

Centurion

GAUTRAIN **STATION** PRECINCT

The application of Urban Design Principles to
Create Habitable

**SAFE AND SELF-SUSTAINABLE
URBAN PRECINCT**

The Case of Centurion

Gautrain Station Precinct

Bn. BARNET NYONI



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DECLARATION

I declare that this research report is my own work. It is being submitted for the degree of Master of Urban Design to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other university.

Signature of Candidate: _____

A handwritten signature in black ink, consisting of stylized, overlapping loops and lines, positioned over a white rectangular background.

Date: _____ 10 February 2020 _____

ACKNOWLEDGMENTS

Firstly, I would like to acknowledge Ludwig Hansen for taking us and guiding us through the academic expedition. Special thanks to Solam Mkhabela and Kevin Goncalves for the supervisory role that they played throughout the research. My great appreciation to Mawabo Msingaphatsi for taking time to offer his mentorship, guidance and encouragement. I also want to recognise the following for moral support, advise, thought provoking debates, technical support, thus Sidney Mpofu, Pulane Motau, Rhulani Mabasa and Bakiel Nxumalo. Finally I would like to thank my family for the moral support given and for allowing me to steal their family time for the past two years.



ABSTRACT

Through urban design a number of spatial and developmental challenges can be mitigated or completely eradicated, thus appropriating urban spaces in order to create robust urban environments for humans to work, live, shop and play. In so doing, a number of urban design tools and urban design principles are applied in transforming undesirable urban environments. Economic stimulation, through the optimisation of public transport infrastructure is also possible. This research aims to establish what constitutes a robust urban environment, identify the key urban design principles that can be used to transform an undesirable urban precinct to desirable and robust urban precincts. These principles are then applied to the study area, which is bounded by Lenchen Avenue, Jean Avenue, Gerhard Street and John Vorster Avenue. Though this precinct is highly accessible with a wide range of land uses, it is relatively underdeveloped. The precinct is inundated with development challenges that include, fragmented development, lack of essential public amenities, unsafe public spaces and vehicular/ pedestrian conflict to mention but a few. This precinct is a business core for the City of Tshwane and is highly connected with easy access to the major national roads like the N1 and the N14. It was developed with the main aim of decongesting the congested commercial activities in the Pretoria CBD. Owing to its strategic location, the study area has potential to be commercially viable, and a thriving hub with mixed economies that can be safely used by people. The theme for this research is "The application of Urban Design Principles to Create Habitable, Safe and Self-sustainable Urban Precinct: The Case of Centurion Gautrain Station Precinct". The main research question being "What role can urban design principles play in transforming undesirable urban spaces to desirable urban spaces?". Keys concepts from Responsive Environments relating to permeability, variety, legibility, robustness, visual appropriateness richness and, personalization will be applied to the study area through design.

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CHAPTER 1

INTRODUCTION



BACKGROUND

The City of Tshwane Metropolitan Municipality is the gateway to most of Southern Africa. It has three strategic commercial corridors, these being the Maputo Corridor, Botswana & Zimbabwe/Zambia. Its location along these corridors has resulted in cross border migration and inter province migration as people move to the City of Tshwane mainly in search of economic opportunities. Though according to Turok and McGranahan (2013) there is no simple linear relationship between urbanisation and economic growth, or between city size and productivity, therefore urbanisation in the city of Tshwane cannot be attributed or linked to economic growth. Watson (2009) states that the rapid population growth which usually leads to amongst other things lack of housing, infrastructure and dire environmental issues. In the context of the City of Tshwane, migration has further resulted, and continues to result in rapid urbanisation which in turn poses a number of urban developmental challenges not only in Centurion and the City of Tshwane but in Gauteng as a whole. These urban challenges include amongst others, pressure on resources such as water, insufficient transport infrastructure, insufficient social amenities, lack of housing, rapid increase of informal settlements, dire environmental impact, solid waste problems, insufficient commercial activities as well as

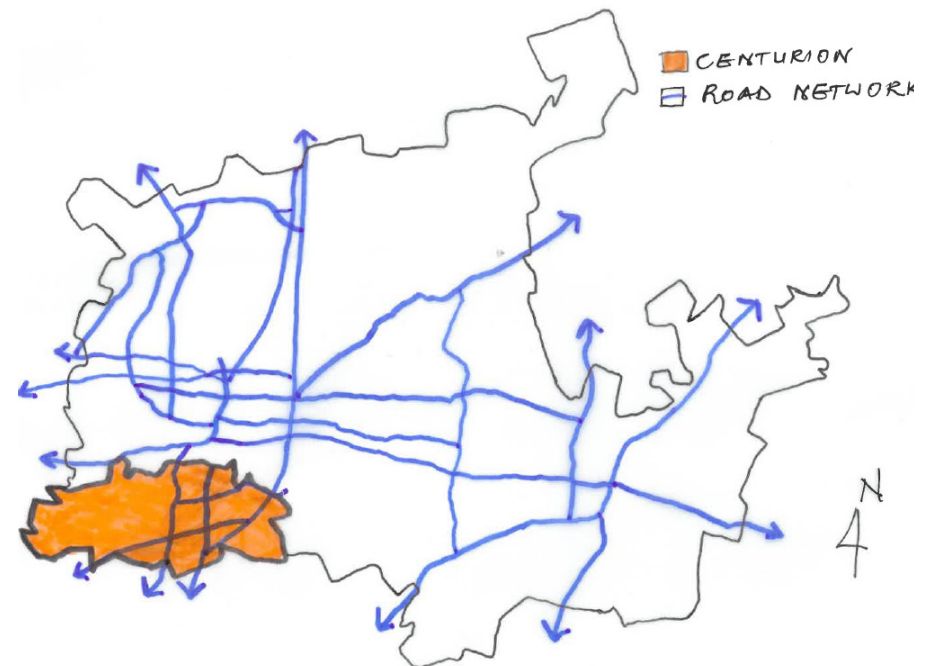


Figure 1_ Centurion Locality Map

unsafe and hostile urban environments. As urban populations continue to grow exponentially and cities evolve, mostly in deleterious ways, the demand for good quality urban facilities and infrastructure also increases (Memluk, 2013).

This research therefore assesses the development trends within the Centurion area and investigate the causes of the current spatial problems.

According to the City of Tshwane Metropolitan Development Framework and the Spatial Development Framework (SDF), the Centurion CBD forms the business core of the Region 4 of the Metropolitan Node. This node therefore, supports the Gauteng Province Economic Triangle meaning it should house considerable business and commercial functions, that support the City of Tshwane Metropolitan businesses and the Gauteng Province as a whole.



Figure 2_ Study Area Locality Map

DOCUMENT STRUCTURE

This section presents a summarised version of the research report document structure.

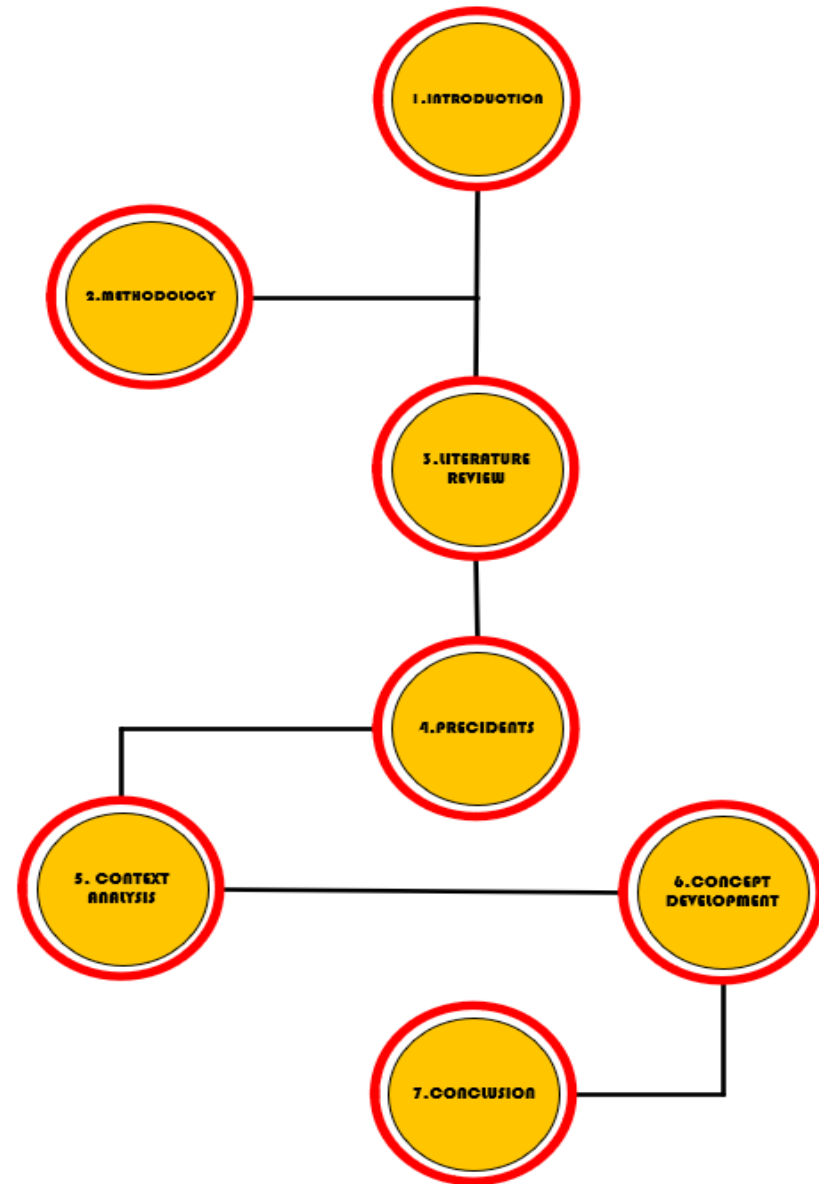


Figure 3_ Document Structure

GAUTENG ECONOMIC

In its quest to foster economic development within the Gauteng region, the Gauteng Government proposed and identified the Gauteng Economic Triangle. The Concept of the Economic Triangle attempts to and strengthen the process of interaction between industrial and business locations, global value chains and global networks dedicated to setting standards. This economic triangle consists of three points, with the Centurion CBD forming one of the three points with the other two point located in Johannesburg and Ekurhuleni respectively. The selection of Centurion CBD was primarily based on its strategic location as well as it being highly accessible.

It is imperative that both the built form and the spatial form of the Centurion CBD be such that it supports the regional economic development objectives at the same time meeting development imperatives of the City of Tshwane, the day to day needs of the inhabitants of Centurion and usable by those residing and working in the Centurion CBD. In a highly urbanising region, economic development and integration will surely reduce urban poverty. According to Beal & Fox (2009:103), though it is widely held that that economic development is a necessary condition for poverty and informality reduction.

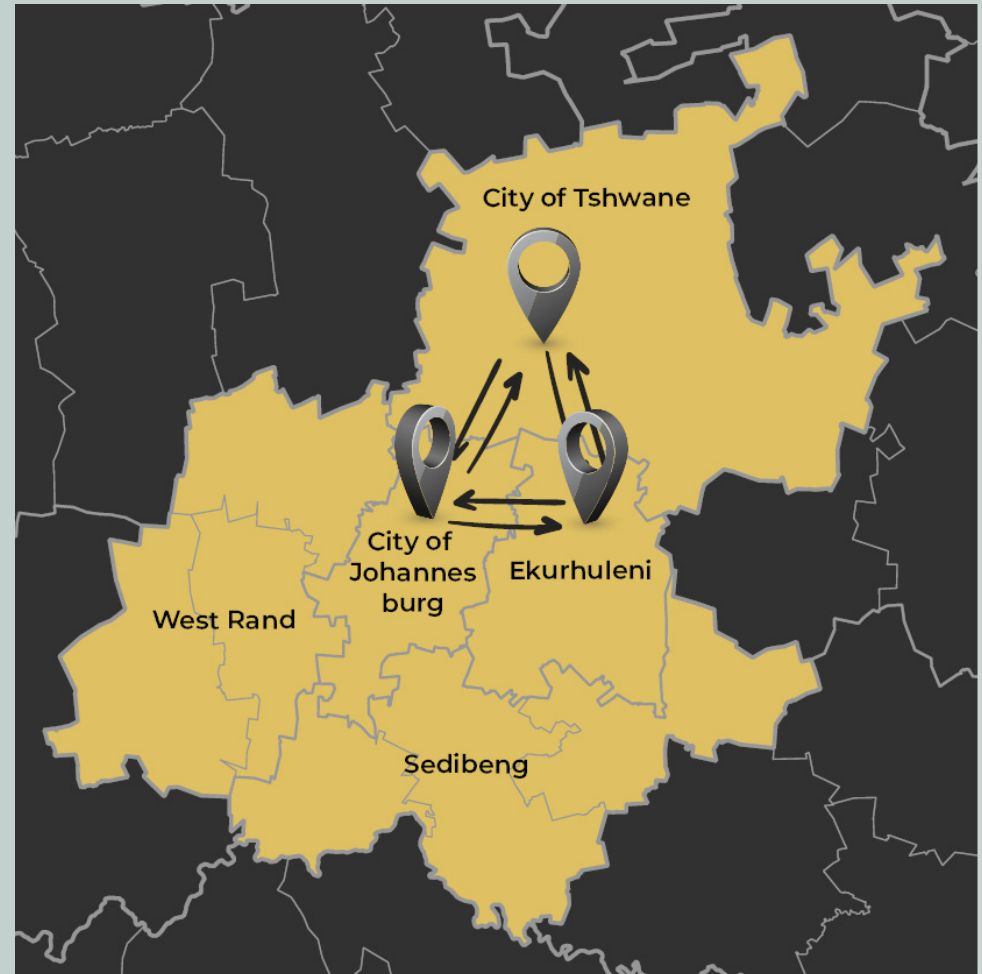


Figure 4_ Gauteng Economic Triangle



Figure 7_ Map of Gauteng



Figure 5_ Map of South Africa

LOCATION OF THE STUDY AREA

The study area is located in the Gauteng Province of the Republic of South Africa. It is in the City of Tshwane which also houses the country's Administration Capital, Pretoria. The main focal points within the study area are the Centurion Gautrain station and the Centurion Mall. The study area is therefore bounded by four major roads that include Lenchen Avenue, Jean Avenue, Hendrick Verwoerd and John Vorster. This area has a diverse land uses, these land uses include residential development, offices / business, light industry, commercial/retail and non – formal trading. The precinct also houses a number of major points of interest that include the Centurion Mall, the Gautrain Station, the Super Sport Park cricket stadium, two hotels, SAPS Investigative Unit, embassies, Home Affairs offices, the City of Tshwane environmental offices. This precinct is also supported by several other land uses that lay next to it. These include Institutional, industrial, recreational the super sport park cricket stadium and a natural water course that traverses the precinct.

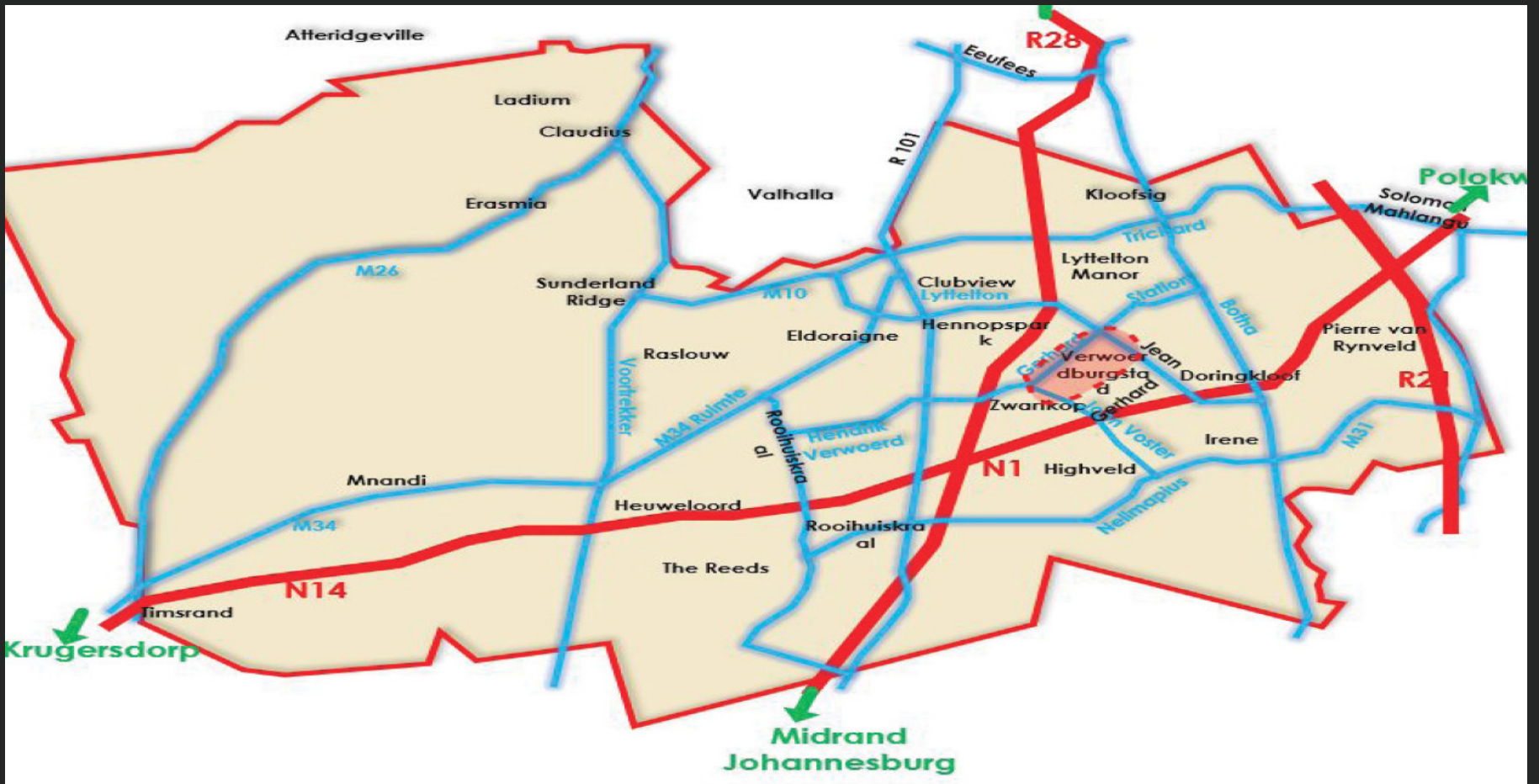


Figure 8_ Map of Centurion

Unlike other areas in the City of Tshwane, the Centurion Gautrain Precinct has been affected by several occurrences, these include uncontrolled decentralization of commercial and office activity due to the then prevailing by market forces. These movements were mainly to Centurion, Hatfield, Brooklyn and Menlyn. Other changes included a shift of trading patterns, a reduction of trade turnover and the loss of jobs in the Pretoria CBD caused by the relocation of the provincial administration, commercial decentralization, and other push factors in the Pretoria CBD, such as crime, litter and decay. Furthermore, mini-bus taxis have resulted in market share loss for trains and buses which again is further compounded by dispersal of economic activities. Pretoria CBD also experienced a growth of street trading and non-formal trading which competed with formal trading.

As aforementioned the study area, is very well located within the economic triangle of Johannesburg, Tshwane and Ekurhuleni and includes a triangular area of land approximately 1000 hectares in extent and which is bordered by the N1, and N14. Again, the study area forms part of the central core of the City of Tshwane Metropolitan Node as stated in Regional Spatial Development Framework as well as the Regional Spatial Development Framework for the City of Tshwane.

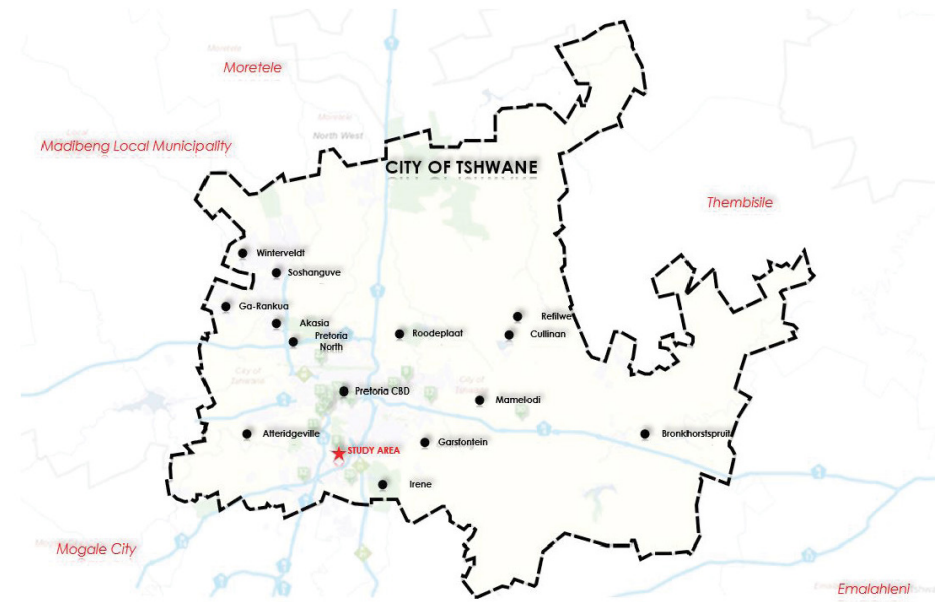


Figure 6_ Map of Tshwane

HISTORICAL DEVELOPMENT

This section presents the historic development of both the City of Tshwane and Centurion so as to give context of the trends of developments. This will aid in understanding the current built form. Figure 9

shows the country's administrative hub (The Union Buildings) which is located in the City of Tshwane.



Figure 9_ The Union Buildings (Source: shutterstock.com)

City of Tshwane Historical Development

The City of Tshwane houses the country's Administrative Capital, Pretoria, and located in the North of the Gauteng Province.

Marthinus Pretorius founded the city 1855 but was later renamed to Tshwane in 2000, thus according to (Raper, 2008, Van der Vyver, 2015). It merged with Metsweding District following the Gauteng Global City Region Strategy (Matlala, 2015).

5 December 2000, is the date when the City of Tshwane Metropolitan Municipality was established. It is comprised of several local municipalities that were previously standalone municipalities that include Kungwuni Local Municipality and Centurion Local Municipality. Its foot print was further increased to 6 368 square kilometres after the incorporation of Metsweding Local Municipality that lies northwest of Soshanguve. The City of Tshwane Metropolitan Municipality is a Category A municipality and is the largest municipality in South Africa.



Figure 10_ Stature of King Tshwane

Prior to attaining the city status in 1935, Pretoria in 1931 built the city hall, what was at the time the largest building in the city which is located on the Paul Kruger Street, on the southern direction of Church Square and is opposite the Transvaal Museum. This became the main civic centre and is depicted on Figure 11.

The City is home to a number of museums, monuments and historical buildings and two nature reserves where one can view wildlife.



Figure 11: Pretoria City Hall (Source: Shutterstock.com)

City of Tshwane Cities/Towns:

The City of Tshwane is made up of an amalgamation of cities and towns. These include Akasia, Atteridgeville, Bronkhorstspuit, Centurion, Cullinan, Ekangala, Ga-Rankuwa, Garsfontein, Hammanskraal, Irene, Kudube, Mabopane, Mamelodi, Pretoria, Pretoria North, Rayton, Refilwe, Roodeplaat, Soshanguve, Temba, Winterveldt and are shown on Figure 12.



Figure 12: City of Tshwane Cities/Towns (Source shutterstock.com)

Main Economic Sectors:

Table 1 and Figure 13 below depict the main economic sectors for the City of Tshwane. From the data presented, Government and Business are the main sources of employment with mining and agriculture providing the least number of people with employment opportunities.

Economic Sector	Percentage
General government	28,10%
Finance, Insurance, Real Estate and Business Services	24,70%
Manufacturing	13,00%
Wholesale and Retail Trade, Catering and Accommodation	11,90%
Transport, Storage and Communication	10,30%
Community, Social and Personal Services	5,20%
Construction	3,50%
Electricity, Gas and Water	1,90%
Mining and Quarrying	0,70%
Agriculture, Forestry and Fishing	0,50%

Table 1: City of Tshwane Main Economic Sectors (Source: Google.com)

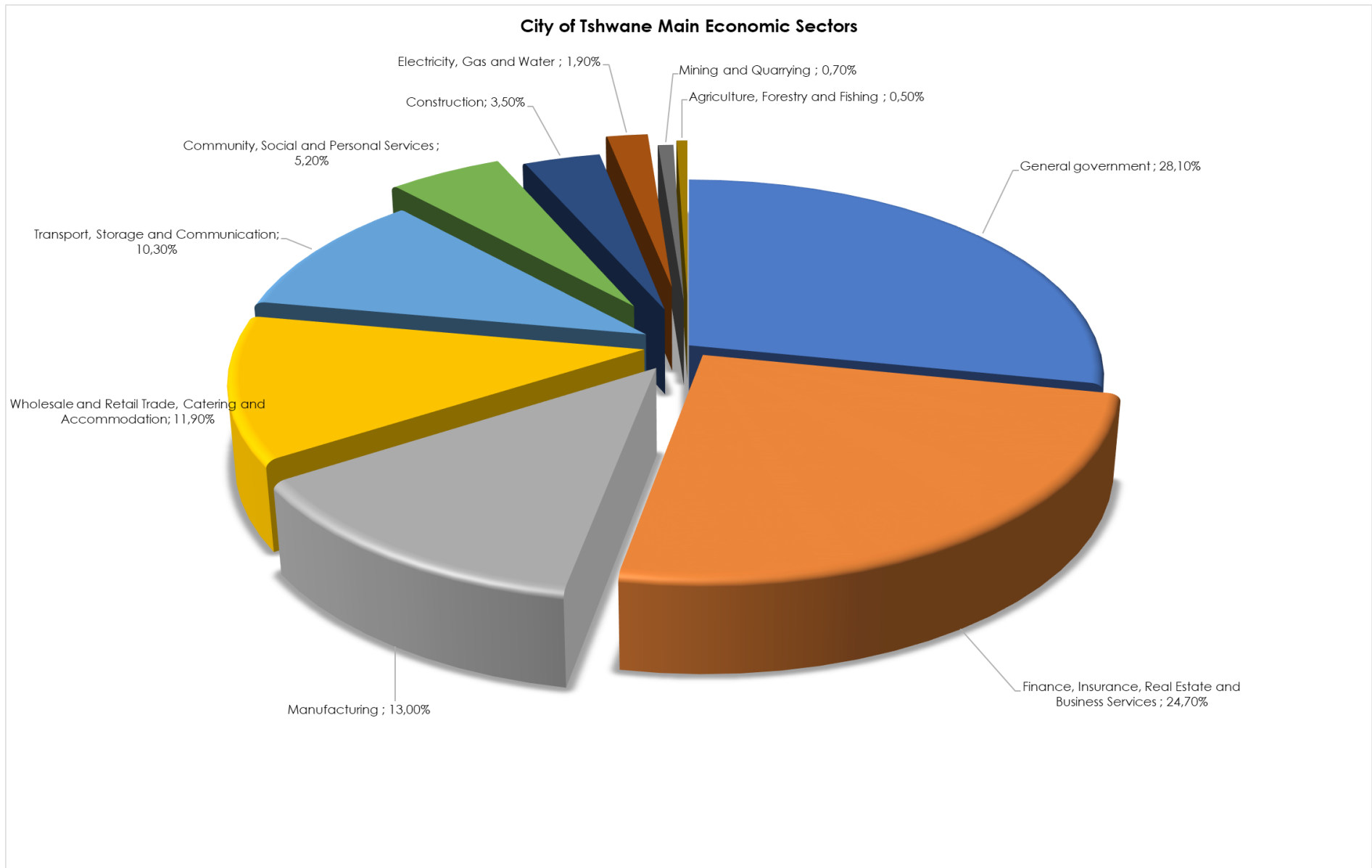


Figure 13_ City of Tshwane Main Economic Sectors

Centurion Historical development

Figure 14 below presents the historic perspective of Centurion from the 19th Century period to 2019.

