:

There is currently no legislation that regulates e-hailing transport operations and the National Land Transport Amendment Bill, which was passed in March 2020 makes provision for the regulation of e-hailing services and is under consideration by the National Assembly. The work done by the eThekwini Metro may need to be considered to prevent duplication of effort and learn from the challenges they could have encountered.

6.4.2 METERED TAXI PLAN

Traffic survey data from the study area indicates that there is a significant demand for metered taxi and e-hailing transport modes in varying degrees. This warrants the provision of formal facilities to cater for these modes and recommendations for facilities are outlined in Table 6-2: Informal PT Facilities to be Upgraded and Table 6-3: Formal PT Facilities Upgrade Proposals. The following policy and legal framework strategies are proposed for enhancing the quality of metered taxi and e-hailing transport modes in the study area:

- An amendment of the Parking Standards as stipulated in the Town Planning Scheme making it mandatory for commercial property developers to provide operational space for metered taxi and e-hailing operations is required.
- Introduction of digital fare and ticketing integration for metered taxis with other regulated public transport modes such as the BRT, PUTCO, Metrobus and Minibus Bus as part of the planned Electric Motor Vehicle (EMV) based integrated fare system [14].
- Standardisation of metered taxi operations in terms of at least the following, vehicle specifications and operating conditions, brand colours and trip and cost meters.

6.4.3 METERED TAXI PROJECTS

Specific metered taxi projects have not been identified. However, within the proposed public transport facilities (new) and multimodal facilities for the study area, a recommendation has been made to ensure there is holding space for metered taxi services and operations.

6.5 PASSENGER RAIL SERVICES – GAUTRAIN

6.5.1 POLICY FRAMEWORK

The CoJ SITPF 2013 [14] intends to achieve the following objectives in respect to the Gautrain services:

- Integration between the fare medium of Gautrain and Rea Vaya. Gautrain is presently using a Mifare smartcard but will need to switch to an EMV-based smartcard in terms of the national regulations. This will enable Gautrain passengers to use Rea Vaya services for feeder and distribution purposes.
- Fare harmonisation and allowing Gautrain to allow non-rail users to use its buses at more affordable fares.
- Continue to plan Rea Vaya and other future city public transport contracts so the network integrates closely with the Gautrain stations.
- Improve and manage providers of transport services from Gautrain stations such as metered taxis and tuk-tuks.

6.5.2 GAUTRAIN PLAN

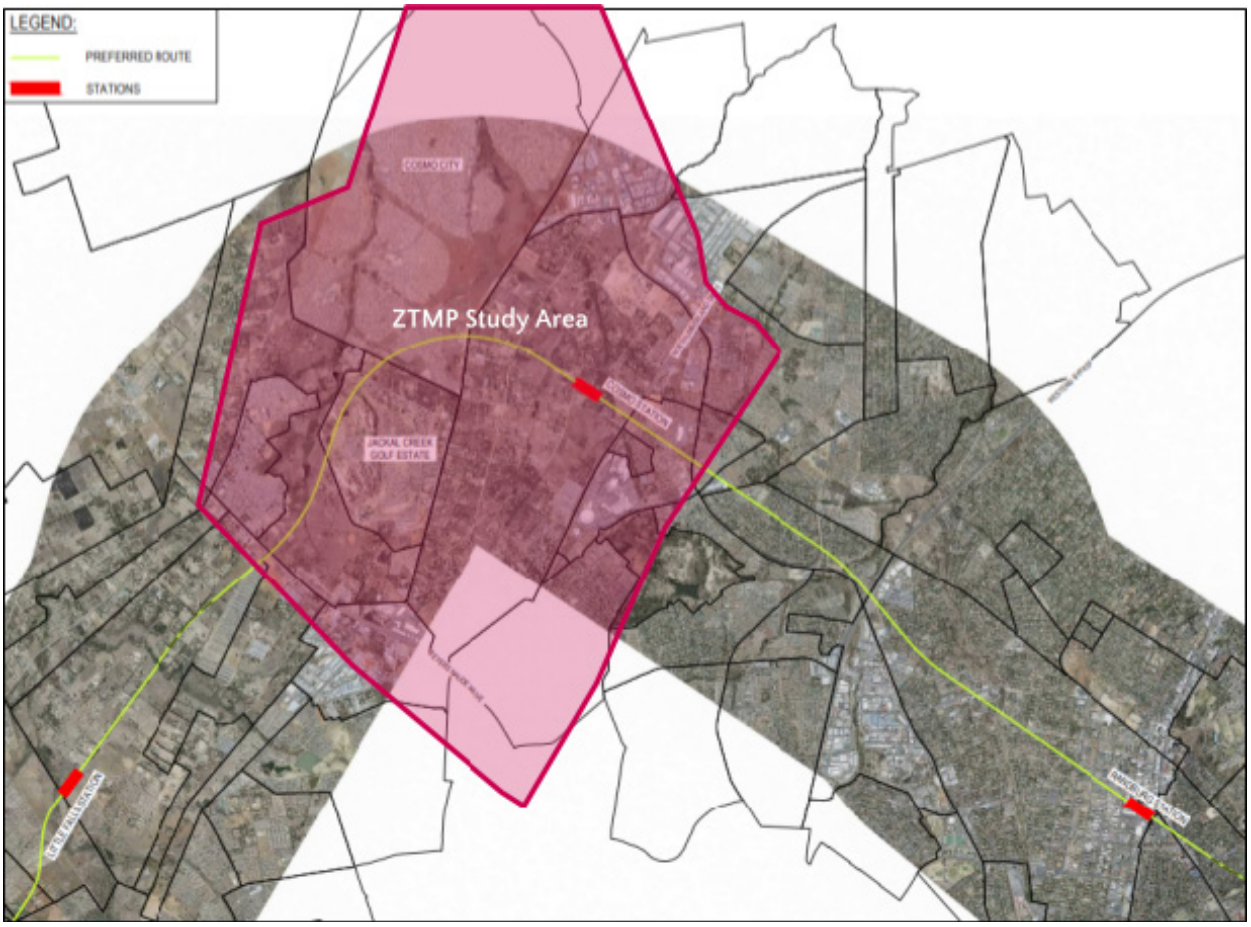
6.5.2.1 Route Description

The Gautrain Management Agency (GMA) has recently published the Preliminary Route Determination Report for Phase 1 of the Gauteng Rapid Rail Integrated Network (GRRIN) [20] extension from Marlboro to the Little Falls Station. The ZTMP is affected by the proposed alignment of the GRRIN extension and a new Cosmo City station is proposed to the north of the existing Northgate Shopping Centre, see also reference to this matter in Section 5.5. The proposed rail alignment is shown in Figure 6-5 [20] and starts at the location of the new Little Falls Station and follows a north-easterly direction through Zandspruit, passes to the west of Jackal Creek Golf Estate, and changes to a south-easterly direction through Kevin Ridge to the new Cosmo City Station. Leaving Cosmo Station, the route will continue in a south-easterly direction towards the newly proposed Randburg Station, passing through North Riding, Olivedale, Bryanston, and Ferndale. The section of the route which passes through the study area is at grade and will only go underground closer to Randburg.

6.5.2.2 Road Crossings in the Study Area

The following existing and planned roads will be crossed, either as a rail over road or as a road over rail configuration, by the recommended route alignment:

- Northumberland Ave.
- Malibongwe Dr.
- Beyers Naude Dr.
- Boundary Rd.
- Slovenia St.
- Jubilee Rd.
- Constantia St.
- Eureka St.



6.5.2.3 Land Use Impact and Development

Figure 6-5 shows the proposed location of the new Gautrain Cosmo City station and the surrounding land uses within a 3 km radius. The station is located at the corner of Aureole Avenue and Northumberland Avenue. The surrounding land use comprises retail, residential and industrial land uses with undeveloped or agricultural holdings. The recommended Gautrain route alignment affects the following suburbs and settlements in the study area:

- Kevin Ridge.
- Sonnedal AH.
- North Riding AH.
- Cosmo City.
- Jackal Creek Golf Estate.
- Zandspruit Informal Settlement.

The alignment and indicative rail reserve not only affect existing residential developments, but also affects majority of the planned residential developments in Kevin Ridge, namely:

- Kevin Ridge Ext. 26.
- Kevin Ridge Ext. 20, 21 & 30.
- Kevin Ridge Ext. 38 & 40.
- Kevin Ridge Ext. 36.
- Kevin Ridge Ext. 6.
- Kevin Ridge Ext. 15.
- Kevin Ridge Ext. 27.
- Kevin Ridge Ext. 39.
- Kevin Ridge Ext. 24.