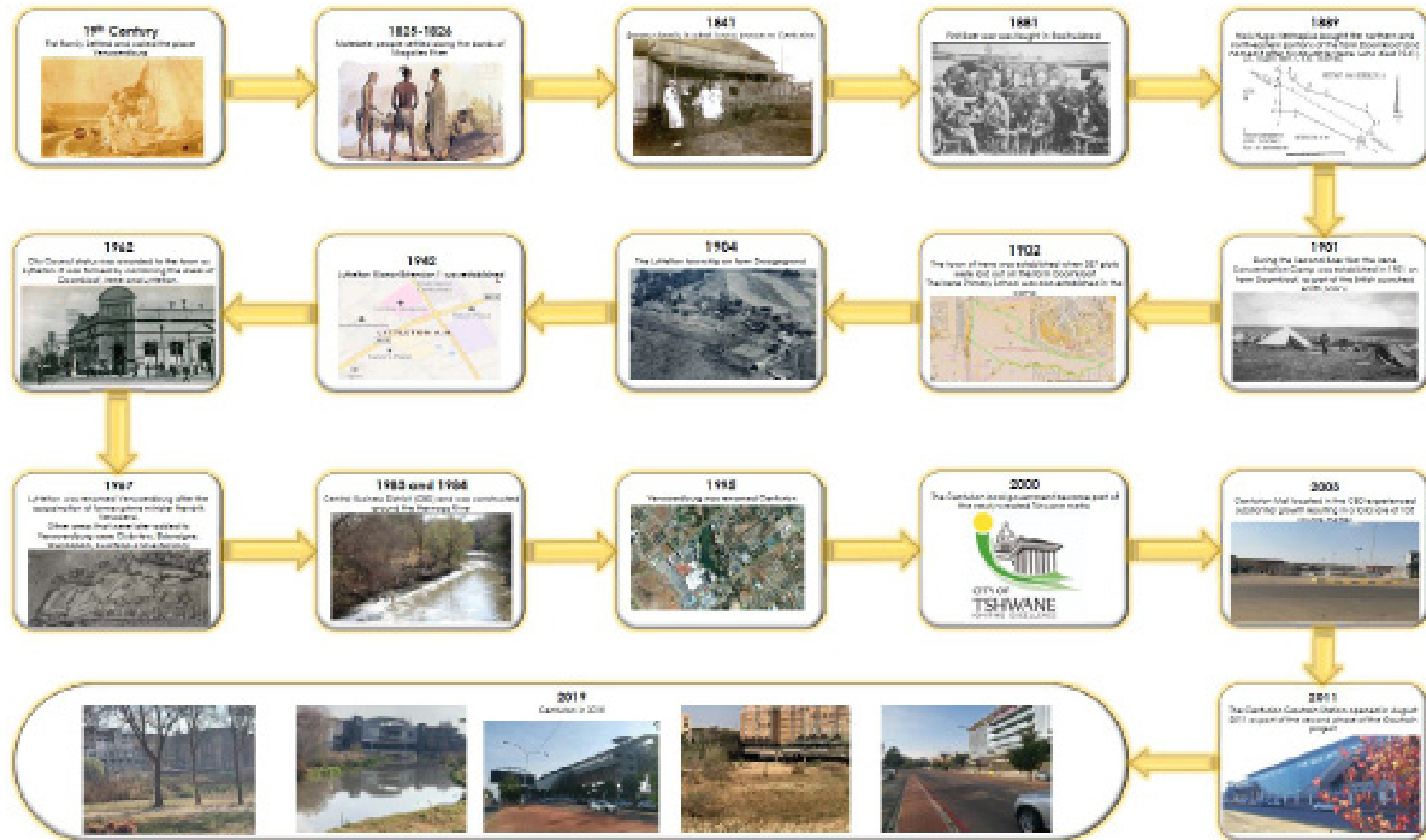


Figure 14_ Centurion Historic Perspective

CENTURION

GAUTRAIN STATION

For cities to be competitive, thus, economically competitive, investment is essential for transportation and communication infrastructure, this is according to Huchzermeyer (2011). The Gauteng province has therefore invested and continues to invest on the Gautrain. The Gautrain is a rapid transit system in the Gauteng Province. As depicted in the Figure 15, the Gautrain connects the study area to a number of areas, these include Hatfield, Pretoria, Midrand, Marlboro, OR Tambo International Airport, Sandton, Rosebank and Park Station. The Gautrain Centurion station is perceived to be located midway of the longest bridges on the Gautrain system that runs from the John Vorster N1 interchange, and to Jean Avenue N14 interchange. The station is located in Die Howes along West Avenue in an area with both residential and business developments. It is currently not supported by any other public transport mode save for its own buses gautrian and passengers private cars.

The Research will also explore the possibility of integrating the Gautrain station with other modes of transport. Furthermore, the research will contemplate the possibility of using the Centurion Gautrain Station as a catalyst for development.

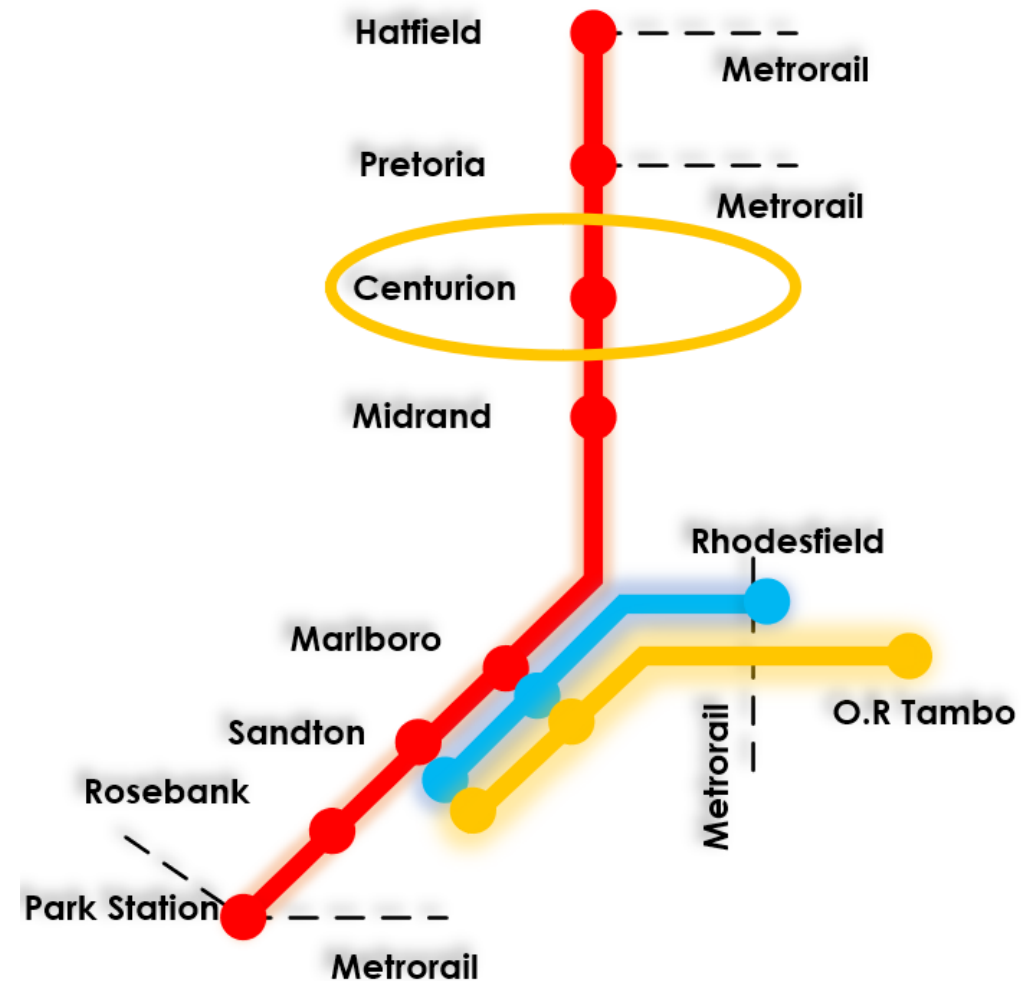


Figure 15_ Gautrain Route



CENTURION MALL

Centurion mall (depicted on Figure 16) is located in the Centurion Central Business District (CBD) and was constructed around the Hennops River during the 1983 and 1984 period. Over the years, the mall has witnessed substantial growth with major growth experienced in the 2003 with a total area of 105 000 square metres resulting in being the second largest mall after Menlyn mall in the Tshwane Metropolitan Municipality.

The resultant Centurion CBD has a wide variety of land uses supported by relatively large shopping centre with land uses ranging from light industry, institutional, commercial, business, public spaces, offices and retail. The area has a suburban character that is, car orientated with use zones separated by roads.

The original historic CBD of the town of Centurion is a mixed-use district centred on a very large shopping centre and contains a mix of retail, offices, light/service industrial and public open space. The spatial structure of the area is reasonably regular, but is suburban in character, significantly car oriented and displaying insular clusters of single use zones separated by wide and “spaceless” road corridors.



Figure 16_ Centurion Mall

Understanding the Research Objectives

The Centurion Metropolitan Node, which is the business node for the City of Tshwane, continues to face a substantial upsurge in development pressures and interest as a result of its very high locational advantages within the Johannesburg, Tshwane, and Ekurhuleni.

The objective of the research is therefore to address the developmental pressures through identifying possible scenarios to be used as catalysts for the regeneration of underdeveloped urban spaces at a precinct scale in order to improve the physical, social and economic aspects through urban design. The study also aims at making the Centurion CBD economically and commercially viable, again through urban design. The Centurion Gautrain Precinct currently has inefficient urban form which will be addressed by striving to achieve the following;

- Using the Gautrain Station as a catalyst for economic development.
- Creating mixed uses across the precinct.
- Achieve interconnectedness of existing and proposed land uses and of major points of interest and creating a safe environment for pedestrian movement.
- Making development proposals that contribute positively to the urban structure of the city to create integrated and legible places and neighbourhoods.
- Making development proposals that contribute to improved quality of public realm and public spaces.
- Making development proposals that contribute to the creation of safe and secure public communities. How space is organised influences human relations (Williams, 2013)
- Making development proposals that ensure opportunities and amenities are accessible and that people can move about easily and efficiently. Equity is about serving the most deprived and marginalised first over quantity (Equity for Children, 2013)
- Making development proposals that protect, value and enhance the natural environment through sustainable design.



Figure 17_ Undesignated Bus Rank (Picture by Author)



Figure 18_ Lost Spaces Picture by Author

Rationale

The research investigates the currently urban forms in Centurion and Centurion CBD and assesses if the forms suitably address challenges faced by the contemporary cities in creating desirable urban spaces for the people. Furthermore, with the aid of concepts laid out in the Responsive Environments literature. The research will attempt to define what constitutes safe and habitable urban spaces in the wake of rapid urbanisation.

A multi-faceted and multi-disciplinary approach will be explored and applied in solving urban problems faced by contemporary cities. Proponents of positivism contend that there needs to change in the way

we (urban designers, planners and architects) think, and that the only real solution to the contemporary city's problems is innovation (Sánchez, 2014).

Over and above the above-mentioned research intends to define habitable/liveable urban spaces, investigate what constitutes safe urban spaces, define Self-Sustainable urban spaces, define urban design principles, investigate what urban design principles and how urban design principles can be applied to the Centurion Gautrain Precinct to make it economically viable and usable by the local inhabitants.



Figure 19_ Lost Spaces Picture by Author

Problem Statement

According to the Centurion Development Framework 2015, the City recognised that the CBD area is viable as a business and residential area but has now lost its identity, human scale and overall townscape and urban quality. The significant development pressures thus represent a very real opportunity to restructure the urban fabric of the Centurion CBD and to upgrade it into a high-quality metropolitan business destination and high-performance urban living area.

The Centurion CBD resulted in the decentralisation services from the Pretoria CBD thereby housing a number of essential services. Despite this noble attempt, the precinct has experienced a number of challenges and spatial problems. These include the need for safe public spaces, vehicular and pedestrian conflict, unclear and unsafe pedestrian walkways, high rate of crime, non-formal trading structures, insufficient public transport amenities including the lack of integration thereof and fragmented development. The study will therefore investigate why an area with great potential owing to its connectivity and diverse land uses is generally under developed. Huchermeyer (2013) notes that often

the settlements are treated in isolation, out of touch with context and not integrated to the holistic urban context in which they exist. Additionally, traditional urban planning and design approaches, (formulated in the global North) also known as 'modern' urban planning models, are repeatedly imposed onto the African planning context. This entails there could be a number of reasons resulting to the current status core of the study area. Furthermore, there could be a disconnect between what the urban planners are taught and what they apply in order to plan for and improve the livability of the people. These challenges have had a negative impact on the social and economic spheres of lives for the inhabitants. This study therefore sets to research planning trends employed by the City of Tshwane, evaluate if there could be a need to propose in new planning approach in dealing with the contemporary urban problems. According to Watson and Agbola (2013), planning is the single most important tool that governments have at their disposal for managing rapid urban population growth and expansion.

Informality is prevalent in urban settings, and according to (Chen & Skinner, 2014) is because of the large number of urban inhabitants in the developing countries that are dependent on the informal economy.



Figure 20_ Non-formal trading (Picture by Author_2019)



Figure 21_ Narrow and in active (Picture by Author)



Figure 22_ Non-active sidewalks (Picture by Author)



Figure 23_ Need for street furniture (Picture by Author)

With staying places or standing zones Gehl (2006) states that people carefully select places to stand in recesses, on corners, in gateways, or near columns, trees, or anywhere where there is physical support for resting against. Furthermore, the placement of seating must be guided by a thorough analysis of spatial and functional qualities of the location.

Personal Experiences

The Centurion Gautrain Precinct is my place of work, meaning I walk the study area almost on a daily basis. In so doing I have come to realise the great potential that the precinct holds, thus through walking the precinct as aforementioned and driving to and from the precinct with ease. Despite these, I have experienced a number of challenges that include crime are a daily occurrence, irrespective of the time of the day. I have on two occasions been

a victim of crime. Vehicle and pedestrian conflict is predominant within the precinct making it unsafe especially for the disadvantaged groups to walk freely within the precinct. The motorised transit is dominant. Other challenges experienced include unsafe on street parking, inactive street edges, unsafe public park, lack of street furniture for public use, and lack of green structure for comfortable walkable sidewalks.



Figure 24_ Unsafe Parking (Picture by AuthoT)

RESEARCH QUESTION AND SUB-QUESTIONS

Main Research Question

What role can the urban design principles play in transforming undesirable urban spaces to desirable urban spaces?

Sub-Questions

- What are urban design principles and what are they set to achieve?
- What are the physical conditions that make urban spaces safe and usable by everyone?
- What are the key urban design instruments, interventions, elements or tools to consider when transforming or re-reimagining undesirable urban precincts?

RESPONSIVE ENVIRONMENTS IN CONTEXT

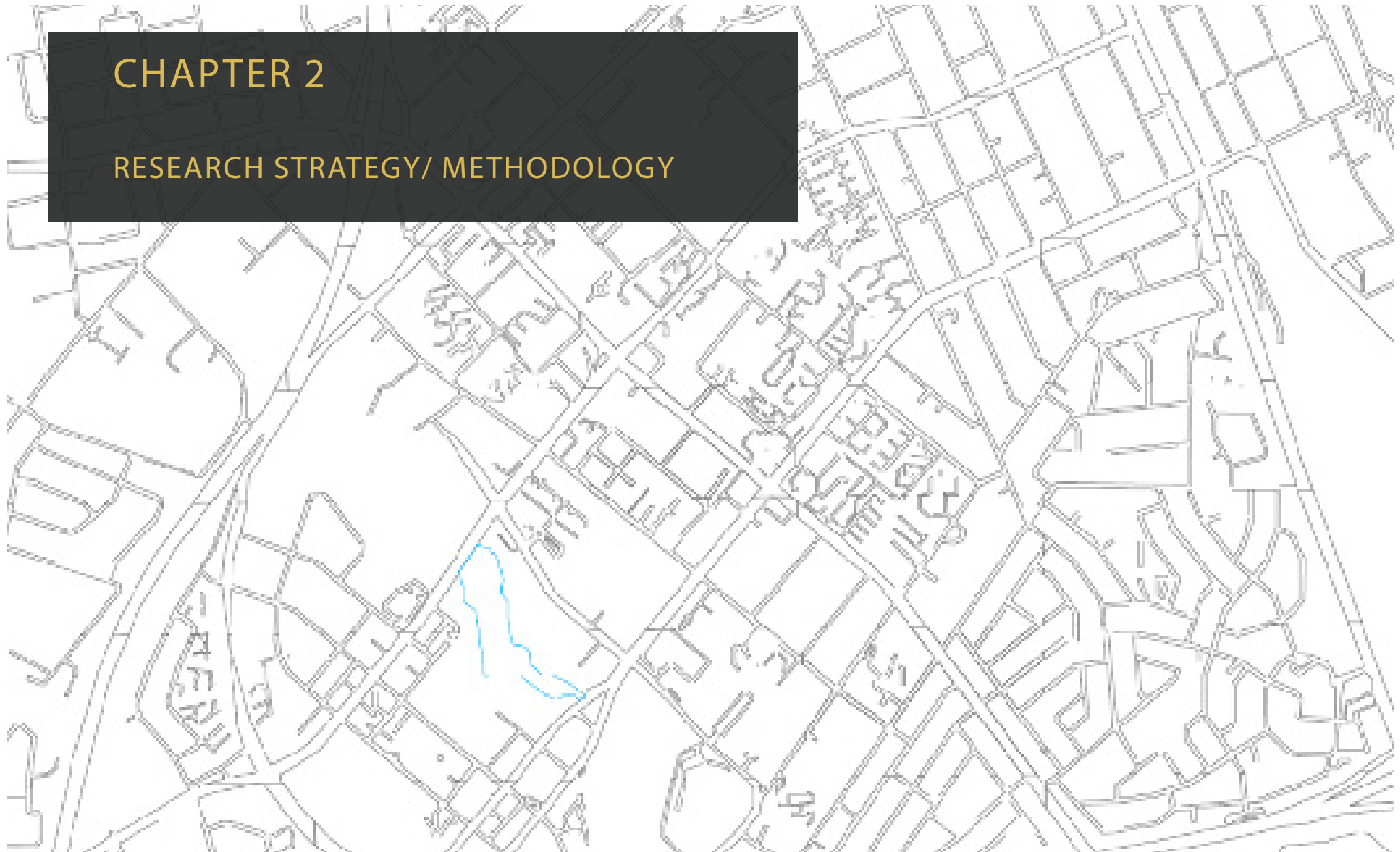
- Permeability-Where they can and cannot.
- Variety- range of uses available.
- Legibility-How easily one can comprehend what opportunities a place offers.
- Robustness- Degree to which a place can be used for different purposes.
- Visual appropriateness-Whether the detailed appearance of the place makes them aware of the choice available.
- Richness- Choice of sensory experience.
- Personalisation -The extent to which they can put their own stamp on a place.



Figure 25_ The key urban design qualities (BENTLEY et al., 1985)

CHAPTER 2

RESEARCH STRATEGY/ METHODOLOGY



INTRODUCTION

The proposed methodology for this research is designed such that a comprehensive site analysis and characteristics is obtained. Some of these characteristics include the natural features, pedestrian movement patterns, traffic patterns and other characteristics that influence design that may exist within and adjusted to the study area. The qualitative method of research will be used predominantly in this research. A qualitative research approach is exploratory in nature and seeks to provide an increased understanding of intricate phenomena (Leedy and Ormrod, 2005: 95). In this research two main approaches will be used to collect and analyse the data. These are observation surveys and the infrastructure valuation approach.



Figure 26_ Research Process (source_ Google.com).

Qualitative Approach

A qualitative research approach can be loosely defined as a research technique that places emphases on obtaining data through open-ended and conversational communication.

A qualitative research approach is exploratory in nature, and seeks to provide an increased understanding of intricate phenomena (Leedy and Ormrod, 2005: 95).

Of the qualitative methods presented in Figure 27, only ethnographic research, process of observation, case study research and record keeping were used for in this research.



Figure 27_ Qualitative Research Methods

DATA COLLECTION

Data collection refers to the systematic approach of gathering specific information from a number of different sources. This may be qualitative data or quantitative data. This section details how the data that informs the design was collected. Two data sources were used in the research, thus primary data sources and secondary data sources. These are shown of Figure 28 and further elaborated on below.

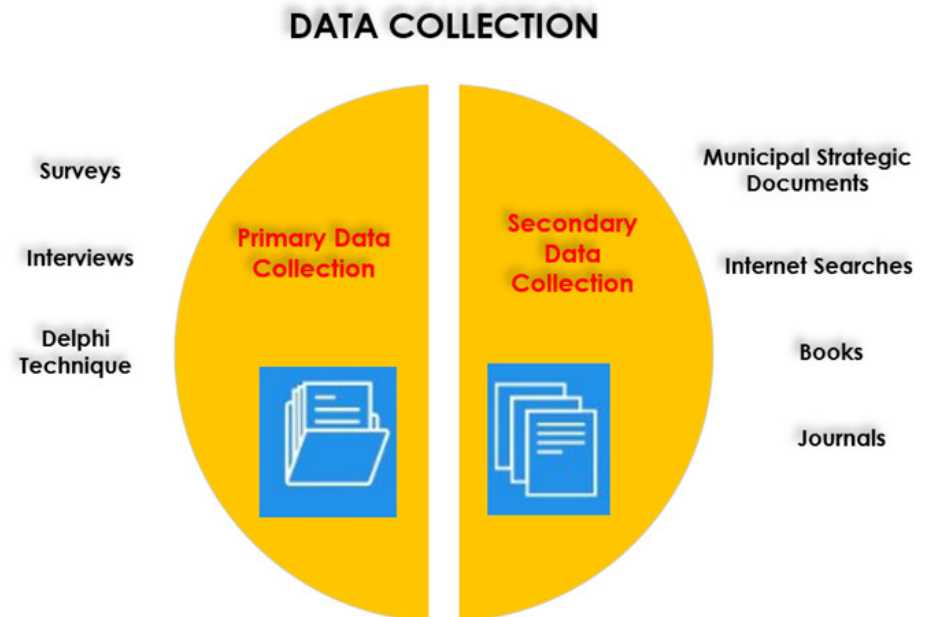


Figure 28_ Data Collection Methods

Primary data sources

Primary data sources are the first-hand information that was collected by myself and used in this research. In some instances, secondary data sources, such as land use maps downloaded from the City of Tshwane online maps were verified on site and updated through surveys conducted by myself thereby rendering these primary data sources.

Secondary data sources

Secondary data sources are data sources that are already in existence and are readily available for use, some with further processing required and some with none. Secondary data refers to the re-analysis of primary data, and can be found in various forms including legislation, textbooks, journal articles and newspapers, which are mostly published material (Babbie, 2005: 286).

In this research a substantial amount of secondary data sources were used. These were specific to the study area in question and include, legislative frameworks, books and journals. Specific issues that pertain to the study area were extracted and interrogated extensively and further informed the planning decisions made relating to the final study area design.

Ethnographic Research

As stated earlier, I live and work in the study area in question. Therefore, an ethnographic research is also applicable in this research. Loosely defines Ethnographic research is a qualitative method where a researcher interacts with a study area in the real-life environment. Through driving and walking to and from work, home, shopping, leisure I was able to observe and compile vital information that would later inform my decision making.

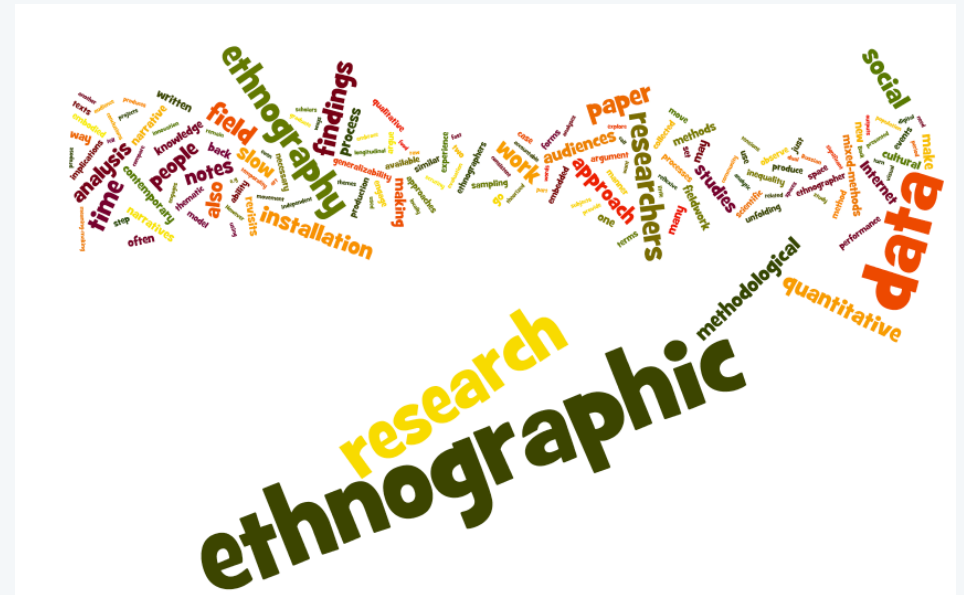


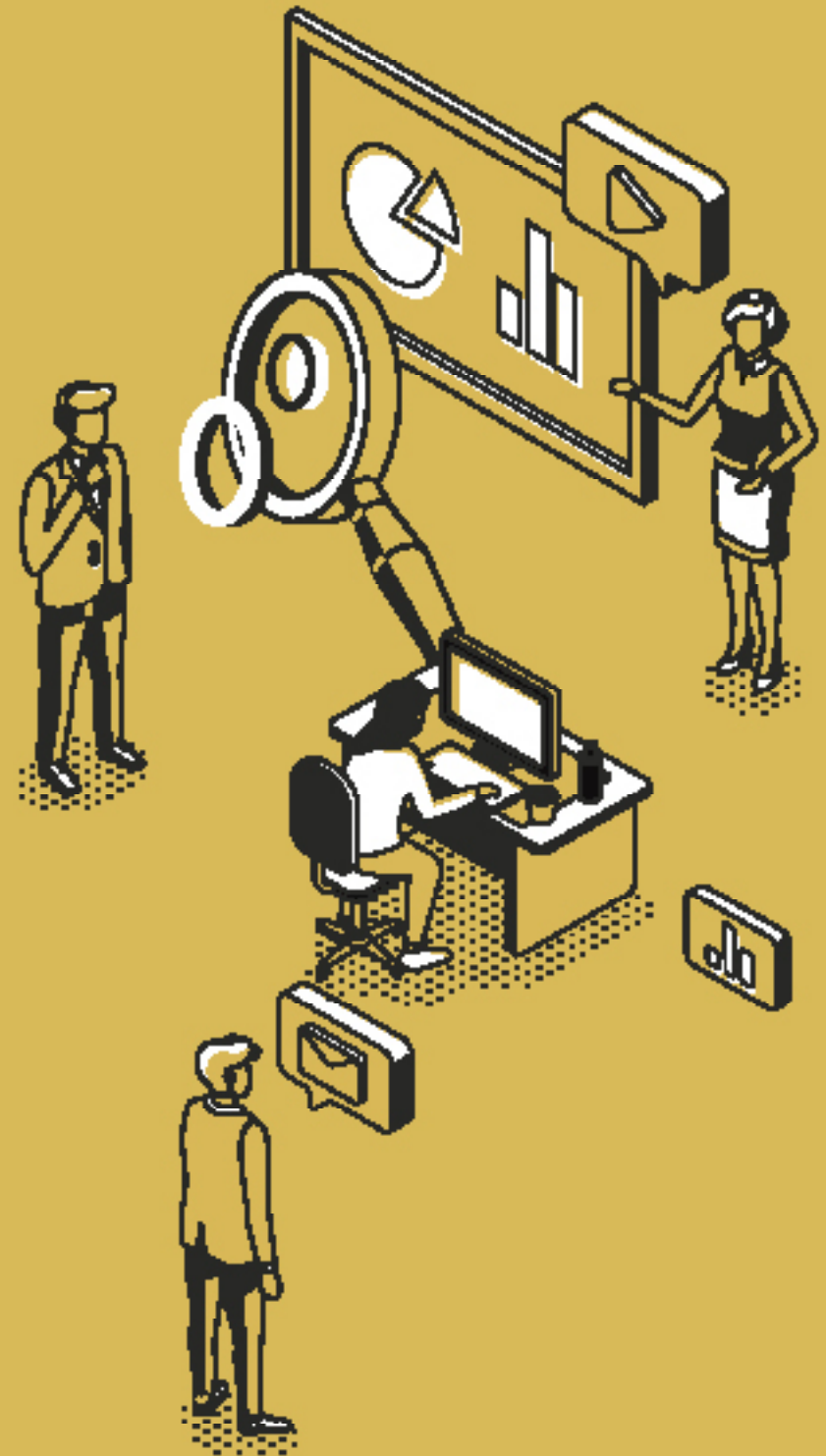
Figure 29_ Ethnographic Research

DATA COLLECTED

As aforementioned, some of the data used in this research was collected by myself through structured surveys that aimed at obtaining specific information. Some of the data was again obtained through the daily interaction with the study area. Data will be collected by myself physically on site. Specific points of interest were selected and marked on maps that were downloaded online and observation will be conducted on selected points. The information that was collected included the following;

- Land uses;
- Pedestrian movement patterns;
- High activity areas;
- Building typologies;
- Edge conditions
- Daytime and night activities
- Density;
- Street elements; and
- Traffic movements.

No interviews were conducted in this research. Below are some of the resultant images that were taken during the data collection phase of the research. These images will be analysed and interpreted in the context analysis section of this document.