The above-mentioned developments are located within the agricultural holdings land shown in Figure 6-5 and have been approved by the Johannesburg Roads Agency (JRA). The 2021 Preliminary Route Determination Report proposes the following strategies to support increased development around the Cosmo City Station:

- Medium to high-density residential developments to be developed in the larger pockets of land to the east of the proposed station location.
- Further development of existing industrial areas north of the station.

The Sandton Station node is intended to be used as a benchmark for a precinct development around stations comprising retail, offices, and recreational facilities, although the transport infrastructure integration is lacking and shall not be used as a model.

6.5.2.4 Recommendations for the Zandspruit Transport Masterplan

A park-and-ride facility is strongly recommended for the Cosmo City Gautrain Station to attract private car users from Cosmo City to the rail facility. This will encourage regional travel and would be supported by lower-order public transport modes to facilitate increased access to the station. Feeder and distributor services to the station have been proposed in the form of bus or minibus taxi feeder services to stations as well as through improved last-mile services, including NMT. Demand analysis undertaken as part of the Phase 1 extension feasibility study indicates that substantial commuter trips would be generated from the ZTMP study area towards Sandton, Randburg and Park Station in Johannesburg. This is corroborated by recent transport surveys undertaken in the study area which show that travel demand from the study area is predominantly towards the south-easterly direction of Sandton, Randburg and Johannesburg

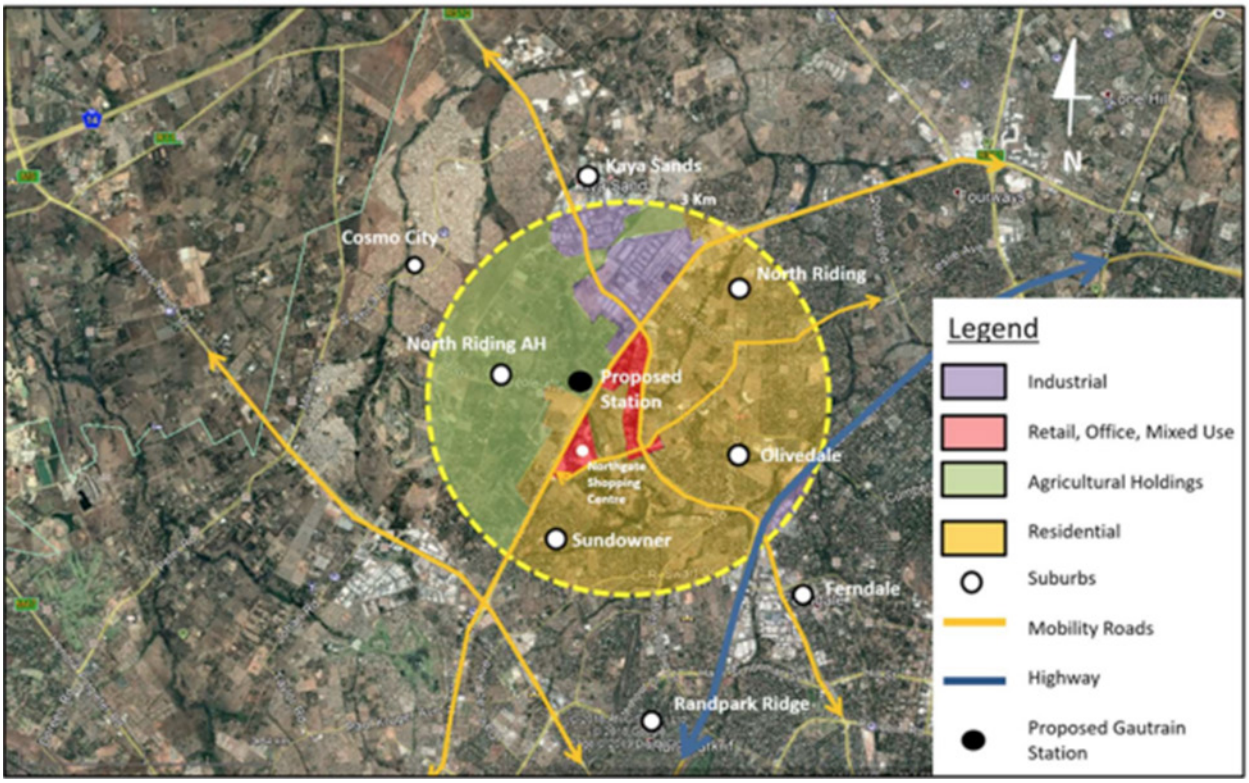


Figure 6-6: Location of new Cosmo City Station (Preliminary Route Determination Report, 2021)

The implementation of the GRRIN Phase 1 extension is likely to fall outside of the useful life of this public transport plan. However, the proposed public transport infrastructure and services ought to be done while considering the planned extension and allow for seamless integration once the infrastructure is provided.

6.5.3 PASSENGER RAIL PROJECTS

The following projects have been identified as part of the passenger rail plan for the Zandspruit Transport Masterplan. Also refer to Figure 6-4..

Table 6-5: Passenger Rail Projects

PROJECT NUMBER	PROJECT TYPE	PROJECT DESCRIPTION	PRIORITY / TIMEFRAME
PTF 003	Planning, Assessment & Investigations	Detailed feasibility and demand assessment for new multimodal public transport facility in Kevin Ridge.	> 10 years
PTN 004	Planning, Assessment & Investigations	Feasibility study to ensure integration of modes within the IPTN, including identification of all multi-modal transfer facilities as well as park and ride facilities.	0 – 3 years

6.6 NON-MOTORISED TRANSPORT CONSIDERATIONS

Non-Motorised Transport (NMT) Infrastructure plays a critical role in the safety, security and inclusivity elements of transport. South Africa has a significant proportion of learners (64%) that use walking as a means of transport on a daily basis to a place of education and workers (21,1%) to place of work (Statistics SA, 2014)[18], which are predominantly located in peri-urban and rural areas. Therefore, NMT planning should have a primary priority in the study area, but has largely been neglected, potentially due to the lack of awareness of the role of NMT modes of transport, minimal funding and often other basic transport infrastructural needs take preference over NMT. Non prioritisation of NMT among other reasons, results in high rates of pedestrian accidents, with approximately 40% of pedestrian fatalities recorded in South Africa [7]. According to counts undertaken within the study area, an overwhelming majority of NMT users are pedestrians (98,5%), with a menial share taken up by cyclists (1,1%), trolley pushers (0,5%) and other (0,04%). Pedestrian numbers are high at the pedestrian bridge in Zandspruit on Beyers Naude Dr, the Zandspruit Clinic and the road south of Eureka St. past the Zandspruit taxi rank.

6.6.1 POLICY FRAMEWORK

The City of Johannesburg adopted its first NMT Framework in 2009, which guides the planning and implementation of NMT infrastructure, such as sidewalks, cycle lanes and other supporting facilities. The framework aims to not only address transport related issues e.g., traffic congestion, as well as improve social, environmental and economic issues in the city but also business investments. When the City's transport system is integrated, seamless and addresses the needs of pedestrians and public transport users, the majority of car users may be attracted to the public transportation system and this will have environmental benefits through the reduction of carbon

dioxide emissions. The NMT Framework (2009) was further developed into the Complete Streets Design Guideline (2013) [9], where streets are categorized into broader typologies that account for non-motorised road users as well as the land use context and environmental factors. Key to implementing the vision and objectives for NMT, its important to gain an understanding of current and future NMT user travel patterns, current challenges of NMT users and the condition of the existing NMT infrastructure, as noted below:

6.6.1.1 Barriers

The settlement patterns within the study area have been influenced by both natural and man-made barriers. The natural barriers include water courses and their tributaries and other environmental considerations. The man-made barriers are the main roads (future planned K-routes / provincial roads traversing the study area. These have caused a division between lower-income settlements; middle-income settlements; industrial and commercial areas in North Riding. These barriers present challenges for NMT users as they result in unsafe crossing conditions when attempting direct access to attractions. Longer distances are experienced as NMT users travel longer routes when attempting to avoid unsafe crossing points or when hindered by access issues caused by natural barriers.

6.6.1.2 Conflict

Another key concern is the conflict between pedestrians, vehicles and informal traders. In a number of areas, the sidewalks have been taken over by informal traders, resulting in pedestrians needing to go onto the roadway, this is especially problematic in the vicinity of public transport facilities.

6.6.1.3 Accessibility.

Characteristic of the study area is the location of community facilities such as schools, places of worship, shops and public transport facilities adjacent to the main roads. This has resulted in NMT user desire lines that frequently traverse the highly trafficked class 2 and 3 road network at various places, especially around schools. This leads to a significant number of accidents along roads with unsafe pedestrian crossings. Desire paths are often found connecting between residential (formal and informal) clusters that had no direct formal connection and residential clusters linking with social infrastructure. An example is the desire paths between Cosmo Extension 5 and Extension 6. As the only road that connects all parts of Cosmo City, South Africa Dr. experiences substantial traffic pressure, evidenced by the constant peak hour congestion and several pedestrian accidents. Though the count data for the desired paths may be low, the provision of NMT infrastructure may not be ignored.