Data collection images



Figure 30_ Informality and narrow sidewalks (Pictures by Author_2019)

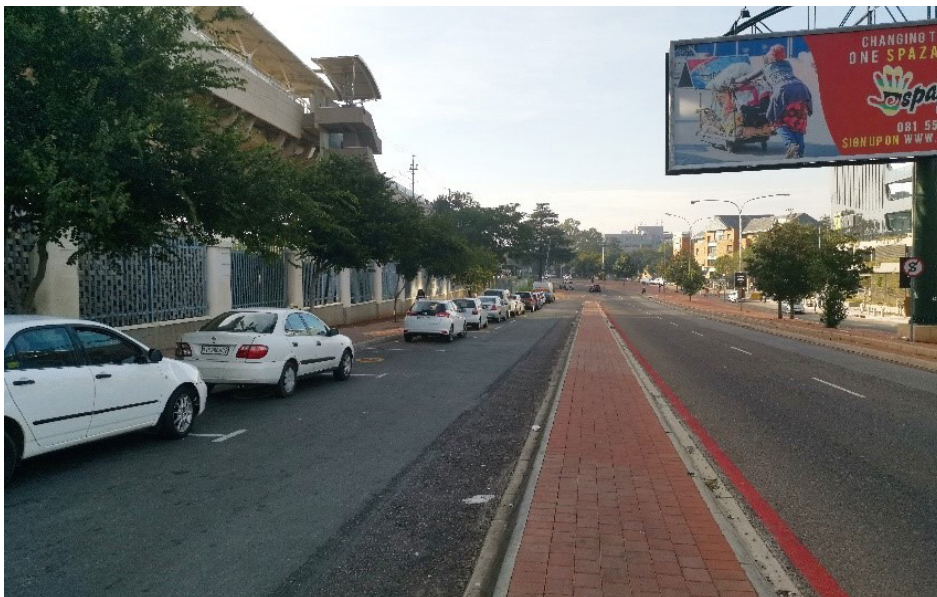
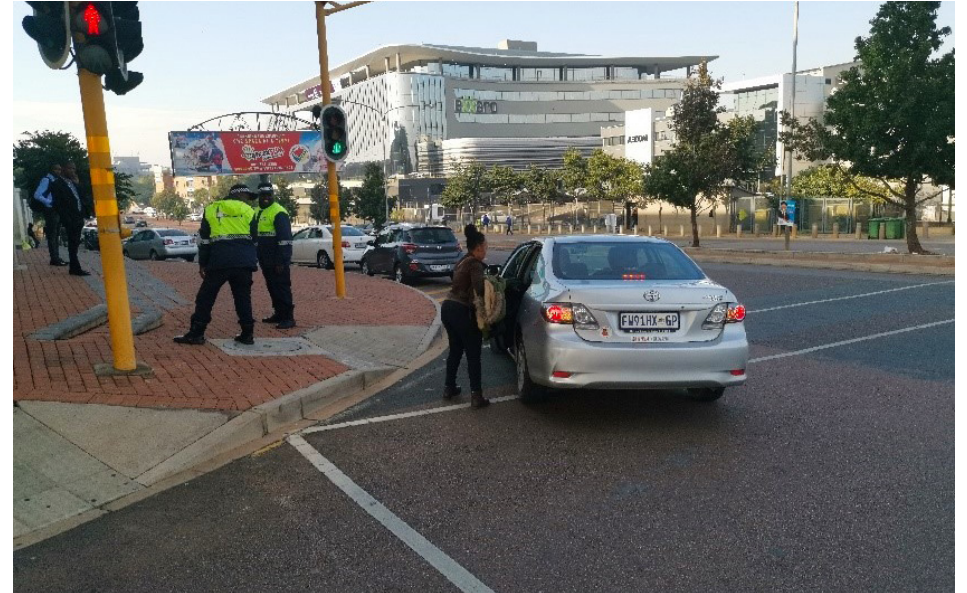
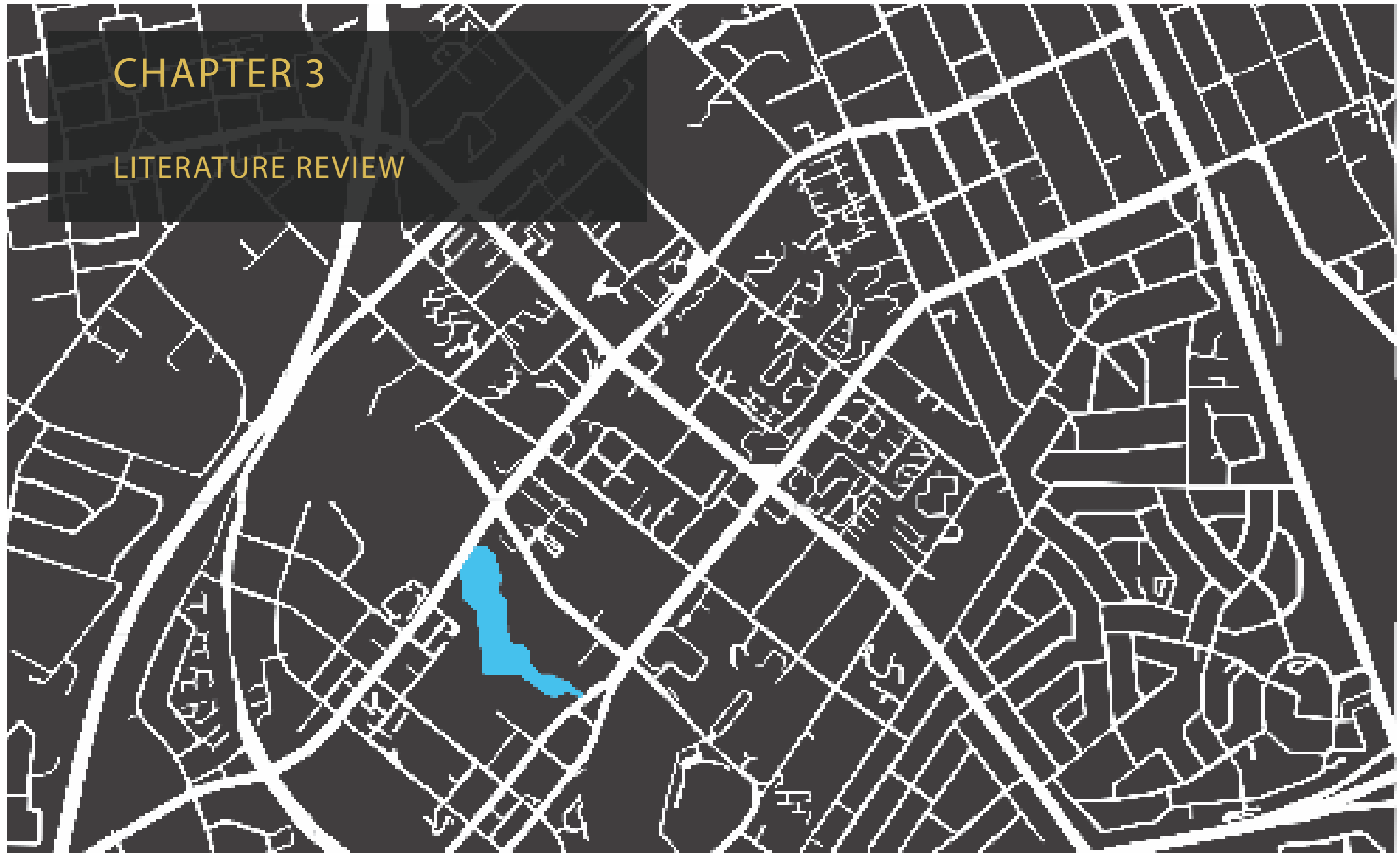


Figure 31_ lack of Pedestrian Infrastructure(Pictures by Author_2019)

CHAPTER 3

LITERATURE REVIEW



URBAN DESIGN PRINCIPLES

These are principles that are applied to an urban setting in order to enhance the appearance, as well as the public spaces and spaces between buildings. These principles do not only enhance spaces but also make them usable for everyone. Some of these principles are briefly described below;

Character

This is when a place is identifiable by its people through the arrangement of the landscape and its cultural context.

Continuity and enclosure

This is when public places are clearly framed by buildings to create a room like environment.

Quality of the public realm

This is when the outdoor spaces are usable and safe for everyone.

Ease of movement

This is when it is relatively easy to get around a place. Permeable places are also easy to navigate. Access to facilities is enhanced.

Legibility

Places that are clearly and easily understandable are termed legible places. Landmarks and intersections aid in making places legible.

Adaptability

Places with uses that can change with time are termed adaptable

Diversity

These are places that offer variety of choice through the use of compatible uses.

LITERATURE ANALYSIS

In order to navigate the city at all or urban environments at a smaller scale of an inner-city precinct, the exertion of the cognitive and psychological mind is rudimentary action people use in order to understand and interpret urban environment around them. This is the essential activity people engage themselves with in order to assimilate vast information in these immediate environments. This is so to exclude the new and reinforce the old information that reinforces beliefs

and ideas to aid in spatial navigation and way finding within these urban precincts. Often times, for urban space users, of their highest concerns often is safety and habitability in these spaces. It is unavoidable to state that within an Urban Design study the concepts of safety and habitability are critical principles which frame the foundations of creating public spaces for people (Clope, Philo and Sadler, 1991). Alongside the idea of creating a safe and habitable space, it is important to also understand the sustenance in these spaces. To build on the topic analysed in the first chapter, this chapter gives a detailed discussion on the theoretical framework that underpins this research. It is aimed at understanding the creation of safe, habitable and sustainable urban precincts. To further extend this discussion, these three concepts

are explored in a Transport Oriented Development kind of urban precinct. The chapter opens by a discussion aimed at understanding the how urban design creates and appropriates public spaces through the 'right of the city' perspective. Then, it follows on to understand sustainability within the frames of urban precinct creation. Lastly, in placing urban planning in the centre of the debate, the chapter will discuss the relationship between the TODs and the general creation of precincts such that they are safe, habitable and sustainable, and what that means for people using these spaces.

Urban design as an appropriation of promoting the Right to the City.

As the scholarship of Tibbalds (1992) 'places matter most' argues for the creation of intricate places which are related to the human scale, the scale of walking, which in turn speaks to the people as users of space and not those of mass traffic as a result of cars and massive constructions of more buildings, the latter seem to suffice more that it is advocated practise. This creates non-cohesive urban spaces without character and urban fabric richness. In the absence of this, according to Mooketsi (2018) non-cohesiveness and lack of character is a contributing factor towards unsafe and hostile public spaces. A call for rectification lies in what Madanipour (1997) describes in his work as the practise urban design; which is a balance and collaborator spatial tool to maximise the use value experience to service all people present in that particular space rather than a group in society. Speaking to Transport Oriented Urban Precincts, the message being driven across is in particular to the support of both the transportation and the commuters or even those who use spaces in the surround. The ambition of the practise to change and balance societies through urban spaces lies within the urban designers' skill to intertwine social, economic and spatial values of urban spaces (Madanipour, 1996). Further assertion from his work suggests the existing correlation between societies and urban spaces; and that the injection of an economic aspect should not overshadow the existence of the social. Creating a transport hub within the city which is supported by businesses must not overshadow the need for the urban space users (people) to can habit the space. Broadening the scope of making urban spaces that can nurture this three-dimensional relationship, it is of great importance that the physical space must be understood first as spaces where life exist.

Gehl (2010) elucidates how streets, squares, markets, parks and public transport stations are the building blocks of any city. Gehl (2010) further asserts that regardless of a person's citizenry status [visitor or resident] of an urban space, one experiences the life of the city by moving through the public spaces nestled in the urban fabric—this is the need to can habit the spaces safely. Gehl (2010) highlights the importance of caring for people in the city by providing sufficient and good quality

In order for space to manifest Gehl's desires, the appropriation of the right to the city notion needs to be a central focus. Urbanism scholars such as Lefebvre are well known for their advocacy work on rights to the city and issues of social justice in urban spaces. The discussion in this paper is opened from one of the frameworks he developed to criticise the Everyday Life in 1991. This work highly considers the commonness of human alienation in urban spaces. Often, people in these spaces experience a feeling of neglect, unsafeness and a separation from what life in an essence is in an urban space. Many urban spaces, instead of embracing designs, plans and developments that recognise the human being as the heartbeat of the space tend to find means to marginalise him from space in favour of the car and the building (Harvey, 2008). In many cities, including Centurion, this becomes an unintentional case where the means to clean-up and create a once-off world-class transit without a mix of informality leaves the human being contesting to use the space with buildings and cars (Mashiri, 2017).

It is amply important to define what is meant by right to the city before progressing to the place-making discussion. The notion of right to the city has evolved through space and time over the years. The writer adopts to extent the notion of social justice and right to the city from Lefebvre's writing. According to Marcus (2009), the 'right' in this notion is a conglomerate of other rights which should work together for the well-being of the user and experience within that urban space. Lefebvre (1996) notes that at the most basic level, the right to the city includes an individual's right to live (habitability), work and play (a place of sustainance). It further recognises the right to access a mix of use within the jurisdiction of a particular urban space. Furthering the definition is Strauss (2017) who believes that the notion of right to the city needs to be in line with urban design principles of place-making which seek to transform urban spaces in order to appropriate the meanings change and adapt over time, and so will the forms of appropriation. A successful urban environment is one which provides various opportunities for life to take place, enabling rather than restricting it (Banerjee, 2001).

Just when the urban planning and design profession is globally enquiring ways in which it can address questions entangling the inclusion and integration of the greater urban citizenry into the 'public spaces' through injecting massive amounts of public resources; political governance and economic investment play a critical role in determining the outcomes (Biddulph, 2011). As forwarded by (Strauss, 2017) many are the questions arising within the sustainable urbanism circle of how political and economic emulations of world class cities affect the desire to plan and enact the right to the city for all. This leaves the planner and designer with more work of figuring out how one should re-route or redirect their approach of building an inclusive urban space with is in-turn safe, habitable and sustainable. According to Uitermark and Nicholls (2017) more than creating newer urban spaces, some of the burning questions are deeply rooted in the phenomena of regenerating and revitalising declining urban spaces to be inclusive. This phenomenon is reviewed below and further in within the greater document through the case of Centurion Gautrain Station. To wrap the discussion, it is only urban spaces that had been designed with people in mind that can successfully function to support every urban space user, this is the kind that is not exclusionary, however, allows for mix-use function that can support the human being. Moreover, the urban elements within the spaces play a catalytical role in ensuring that the desire to have a healthy three-dimensional relationship within an urban space is made manifest.

Three-dimensional relationship of urban design principles within an urban space

In order to successfully deliberate on the three-dimensional relationship between safety, habitability and sustainable development of public spaces, it is important that I mention that these are part and parcel of the Urban design principles. Briefly, urban design principles are referred to as elements applied to a town or city in order to enhance appearance, transportation, the public spaces along streets between the private property lines, and location decisions about specific civic and private land uses. They often can all be grouped under sustainable place-making of a precinct. This section seeks to define the three concepts already alluded to in the beginning of the chapter; safety, habitability and sustainability. These, work hand in hand and should be realised alongside each other in any designed environment. Safety is discussed first, and the second layer will be the discussion of what it means to be habitable and lastly, all elements will be tied in the discussion of

Safety

Urban safety is recognised globally as an essential ingredient of urban development. According to UN-Habitat, 60% of all urban residents in developing countries have been victims of crime at least once over the past five years – 70% of these residents live in Latin America and Africa. Urbanisation is typically accompanied by increased crime and violence, the proliferation of weapons, substance abuse and mass youth unemployment. These crime levels and feelings of insecurity hamper the social and economic development of cities. Thus the prevention of violence and crime is recognised internationally as a key feature of sound urban safety strategies. There is a growing understanding both globally and in South Africa, that cities are central in advancing urban safety. Because cities experience higher rates of crime than semi-urban and rural areas, safety challenges impose severe limitations to their growth and development, as well as quality of life of residents. In South Africa, an uneven spatial distribution of safety affects the overall inclusivity, efficiency and functioning of cities. Further, as a result of poor planning, an exclusionary spatial form and socioeconomic factors, low-income areas, such as townships and informal settlements, suffer from especially low levels of safety.

Habitability

Habitability has emerged as an important concept in the field of urban planning and design. habitability is used in wide array of contexts within the field of planning: transportation, community development, resilience, and many other subdisciplines have incorporated habitability is used offers insights on what it means to planners and communities. In simplest term, it refers to being able to reside, or live in a space or place without the fear of crime, environmental uncertainties. It supports life well.

In order for space to manifest Gehl's desires of a habitable urban space, the appropriation of the right to the city notion needs to be a central focus. Urbanism scholars such as Lefebvre are well known for their advocacy work on rights to the city and issues of social justice in urban spaces. The discussion in this paper is opened from one of the frameworks he developed to criticise the Everyday Life in 1991. This work highly considers the commonness of human alienation in urban spaces. Many urban spaces, instead of embracing designs, plans and developments that recognise the human being as the heartbeat of the space tend to find means to marginalise him from space in favour of the car and the building (Harvey, 2008). In many cities, including Johannesburg, this becomes an unintentional case where the means to clean up and create a world class leaves the human being contesting to use the space with buildings and cars.

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SUSTAINABILITY

Sustainable urbanism is a movement in space which considers a new way of planning and designing towards compactness. According to Farr (2008) sustainable urbanism cannot be achieved with low densities urban form. It is envisioned to be dense enough to set the place with comfortable and walkable distances whilst providing the place with a good public transport system. Closely associated with the study of compact city and densification, the review attempts to weave the concepts that underly issues of sustainable urbanism in creating habitable and safe urban precincts.

At the most basic level, densification of the urban built environment plays a vital role in the city efficiency. There is widespread agreement that more compact cities that includes mixed land uses and sufficient public transport will result in more sufficient environmentally sustainable cities. There is an ambiguity however that exists in the conception of the word densification. To clarify this, the review looks at densification as a process to increase densities within a given space (Turok, 2011). According to Boyko and Cooper (2011), densification can be seen in various ways, which include: population density, block density, occupational density net neighbourhood residential dwelling or habitable room per hectare. Densification is an outcome of the alteration of the physical structure taking a vertical or a horizontal shape. Vertical densification is concerned with accommodating more people and land-uses on a smaller surface and it is widely known as an approach to build smart cities in the studies of new urbanism. Vertical densification is characterized by developments of vertical-rise structures predominantly functioning as housing spaces, offices, retail spaces.

Turok (2011) asserts that an agglomeration of uses together with a diverse transport system can achieve a densification which in turn brings sustainability to the way in which an urban precinct function. If an area with a variant mix-of-use is well serviced with transportation but also non-motorised transportation, it gives out a sense of a liveable community, it is inviting and pleasant to live within. In order to realise and support sustainable development, in areas Centurion Gautrain Station, it is important to densify and bring in a mix of uses whilst giving prevalence for the pedestrians. Simultaneously linked with mix-land uses, Gehl (2010) stresses the importance of mixing uses not only throughout a neighbourhood but also vertically within a specific building as a form of encouraging

functional, effective, efficient, safe and liveable sustainable urbanism and densification. It is assumed that this will attract a mixture of people and result in a richer more diverse neighbourhood character. Different uses together with dense urban form encourage shorter trips and more lively neighbourhoods. The active streets need to be combined with vertical mixed use in order to provide continuous eyes on the public environment to improve safety throughout the neighbourhood. This will further encourage people to use non-motorised transport to move through the neighbourhood, resulting in a more environmentally friendly public realm. The phenomenon that co-exist with densification is the conception of the transect development. This describes the model of space creation in a series of zones that transition from sparse rural and peri-urban development of the urban form to the dense urban core mainly characterized by taller buildings which then function as mix-use-spaces. Every zone of the transect development is fractal in that it contains a similar transition from the edge to the center of the neighborhood. The importance of transect in the practice of planning and design is particularly seen as a tool to influence the manner in which plans are conceived. In these patterns, large areas are dedicated to a single purpose, such as housing, offices, shopping, and they can only be accessed via major roads. The transect, by contrast, decreases the necessity for long-distance travel by any means within the urban core. In order to push the agenda of sustainable development, it is important to consider not only the building of mass vertical structures in the name of densification. However, as forwarded by Gehl there need to co-exist public space, public transport and buildings within the city and these should be flexible to easily accommodate change in public demand and the natural environment. These places should accommodate 'city life' that consists of people moving through spaces and spaces shaped by urban form or buildings. The planned public places are usually the ones society or the designers of these places classify as parks, transport facilities, markets, squares or plazas and the unplanned public open space consists of streets, natural open space, empty land and landscaped areas between buildings. In conclusion, the three-dimensional urban design principles clearly speak to compact cities with Sustainable transport and good public space. These localities have been created with a dominance focusing on mass transit systems linking into well established non-motorized transport options. This helps to create a low impact transit system that is accessible and easy for all. Alternative energy means is also important as well as a reduc-

Transport node creation in the presence of economic power.

Urban Development Frameworks, Precinct Plans and Transport Plans are some of the key ingredient which ensure that the built environment is fit for the future. It is often stressed in policies that social, economic and environmental considerations should form the basis of urban development plans and assist the state in delivering long-lasting outcomes. Bringing together the private and public, formal and informal sectors. This should create broad economic and social benefits for the whole community, such as safe, habitable and sustainable areas to live, work and play. Within the prime of such desired phenomenon, Mashiri (2017) highlights an interesting fact regarding the development of rapid rail transport stations. His analysis of the economic development policies along with rapid rail development as an attempt to compress space in relation to time, even though this is achieved some of the elements of social policy are lost. He positively concurs with local economic development policies that in the context of many developing countries rapid rail systems have been developed for economic function. However, he quickly criticises that in most of the areas which are serviced by the rapid rail transit in South Africa, there seems to be a disintegration by the system to the people, defeating the purpose to achieve 'right to the city'. He points out two main factors, the cost to use the rapid rail system and the outer environment in which it is located. In the interest of this research, we will only discuss the environment.

According to Chiwetu (2017) rapid rail urban developments like the Gautrain often pickily rope in private development to come and operate in an area and sometimes fall into the trap of gentrification. He describes gentrification as a process in an urban community of shifting more towards the interest of wealthier residents and businesses. At the heart of this research paper, the discussion and analysis are limited to the social impacts. Snel (2011) further notes that gentrification could possibly lead to some adverse population migration trends in which poorer residents are displaced by wealthier newcomers. As taken from the interviews conducted on site with around the Centurion station, the informal traders because of the aesthetic that the station is, together with the use zone, it will not allow for them to function. This takes away from the element of being socially integrated, moreover, from observation but supported also through empirical research, the station is disintegrated from the they are residents and users, accommodation prices have hiked so much that they people it serves.

The development of Gautrain station from Johannesburg to Pretoria was mainly aimed at the need to help reduce traffic congestion on our highways. An aim of equal importance was to direct and concentrate economic investment in these areas. In areas such as Johannesburg, Rosebank, Sandton and Hatfield this is evidently seen by the agglomeration very affluent and upmarket businesses. Concurrently,

this development has also created relationship between the suburbs it has stopping stations, however the manner in which some stations relate to the suburbia has often been seen to be too hostile and unfriendly towards humans. Could this be a result of what Van Der Westhuizen (2007) labels as elitism at its best?

Critically important, the access and geographical integration offered by the train system is not necessarily very inclusive, empirical research shows that in some stations such as Centurion, the interchange is very hostile to the integration of pedestrians, other transport services and the informal activity happening close by to the station.

Importance of nodal and precinct treatment and its integration with the fabric.

Urban designers and planners have taken a critical review on typically engineering, planning and political domain of mobility. Questions raised are directed to the appearance of transport and mobility as a whole, as these dominate the visual field of our current cities. Even though seemingly world class, the idea of attractive transport stations more especially rapid rail system is accompanied by an undertone of urgency as to the aesthetics of mobility rather than the need for a mix of the formal and non-formal. This aesthetic relates to linear objects, as roads or tracks, and to the stations as points of concentration, all within the visual field of an urban environment (Houben, 2003). In this section I delve into a discussion of using transport stations such as the Gautrain as gateway urban precincts to serve all people and by affording them a right to the city accompanied by a sense of safety, habitability and sustainability. In this sense they become a crucial part of this aesthetic of mobility and are seen as the existential dimension of the system.

Stations should offer an inevitable 'first impression' of the city or precinct and should not be treated as typically 'transport spaces' but rather as a public domain, a place to wait and a place for social interaction. The questions raised here are firstly; what level of convenience does a transport precinct, like the one Centurion Gautrain Station, offer and to what extent does the integration of station and place benefit both precinct and the human?

Convenience can be seen as another dimension to the spatial proximity between localities. Although around our particular station, the pecks are different for a pedestrian user, as for example they take the train to a city then walk for three minutes to a bus stop, which is within the safe guarded space of the station then catch a five minute bus trip, after the bus another five minute walk to the final destination or for those whose destination are adjacent the station the experience is almost undesirable one.

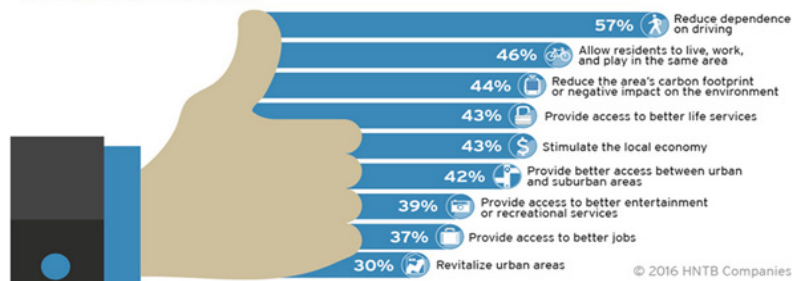
Transit Oriented Development can be defined as strategies to encourage the establishment of mixed use and high-density milieus around transit nodes or corridors (Carlton, 2009). The mix-of-uses often associated with TODs usually include housing, workplaces, shops, social services and open spaces. The theory of TOD highlights that public transport systems and geographic contexts within which they navigate are entities that are mutually dependent for producing sustainable urban forms (Nikolic et al, 2009). The notion of TOD was first conceptualised and developed in the United States of America in the late 1980s by Peter Calthorpe (Carlton, 2009). However, as a fixture of modernist planning and urban design, TOD became more popular in the early 1990s when Calthorpe (1993) published *The New American Metropolis*.

TOD have many benefits, some among others are

- Promotes mixed-use,
- Compact development approaches that meritoriously integrate residential precincts with commercial hubs and other urban facilities as an avenue to improving access to public transportation networks and other mobility preferences such as walking and cycling (Cervero et al, 2002).
- Main element to creating sustainable, liveable urban communities.

BENEFITS OF TRANSIT ORIENTED DEVELOPMENT

Americans believe transit oriented development provides an array of benefits ranging from lifestyle to environmental to economic.