The road network in Cosmo City is predominantly paved, especially the collector and access roads. However, along lower class 5, access roads, no NMT facilities have been provided. This phenomenon is prevalent in Zandspruit, where very little paved road infrastructure exists. Where roads have been upgraded to a surfaced standard, the road reserve is extremely limited, preventing implementing NMT infrastructure. Other safety measures would need to be considered in a case-by case situation.

6.6.2 NON-MOTORISED TRANSPORT PLAN

The objective of NMT within the Zandspruit TMP, is to ensure that there is sufficient NMT infrastructure linking the public transport nodes, schools, the trading facilities as well as adjacent community facilities and places of interest. There shall also be alignment with the City's urban renewal and public upgrade programmes. Therefore, based on the work undertaken in the NMT Framework (2009) as well as the Complete Street Guideline (2013), the following vision and objectives for NMT were adopted for the study area as presented in Figure 6-7.

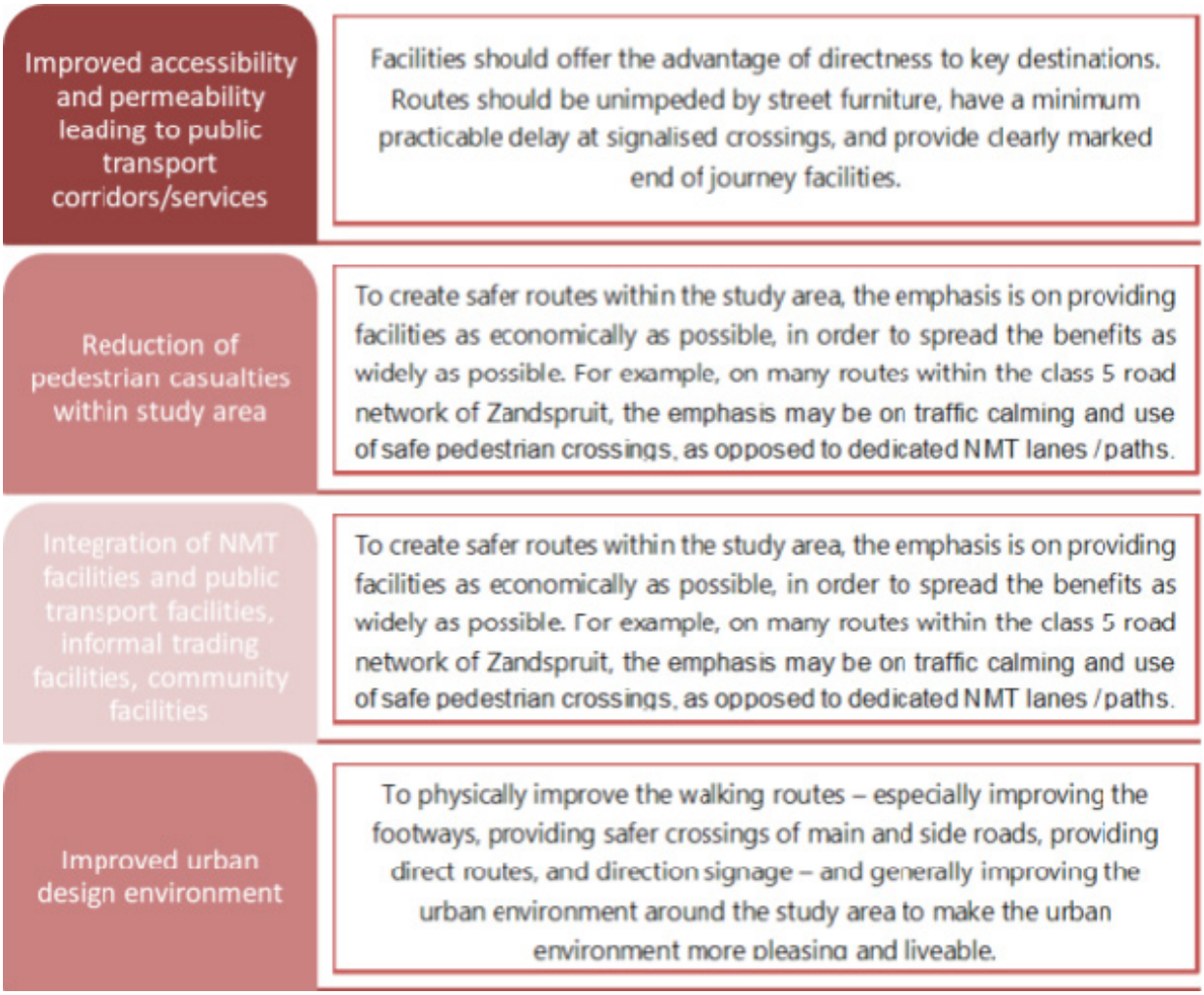


Figure 6-7: Vision and Objectives for NMT in the Study Area

The following are the sidewalk principles embedded in the Complete Streets Guideline:

- Separated sidewalks should be a minimum 1,5 m wide (all classifications).
- Sidewalks should be provided on both sides of all street classifications (including most residential and industrial areas)
- Wider (≥2,0 m) sidewalks should be provided along public transport routes and connections to public transport hubs.
- Wider (≥2,0 m) sidewalks should be provided for connections to schools, within activity centres and near major pedestrian generators (e.g., stadiums).
- Sidewalks should be wider (>2,0 m) to provide separation from traffic when:
    - Truck volumes are > 10% of total volume.
    - Design speed is >60 km/h.
    - Traffic volume is >20 000 vehicles per day (note: does not apply to industrial streets).
- Sidewalk width should be chosen based on surrounding land uses (higher density requires wider sidewalks).

6.6.3 NON-MOTORISED TRANSPORT PROJECTS

The following projects presented in Table 6-6 and Figure 6-8, are proposed for non-motorised transport links along public transport corridors within the study area.

Table 6-6: Identified Non-Motorised Transport Network Projects

PROJECT NUMBER	PROJECT TYPE	PROJECT DESCRIPTION	PRIORITY / TIMEFRAME
NMT 01	Design & Implementation	NMT links (1km) along **Tennesee** towards the high school leading to intersection with Malibongwe Dr.	0 – 3 years
NMT 02	Design & Implementation	Continuation of NMT links (2.3km) along **Angola Avenue / Tanzania Ave** linking schools, taxi facilities to end at the intersection with South Africa Drive.	0 – 3 years
NMT 03	Design & Implementation	**Central African Republic** NMT links (1km) - connection between existing public transport facilities and schools	0 – 3 years
NMT 04	Design & Implementation	**Eureka Street** (0,55km) public environment upgrades project. Concentration on signage, raised crossings, continuous connection to Emthonjeni Community Centre (from Marina)	0 – 3 years
NMT 05	Feasibility Study	Pedestrian **safety awareness campaign** around the pedestrian bridge on Beyers Naude.	0 – 3 years

PROJECT NUMBER	PROJECT TYPE	PROJECT DESCRIPTION	PRIORITY / TIMEFRAME
NMT 06	Design & Implementation	NMT links / public environment upgrade between Zandspruit Taxi Rank and Zandspruit Primary School. Includes : • Formalization of hawker activities along street • Pedestrian sidewalks • Raised pedestrian crossings along route especially around the school • Connection to existing NMT works along xxx street	0 – 3 years
NMT 07	Design & Implementation	NMT infrastructure linked to upgraded trader facilities based on land use audit to be undertaken	3 – 5 years
NMT 08	Design & Implementation	NMT infrastructure linked to proposed road infrastructure upgrade projects along future public transport corridors.	> 10 years

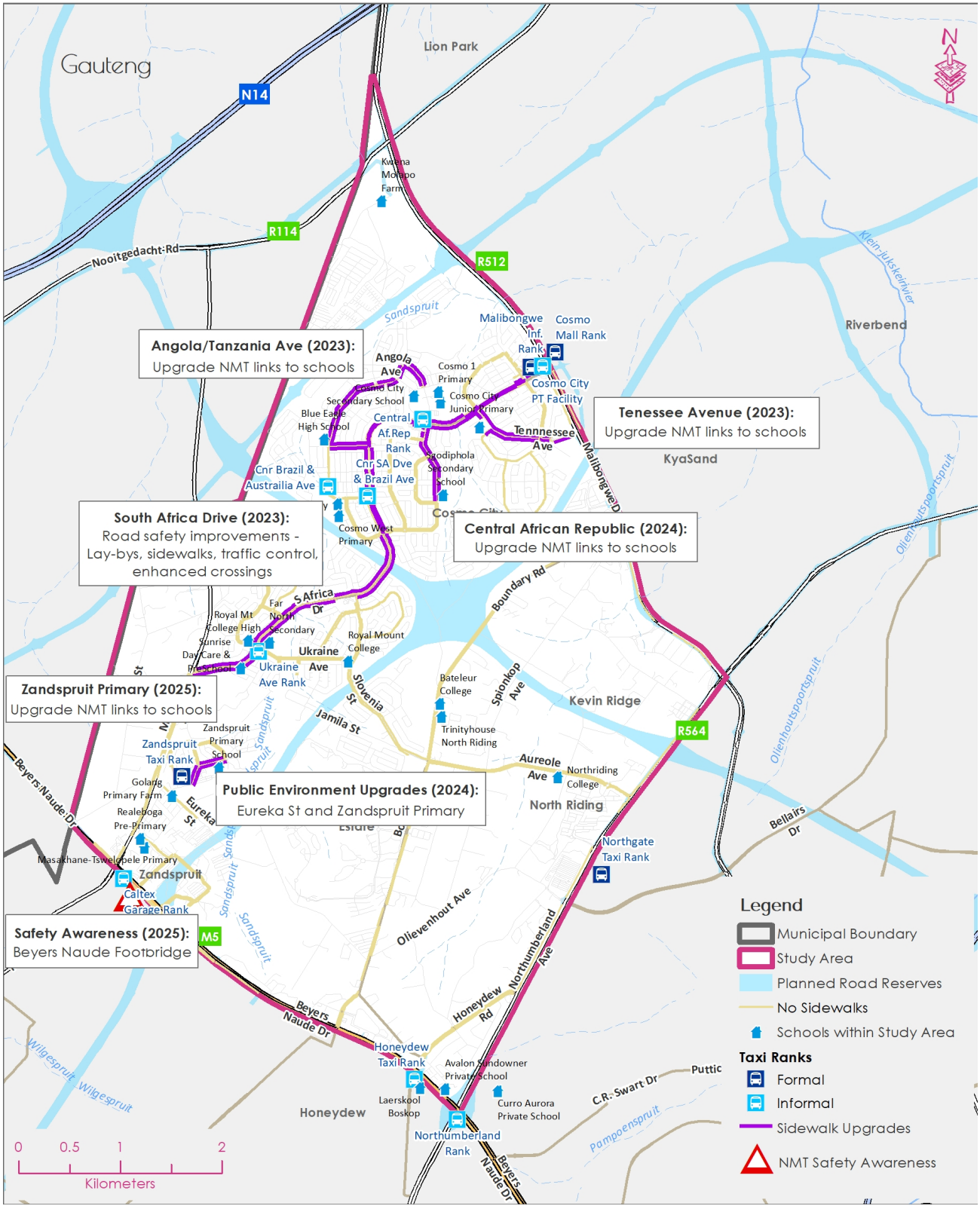


Figure 6-8: Proposed Non-Motorised Transport Projects

6.7 SCHOLAR TRANSPORT CONSIDERATIONS

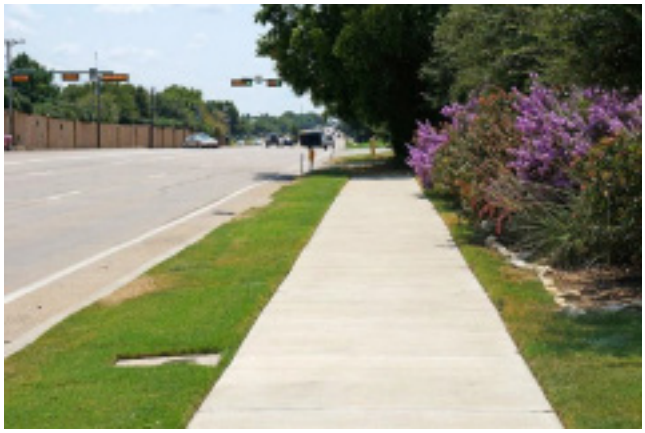
6.7.1 POLICY FRAMEWORK

The National Learner Transport Policy (2015) [17] prescribes a learner transport service design that includes road infrastructure, pick-up, and drop-off points (stops) and signage for safe transportation of learners. This service design should also contain detailed route descriptions, vehicle types, timetables, trip costs, trip lengths, travel times, stops and ranking information. The Zandspruit Cosmo City study area has no history of formal service design plans and these could not be sourced.

6.7.2 SCHOLAR TRANSPORT PLAN

- Public transport lay-by's: Laybys should be provided for pick-up/drop-off, but it should be a no parking zone and appropriate signage should be provided. Public transport bays are normally encouraged on roadways with high operating speeds along existing and future transportation corridors that require minimal supporting facilities. For reasons of road safety, on-street public transport facilities (lay-bys) should be provided downstream of the intersections and past the school entrance on both sides of the road.

- **Non-motorised transport infrastructure links**: non-motorised transport infrastructure is proposed along the Class 4 roads that intersect with Class 3 routes within Cosmo City, the following measures are proposed – extension of NMT sidewalks where they do not exist, leading from the public transport lay-bys.



- Traffic signals with a pedestrian phase: Traffic signals with a pedestrian push button should also be provided near senior schools on major roads and where there is a significant number of pedestrians and vehicles. Appropriate signage to be provided too. These measures to be provided ideally at all primary and secondary schools. Zebra painted pedestrian crossings with appropriate signage be provided outside school premises leading from the NMT infrastructure.

- Pick up and drop off zones outside school premises: Providing off street pick-up/drop-off zones outside school premises are essential as congestion on the roadway will be reduced and increase access to schools.

- A Scholar Transport project needs to be initiated with each school governing body to ensure they adhere to the Scholar Transport Policy. This will include an assessment of scholar transport vehicles to ensure these can transport learners with disabilities and to ensure that they are roadworthy.

6.7.3 SCHOLAR TRANSPORT PROJECTS

The following scholar transport projects have been identified for implementation in the study area:

Table 6-7: Identified Non-Motorised Transport Network Projects

Project Number	Project Type	Project Description	Priority / Timeframe
ST 001	Schools audit	Scholar Transport detailed schools project required to ensure adherence to Scholar Transport policy. Inclusive of: • Providing at minimum 2 off-street parking bays at primary schools e.g. Cosmo City Primary School, Realeboga Pre-Primary in Zandspruit. • Holding areas for operators to wait may help with reducing traffic congestion before peak times. • Zebra painted pedestrian crossings with appropriate signage be provided outside school premises. Leading from the NMT infrastructure provided along South Africa Drive, Tennessee and Angola Avenue. • Assessment of scholar transport vehicles to ensure these can transport learners with disabilities.	0 – 3 years