Source (Google.com)

BENEFITS OF TRANSIT ORIENTED DEVELOPMENT

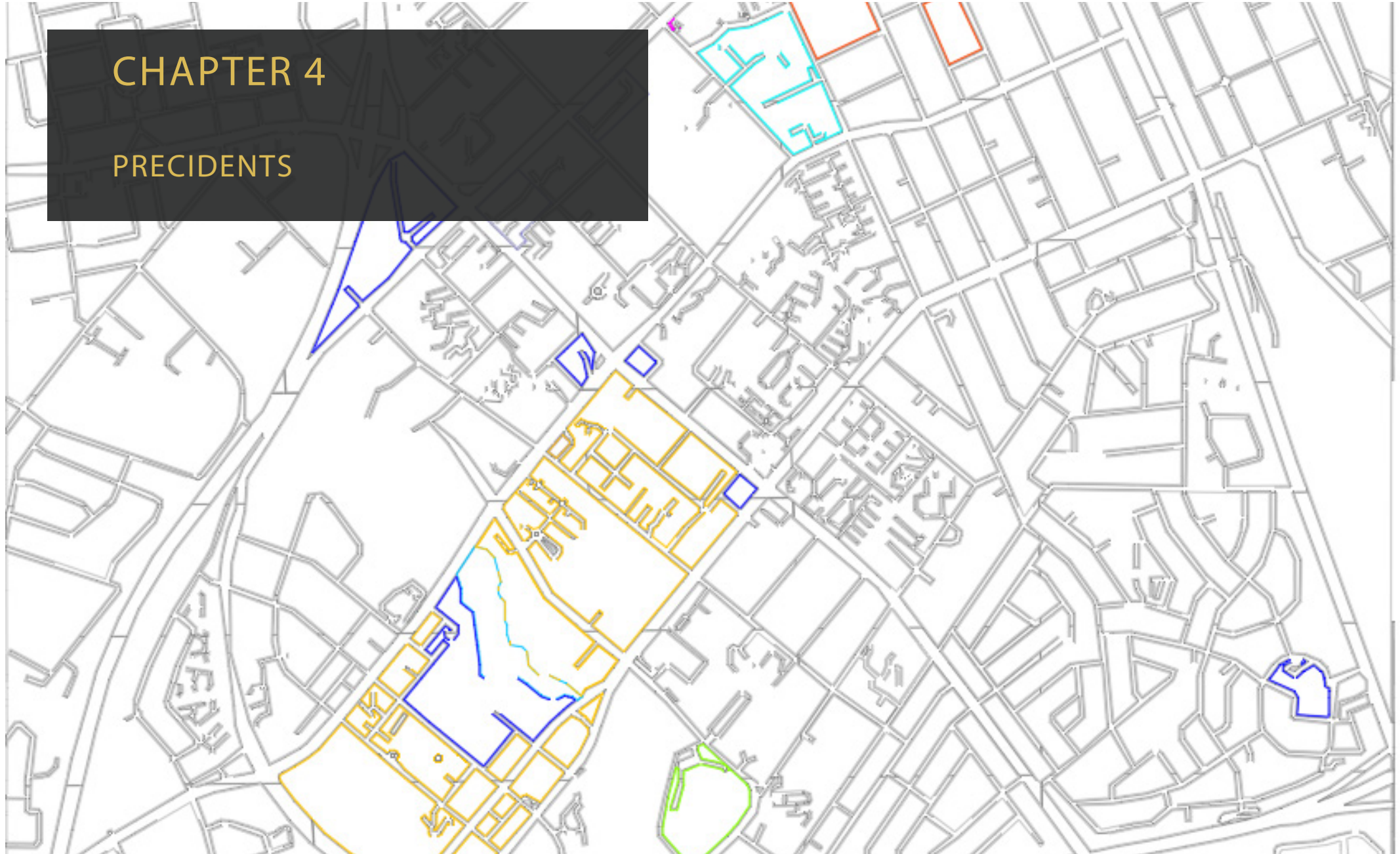
- Higher quality of life with better places to live, work and play
- Greater mobility with ease of moving around
- Increased transit ridership
- Reduced traffic congestion, car accidents and injuries
- Reduced household spending on transportation, resulting from more affordable housing
- Healthier lifestyle with more walking, and less stress
- Higher, more stable property values
- Increased foot traffic and customers for area business
- Greatly reduced dependence on foreign oil, reduced pollution and environmental damage
- Reduced incentive to sprawl, increased incentive for compact development
- Less expensive than building roads and sprawl
- Enhanced ability to maintain economic competitiveness

COMPONENTS OF TRANSIT ORIENTED DEVELOPMENT

- Walkable design with pedestrian as the highest priority
- Train station as a prominent feature of town centre
- Train station as prominent feature of town centre
- Public square fronting train station
- A regional node containing a mixture of uses in close proximity (offices, residential, retail, civic)
- High density walkable district within 10-minute walking circle surrounding train station
- Collector support transit system including street, light rail, and buses etc
- Designed to include the easy use of bicycle and scooters as daily support transport
- Large ride-in bicycle parking areas within stations
- Bikeshare rental system and bikeway network integrated into stations
- Reduced and managed parking inside 10-minute walk circle around town/ train station
- Specialised retail at stations serving commuter and local including cafes, grocery, dry cleaners

CHAPTER 4

PRECEDENTS



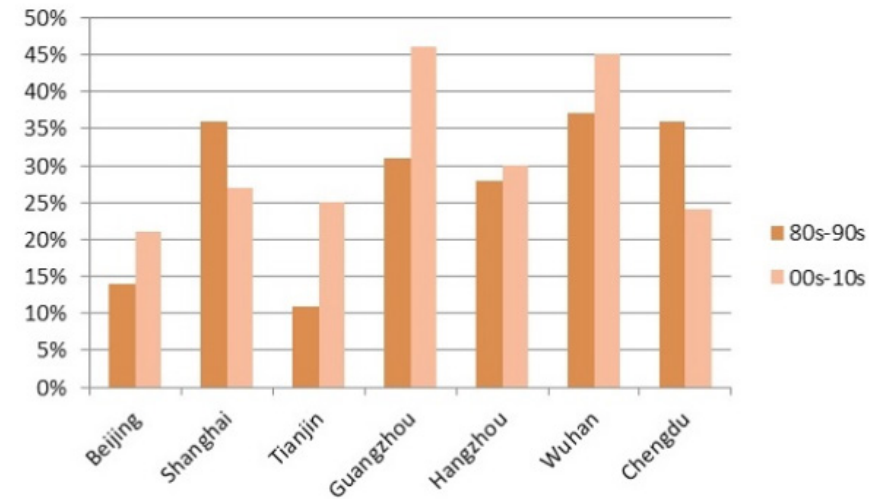
PEDESTRIANISATION IN CHINA

China has on a national scale, put forward its national urbanization plan which encourages pedestrianization. This was as a result of rapid urbanisation that resulted in need to improve safer, improve air quality, and encourage physical activity, but also facilitate commercial and social activity.



Source (Google.com)

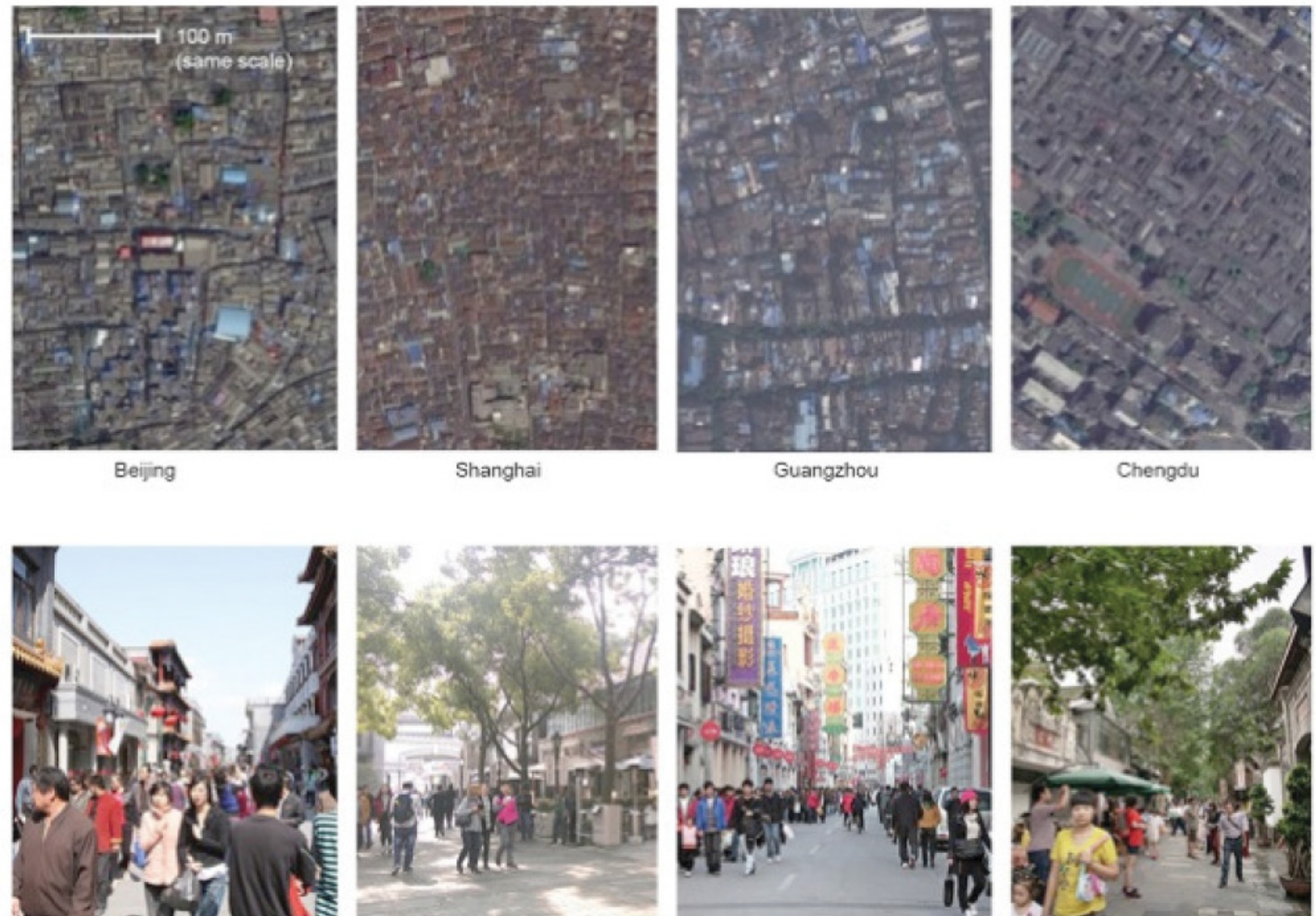
ECONOMIC DEVELOPMENT, BUT POTENTIAL NEGATIVE IMPACTS



Changes in mode shares of walking in selected Chinese cities (1986-92 vs 2003-10). In most cities, the percentage of individuals walking has increased over time. Graphic by Wei Li.

Though the economy is steadily improving there is diminution in quality of health, triggered in part by heavy air contamination and dipping levels of bodily activity.

The pedestrianisation project has resulted in only pedestrian streets cropping up across the country. Cities with pedestrian only streets have seen great economic benefits as they are visited by up to 25000 people per day on average. Shanghai's Nanjing Road is the highest with 2 million. The streets have mainly commercial developments. Despite the economic appeal, there has been set back as a result of very high population numbers. These setbacks include problems such as noise pollution, displacement of residents during transition phases, and traffic congestion. These challenges could be because Chinese cities, offer few of such street. It could signify the high demand for walkable streets.



Traditional neighborhoods in four Chinese cities. Although varying in building styles, these historical streets are walkable for citizens and tourists alike. (Photo credit: 大楊/ Flickr, Tzuhsun Hsu/ Flickr, Ambert Yeung/ Flickr, kattebelletie/ Flickr)
Source (Google.com)

The pedestrianisation projects in china have focused more on commercial developments and tourism making it difficult for some ordinary citizens to walk the streets. The pedestrianisation projects have proved that although some urban settings have seen a decline in walking in the past years, some of the urban settings still have a healthy walking populace. These big interventions were carried out for the first time in china, thus improving walkability of streets and public spaces.



The Bund before (left) and after (right) retrofitting. (Photo credit: Mat Booth/Flickr, SeanSheng/ Pixabay)

Source (Google.com)

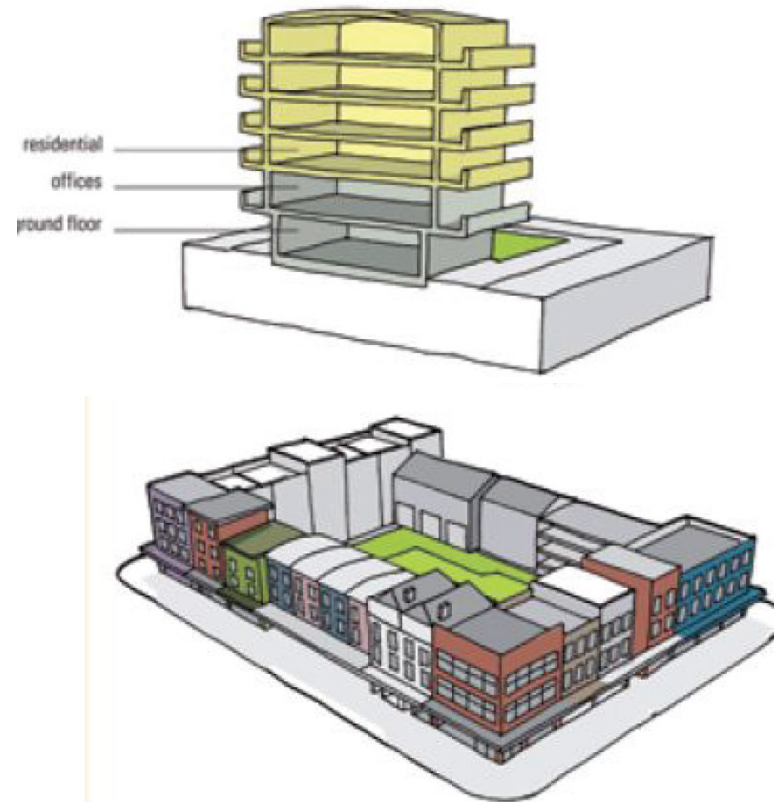
MIXED USE TOWN- NORTH SHORE CITY COUNCIL (NEW ZEALAND)

Mixed use is defined as the mix of residential and non-residential uses from a single building to an entire precinct or area which may be arranged vertically or horizontally or a combination if the two.

Mixed use has promoted quality architectural and urban design as integrated components of a quality developments in the North Shore City Council. The city has placed a great deal of emphasis around the issue of use group compatibility. These compatibility relationships are developed based on uses, noise, and relationship to the street.

Applying these mixed-use developments has helped North Shore City Council to protect the commercial uses that provide employment, contain urban sprawl, retain 24-hour vibrancy, shorter distances to work and provide diversity and choice.

The city's space planning is done by the Council's planning and urban design staff thus between 2002 and 2007 the team addressed specific issues that were common across the city. These included increasing demand for residential accommodation closer to towns, lack of experience amongst some developers, and poor residential developments.



Source (Google.com)

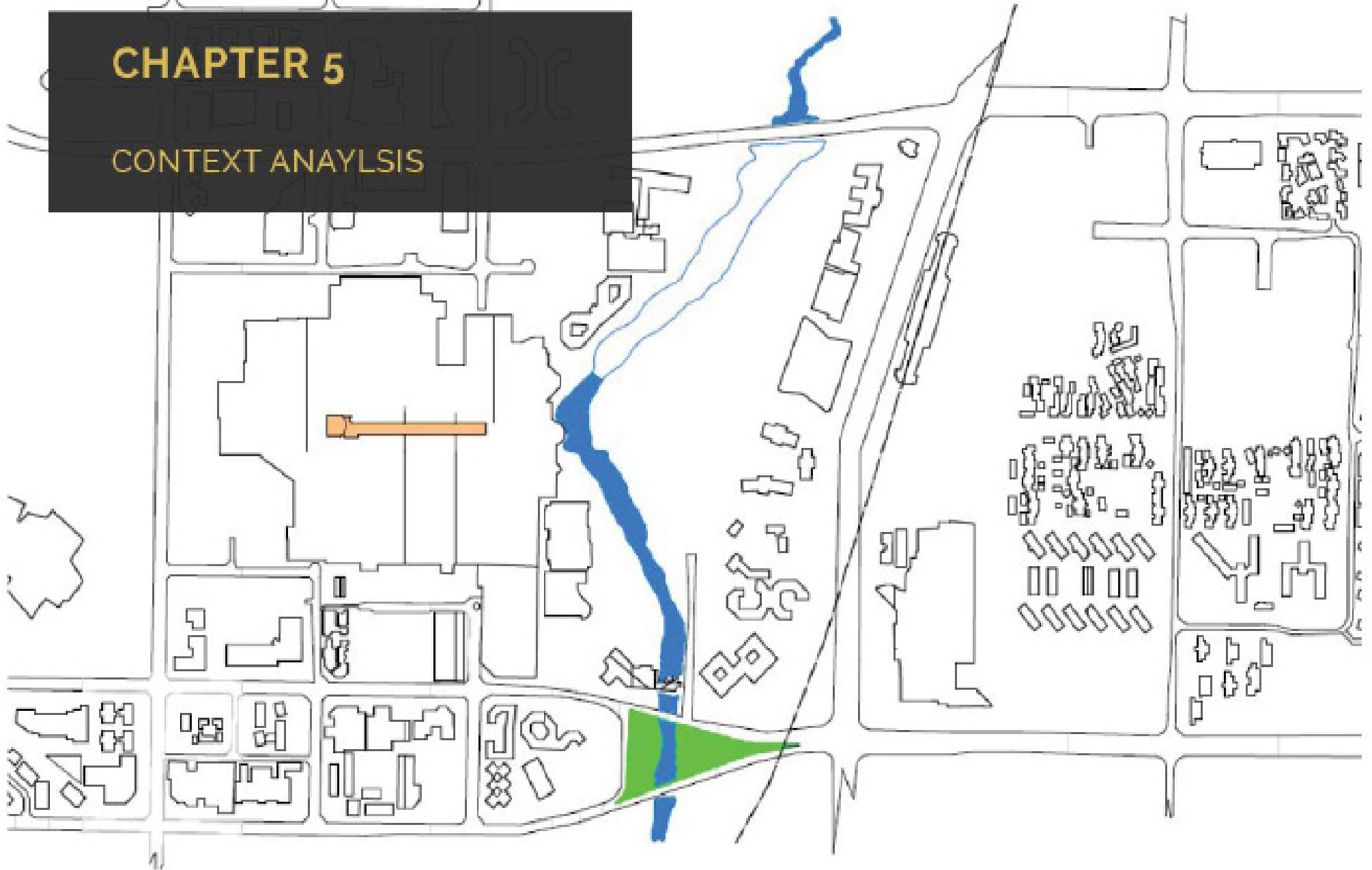
The city then took a non-statutory educative approach to improve development quality, through the development of a mixed-use guide. This Guide explained the mixed use, raised awareness amongst designers to produce quality designs. This guide saw the increase in the number of quality developments. As a result, there was widespread support from other local authorities and saw the development of Mixed-use perimeter block, Hemisphere Apartments, Parnell, Auckland, is a commercial and residential mixed use development, and Queens Parade, Devonport, Auckland uses angled bays to provide a strong vertical modulation to reduce the perceived length of the development. The success of the Mixed-use Guide saw it being incorporated into the Ministry of Environment Urban Design CD. The guide mainly focused on the following principles;

- Choice
- Character
- Context
- Connections
- Creativity
- Custodianship, and
- Collaboration

The Mixed-Use Guide is a treasured resource in the development and implementation of the North Shore City Plan Change for new Mixed-Use Zone guidelines. Same was the document to the council planners when dealing with applications.

CHAPTER 5

CONTEXT ANALYSIS



INTRODUCTION

This section aims to give context of the study area by examining variables that will ultimately influence design. These variables are examined at different scales, thus from a broader context scale to the study area scale.

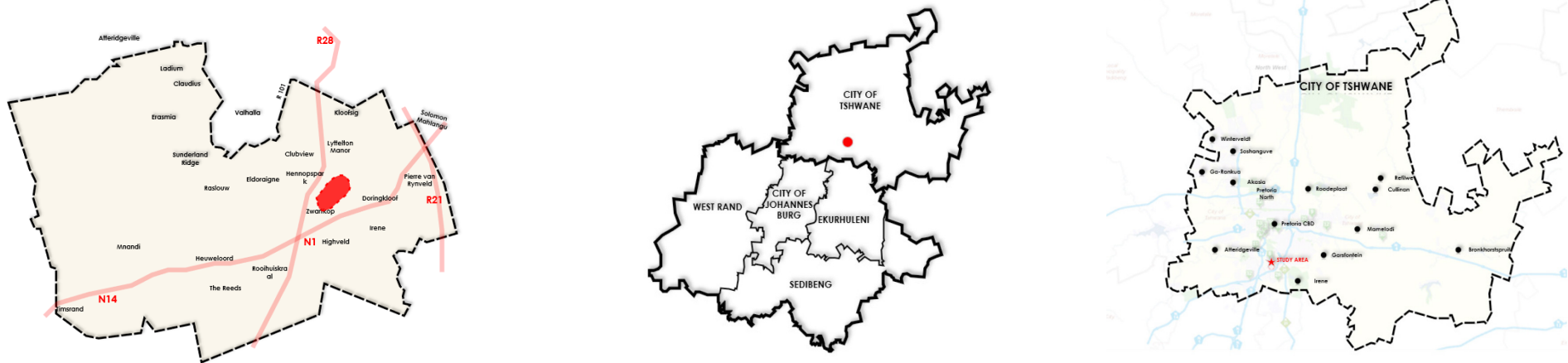
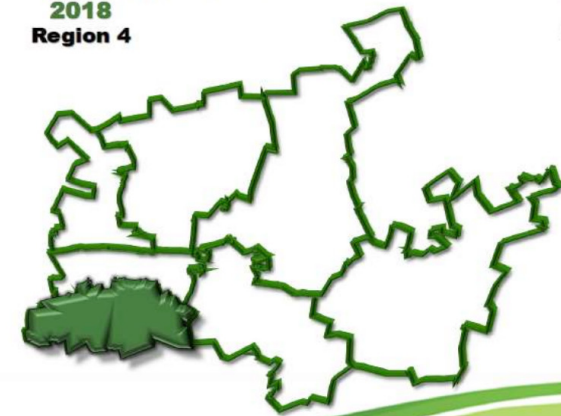


Figure 32_ Context Analysis Scales

POLICY CONTEXT

The study area is located in Region 4 of the City of Tshwane regions. A number of strategic documents have been developed for the area over the years. These documents have among other things addressed issues such as the spatial distribution, economic development, environmental preservation, urbanisation, land use management, strategic planning, regional integration, and the metro vision, goals and objectives.

Regionalized Municipal Spatial Development Framework 2018 Region 4



Annexure A



2019/20 REVIEW OF THE 2017/21 INTEGRATED DEVELOPMENT PLAN

May 2019
Version: 6



CONTEXT OF THE STUDY AREA

The study area is located in the Centurion CBD in the City of Tshwane Metropolitan Municipality that is located in the north of the Gauteng province as depicted on figure Figure 32. The study area forms the business core of the Region 4 Metropolitan Node identified in both the Tshwane Metropolitan Spatial Development Framework as well as the Region 4 Spatial Development Framework. The node is centred on the original town and business centre of the old town of Centurion and it accommodates and supports the expanding high technology cluster that has established in this highly accessible location within the “economic triangle” of Johannesburg, Tshwane and Ekurhuleni.

The study area is made up of two political wards, thus ward 57 and ward 78. As alluded to in the previous sections, it is strategically located in close proximity to national roads and a robust network of other lower order roads, rendering it highly accessible especially through the use of motorised transit.



Figure_33:Centurion in CoT

STUDY AREA DELINEATION

This section attempts to indicate the exact position the border or boundary of the study area. The study area has been carefully delineated such that there is easy access from the major corridors as depicted on Figure 34. Jean Avenue connects to N14 to the North of the precinct, John Vorster Drive connects to N1 to the South of the precinct, Gerhard St connects to Lyttelton (Centurion East), Lenchen Avenue connects to Rooihuiskraal (Centurion West). West Avenue cuts across the precinct connecting all the four major roads delineating the study area. the Centurion Gautrain Station is also located within the study area. Personal experience has also led to the study area delineation as it is my place of work and as such I have experienced crime through mugging and break-ins at my pace of work. The precinct

is generally perceived unsafe for pedestrian movements at all times of the day as a result of high crime rates and vehicular pedestrian conflict.

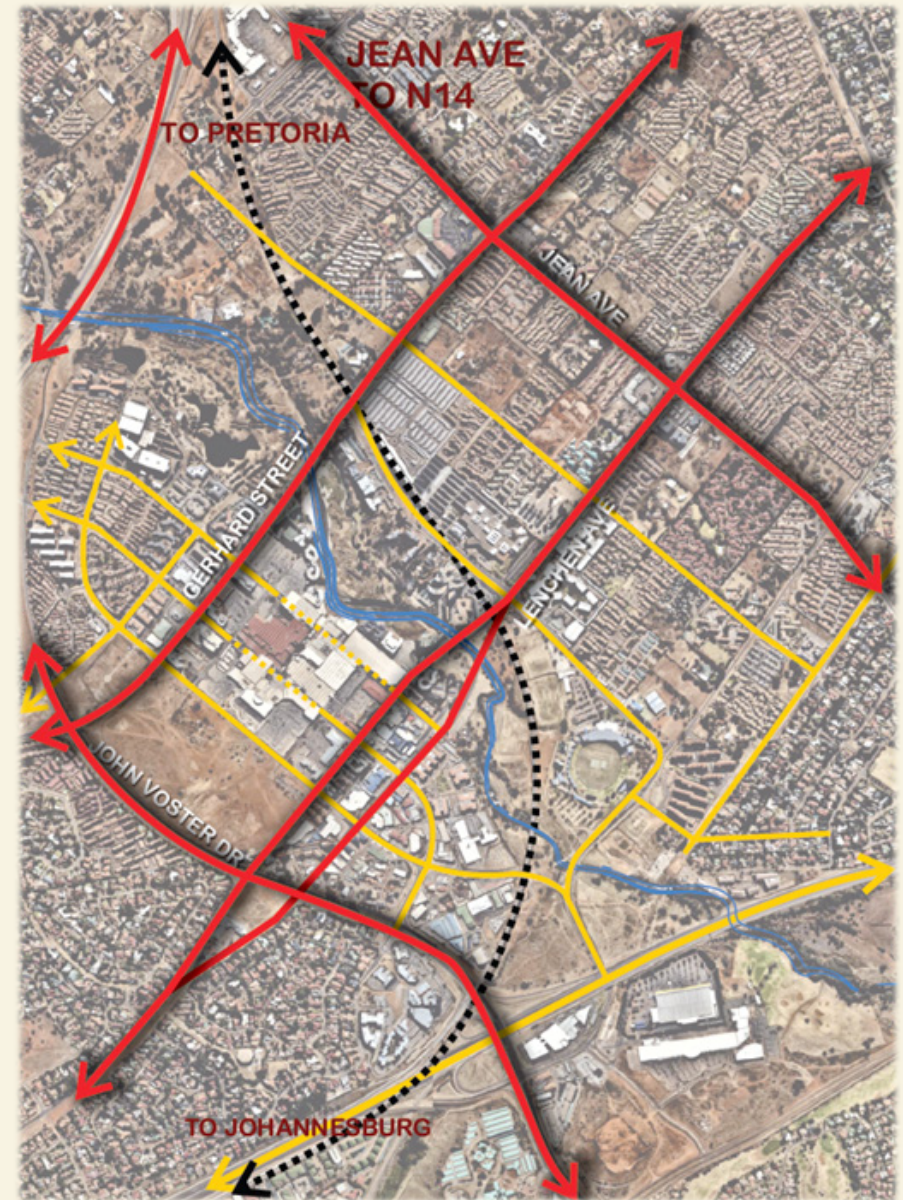


Figure 34_ Study Area Delineation Map

Landmarks

Landmarks refers objects or features of an area that can be easily seen and predictable from a distance. These are sometimes used to establish one's location.

There are a number of points of interest and landmarks as well as diverse land uses that can be found inside and around the precinct. The major ones include Gautrain Station, Centurion Mall, Hennops River & Park, Super Sport Park Cricket Stadium, Residential Developments, Government Offices, Light Industries, and Corporate Offices. These are further listed below;

- 1-Centurion Gautrain Station
- 2-Centurion Mall
- 3-Hennops River
- 4-Super Sport Park Stadium
- 5-Residential
- 6-Government Buildings
- 7-Service/Light Industry
- 8-Offices/Business



Figure 35_ Study Area Landmarks & Points of interest

REGIONAL ANALYSIS

Key Regional Pressures

There are a number of key regional pressures driving the need for development in the Centurion Gautrain Station Precinct; these include the increasing urban and regional growth patterns, business and financial service sectors that have resulted in an abundant and diverse businesses and residential development needs. Again, the impacts of urban and regional social, environmental and economic subtleties caused by associated large scale development programmes and infrastructural interventions and developments such as the Gautrain, BRT and housing are other driving forces pressuring development. According to the Centurion Development Framework 2014 the other regional driving force for development is strategic development management imperatives motivated by climate change scenarios, increased social awareness and pressure on the use of, and management costs of, environmental resources and infrastructure, and the recognition by city managers of the need to create more “environmental shock” resistant / resilient human settlements and the increasing recognition of the need to restructure and reshape urban areas into more integrated, more responsive and more competitive urban working, living and playing environments. In addition to the above-mentioned drivers, it has been recognised in current planning reviews within the metropolitan region that the Centurion Node has the potential to be one of the most accessible locations within the economic triangle that still has significant expansion potential to accommodate growth, but more significantly to do so in a manner which responds to the significant policy imperatives calling for more sustainable, smart and innovative urban development responses.

REGIONAL CONNECTIVITY

The Centurion Gautrain Station Precinct is well connected by road, rail and is in easy access to airports. As depicted by Figure 36, the study area is well connected to prime locations such as Johannesburg, Sandton, Midrand and Pretoria through the Gautrain. There are also plans in place to further extend the Gautrain to Lanseria Airport and Mamelodi. This will further bring human traffic to the study area. National roads such as the N14 and the N1 also connect the study area to major cities and/or towns such as Johannesburg, Pretoria, Krugersdorp, and Polokwane. Airports are also easily accessible from and to the study area by means of a robust network of roads and rail. The airports in question include OR Tambo International Airport, Lanseria Airport, The Grand Central Airport and Wonderboom Airport.