Zandspruit TMP
Scholar Transport

Zandspruit Transport Master Plan

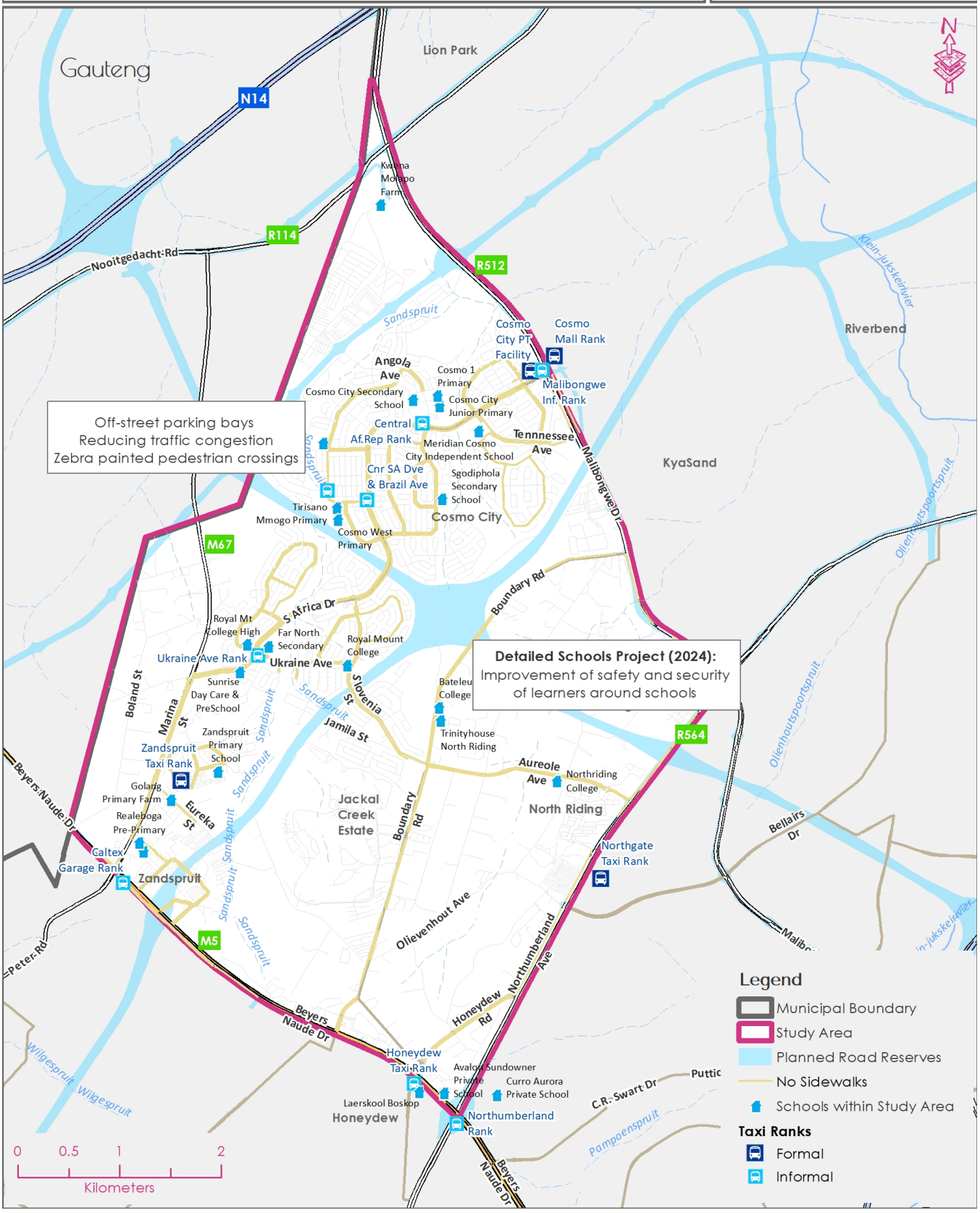


Figure 6-9: Proposed Scholar Transport Projects

6.8 FREIGHT SERVICE AND CONSIDERATIONS

6.8.1 POLICY FRAMEWORK

According to the CoJ Freight Management Plan (COJ FMP, 2016) [13], the economic development strategy for Johannesburg has identified seven Priority Economic Zones (PEZ) with latent industrial potential. Kya Sands has the highest priority, although only neighbouring the study area, adjacent to Malibongwe Drive. Another industrial zone that will impact the study area is Laser Park/Honeydew. One (1) existing freight route exists along Malibongwe Dr. that typically carries between 2 000 and 4 000 HV's per day. According to the Freight Management Plan (2016), a road with such freight volumes, should typically be four lanes in each direction (Typical Freight Route Classification and Standards). This is the case.

6.8.2 FREIGHT MANAGEMENT PLAN

6.8.2.1 Development of Truck Stops

The development of truck stops at high priority areas such as Kya Sands and within commercial nodes requires truck stops. However, the responsibility lies with the developers for the actual development of truck stops, whilst the CoJ and JRA will play an important role in the evaluation of development applications for truck stops. The following characteristics are proposed:

- Parked freight vehicles to be accommodated off-site leading to reduce congestion on internal streets within the study area around commercial hubs;
- Size of truck stop dependent on size of trucks utilising the freight zone.

6.8.2.2 Freight Volumes on Minor Roads

Regulation of recurrent freight vehicles on minor roads such as waste removal and deliveries to small businesses and neighbourhood shopping centres should be enforced. Vehicle load limitations should be enforced within Zandspruit / Cosmo City due to the limitations on the Class 5 street network.

6.8.2.3 Loading Times

According to the COJ FMP (2016) [13], loading and unloading time regulations should be applied to the kerbside and regulated with the appropriate space provision and signage.

6.8.3 FREIGHT MANAGEMENT PROJECTS

Table 6-8: Identified Non-Motorised Transport Network Projects

PROJECT NUMBER	PROJECT TYPE	PROJECT DESCRIPTION	
FR 01	-	Relief of congestion on internal streets through the implementation of the Freight Management Plan: • Ensure commercial developments cater for off-Street Truck stops/loading areas • Freight Regulation on Internal Streets • Develop regulations for access time controls on-street	0 – 3 years

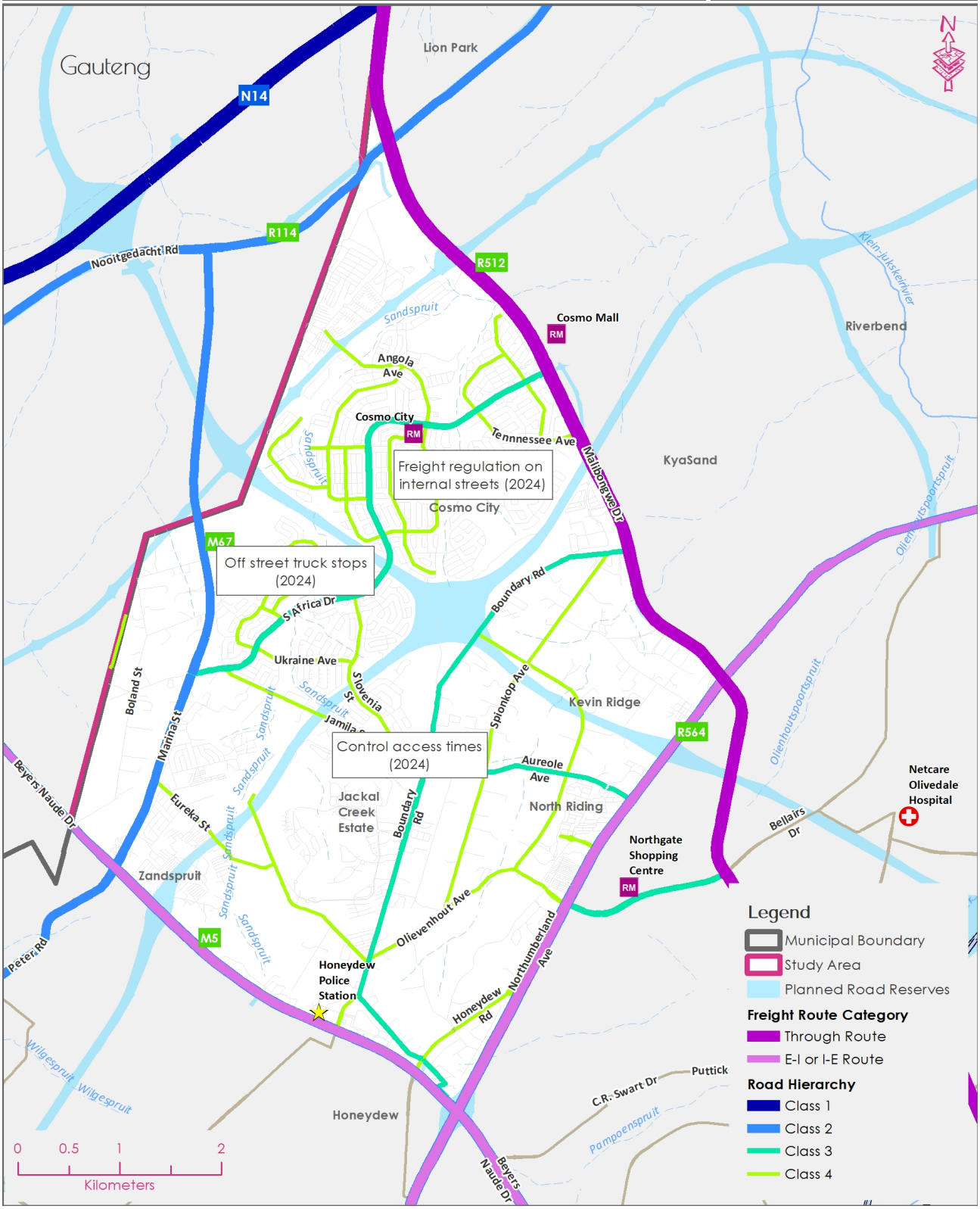


Figure 6-10: Proposed Freight Transport Projects

7 TRAVEL DEMAND MANAGEMENT

Travel demand management (TDM) is concerned with the use of infrastructure and systems to influence and promote more sustainable transport choices by travellers. Travel choices are influenced by several factors, including travel time, travel cost, travel distance, traffic congestion, convenience, safety and environmental aspects. The prevalent traffic and transport issues within Zandspruit and surrounding areas that would benefit from implementing travel demand measures include:

- Traffic congestion on major mobility roads and at primary access intersections.
- Traffic lights not working or out of order, exacerbating congestion.
- Informal on-street taxi ranks reducing roadway capacity and contributing to congestion.
- Lack of appropriate traffic calming and control measures and at high-pedestrian intersections posing safety risks for vulnerable road users, particularly scholars.
- Lack of streetlights and poor maintenance of existing streetlights contributing to pedestrian and road safety issues.
- Poor maintenance of existing road infrastructure including bridges, traffic lights and potholes.
- Safety issues/lack of security.