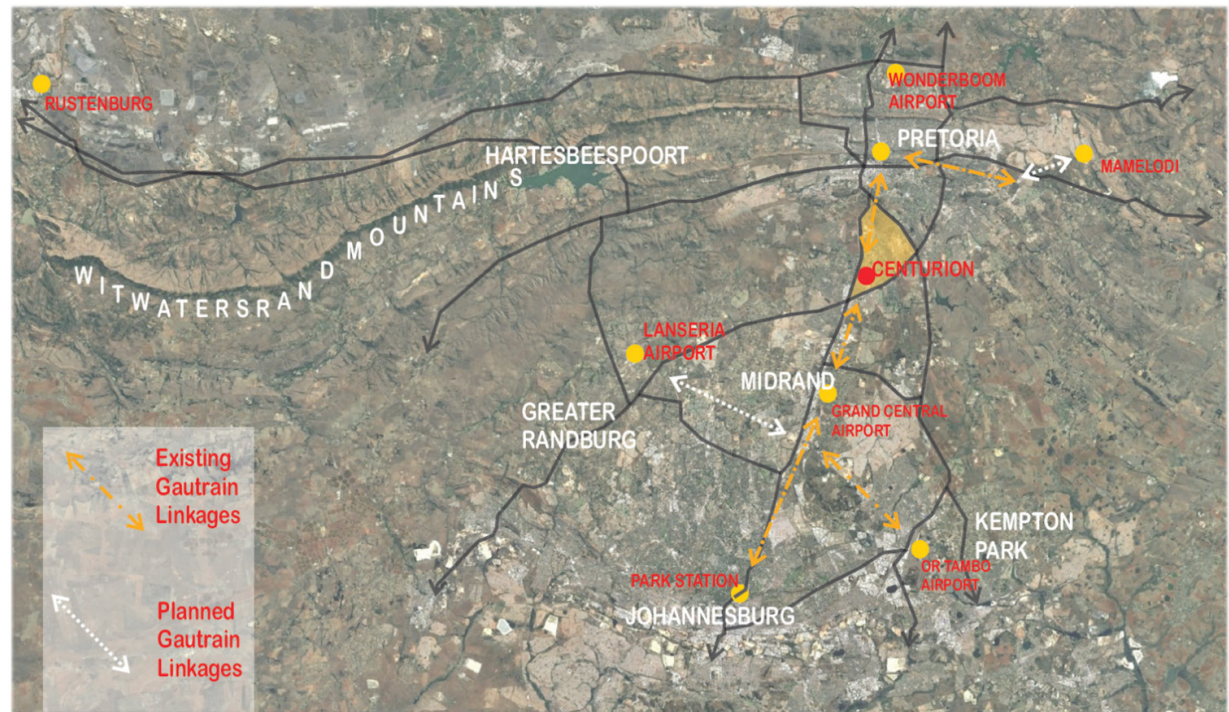


Figure 36_ Regional Connectivity

City of Tshwane Green Structure

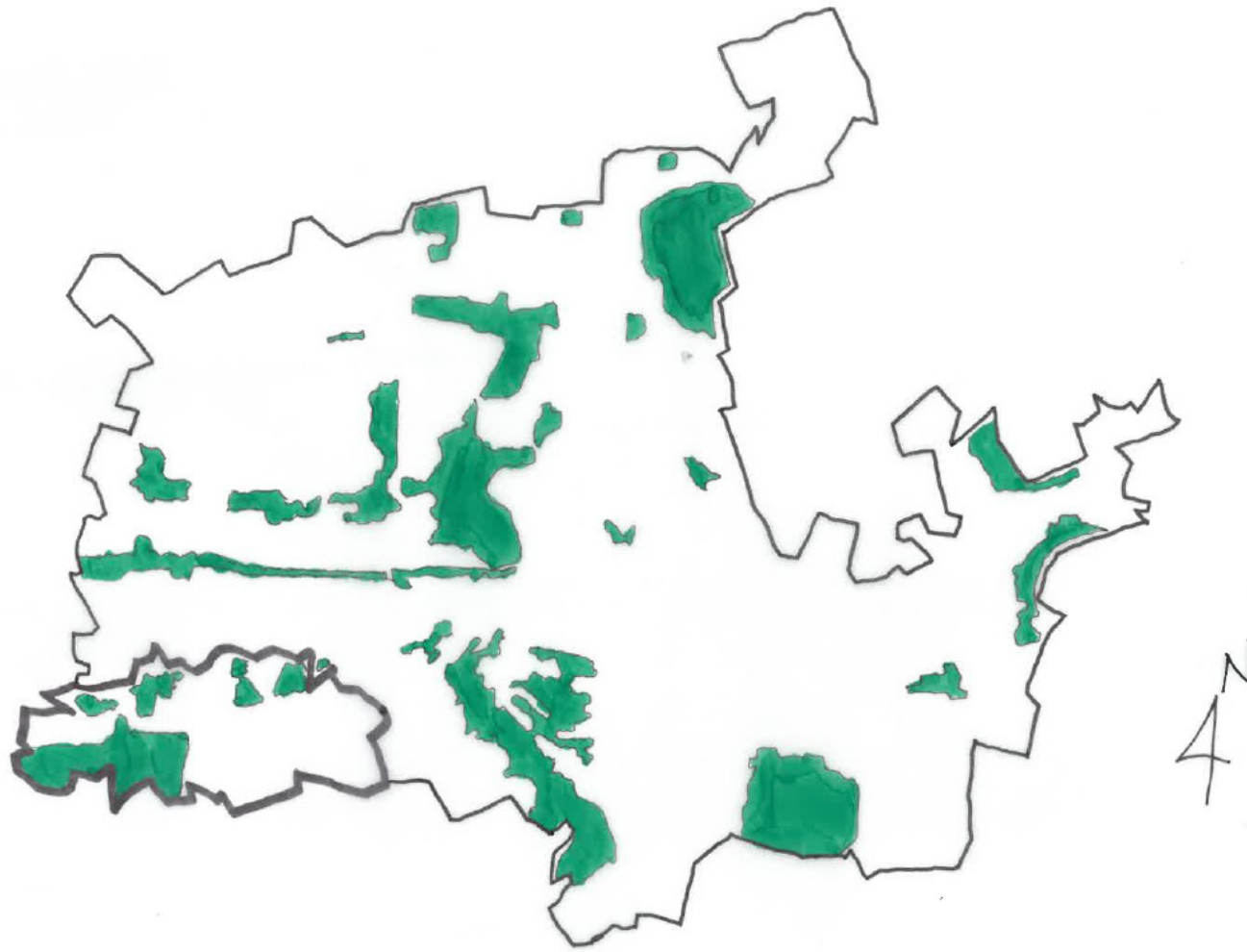


Figure 37_ City of Tshwane Green Structure

City of Tshwane Green Structure Analysis

Historically, green spaces have always been provided for in the planning of the cities. One of the examples is the garden of Babylon which dates back as far as seventh and eight century B.C. This carried on and is also seen in the industrial cities in the 19th century. Examples of such cities in Britain are Hampstead, Welwyn and Letchworth.

In the modern area there are several types of green spaces in the Morden day city which play different roles in the urban context. The varying types of green spaces are planned in different urban scales with different functions in the city Green spaces. These green spaces contain green elements such as trees, gardens, and parks forming part of the city urban fabric.

The dominant factor affecting development in the City of Tshwane is its topography, mainly being natural features that include dolomite and natural reserves. Most of the green area that are prominent on Figure 37 are natural reserves such as Pierre van Ryneveld Nature Area, Austin Roberts Memorial Bird, Bronkhorstspuit Nature Reserve, Kwaggaspruit Nature Area, Faerie Glen Nature Reserve, Invasive Plants in Tshwane and Groenkloof Nature Reserve. Though some of these are perceived as passive green spaces, the city has several other active green spaces that have strategically placed in different locations. These are in the form of parks. The green acts as a carbon sink for the highly urbanised city. Nature reserves such as wetlands are a haven for biodiversity and are pivotal in maintaining a healthy ecosystem. A SWOT analysis of the City of Tshwane green structure is presented on Table 2.

STRENGTHS	WEAKNESSES
• Dedicated city planning department to plan for more green spaces • Conducive for people to use	• Driven mainly by ecological goals • Unsafe for young people to use
OPPORTUNITIES	THREATS
• Developing open spaces to active green spaces • Create big areas for leisure • Ecological benefits • Act as natural drainage during rain • Green areas are carbon sinks, especially for polluted urban areas. • Social opportunities • Health benefits • Inducing a cooling effect within a built-up area.	• Competes with other land uses • Climate change has negative impact • Reduction of green structure to enhance economic growth

Table 2: City of Tshwane Green Structure SWOT Analysis

City of Tshwane Densities



Figure 38_ City of Tshwane Existing Suburban Densities

City of Tshwane Suburban Densities Analysis

Loosely defined density refers to the degree of compression of a given element. In the urban planning context density refers to the measurement of the population contained in an urbanised area. Whereas residential density refers to the number of dwelling units in a given area.

The City of Tshwane suburban densities are not evenly spread across the metropolitan. Most of these density areas can be seen along major corridors and main urban centres such as the Pretoria CBD, Pretoria North, Centurion, Hatfield, Lynnwood, Menlyn and Silverton. the main factors affecting this distribution are topographic factors, the locating residential areas closer to major corridors, and the need to be in close proximity to economic activity areas. The immediate open spaces continue to be used up for residential and other developments. McHarg, (1995) states that the effects of population growth by stating that urbanisation proceeds by increasing the density within the extending periphery, always at the expense of open space.

Centurion has a significant suburban density within and in close proximity.

A SWOT analysis of the City of Tshwane suburban density is presented on Table 3.

STRENGTHS	WEAKNESSES
• Opportunities to offer public transport	• Traffic congestion • High levels of pollution
OPPORTUNITIES	THREATS
• Easy provision of services and public facilities • Maximum utilisation of natural resources. • Advocate the use of public transport	• Loss of natural resources due to pollution • Congestion due to inefficient public transport system and the use of private cars

Table 3 City of Tshwane Suburban Densities SWOT Analysis

Broader Land Use

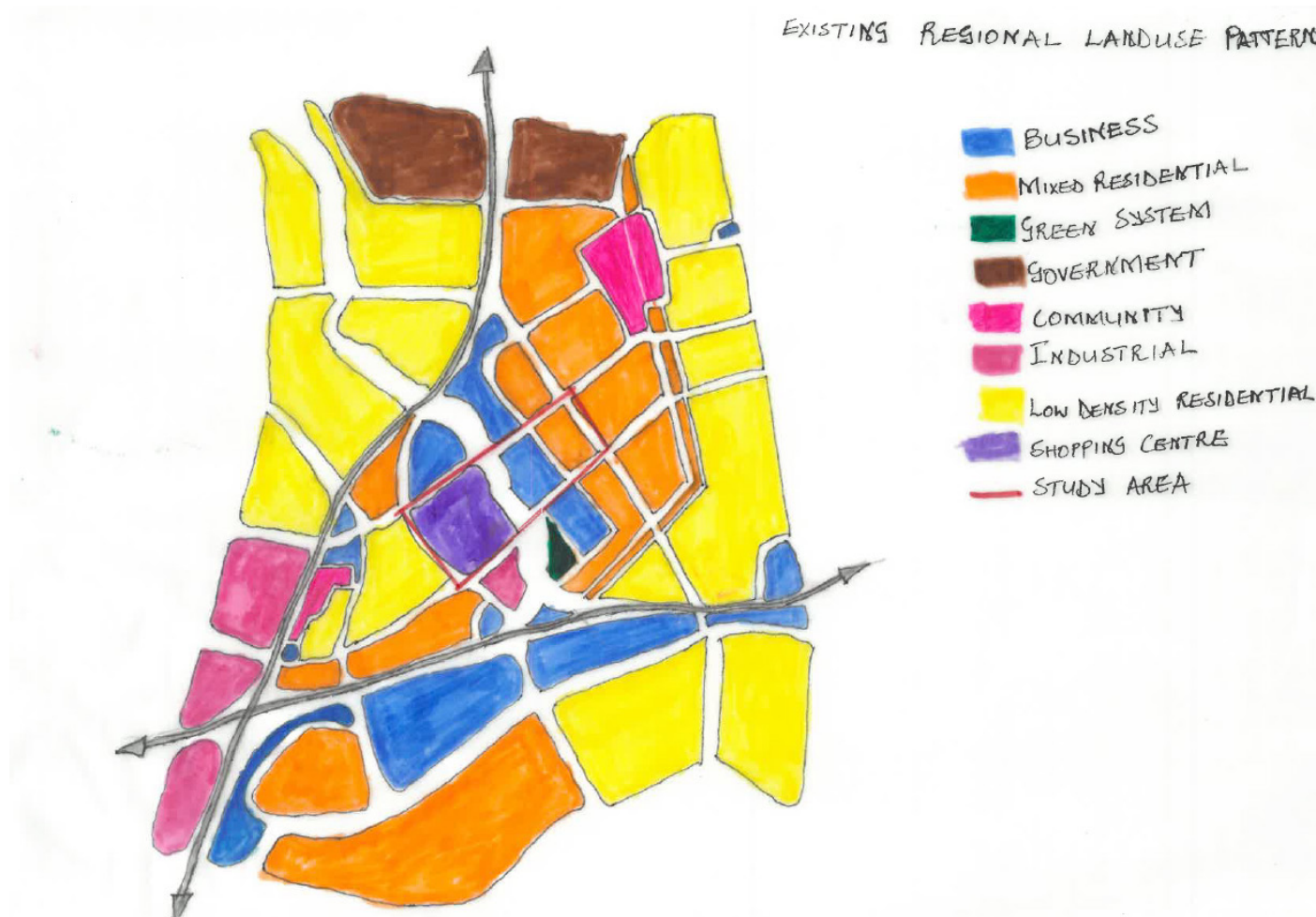


Figure 39_ Existing Regional Land use

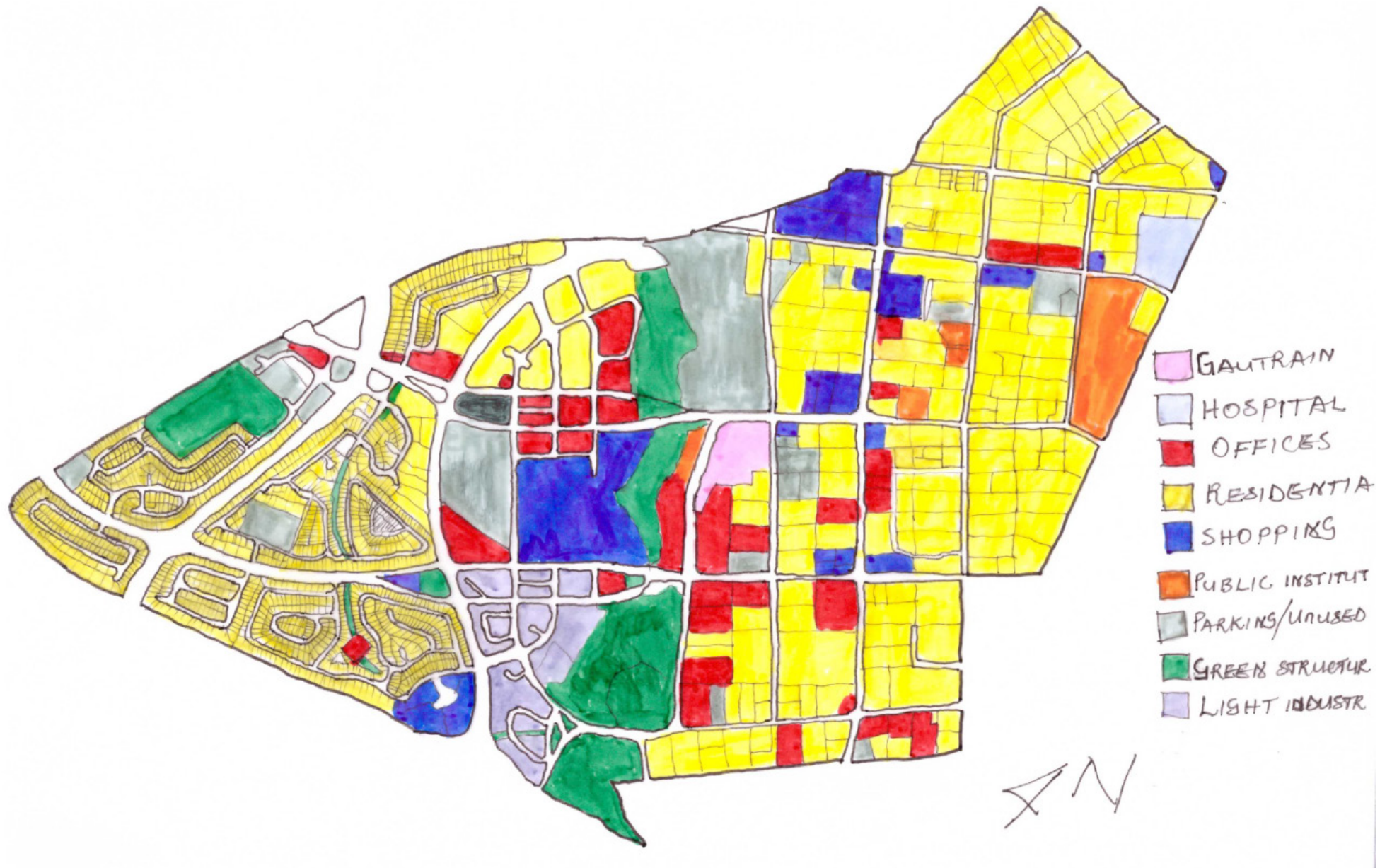


Figure 40_ Existing Broader Land use.

Broader Land use Analysis

Land use refers to the purpose to which a land cover is dedicated to serve, where land use management refers to the approach taken to achieve a land use outcome the 'how' of land use.

This broader analysis presents the analysis for the immediate that surrounding of the study area. Land is analysed in this section as it is one of the major structuring elements of Centurion. This analysis gives an over view of activities that exist within the Centurion area and how these interact with the study area.

From the Figure 39 and Figure 40, it can be seen that the predominant land use is residential with the green structure and business land use also being prominent. Tracks of unused large pieces of land can also be seen.

Overall, a number of land uses exist within the centurion area, thus public facilities, residential, business, offices, shopping, light industry, parks and public parking.

A SWOT analysis of the broader land use is presented on Table 4.

STRENGTHS	WEAKNESSES
• Opportunities for linking existing uses • Innovation on unused spaces	• Current open spaces are unsafe • Pedestrian unfriendly environment • Motorised transit oriented
OPPORTUNITIES	THREATS
• Urban agriculture • Densification • Pedestrian and public facilities	• Lack of space integration and connection • Safety • Environmental pollution

Table 4: Broader Land use Analysis

Transport and Movement Network

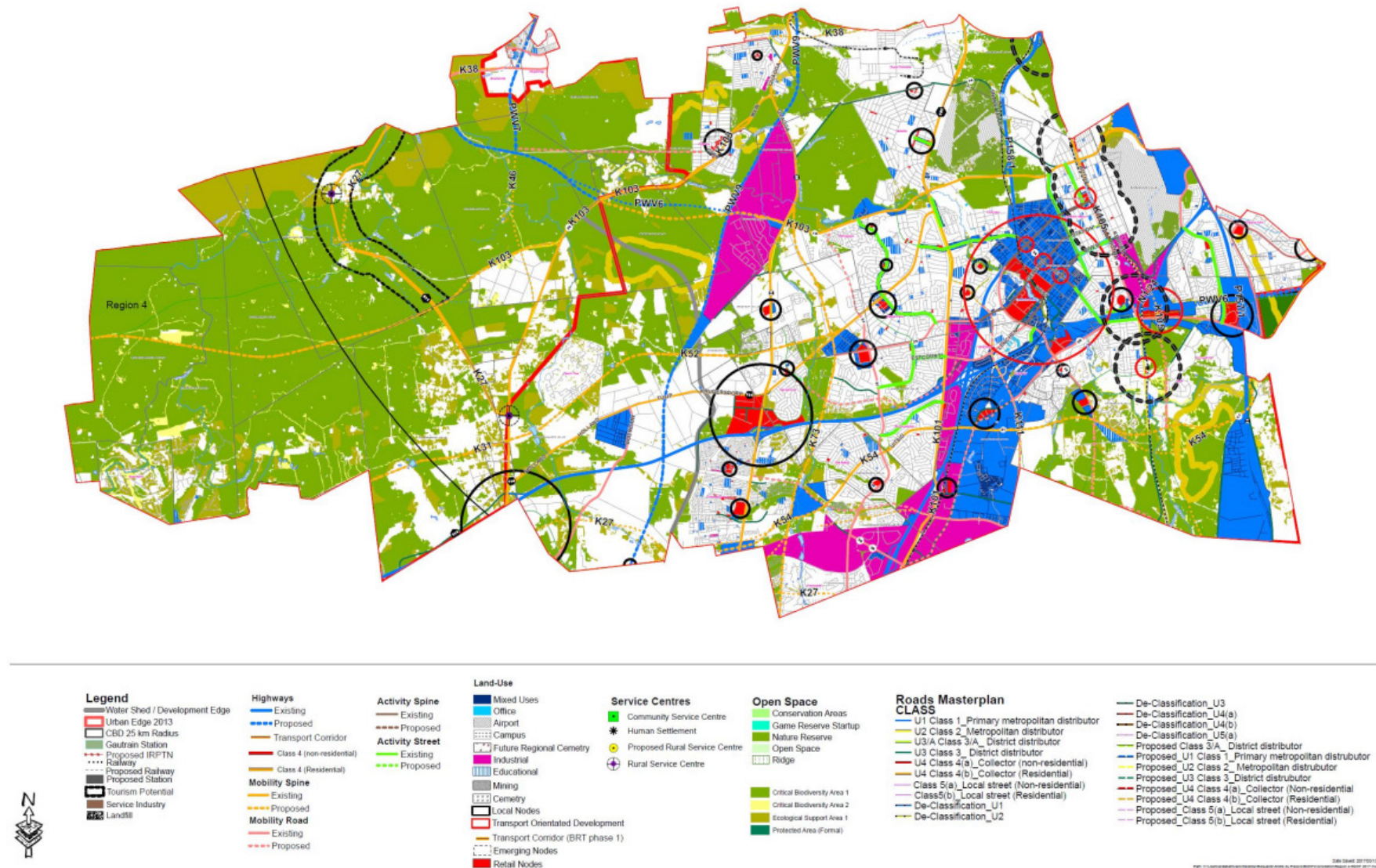


Figure 41_City of Tshwane Regional Spatial Development Framework, Region 4. 2018 (CTMM, 2018)

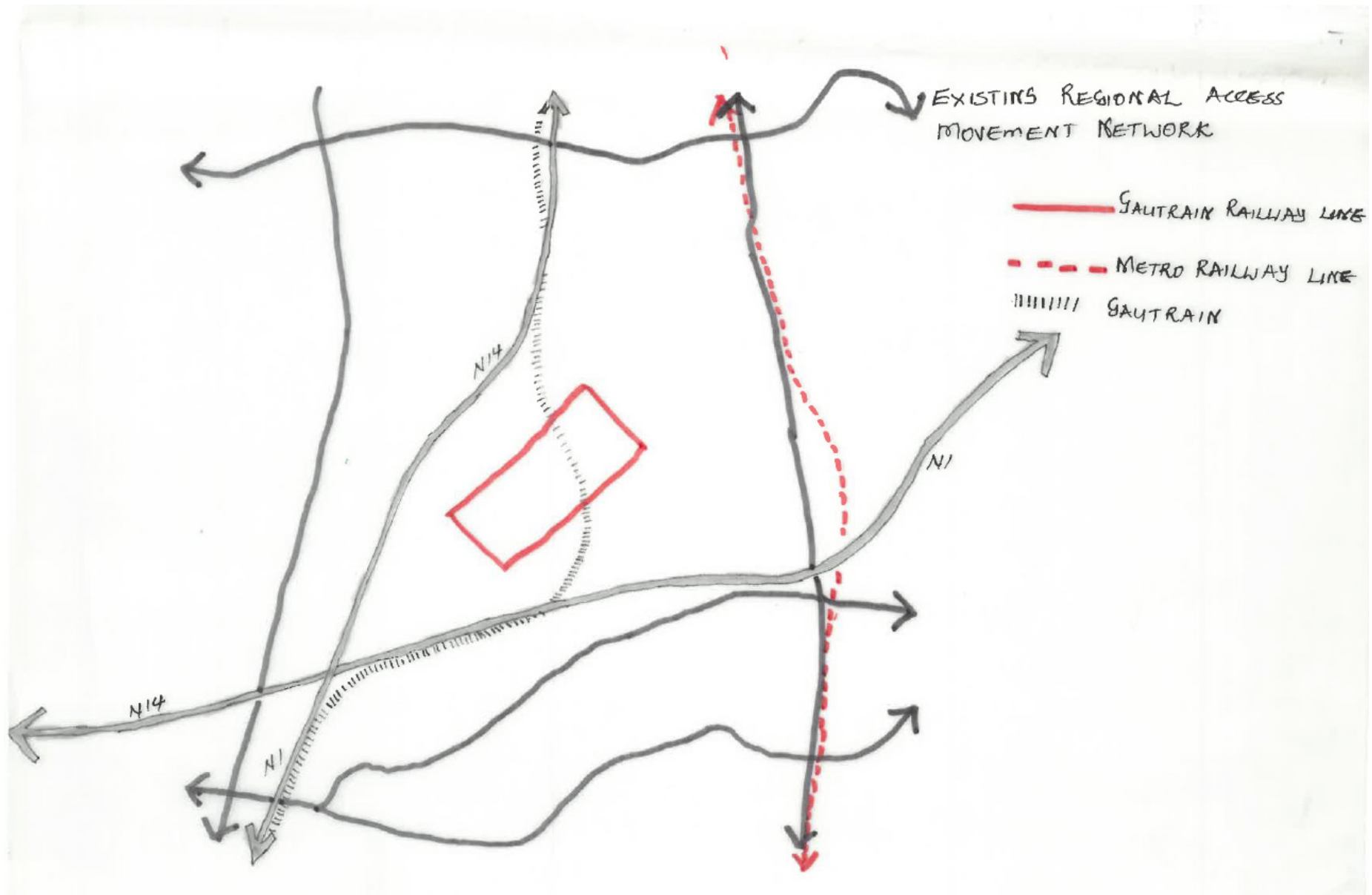


Figure 42_ Existing Regional Movement Network

Transport and Movement Network Analysis

Transportation and movement networks aid in connecting places and facilitating activities, thus allowing people and goods to be moved from one place to another. It is therefore imperative to have robust transportation and movement network infrastructure for all form of modes in order to promote economic activities and development.

Marshall (1995) goes on to say that hierarchies can be criticized for helping and abetting demolition and severance by urban motorways thus giving rise to the car-oriented townscape. While on the other hand, the same hierarchies are embraced for urban structural purposes. Furthermore Marshall (1995) states that the hierarchy of streets created a system of segregation of traffic in Middle Ages, Leonardo da Vinci. This further enhances safety as well as the environmental quality of urban areas.

The broader movement network analysis reinforces the accessibility of the study area as depicted on Figure 42. The study area is in close proximity to national roads such as the N14 and the N1, that leads to major towns and/or cities of interest such as Johannesburg, Krugersdorp, Polokwane, Pretoria and Midrand.

A SWOT analysis of the transport and movement network is presented on Table 5.

STRENGTHS	WEAKNESSES
• Good connectivity • Access to major points of interest • Good accessibility	• Trmobility roads in study area • Motorisedtransit-orientedenvironment • Lackofpedestrianandnon-motorised transit consideration • Highly unsafe for pedestrians
OPPORTUNITIES	THREATS
• EasyprovisiEasy movement of people to and from the centurion area • Investment opportunities as a result of accessibility	• CLosroadnetworkencouragespeople to drive • Discouragestheuseofpublictransport

Table 5: Transport and Movement Network SWOT

Broader Pedestrian and vehicular routes

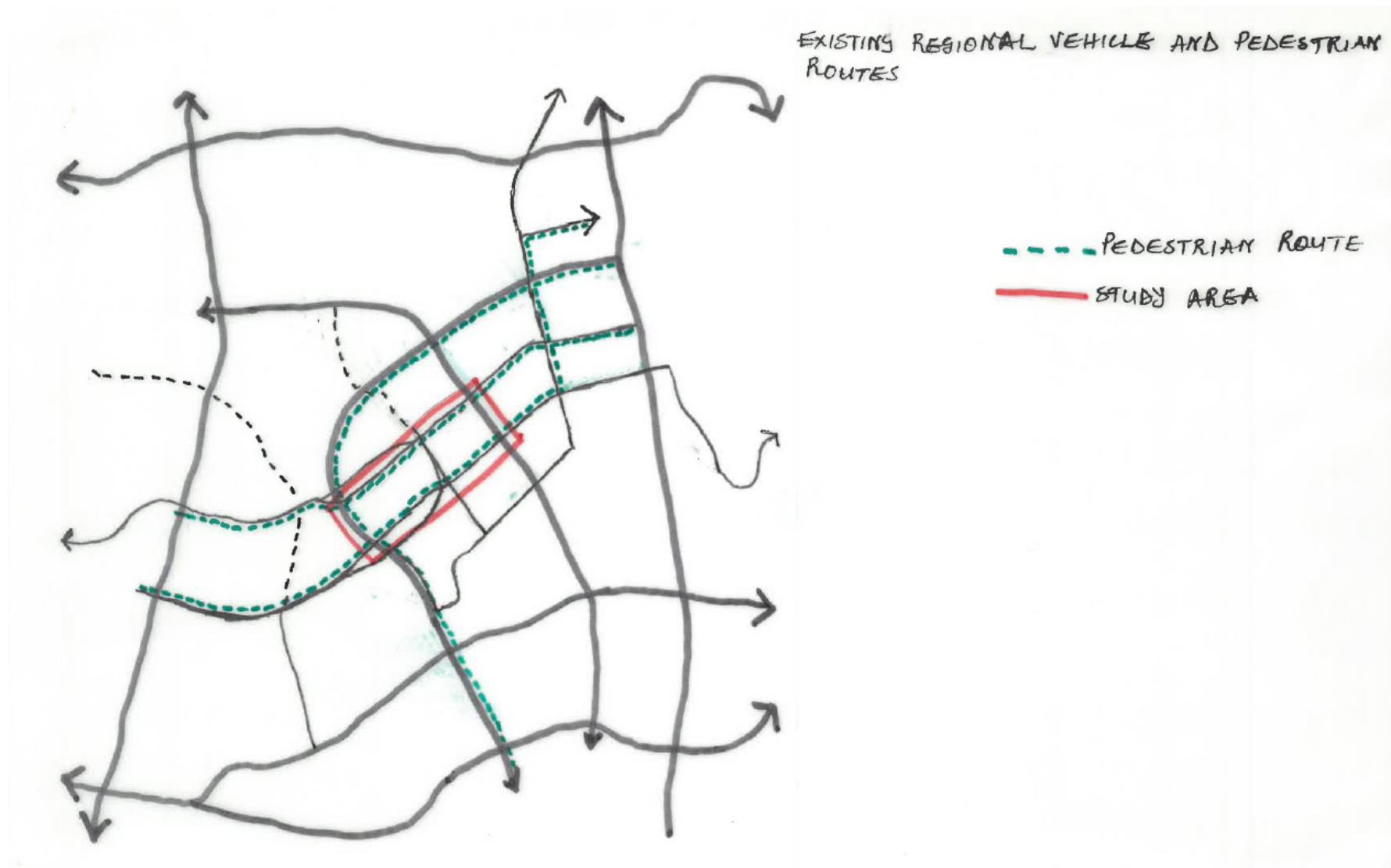


Figure 43_ Existing Pedestrian and vehicular routes

Broader Pedestrian and vehicular routes Analysis

It is unavoidable that as cities continue to grow, congestion levels will get worse thereby imposing negative impacts mostly on humans. Public transportation in some instances is introduced as means of mitigating vehicular congestion in the form of trains, buses and taxis. It therefore becomes imperative to integrate public transport facilities with pedestrian networks.

The broader pedestrian and vehicular routes analysis is presented in Figure 43. The figure shows the main corridors around the study area as well as the main pedestrian routes that bring pedestrians into the study area mainly for economic activities (formal and nonformal employment), shopping, recreational activities and public services. A considerable volume of pedestrians is also generated by the Gautrain station within the study area. Pedestrians are usually seen during peak periods accessing and exiting the Gautrain station. The presence of public facilities such as the home affairs, city of Tshwane offices and the police offices located just opposite the Gautrain station are also a generator of pedestrian traffic. The location of hotels within the precinct also bring pedestrian traffic where pedestrians travel between the Gautrain station and the hotels. The Super Sport Park cricket stadium is an occasional puller of pedestrian traffic with its occasional events such as cricket matches and marathons, usually on weekends.

STRENGTHS	WEAKNESSES
• Good Presence of economic activities to make people walk • Good infrastructure network exist e.g. train station	• The study area is dominated by vehicles • Walkways are in short supply • Pedestrian walkways are unsafe • Economic growth proposals will attract more vehicular traffic
OPPORTUNITIES	THREATS
• Development of mixed use development to enhance pedestrian movement • Un developed land can have developmental proposals that are pedestrian orientated • Increasing landscape beauty at the same time providing comfortable pedestrian walkways through green infrastructure	• Poor connections for pedestrians • Pollution of the river might occur if waste management measures are not put on pedestrian infrastructure along the river. •

Table 6: Broader Pedestrian and vehicular routes



Figure 44_ Sporting Activities on West Ave (Source_ Google.com)



Figure 45_ Supersport Park Stadium (Source_ Google.com)

Broader Public Transport Interchanges

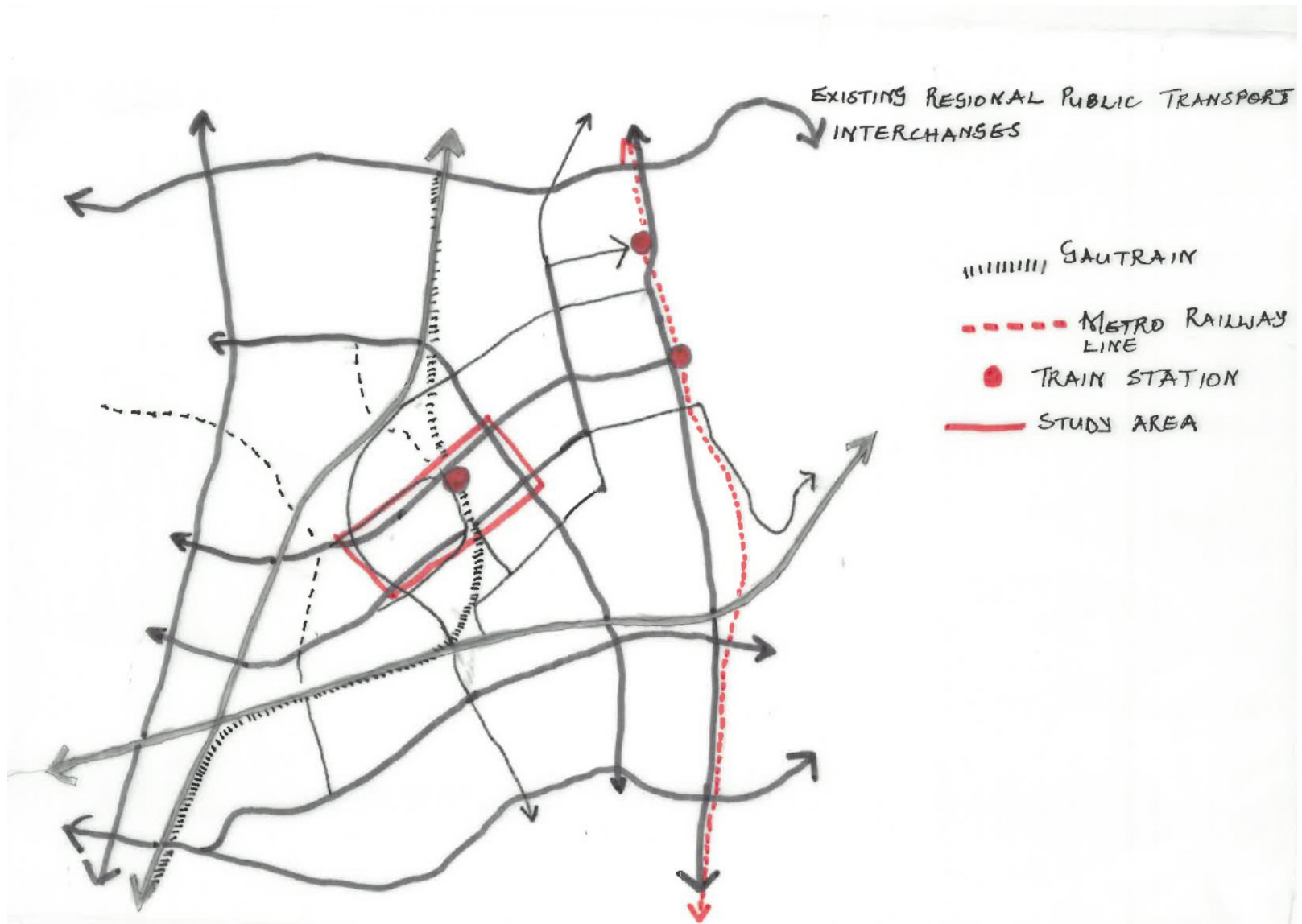


Figure 46_ Existing Public Transport Interchanges

Broader Public Transport Interchanges Analysis

Public transport nodes, thus stations and interchanges, are nodes that are supported corridors. The transportation nodes carry public transport different characteristics that include long distance intercity traffic, medium distance in-tertown traffic, internal external traffic, and intra-urban traffic.

Figure 46, shows the formal three transport interchanges servicing the study area, one of which is located inside the study area. These interchanges are train stations, with two being metro rail train stations, thus Centurion Train station and Sportpark train station. The metro rail train stations are mainly used by the low-income groups to and from the study area. Considerable pedestrian movement can be seen in the morning and afternoon peak pe-riods. Amongst the users of this mode of transport are school children who use schools around the study area. A SWOT analysis of the Public Transport interchanges is given on Table 7.

STRENGTHS	WEAKNESSES
- Existing transport interchanges facilitates movement for the highest number of pedestrians in the study area - Possibility of high pedestrian connectivity - Spaces for the development and integration of more interchanges within the study area	- Low cost public transport interchanges are located a long distance for the study area - No formal low-cost interchange exists within the study area
OPPORTUNITIES	THREATS
- Wider roads allow for the integration of non-motorised movement. - Connectivity of pedestrian networks to existing interchanges - Connections with surrounding areas	- Creation and expansion of interchanges may come at the cost of pedestrian infrastructure and parking bays. - Bus routes along the main corridors create barriers for pedestrian movement and crossing - Dedicated public transport routes may compromise pedestrian infrastructure

Table 7: Broader Public Transport Interchanges SWOT Analysis



Figure 47_ Sportpark Metro Rail Station (Source_ Google.com)

Broader Road Network

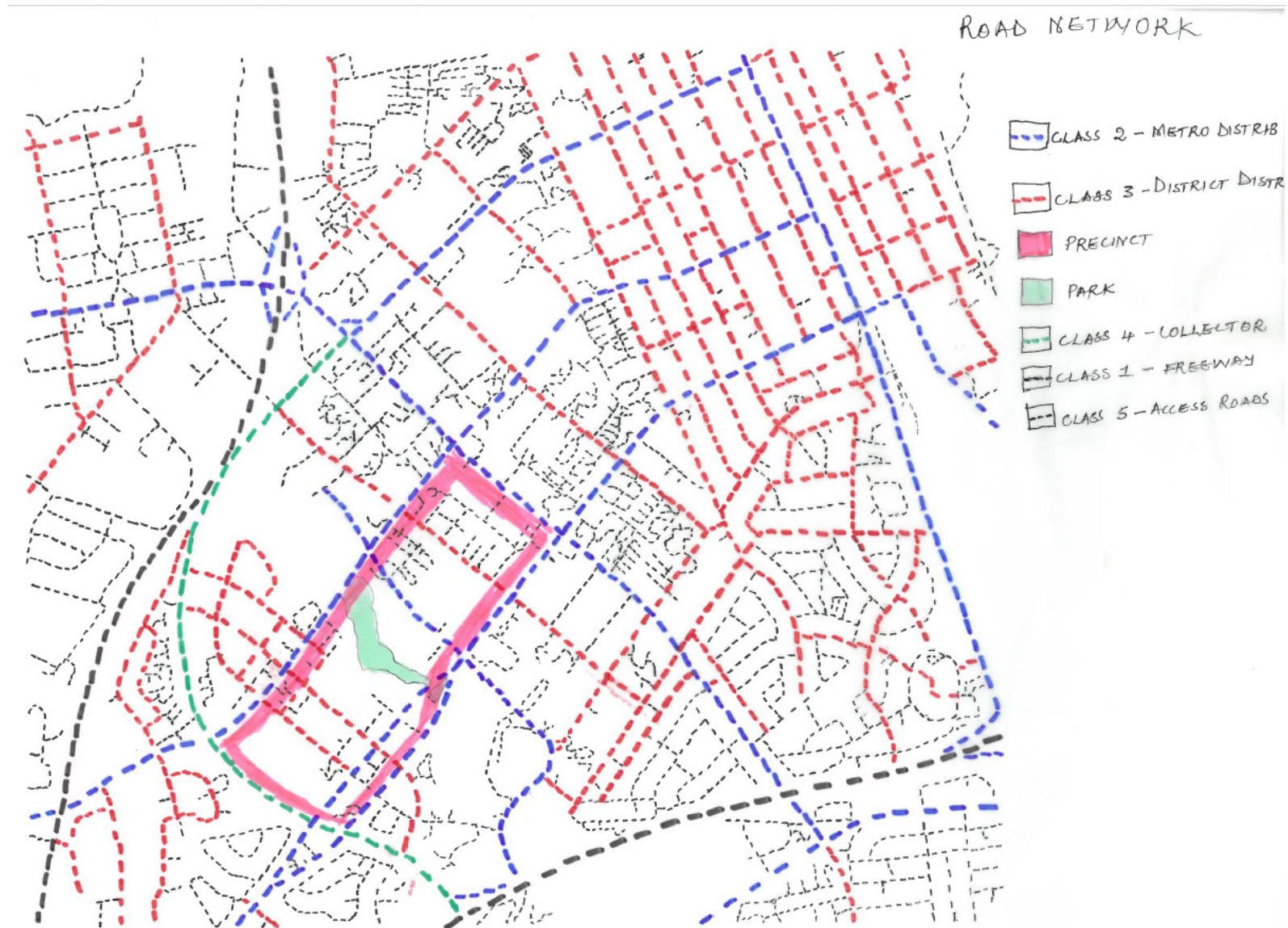


Figure 48_ Broader Road Network

Broader Road Network Analysis

Streets save as an interface between the private and public realms. The primary function of streets is therefore to ensure mobility in the built-up urban setup. Streets have classification, thus from mobility function streets to access function streets. Marshall (1995) defines road hierarchy as a classification of roads in which each type has a ranked position with respect to the whole set of types.

A roads network is usually viewed together with the land use within which then network in question exists. According to the South African Roads Classification and Access Management Manual (2012), a road network is determined by the land use, and the functional classification makes it clear that it is the size, importance and density of destinations that need to be served that determine the number and class of road required to serve them.

Figure 48, presents a broader road network that services the study area. This is a very robust road network with all road classes from mobility to access roads being present. These include Class 1- National Roads (free-ways), Class 2- Metro Distributor, Class 3- District Distributor, Class 4 – Collector, Class 5- Local Street. Class 6- though not shown on the map represents pedestrian walkways. These road classes enable travel lines from one place to another as depicted on Figure 49: Travel Lines, and a SWOT Analysis for the broader road network is presented in Table 8. Though the road network is perceived to be robust, such that it facilitates economic development it is pro motorised transit. As a result, observation surveys revealed little consideration is given to pedestrians resulting in vast vehicular pedestrian conflict.

STRENGTHS	WEAKNESSES
• A robust road network has economic benefits • Movement to and from the broader area is easy • Close proximity to national roads is beneficial to the study area	• The broader road network reflects an area that is vehicular orientated • The movement of pedestrians is not encouraged
OPPORTUNITIES	THREATS
• There are opportunities for introducing pedestrian walkway networks as a result of wider roads • Introduction of non-motorised transit in the wider roads	• Road network might attract the manufacturing sector which might be detrimental to the environment. • Dire environmental impacts due to the high use of motorised transit • High use of private cars due to the low supply of public transport

Table 8: Broader Road Network SWOT Analysis

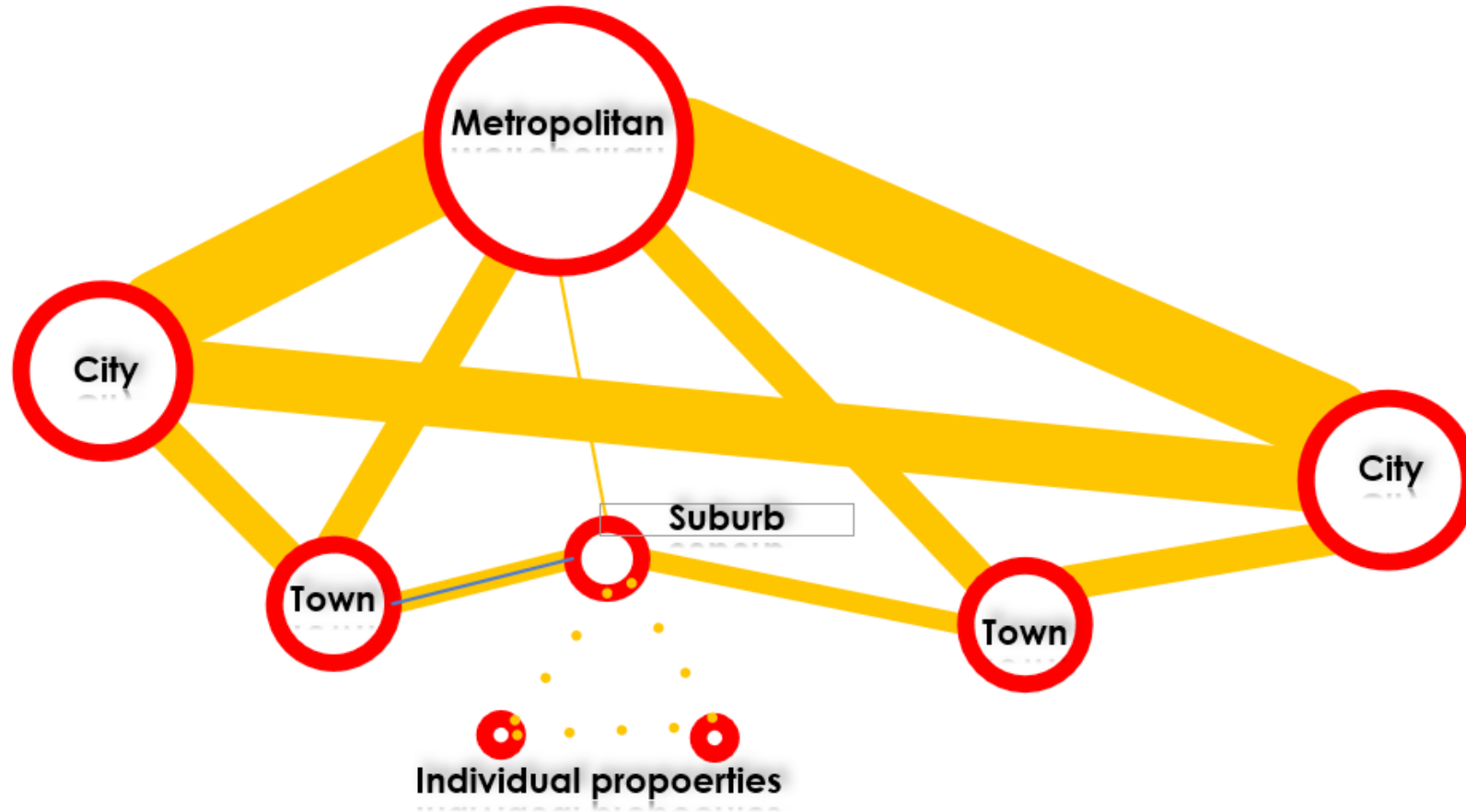


Figure 49_ Travel Lines

Broader Green Structure

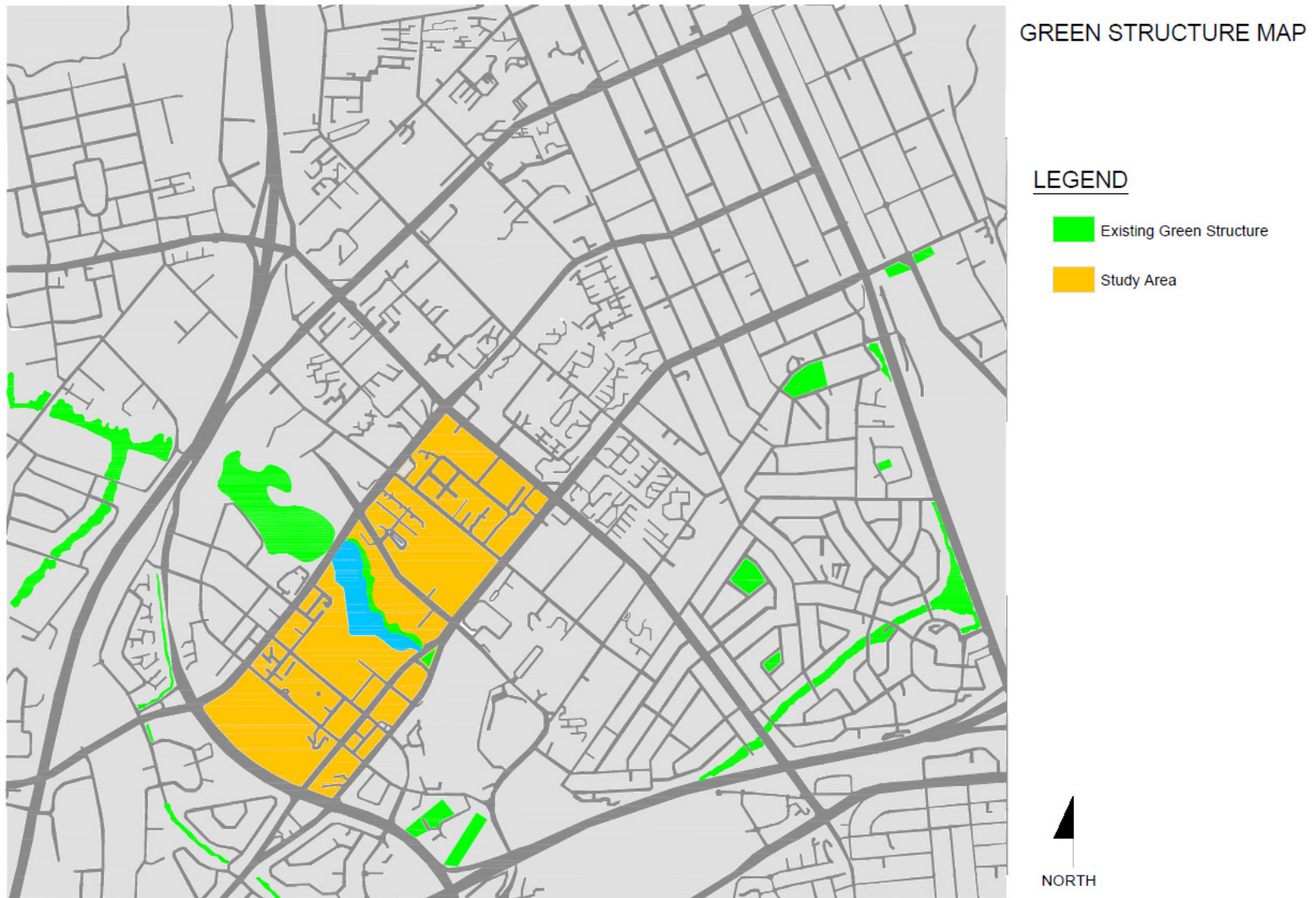


Figure 50_ Broader Green Structure

Broader Green Structure Analysis

According to Rouse (2013), green infrastructure is an agent of environmental quality and an effective expression of local conditions. The biodiversity and the green infrastructure that the city has captures the local conditions.

Domestic gardens and parks provide a number of human benefits at a broader scale depicted in Figure 50

Urban green spaces such as domestic gardens, parks and woodlands provide a multitude of benefits to human urban populations, and a vital habitat for wildlife. By improving physical fitness and reducing depression, the presence of green spaces can enhance the health and wellbeing of people living and working in cities.

The broader study area doesn't have much of green infrastructure. Furthermore, the existing green structure doesn't seem to be integrated. Tiny pockets of green infrastructure are scattered across the area and most of the open spaces being non active open spaces (passive) as they are run along rivers.

Table 9 presents the broader green structure analysis.

STRENGTHS	WEAKNESSES
• Freespacesareavailablethatcanbeused to enhance the green structure • Protection of natural areas	• Minimalgreenstructureexistsalongthe streets • Lackofgreenstructureontheground, including building roofs and streets.
OPPORTUNITIES	THREATS
• Urban agriculture for sustainable urban food production • Carbon sink for urban air pollution • Opportunities for urban agriculture are available on the free spaces	• Flooding risk as a result of increased surface runoff • AcceleratedClimatechangeasaresultto lake of greenery • Temperatures may be too high as a result of the absence of ground cover • Climaticandweather conditionsare a threat to the green structure

Table 9: Broader Green Structure SWOT Analysis

Broader Public Facilities

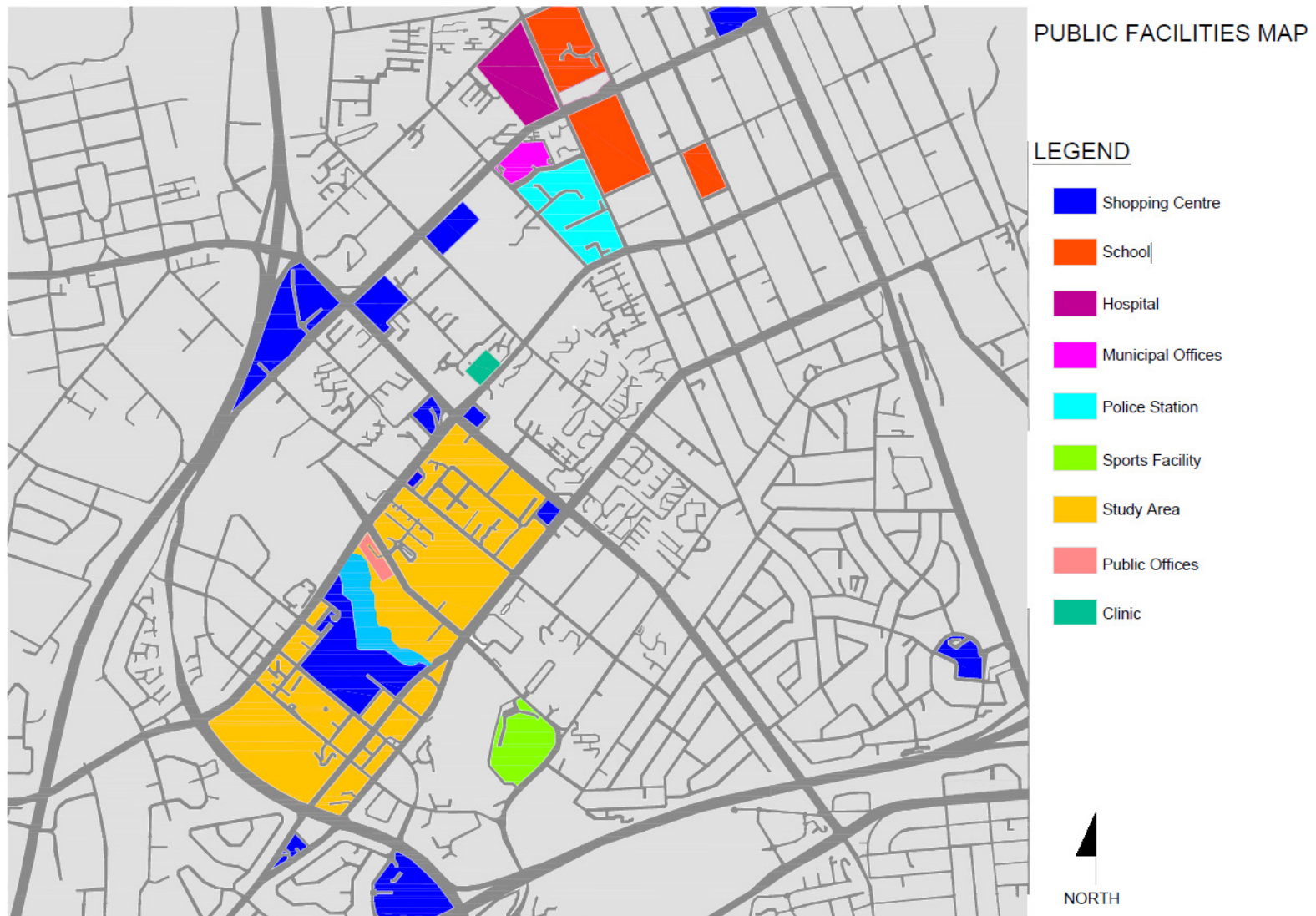


Figure 51_ Broader Public Facilities

Broader Public Facilities Analysis

Public Facilities are buildings that provide the general public with civil services. These services are provided through the construction and use of infrastructure that include buildings, recreational areas and property that are leased or owned by the state or an organ of the state. In some instances, public facilities are owned and operated by the private sector for example private schools and hospitals. The study area has a number of public facilities within it, but mostly around it. These facilities include shopping centres, schools, hospitals, clinics, municipal offices, government offices and sports facilities.

A SWOT analysis for the broader analysis of public facilities is presented in Table 7.