7.1 TDM OBJECTIVES

The aim of TDM in Zandspruit and the surrounding areas is to put into practice various behaviour-influential strategies that will encourage people to switch to sustainable transportation modes like walking, bicycling, and public transportation while also maximizing the effectiveness of the transportation system. This is in line with the CoJ SITPF 2013 objectives to encourage a modal shift away from private car use. The typical objectives for developing and implementing a TDM plan in a city include:

- Reducing the need to travel and therefore reducing the overall travel demand;
- Reducing the use of single-occupancy vehicles (SOV) or private cars;
- Increasing occupancy of all vehicles on the road network;
- Increasing the use of sustainable transport modes such as walking, cycling and public transport;
- Reducing trip lengths and durations; and
- Providing alternative destinations through intentional land use development.

For the Zandspruit study area, TDM will have the following three core goals:

1. To reduce congestion;
2. To make public transport and non-motorised transport more accessible; and
3. To reduce and manage parking demand.

7.2 TDM STRATEGIES & IMPLEMENTATION PLAN

Review of available literature indicates that a wide array of TDM interventions and measures exist, however, not all are appropriate to implement anywhere, there is no blanket solution for managing travel demand and it is important that context specific measures are implemented for each unique area. In light of this, six (6) primary areas of TDM strategies have been identified for the study area in accordance with the transport and land use status quo and transport vision and objectives for the project. The six primary areas are explained below:

1. **Congestion Management Strategies** – measures to reduce vehicle demand and thus mitigate against the impacts of traffic congestion which include high travel delays and costs, driver frustration and reckless behaviour, and increased greenhouse gas emissions.

2. **Public Transport and Non-motorised Transport Strategies** – measures that prioritise public transport and non-motorised transport modes and encourage a mode shift from single-occupancy vehicles.

3. **Parking Management Strategies** – measures that encourage more efficient use of existing parking facilities and reduced demand for parking or private car use.

4. **Transit Oriented Development Strategies** – planning of land use development to be compact and mixed and centred around public transport use.

5. **Freight Transport Management Strategies** – policy and legislation measures to reduce freight demand on residential and public transport roads.

6. **Education & Marketing Strategies** – the use of effective marketing strategies to educate commuters and make them of alternative modes available to them as well as to educate them on the importance of sustainable transportation.

The proposed implementation plan for TDM within the study area has been developed to align with the various transport plans and interventions as detailed in previous chapters and with due consideration of the identified projects, relevant implementing agent, and realistic timeframes. The possible implementation timeframes are defined in terms on immediate, short-term, medium-term and long-term priorities as shown in Table 7-1.

Table 7-1: TDM Implementation & Prioritisation Strategy

Priority	Description	Timeline
A	Immediate	0 to 3 years
B	Short-term	3 to 5 years
C	Medium-term	5 to 10 years
D	Long-term	After 10 years

The proposed strategies for TDM and the desired impacts are described in Table 7-2.

Table 7-2: Proposed TDM Strategies

No	TDM Category	TDM Strategies	Priority	Potential Impact
1	Congestion Management	Development of an east-west road link within the local road network.	C	• Increased accessibility and connectivity • Increased route choice
		Install Adaptive Traffic Signals on congested routes to allow for real-time adjustment of signal timings based on demand.	A	• Reduced congestion
		Develop a City Carpooling Website/ Software Application to connect commuters with common origins/destinations.	C	• Reduced private vehicle trips
2	Public Transport & NMT	Provision of free Wi-Fi at public transport facilities	B	• Increased use of PT facilities and services
		Fast-track integrated ticketing and fare system to also include minibus taxi and metered taxi services.	C	• Increased use of PT facilities and services • Encourages mode shift
		Exclusive public transport lanes on high demand public transport routes with regional connectivity.	D	• Improved service level for PT services • Increased travel capacity through high-occupancy vehicles • Reduced travel time via PT
3	Parking Management	Time restrictions on legal on-street parking with sensors and automatic billing based on the vehicle registration number.	B	• Reduced demand for parking
		Park-and-Ride facility at the planned Cosmo City Gautrain Station.	D	• Reduced private vehicle trips
4	Transit Orientated Development	Reclaiming road reserve that is occupied by private property developers and implementing PT and NMT infrastructure.	C	• Increased use of NMT facilities • Increased use of PT facilities and services
		Develop formal linear markets on key informal trading corridors with high pedestrian activity.	C	• Increase in walking and use of PT and NMT facilities

No	TDM Category	TDM Strategies	Priority	Potential Impact
5	Freight Transport Management	Regulation of recurrent heavy vehicles on minor roads through time restrictions and load limitations.	B	• Reduced heavy vehicle trips during peak periods • Reduced travel time delay behind slow heavy vehicles
6	Education & Marketing	Develop and operate educational campaigns at schools, community facilities and on local media about benefits of using different modes of transports and encouraging car-pooling.	A	• Increased awareness and use of sustainable transport modes
		Public transport awareness campaign to encourage the use of existing services. A full month's worth bus ticket for PUTCO or Metrobus offered as a reward to several winners.	A	• Increased awareness of available PT service

8 INTEGRATED PROJECTS

From the concepts and detailed proposals in this chapter of the report, numerous individual projects were identified, based on the basic building blocks. The integrated projects that may lead to a sustainable TMP for the study area as part of the Draft Transport MasterPlan. However, before the projects are listed, the following project governance issues need to be highlighted.

8.1 GOVERNANCE

Throughout various preceding reports, reference has been made to the role of the governance processes in ensuring the TMP becomes an effective planning tool into the future. The following matters are referenced below to ensure different CoJ entities deal with these in the near future, amongst others:

- The Land Assembly unit of the CoJ Department of Human Settlements to get an updated understanding of the complexities of land ownership, acquisition and trading in that area.
- Co-ordination with Zandspruit UISP team from CoJ Department of Human Settlements, to understand the future trajectory of road upgrades.
- Bridge along Aureole Road, a critical connector and projected future BRT route that is currently impassable for busses or large trucks.
- Improved mapping of various environmental and land use activities to be considered in future social development in the area.
- Policies that advocate for limitation of rapid urban motorization and promote the use of public transport to limit toxic gases produced by vehicles.
- On-Demand Ride Services – Establishment of policies to guide e-hailing services.
- Traffic Management Systems – technology-based systems that utilizes detectors, cameras, and communication systems to monitor traffic, optimize signal timings and control the flow of traffic.
- Approval process of the TMP to be dealt with at the highest priority to ensure these matters are addressed.

8.2 INTEGRATED TRANSPORT MATRIX

An integrated transport project matrix has been compiled. The IPTN Plan identified key public transport corridors within the study area. These were classified into “Primary” and “Secondary” public transport corridors. To support these corridors, a few proposed infrastructure interventions were proposed. These range from public transport facilities such as lay-bys, stops and seating, to non-motorised measures that focus on road safety, to urban design measures that are aimed at improving the general environment of the study area. These have been summarised in the Table 8-1. A summarised list of projects is then provided in Table 8-2, with projected implementation programme, prioritisation, estimated costing as well as .

Table 7-2: Integrated Public Transport Project Matrix

Primary and Secondary Public Transport Corridors			Existing Infrastructure				Proposed Infrastructure Intervention											
							Roads & Streets				Public Transport		Non-motorised Transport		Urban Design			
Rank	Priority Transport Corridor	Motivation	Road Infrastructure	PT Services	PT Infrastructure and Facilities	Economic development (trading)	Road Safety Improvements	Intersection Capacity & Control Improvements	Link Capacity Improvements	New Road Link	PT Lay-bys	PT Sheltered Stops & Seats	Sidewalks incl. Universal Access	Road Crossings	Streetlighting	Waste bins	Information Boards / Wayfinding Signage	Trading Stalls
1	South Africa Drive	Important North-South Connector Public Transport Corridor High priority for Cosmo City community	Yes	Yes. Bus, MBT, Avanza, NMT	No	Yes	x	x			x	x	x	x	x	x	x	x
2	Aureole Avenue	Important East-West Connector Traffic congestion relief Improved network accessibility and connectivity Public Transport Corridor	Yes, insufficient capacity		No NMT, PT infra		x	x	x		x	x	x	x	x		x	
3	Constantia Street	Improved network accessibility and connectivity Planning/implementation has commenced Easy to fund through development approval	No. Gravel road	No	No	No				x	x		x	x	x			
4	Boundary Road	Public Transport Corridor Road safety improvements	Yes, insufficient capacity	Yes. MBT, NMT			x	x	x		x	x	x	x	x		x	
5	Noble Street	Improved network accessibility and connectivity Planning/implementation has commenced Easy to fund through development approval		MBT						x	x		x	x	x			
6	Beyers Naude Drive	Road safety improvements High pedestrian activity High informal trading activity Public Transport Corridor Planning has commenced	Yes	Yes. Bus, MBT, Avanza, NMT	Yes	Yes	x	x			x	x	x	x	x	x	x	x