STRENGTHS	WEAKNESSES
• Easy access to public facilities as a result of spatial distribution • Well balanced supply of public facilities	• The existing public facilities cannot be easily accessible by pedestrians • Public facilities attract a high number of vehicular traffic • Some public facilities cannot be accessed using public transport
OPPORTUNITIES	THREATS
• Unused parcels of land present opportunities for additional public facilities • Densification of residential developments is possible as it is supported by the already existing public facilities	• High levels of urbanisation are a threat to the existing public facilities • Large commercial developments are a threat to the development of more public facilities

Table 10: Broader Public Facilities SWOT Analysis

STUDY AREA ANALYSIS

Study Land Mass

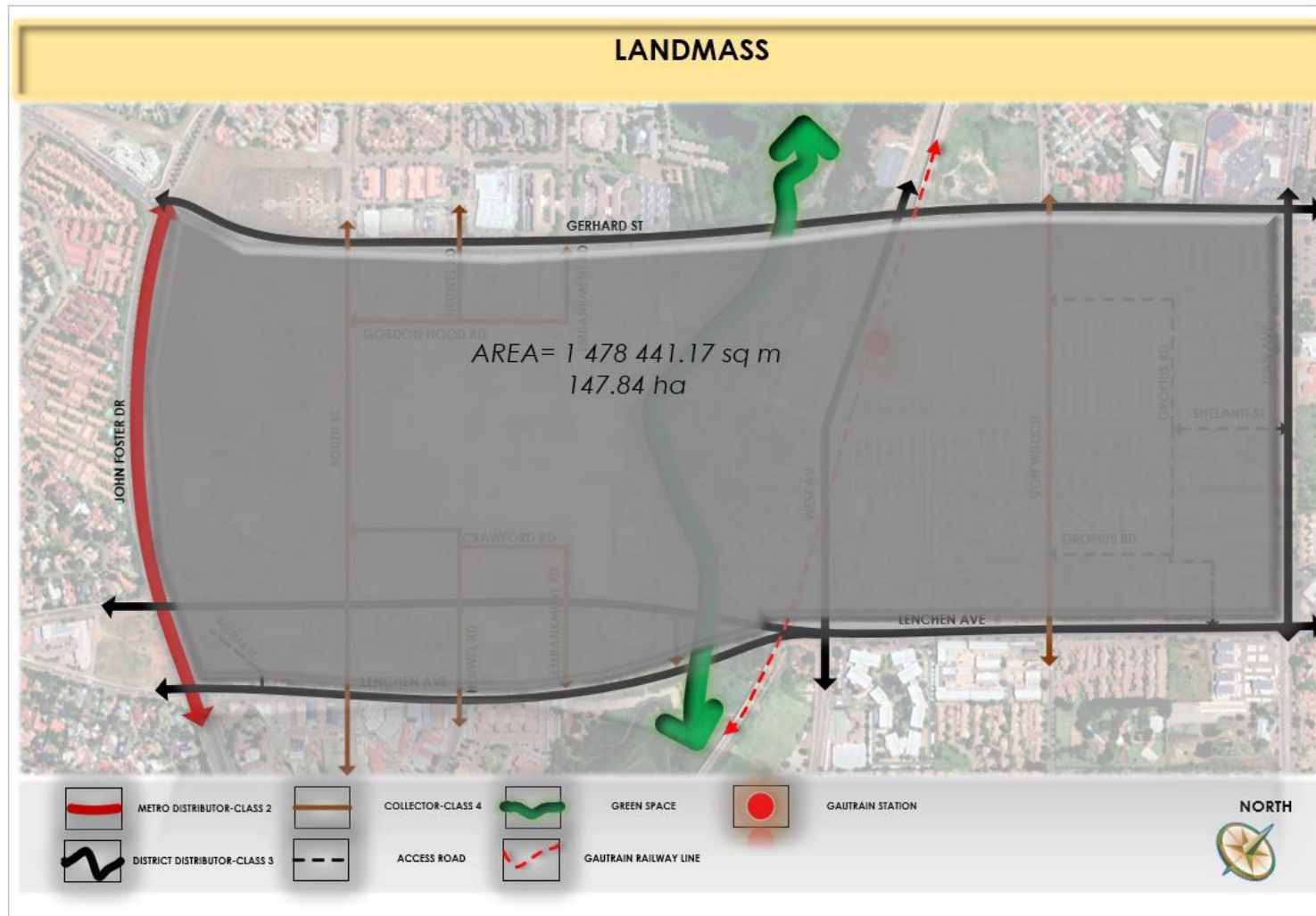


Figure 52_ Study Area Landmass

Massing

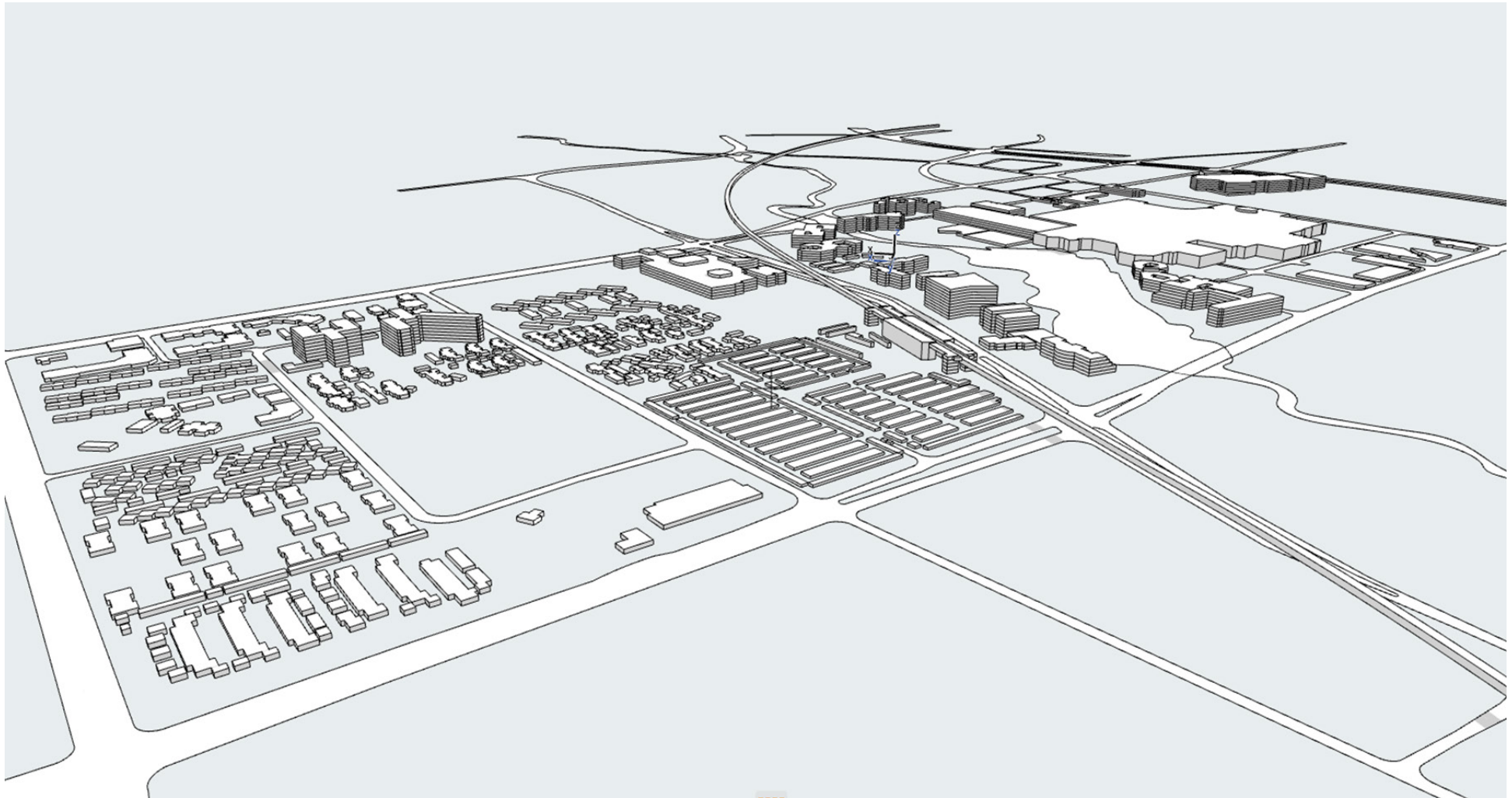


Figure 53_ Study Area Massing

Study Area Landmass and Massing

Land mass in this context refers the piece of land covering the study area and massing shows the existing built form, showing the general form, size and shape of the existing objects in space.

The landmass of the study area measures approximately 148 ha as shown in Figure 52. This translates to linear dimensions of approximately 1900 metres by 700 metres. The existing built form is represented in Figure 51. The urban form does not represent that of a rapidly urbanising urban environment as it still has vast pockets of empty spaces and single-story buildings. The optimisation the Centurion CBD land has not taken place yet. The main corridors which should have high intensity developments are lagging behind substantially.

A swot analysis of both the landmass and massing is presented in Table 8.

STRENGTHS	WEAKNESSES
• Available land to accordingly for high levels of urbanisation • Surrounded by major points of interest and public facilities	• Developments on the landmass are fragmented • Pro-economic development
OPPORTUNITIES	THREATS
• Opportunities for development proposals • Opportunities for coordinated development • Opportunities for the application of contemporary planning techniques	• Inadequatebulkinfrastructuretocarter for growth • Pollution of the river traversing through the study area

Table 11: Study Area Landmass and Massing

Study Area Building Heights



Figure 54_ Precinct Building Heights

Study Area Building Heights Analysis

The study area has varying building heights, these range from 1 floor to seven floors. The tallest building within the study area is used for residential purposes. The average building height is three floors, and that again being residential. Taller buildings along west avenue (road leading to the Gautrain Station) are beginning to come up on the western side. On the immediate east of west avenue, there are no tall buildings, and thus could be because of the gautrain railway line.

These buildings are mainly used as offices. Despite west avenue being a prime corridor as it houses a morden transportation interchange, fragmented development is prevalent along the route.

Figure 54 and Table 12 reflect the buildings heights within the study area and the SWOT analysis thereof.

STRENGTHS	WEAKNESSES
• Varying building heights already exist • Maximum utilisation of land will be achieved through building going up • Higher buildings provide diversified services.	• Geology of the area is a limiting factor to building heights • Attempts to stabalise taller structure uses up a lot of space
OPPORTUNITIES	THREATS
• Opportunities to build going up • Densification is still possible within the study area	• Higher ecological footprint • Higher densities bring overcrowding

Table 12: Study Area Building Heights Analysis

Study Area Figure Ground Map Analysis

A figure ground map is usually used in the analysis of urban form. A figure ground drawing shows the buildings as figures that visually contrast the ground. The two-dimensional map depicting an urban space therefore shows the relationship between built and space. Figure 53 is used in the analysis of urban built form of the study area.

From the figure it can be seen that the shopping area has a dominant large block, that shows the Centurion mall, while on the north east of the study area small blocks are seen and are predominantly residential. Vast spaces that are unused/ undeveloped can also be seen across the study area.

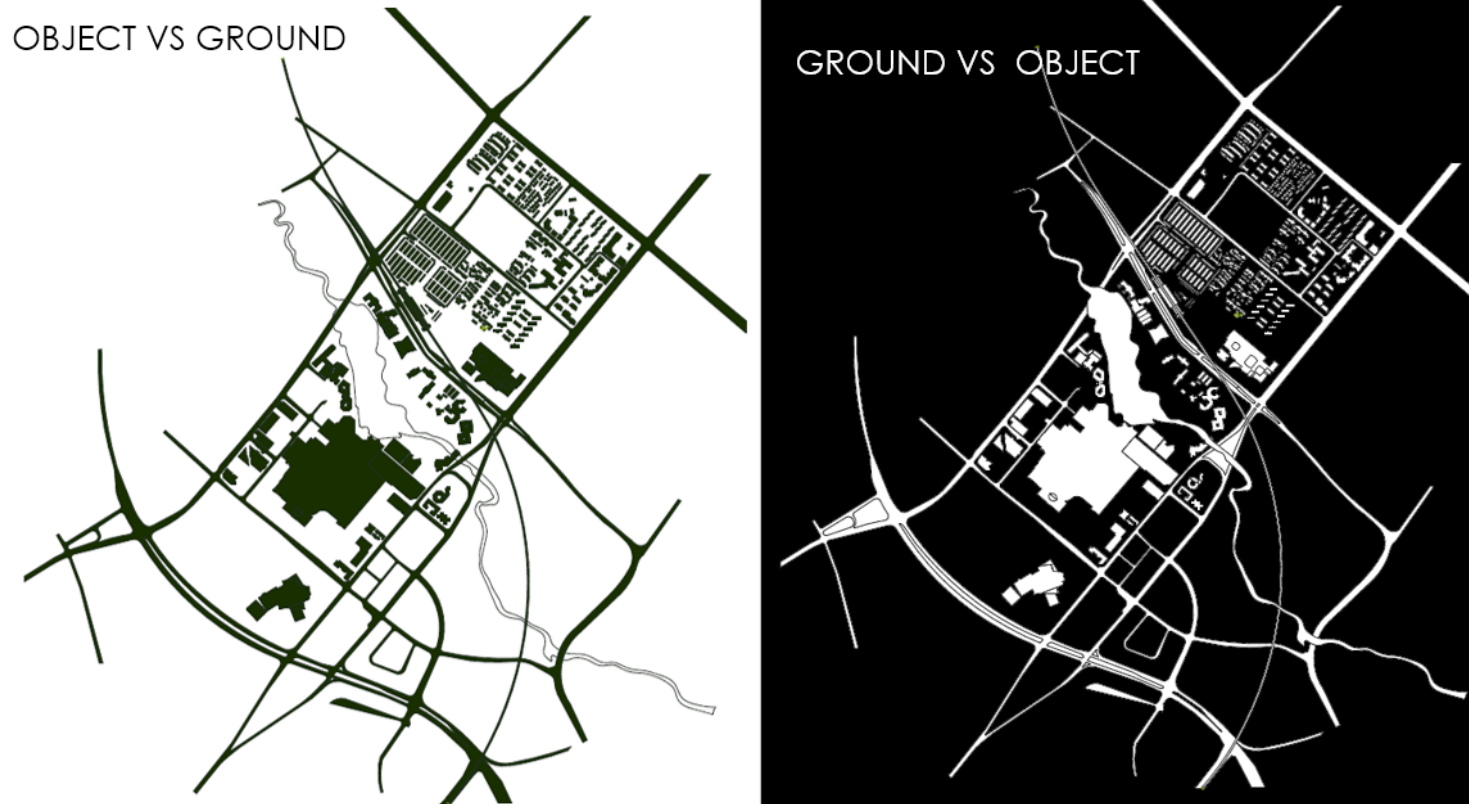


Figure 55_ Study Area Figure Ground Map

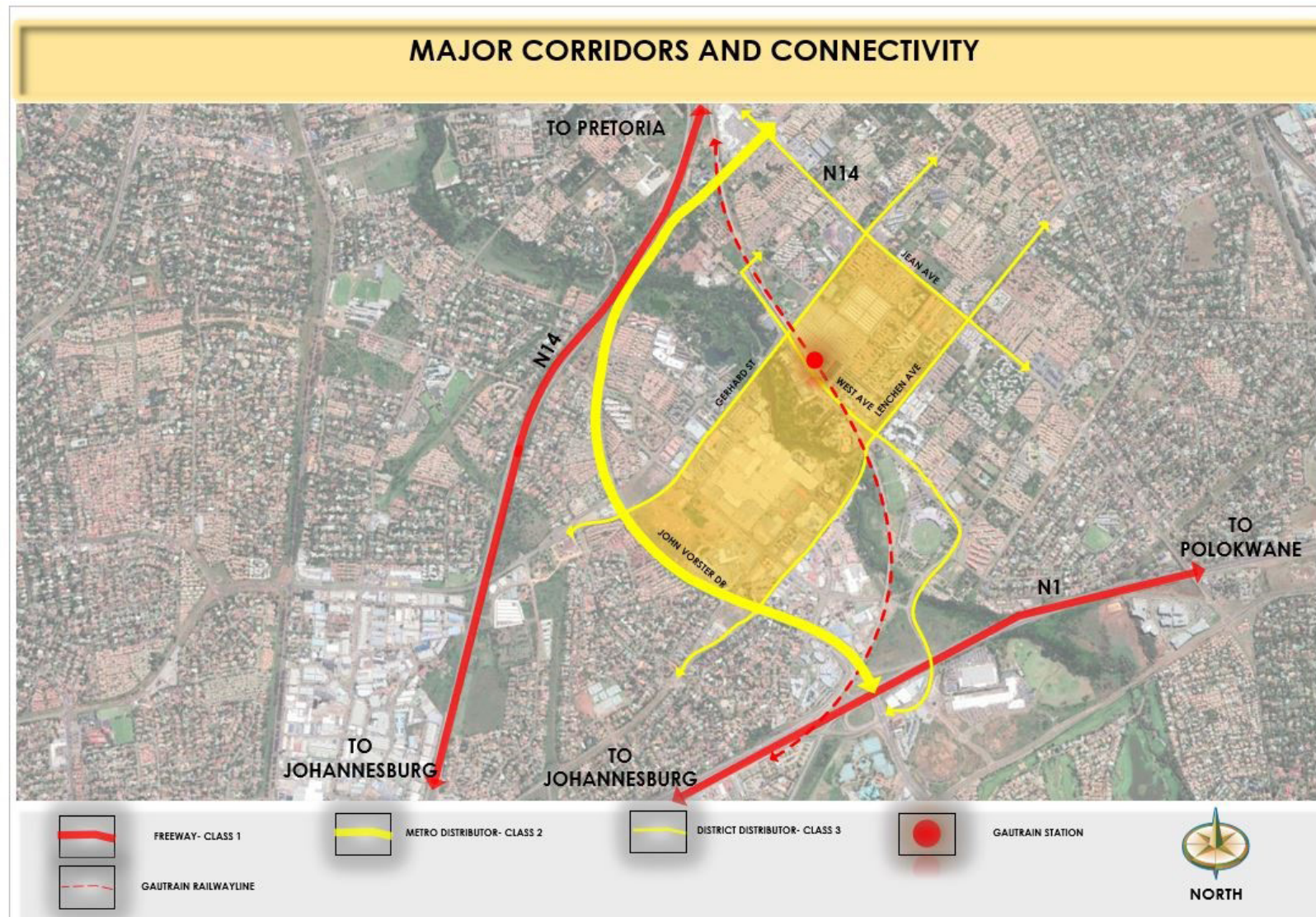


Figure 56_ Major Corridors and Connectivity.

Study Area Connectivity Analysis

The connectivity of the study area is of vital importance for its growth and development. Connectivity further provides access to employment, social, health, education and leisure. Connectivity opens up more developmental opportunities that eventually stimulate economic and social development.

The study area is well connected and is in close proximity to major corridors that include the N14 and the N1. This is depicted on figure 56. These major corridors connect to Pretoria CBD, Krugersdorp, Johannesburg and Polokwane. The study area is also located not too far away from two airports, thus OR Tambo International Airport (connecting through N1 & R21 and also connecting through the Gautrain) and Lanseria Airport (connecting through N1 and N14). These roads reinforce the selection of the study area as one of the three nodes that make up the Gauteng economic triangle.

The connectivity of the study area is shown on Figure 56 and the SWOT analysis is reflected on Table 13.

STRENGTHS	WEAKNESSES
• Shorter travel time to and from the study area • Strategic for economic development • Potential to develop further the transport infrastructure • The favourable geographical location	• Substantial funds essential for infrastructure modernization • Poor condition of some of the roads leading to the study area
OPPORTUNITIES	THREATS
• Easy movement of people and goods • Increased regional integration of the study area	• High number of motorised transit • Dire environmental impacts • Traffic safety is compromised • High speed transit

Table 13: Study Area Connectivity SWOT Analysis

Study Area Local Hazard

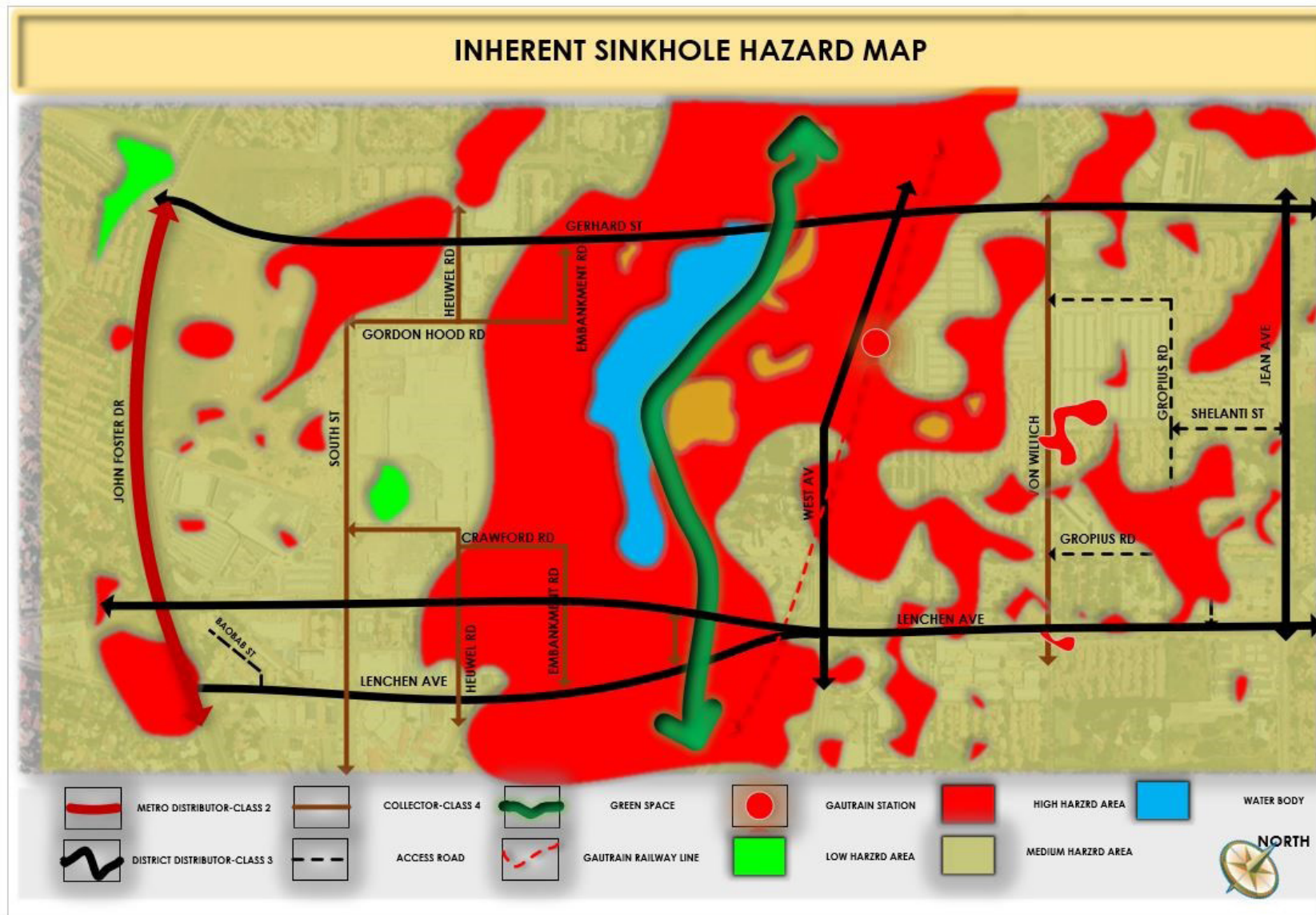


Figure 57_ Study Area Inherent Sinkhole Hazard Map

Existing Built form on Sinkhole Hazard Areas



Figure 58_ Existing Built Form on Hazard Areas

Study Area Local Hazard Analysis

McHarg (1995) highlight a number of limitations that nature can present to most urban setups. These include geology, which plays a part in, and the heights of buildings in any urban setup thereby also presenting an effect on the street as well as street activities.

Sinkholes refer to holes that form in the ground, usually as a result of the geological composition of the area in question. The Centurion area is known for the presence of dolomite which in some instances has resulted in sinkholes with the recent one being rehabilitated in 2018 and located on the north-east of the study area, thus corner Jean Avenue and Gerhard Street. The figures above show the inherent sinkhole hazard map in the study area. The greater part of the study area is categorised as a medium risk area which carries some of the tallest buildings within the study area. The area along the river is the high-risk area of the study area. Despite this being a high risk, buildings as high as six floors currently exist on site. Basement parking spaces were also seen during site surveys, mainly around the Centurion Mall area which sits on both medium and high-risk areas.

From Figure 58 it can be seen that despite the study area land being characteristic of inherent sinkholes, with proper geotechnical investigations, certain high rise and basement parking is possible and the geology of the area should not be perceived as a factor that inhibits development of buildings and infrastructure. A

Study Area Local Hazard SWOT Analysis is presented in Table 14.

STRENGTHS	WEAKNESSES
Development intensity resulting in overcrowding is discouraged	- Creates fragmented development - Specialist building techniques may be necessary, and certain types of development may not be safe
OPPORTUNITIES	THREATS
Presents opportunities for ecological preservation along the river	- Damage to infrastructure - Unstable land

Table 14: Study Area Local Hazard SWOT Analysis

Study Area Land use

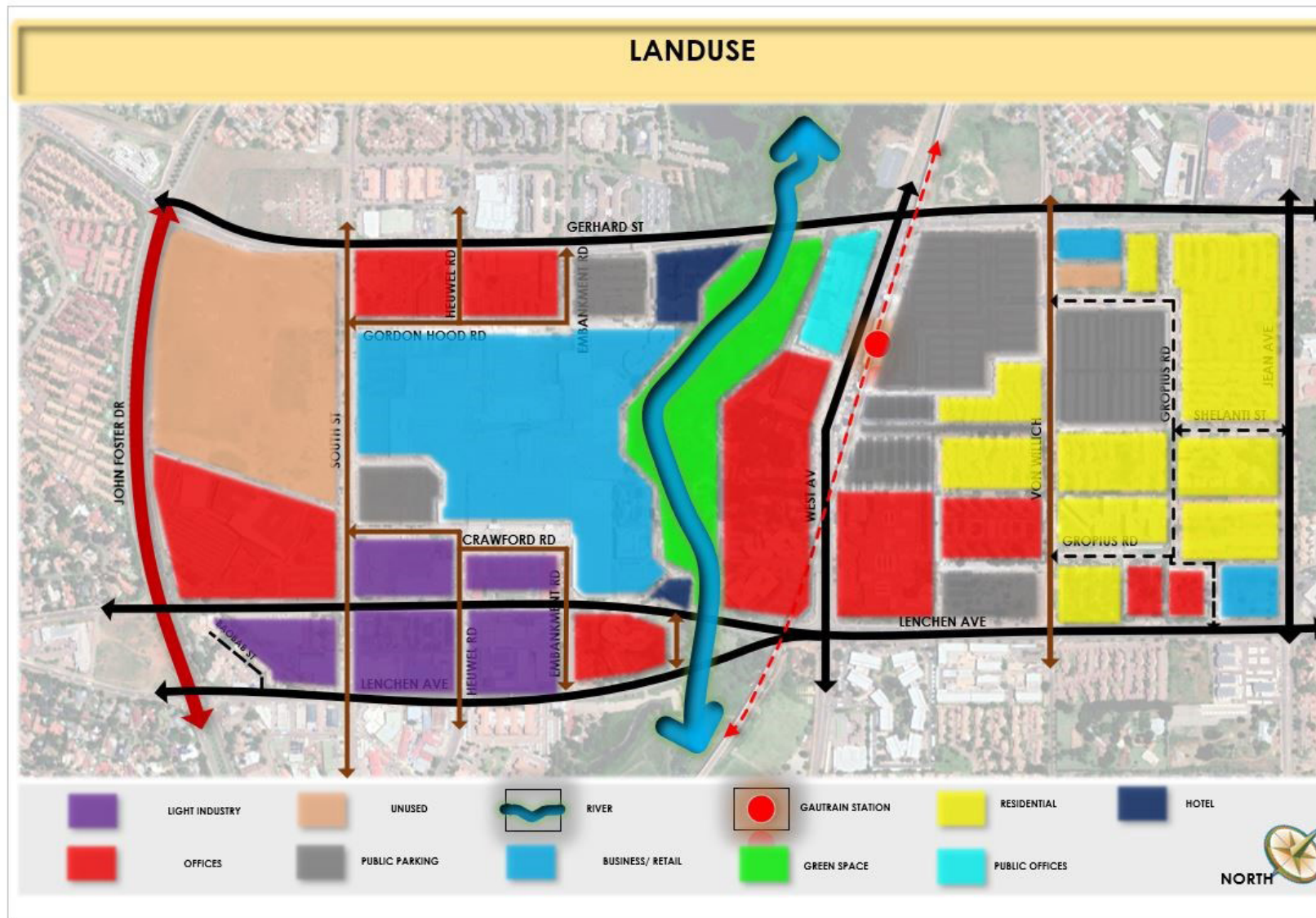


Figure 59_ Study Area Existing Land use.