Table 8-2: Zandspruit TMP Implementation Project List

TECHNICAL FIELD	PROJECT NUMBER	DESCRIPTION	UNIT	PRIORITY/ TIMEFRAME	MOTIVATION	ESTIMATED VALUE (R MILLION)	IMPLEMENTATION
Public Transport Network Corridor Projects	PTN 001	South Africa Drive: Upgrading of intersection controls from All-Way-Stop-Control (AWSC) to signalized and coordinated. Introduction of pedestrian phase at traffic signals. • Traffic signal timing plans required, Signal pole layouts and implementation on site.	9 Intersections	0 – 3 years	Major public transport route, regional.	R 11,0	2024
	PTN 002	Feasibility study on the upgrade of **Aureole Avenue** to improve road safety, meet standard road classification design requirements, and accommodate bus mobility requirements.	Extension to SA Drive = 2.3km Extension to Malibongwe= 0.8km	0 – 3 years	Major public transport route, local.	R 1,0	2024
	PTN 003	Feasibility study on the upgrade of **Boundary Road** to improve road safety, meet standard road classification design requirements, and accommodate bus mobility requirements.	7.5km in total	5 – 10 years	Major public transport route, local.	R 1,0	2027
	PTN 004	Undertake detailed **feasibility study** on the concept of IPTN with buses being the anchor along major public transport corridors within the study area. Identify all future multi-modal transfer facilities between the various modes (bus, taxi, meter taxi) to be provided within the study area.	One (1) study	0 – 3 years	One planned IPTN anchor corridor (Kya Sands/Cosmo City to Randburg) to operate an articulated bus (long term). Project needs to expand bus service to cater for passenger demand within study area and ensure integration with existing public transport services.	R 3,0	2024
	PTN 005	Exclusive Public Transport Lane on **Malibongwe Drive** to facilitate integrated public transport services and improve public transport service levels	7.4 km one way 14.8km in total	> 10 years	Major public transport route, regional	R 2,0	2035

TECHNICAL FIELD	PROJECT NUMBER	DESCRIPTION	UNIT	PRIORITY/ TIMEFRAME	MOTIVATION	ESTIMATED VALUE (R MILLION)	IMPLEMENTATION
	PTN 006	Exclusive Public Transport Lane on **Beyers Naude Drive** to facilitate integrated public transport services and improve public transport service levels.	4.7km one way 9.5km in total	> 10 years	Major public transport route, regional	R 2,0	2035
Public Transport Facilities	PTF 001	Detailed **assessment of public transport rank facilities** in terms of condition, operations, capacity, utilization and limitations, with recommendations for infrastructure improvements.	One (1) study	0 – 3 years	Improve access to public transport facilities, improve quality of public transport infrastructure and services	R 0,5	2025
	PTF 002	Feasibility study for the consolidation and formalization of seven (7) informal taxi ranks.	One (1) study	5 – 10 years		R 1,0	2027
	PTF 003	Feasibility study for upgrading the existing **Cosmo City Public Transport Facility** into a multi-modal transfer facility.	One (1) study	5 – 10 years		R 1,5	2027
	PTF 004	Feasibility study for **new taxi rank in Kevin Ridge** to cater for future public transport needs. Investigate possibility of integrating with the planned Gautrain Station.	One (1) study	> 10 years		R 2,0	2032
	PTF 005	The provision of facilities for traders at all taxi ranks and other public transport facilities	One (1) study	0 – 3 years		R 10,0	2025

TECHNICAL FIELD	PROJECT NUMBER	DESCRIPTION	UNIT	PRIORITY/ TIMEFRAME	MOTIVATION	ESTIMATED VALUE (R MILLION)	IMPLEMENTATION
Scholar Transport	ST 001	Scholar Transport detailed schools audit project required to ensure adherence to Scholar Transport policy. Inclusive of: • Providing at minimum 2 off-street parking bays at primary schools e.g. Cosmo City Primary School, Realeboga Pre-Primary in Zandspruit. • Holding areas for operators to wait may help with reducing traffic congestion before peak times. • Zebra painted pedestrian crossings with appropriate signage be provided outside school premises. Leading from the NMT infrastructure provided along South Africa Drive, Tennessee and Angola Avenue. • Assessment of scholar transport vehicles to ensure these can transport learners with disabilities.	One (1) study	0 – 3 years	Improvement of safety and security of learners around schools within study area. Not enough data collected from GDE regarding scholar transport.	R 1,0	2024
Non-motorised Transport	NMT 01	NMT links along **Tennesee** towards the high school leading to intersection with Malibongwe Dr.	1 km	0 – 3 years	NMT links to schools within Cosmo City	R 10,0	2023
	NMT 02	Continuation of NMT links along **Angola Avenue** / **Tanzania Ave** linking schools, taxi facilities to end at the intersection with South Africa Drive.	2,3km	0 – 3 years	NMT links to schools and taxi facilities within Cosmo City	R 20,0	2023

TECHNICAL FIELD	PROJECT NUMBER	DESCRIPTION	UNIT	PRIORITY/ TIMEFRAME	MOTIVATION	ESTIMATED VALUE (R MILLION)	IMPLEMENTATION
	NMT 03	**Central African Republic** NMT links - connection between existing public transport facilities and schools	1,0 km	0 – 3 years	NMT links to schools and major public transport routes in Cosmo City	R 10,0	2024
	NMT 04	**Eureka Street** public environment upgrades project. Concentration on signage, raised crossings, continuous connection to Emthonjeni Community Centre (from Marina)	0, 55km	0 – 3 years	NMT links to public transport route and community facilities in Zandspruit.	R 5,0	2024
	NMT 05	Pedestrian **safety awareness campaign** around the pedestrian bridge on Beyers Naude	One (1) study	0 – 3 years	Raise awareness, encourage road safety, understand and encourage usage of existing pedestrian bridge	R 1,0	2025
	NMT 06	NMT links / public environment upgrade between **Zandspruit Taxi Rank and Zandspruit Primary School.** Includes : • Formalization of hawker activities along street • Pedestrian sidewalks • Raised pedestrian crossings along route especially around the school • Connection to existing NMT works along xxx street	0,5 km	0 – 3 years	Pedestrian safety enhancements along major public transport and schools route in Zandspruit.	R 5,0	2025
	NMT 07	NMT infrastructure linked to upgraded trader facilities based on land use audit to be undertaken	TBD	3 – 5 years		TBD	2027
	NMT 08	NMT infrastructure linked to proposed road infrastructure upgrade projects along future public transport corridors	TBD	> 10 years		TBD	2032

TECHNICAL FIELD	PROJECT NUMBER	DESCRIPTION	UNIT	PRIORITY/ TIMEFRAME	MOTIVATION	ESTIMATED VALUE (R MILLION)	IMPLEMENTATION
	NMT 09	Public transport (lay-bys), non-motorised transport (sidewalks, traffic control, enhanced crossings), and road safety improvements on **South Africa Drive.**	10.6km (N/S)	0 – 3 years	Stakeholder engagement needs identified safety as a major concern along route.	R 60,0	2023
Road Infrastructure	RIU 001	Internal East-West connector: Aureole Avenue including eight (8) signalized intersections and a bridge and expropriation along the route. X-section and intersection improvement. Varying reserve width. Upgrades to comprise of: • Capacity improvements • Complete streets interventions inclusive of non-motorised transport, bus shelters, public transport lay-bys, enhanced pedestrian crossing facilities. • Horizontal and vertical alignment improvements • Cross-section improvement • Pavement improvement • Access management (intersection control and configuration) • Stormwater management (bridges, culverts and road drainage prism)	5,1 km	> 10 years	**Internal East-West connector. Future primary** PT route. Planning will take long inclusive of numerous governance aspects. Extension to link with South Africa Dr and Malibongwe Dr on opposite ends.	TBD	2030

TECHNICAL FIELD	PROJECT NUMBER	DESCRIPTION	UNIT	PRIORITY/ TIMEFRAME	MOTIVATION	ESTIMATED VALUE (R MILLION)	IMPLEMENTATION
	RIU 002	Upgrade Boundary Road including five (5) signalized intersections and a bridge and expropriation along the route. X-section and intersection improvement. Varying reserve width. Upgrades to comprise: Capacity improvements Complete streets interventions inclusive of non-motorised transport, bus shelters, public transport lay-bys, enhanced pedestrian crossing facilities. Horizontal and vertical alignment improvements : Cross-section improvement, Pavement improvement Access management (intersection control and configuration) Stormwater management (bridges, culverts and road drainage prism)	6,6 km	> 10 years	**Internal North-South connector. Future primary PT route.** Planning will take long inclusive of numerous governance aspects	TBD	2030
	RIU 003	**Constantia Street:** Upgrade of gravel road (2,4 km) and new road extension to surfaced standard inclusive of one (1) bridge. Varying reserve width	3,1 km	> 10 years	**Future secondary PT route.** Planning will take long inclusive of numerous governance aspects	TBD	2030
	RIU 004	**Olievenhout Street:** Upgrade of gravel road (1,6 km).	1,6 km	> 10 years	Planning will take long inclusive of numerous governance aspects	TBD	2030

TECHNICAL FIELD	PROJECT NUMBER	DESCRIPTION	UNIT	PRIORITY/ TIMEFRAME	MOTIVATION	ESTIMATED VALUE (R MILLION)	IMPLEMENTATION
	RIU 005	**Valley Road**: Upgrade of gravel road (2,9 km) to surfaced standard.	2,9 km	> 10 years	Planning will take long inclusive of numerous governance aspects	TBD	2030
	RIU 006	**Spionkop Avenue**: Upgrade of gravel road (2,6 km) to surfaced standard.	2,6 km	> 10 years	Planning will take long inclusive of numerous governance aspects	TBD	2035
Modelling, Traffic Signals and maintenance thereof	MTS 001	Implement a maintenance and implementation plan and synchronize in accordance with proposed signal timings provided in TMP for year 2022.	Project	0 – 3 years	The improvement of traffic flow until the new infrastructure comes into effect.		2023
	MTS 002	Apply TMP Modelling output on Malibongwe Drive between the N1 and N14 freeways	Project	0 – 3 years	Prepare for meeting with SANRAL and Gauteng Department: Roads and Transport and apply to TMP modelling.		2023

TECHNICAL FIELD	PROJECT NUMBER	DESCRIPTION	UNIT	PRIORITY/ TIMEFRAME	MOTIVATION	ESTIMATED VALUE (R MILLION)	IMPLEMENTATION
Developmental and Land use practices	LUP 001	A housing strategy	One (1) Study	0 – 3 years	A housing strategy is required to manage settlement growth and accommodate more sustainable forms of housing as well as facilitate the improvement of living conditions within the informal settlement areas. To include the upgrade of informal settlements, backyard dwelling management, as well as formal affordable housing opportunities provision	R 2,0	2023
	LUP 002	Review of the urban development boundary	One (1) Study	0 – 3 years	The provision of new formal housing may require a review to enable formal expansion in addressing the backlog of housing within the adjacent farm or agricultural zones / areas	R 1,0	2023

TECHNICAL FIELD	PROJECT NUMBER	DESCRIPTION	UNIT	PRIORITY/ TIMEFRAME	MOTIVATION	ESTIMATED VALUE (R MILLION)	IMPLEMENTATION
	LUP 003	Informal Traders Audit and Strategy	One (1) Study	0 – 3 years	A detailed study of traders in order to understand their patterns and needs.	R 1,0	2023
	LUP 004	Community Facilities Audit	One (1) Study	0 – 3 years	Comparison with the applicable standards for social facilities should be undertaken to determine types and number of facilities required.	R 1,0	2023
	LUP 005	Land Acquisition Strategy	One (1) Study	0 – 3 years	Strategies need to be put in place to acquire land in areas which have no facilities and also have no government owned land available.	R 1,0	2023
	LUP 006	Environmental Study	One (1) Study	0 – 3 years	Confirmation of all environmentally sensitive areas through a study is required; Appropriate geo-referencing and mapping of these areas; Formal proclamation of these as open space / environmental protected zones; and Establishing approval processes including initial project boundary determination that comprehensively assess the environmental layers.	R 1,0	2023

9 REFERENCES

The following documents are referred to in this document.

REF	DOCUMENT NUMBER OR URL ADDRESS	REVISION OR DATE OF PUBLICATION	DOCUMENT TITLE	AUTHOR
[1]	https://sustainabledevelopment.un.org/topics/transport/decisions#:~:text=Sustainable%20transportation%20can%20enhance%20economic,economy%20while%20respecting%20the%20environment.	Online	Sustainable Transport	United Nations; Department of Economic and Social Affairs Sustainable Development Goals Knowledge Platform
[2]	ISBN 978-0-367-36463-2 https://transportgeography.org/ https://doi.org/10.4324/978042934632 3	Online	The Geography of Transport Systems, Fifth Edition	Jean-Paul Rodrigue (2020), New York: Rutledge
[3]	ISBN 0-88285-161-6	2005 Third Printing	Transport for Livable Cities	Vukan R. Vuchic
[4]	https://www.dbsa.org/article/how-improving-road-infrastructure-south-africa-can-help-benefit-economy-society-and-health	Online	How improving road infrastructure in South Africa can help benefit the economy, society and health care	Development Bank of Southern Africa
[5]	https://www.dffe.gov.za/projectsprogrammes/nonmotorizedtransport_southafrica#:~:text=Non-motorized%20transport%20(NMT),transport%20through%20walking%20or%20cycling	Online	Non-Motorized Transport – South Africa	Department: Forestry, Fisheries and the Environment
[6]	https://www.iisd.org/system/files/2021-05/still-one-earth-sustainable-transport.pdf	On ine May 2021	The Road to Sustainable Transport	International Institute for Sustainable Development (IISD) Earth Negotiations Bulletin. Leila Mead

REF	DOCUMENT NUMBER OR URL ADDRESS	REVISION OR DATE OF PUBLICATION	DOCUMENT TITLE	AUTHOR
[7]		2020	City of Johannesburg Nodal Review Policy 2020.	City of Johannesburg
[8]		2016	Johannesburg Spatial Development Framework 2040.	City of Johannesburg
[9]	https://www.joburg.org.za/departments_/Documents/transport/department%20project/Complete%20Streets%20Design%20Guideline%20Manual.pdf	2010	CITY OF JOHANNESBURG COMPLETE STREETS DESIGN GUIDELINE	City of Johannesburg
[10]	https://www.transport.gov.za/documents/11623/21913/RISFSAOct2016_comppages11to20.pdf/2d533503-e2d4-44af-bae3-20dc16688769	2006	Road Infrastructure Strategic Framework for South Africa	Government of South Africa; Department of Transport
[11]	Technical Recommendations for Highways TRH 26	Version 1.0 August 2012	South African Road Classification and Access Management Manual	Committee of Transport Officials
[12]	https://jra.org.za/wp-content/uploads/2021/10/Code_of_Procedure.pdf	June 2015	Roads & Stormwater Manual, Volume 1, Code of Procedure	Johannesburg Roads Agency SOC Ltd
[13]		2016	City of Johannesburg Freight Management Plan	City of Johannesburg
[14]	https://www.joburg.org.za/Campaigns/Documents/2014%20Documents/CoJ%20SITPF.pdf	2013	Strategic Integrated Transport Plan Framework for the City of Johannesburg	City of Johannesburg
[15]		October 2014	Detailed Operational Plan for Metrobus (Final Report)	ITS Engineers for City of Johannesburg
[16]	https://www.joburg.org.za/documents_/Documents/Joburg%20GDS%202040/Joburg%202040%20GDS%20Low%20Res.pdf	October 2011	Joburg 2040 Growth and Development Strategy	City of Johannesburg
[17]	https://www.gov.za/sites/default/files/gcis_document/201510/39314gon997.pdf	June 2015	National Learner Transport Policy	National Department of Transport
[18]		2014	National Household Travel Survey 2013	Statistics SA

REF	DOCUMENT NUMBER OR URL ADDRESS	REVISION OR DATE OF PUBLICATION	DOCUMENT TITLE	AUTHOR
[19]		2017	Traffic flow variations in urban areas	J Sampson, 36th Southern African Transport Conference
[20]	https://gma.gautrain.co.za/projects/Shared%20Documents/Preliminary%20Route%20Determination%20Report%20-%2018%20November%202021.pdf	2021	Preliminary Route Determination Report – Phase 01 of The Gautrain Rapid Rail Integrated Network Extension from Marlboro Station to Little Falls Station	Gauteng Provincial Government
[21]	https://www.transport.nsw.gov.au/sites/default/files/media/documents/2017/integrated-pt-service-planning-guidelines-sydney-metro-dec-2013.pdf	December 2013	Integrated Public Transport Service Planning Guidelines	Transport for NSW
[22]	https://www.vtpi.org/tdm/	Online	TDM Encyclopedia	Victoria Transport Policy Institute

MERCHELLES
COLLECTIVE