Figure 60_ Study Area Existing Land use- East 3D view

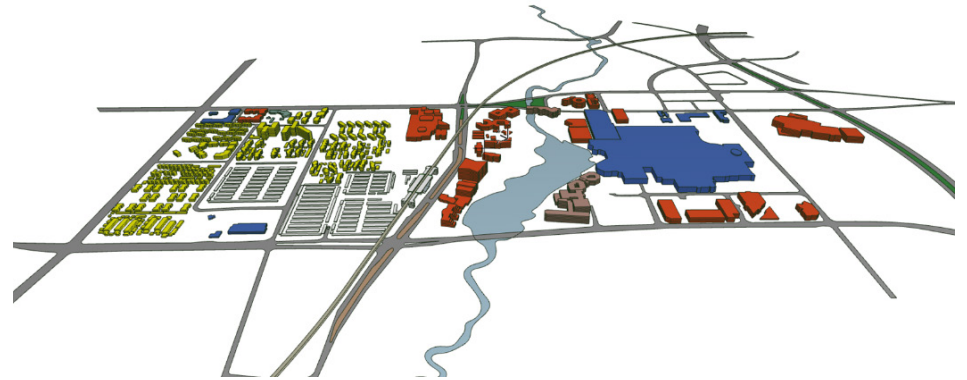


Figure 61_ Study Area Existing Land use- West 3D View



Figure 62_ Study Area Existing Land use- South 3D View



Figure 63_ Study Area Existing Land use-North 3D View

Study Area Land Use Analysis

Land use describes what a piece of land is used for. The above figures show the existing diverse land uses that exist within the study area. These land uses are residential, shopping, offices, light industry, hotels, parking, public offices, passive and active green spaces, and unused land. Despite the study area having a diverse number of land uses, these uses are apportioned to certain pieces of land per land use and not mixed used are present on one parcel of land or one building. A land use SWOT Analysis is shown on Table 15.

STRENGTHS	WEAKNESSES
• Diverse land use patterns • High motorised transit connectivity between the different land uses	• Fragmented land use • Segmented land uses with no mixed use on one plot or one building
OPPORTUNITIES	THREATS
• Opportunities for improved land use planning • Opportunities for integrating the study area with the broader area • Opportunities for economic growth enabling innovation	• Land use change • Illegal developments and settlements • Mobility demands to enable the movement between the different land uses

Table 15: Study Area Land Use SWOT Analysis

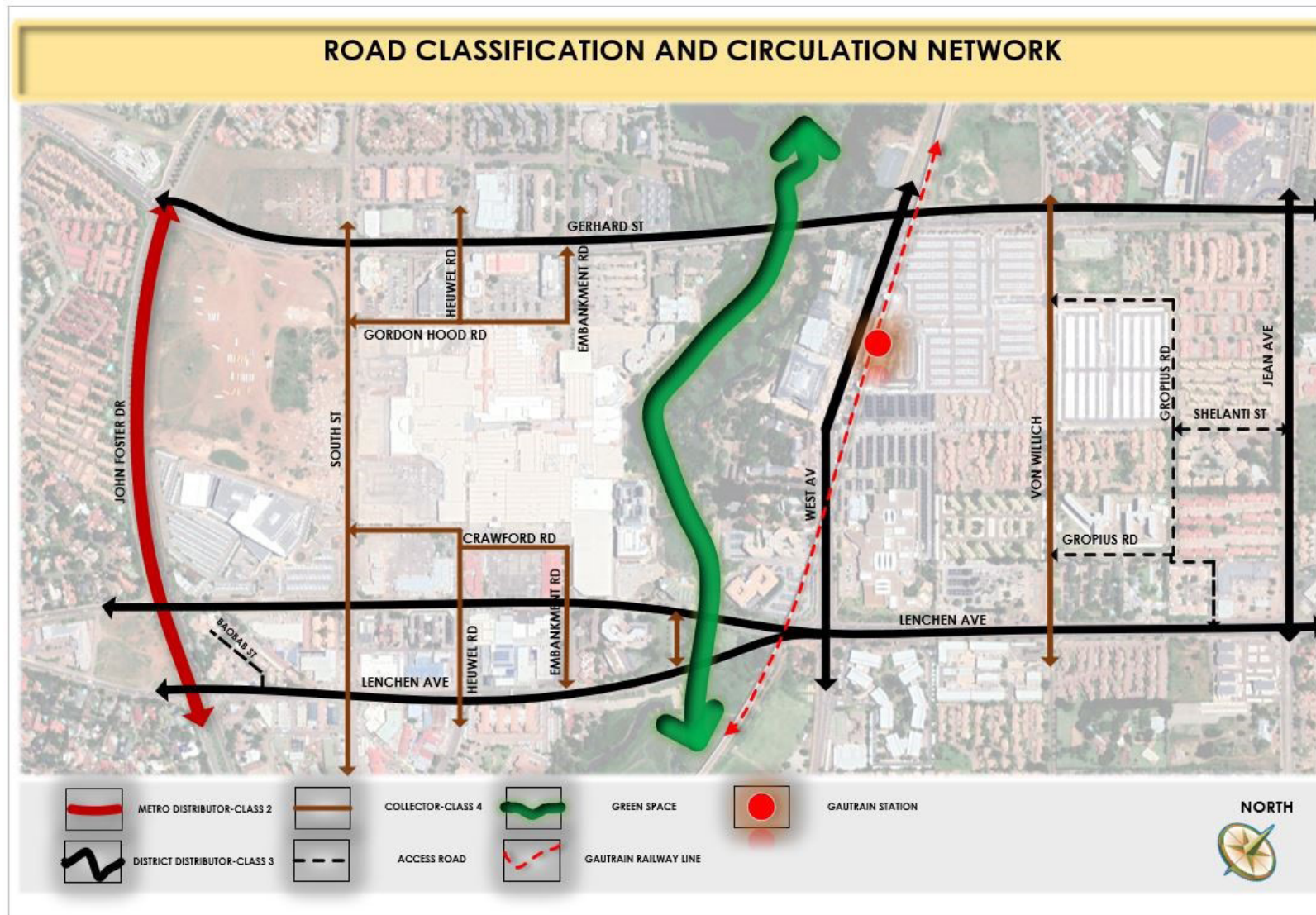


Figure 64_ Study Area Road Classification

Study Area Road Classification Analysis

Different road classes within any given area serve the function of facilitating distribution of traffic. The study area has all the road classes save for Class 1- National roads (freeway). Though these road classes are present, traffic congestion is rarely seen in the study area. Congestion is occasionally witnessed only when there are activities taking place at the Super Sport Park cricket stadium. These roads are shown on Figure 64 and Table 16 shows the SWOT Analysis.

STRENGTHS	WEAKNESSES
- A robust road network within the study area has economic benefits - Movement within the study area is easy	- The study area road network reflects an area that is vehicular orientated - The movement of pedestrians is not encouraged
OPPORTUNITIES	THREATS
- There are opportunities for introducing pedestrian walkway networks as a result of wider roads - Introduction of non-motorised transit in the wider roads	- Road network might attract the manufacturing sector which might be detrimental to the environment. - Direct environmental impacts due to the high use of motorised transit - High use of private cars due to the low supply of public transport

Table 16: Study Area Road Classification SWOT Analysis

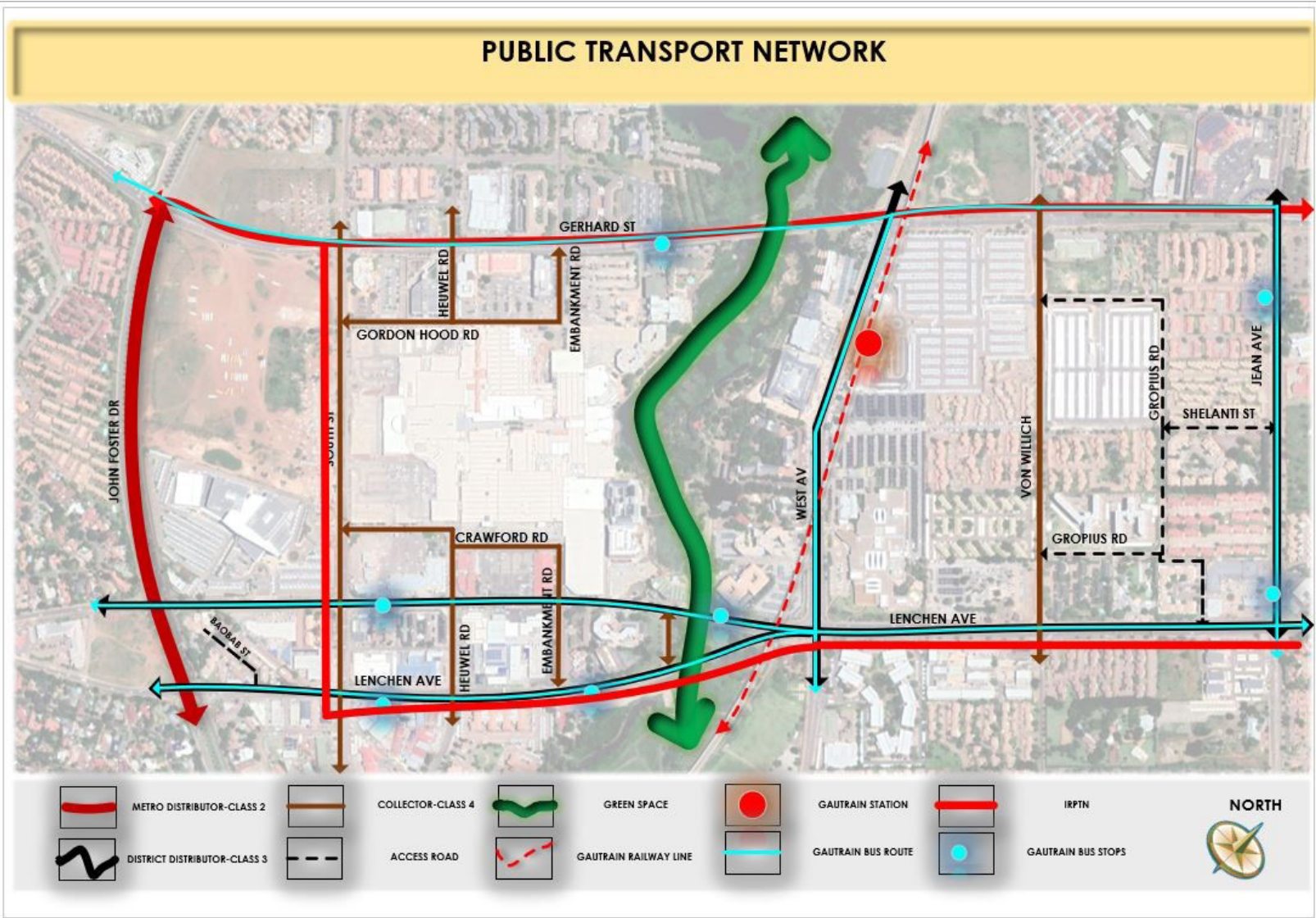


Figure 65_ Precinct Public Transport Network

Study Area Public Transport Network Analysis

Public transport refers to group travel systems that are used by the general public. In this context I refer to taxis and buses. The study area is serviced by the convectional taxis, Gautrain buses and Putco buses. The Gautrain pick up and drop off points can be prominently seen in the study area making it easy for pedestrians to access and exit the study area.

STRENGTHS	WEAKNESSES
• Good connectivity • Space is till available for innovative ideas	• Lack of transport modal integration • No low-cost transport facilities within study area
OPPORTUNITIES	THREATS
• Developing transport technologies and new approaches • Connections with surrounding areas • Connectivity of pedestrian networks to existing interchanges	• Bus routes along the main corridors create barriers for pedestrian movement and crossing • Dedicated public transport routes may compromise pedestrian infrastructure

Table 17: Study Area Public Transport Network SWOT Analysis

Study Area Green Structure



Figure 66_ Existing Precinct Green Structure

Green spaces represent the fundamental component on the urban ecosystem and is therefore of paramount importance. These green spaces include gardens, parks, wetlands and are used mostly by the local inhabitants for physical activities, recreational activities and general relaxation, thus, over and above the known environmental benefits that include cooling the environment, providing oxygen, acting as a carbon sink and filter for harmful pollutants in the air. Furthermore, green spaces also are important to mental health. Access to green spaces can improve the mental well-being of people and mitigate depression.

With that being said, fewer green spaces exist within the study area. The only large green space is along the Hennops river. This park is generally unsafe, with a high rate of mugging and other criminal activities. I have personally been a victim of mugging where I lost valuables. The park is also inundated with pollution, resulting in the river being polluted as well. This main park is strategically located between the mall (shopping area) and business offices. Its unsafe nature is due to the fact that all buildings have turned their back on this park, with no surveillance eyes on the park thereby creating a conducive haven for criminal with their criminal activities and also for dumping of wastes. Private green spaces can be seen within the study area, but there is need for these to be supported by bigger and preferable public green spaces.

Study Area Pedestrian Movement

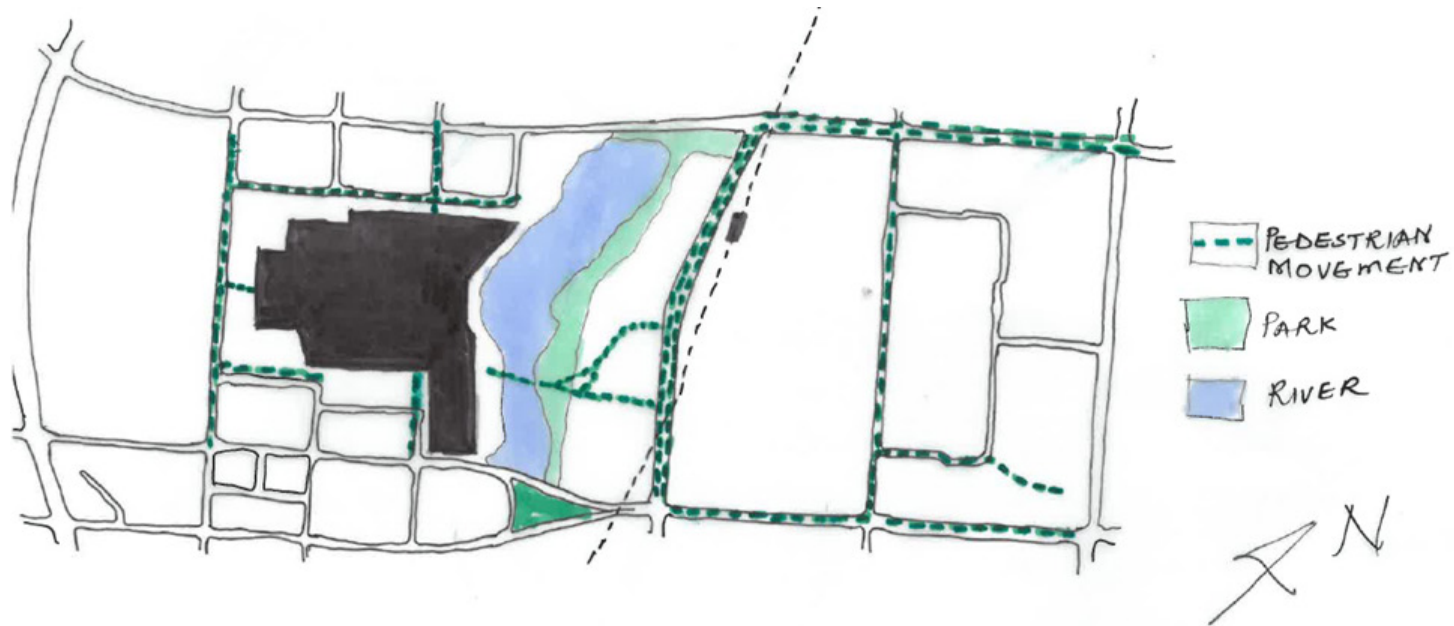


Figure 67_ Existing Precinct Green Structure

Study Area Pedestrian Movement Analysis

Pedestrian Movement refers to the movement of people in pursuit of economic, social or leisure activities. This movement is usually predictable and can be mapped especially in urban areas.

In the study area pedestrian movement is concentrated around places of economic activities (the centurion mall) and around the Gautrain station precinct. Gerhard street brings a considerable volume of pedestrian traffic usually during the morning peak period as people come from the metro rail stations in pursuit of economic activities located in and around the study area.

STRENGTHS	WEAKNESSES
• Presence of economic activities to make people walk • Good infrastructure network exists e.g. train station	• The study area is dominated by vehicles • Walkways are in short supply • Pedestrian walkways are unsafe • Economic growth proposals will attract more vehicular traffic
OPPORTUNITIES	THREATS
• Development of mixed- use development to enhance pedestrian movement • Un developed land can have developmental proposals that are pedestrian orientated • Increasing landscape beauty at the same time providing comfortable pedestrian walkways through green infrastructure	• Poor connections for pedestrians • Pollution of the river might occur if waste management measures are not put on pedestrian infrastructure along the river.

Table 18: Study Area Pedestrian Movement SWOT Analysis

Economic Activitiess

There are a number of economic activities within and around the study area, most of which lie inside the study area.

Economic activities loosely defined refers to the production, distribution, exchange, consumption of goods and services. This ultimately creates economic opportunities for people. Though such economic opportunities are available within the study area, they can be further enhanced, and their development managed to mitigate or completely eradicate dire effects that come with economic development such as environmental degradation. Introducing residential areas (mixed use) within these economic activities will reduce travel times, to and from work thereby enhancing environmental preservation. Transportation interchanges are also critical in economic development as they facilitate the movement of people and good. The study area still has potential to be developed as a pedestrian friendly economic activities and function as an economic node not only for Centurion and Pretoria but for Gauteng as a region to fulfil its function as one of the points of the Gauteng Economic Triangle.

The informal economic sector is also prevalent in the study area, this is to be addressed through design. Informality is neither preserve of the poor nor the absence of the law (Varley 2013), and a holistic approach is therefore essential to address informality. In the case of the study area, informality is present in spaces that are not zoned. According to (Chen and Skinner (2014), informality is seen as means of income for the urban poor. Informality is often found in parts of the city that lack facilities and is seen as resistance to the State. This can be attested by informality being present next to a non-formal taxi rank where no facilities have been provided. Formal and nonformal economic activities need to be catered for in the study area.

STRENGTHS	WEAKNESSES
• Strategic location in close proximity to main corridors • Supported by residential developments in close proximity as sources of labour • Good mix of private and public sector services.	• No residential exists within the commercial activities • Low levels of innovation
OPPORTUNITIES	THREATS
• Well mixed used development, integrating economic activities with other land uses • Opportunities for the development of NMT infrastructure. • Opportunities to improve the business environment	• Economic Development at the cost of the natural environment (Natural environment fragmentation) • Pollution of the air and soil

Table 19: Economic Activities SWOT Analysis

Study Area Public Transport Network Analysis

This section presents a pictorial analysis of the study area. These pictures were taken by myself during intense periods of vigorously interacting with the study area. The pictures were taken at different days, different time slots (peak and off peak) and at different places within the study area.



Figure 68_ Poor state of roads infrastructure (Author-2019)



Figure 69_ Informality in the CBD Area (Author-2019)



Figure 70_ Unsafe informal trading in the CBD area (Author-2019)



Figure 71_ Unsafe pedestrian crossing (Author-2019)



Figure 72_ Non formal taxi rank in Centurion CBD (Author-2019)



Figure 73_ Unsafe pedestrian crossing to access taxi rank (Author-2019)



Figure 74_ Unused paved pedestrian walkway (Author-2019)



Figure 75_ Non-active edge (Author-2019)

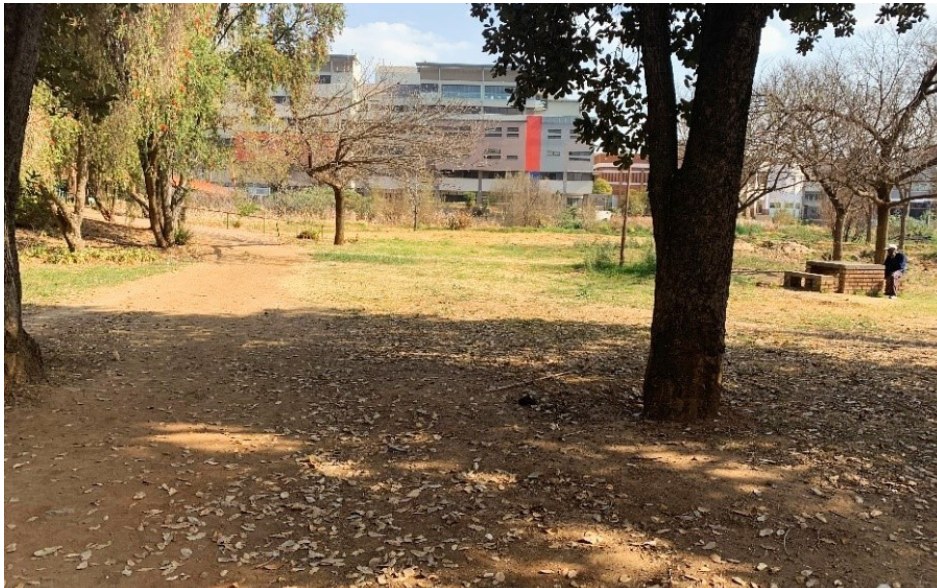


Figure 76_ Unused park in the CBD area (Author-2019)



Figure 77_ Unused Park pedestrian walkway in the Centurion CBD (Author-2019)



Figure 78_ Unused Park Infrastructure and buildings (Author-2019)



Figure 79_ Buildings turning their backs on well-developed park (Author-2019)



Figure 80_ Landscaped Park area (Author-2019)



Figure 81_ Narrow & inactive pedestrian walkway from West Ave to Park(Author-2019)



Figure 82_ Hennops River with ecological potential, adjacent to park (Author-2019)



Figure 83_ Hotel overlooking Hennops River (Author-2019)



Figure 84_ Disused park infrastructure (Author-2019)



Figure 85_ Centurion Mall Overlooking Hennops river (Author-2019)



Figure 86_ Pollution on park infrastructure (Author-2019)

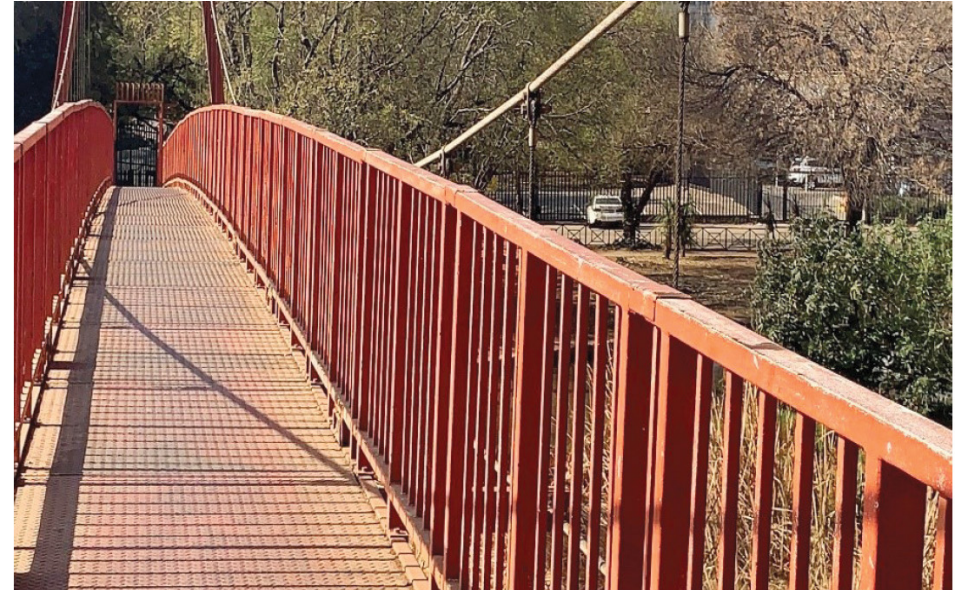


Figure 87_ pedestrian bridge over Hennops river joining the NE and SW (Author-2019)



Figure 88_ Hotel overlooking Hennops river (Author-2019)



Figure 89_ Unsafe centre parking (Author-2019)



Figure 90_ Mid-road pedestrian walkways (Author-2019)



Figure 91_ wide pedestrian walkways in the middle of West Ave (Author-2019)



Figure 92_ New Building with non-active frontage (Author-2019)



Figure 93_ Lack of pedestrian infrastructure on west Ave (Author-2019)



Figure 94_ Link between Gautrain and public offices (Author-2019)



Figure 95_ Wider pedestrian walkways in the middle of West Ave (Author-2019)



Figure 96_ Narrow sidewalk (1.5 mtrs) along West Avenue (Author-2019)

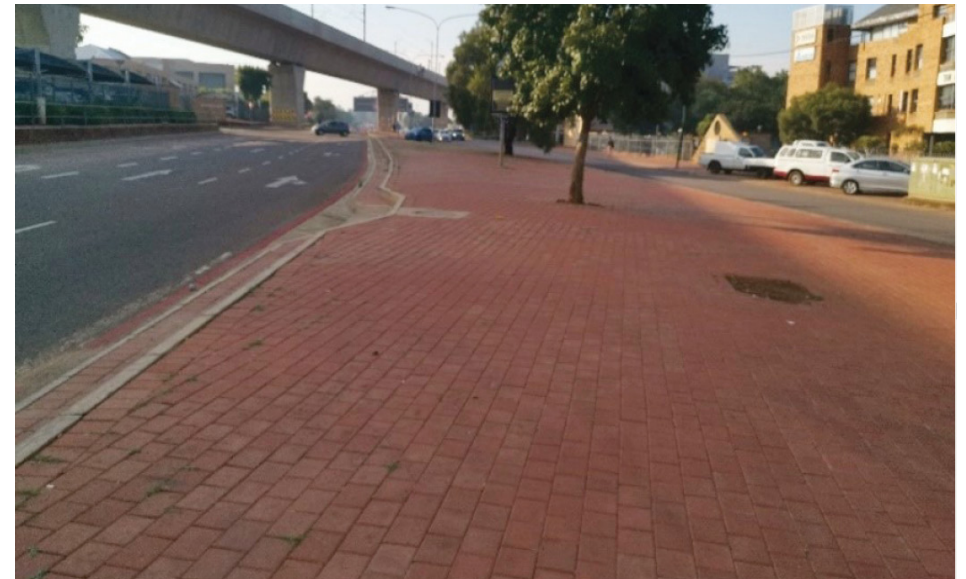


Figure 97_ Green Structure on West Ave not serving pedestrians (Author-2019)



figure 98.PNG

Figure 98_ Wider pedestrian walkways (8.5mtrs) in the middle of West Ave (Author 2019)



figure 99.PNG

Figure 99_ Onstreet parking along West Ave (Author 2019)



Figure 100_ Pedestrians accessing Home Affairs offices from the sidewalks (Author-2019)



Figure 101_ Lost spaces used for parking inside Gautrain Station (Author-2019)



Figure 102_ Residential developments in the Study Area (Author-2019)



Figure 103_ disused, lost spaces in the Centurion CBD (Author-2019)



Figure 104_ Disused lost spaces used for dumping in the CBD area (Author-2019)



Figure 105_ Potential sidewalks along John Voster Dr (Author-2019)



Figure 106_ Lack of pedestrain Infrastructure at crossings (Author-2019)



Figure 107_ Lack of Pedestrian infrastructure (Author-2019)



Figure 108_ Non-formal trading in the Centurion CBD (Author-2019)



Figure 109_ Ground pollution in the centurion CBD (Author-2019)



Figure 110_ Non-formal taxi rank in the Centurion CBD (Author-2019)



Figure 111_ Lack of designated taxi pick & drop off points (Author-2019)



Figure 112_ Disused parking in the Centurion Mall (Author-2019)



Figure 113_ Disused Parking in the Centurion Mall (Author-2019)



Figure 114_ Inactive paved pedestrian sidewalk (Author-2019)



Figure 115_ Bollards serving no purpose (Author-2019)



Figure 116_ Uncomfortable pedestrian sidewalk (Author-2019)



Figure 117_ Non-active sidewalks in the Centurion CBD (Author-2019)



Figure 118_ Narrow and nonactive sidewalks along Gerhard Street (Author-2019)



Figure 119_ Lost spaces in the form of underutilised parking in the CBD (Author-2019)



Figure 120_ Narrow (1.8mtrs) and inactive sidewalk along Gordon Hood Rd (Author-2019)



Figure 121_ Narrow (1.8mtrs) and inactive sidewalk along Gordon Hood Rd (Author-2019)



Figure 122_ lost spaces in the form of underutilised parking along Gordon Hood Rd (Author-2019)



Figure 123_ need for pedestrian infrastructure on Gordn Hood Rd (Author-2019)



Figure 124_ Need for street furniture and pedestrian crossings on Gordon Hood Rd (Author-2019)



Figure 125_ Non-active fronts on Lenchen Ave (Author-2019)



Figure 126_ No pedestrian side walk along Lenchen Ave (Author-2019)



Figure 127_ Non-active sidewalk on Lenchen Ave (Author-2019)



Figure 128_ Lost spaces in the form of underutilised parking on lenchen Ave (Author-2019)



Figure 129_ Parkade at the Centurion Mall (Author-2019)



Figure 130_ Disused park in the Centurion CBD (Author-2019)



Figure 131_ Disused street furniture leading to park (Author-2019)



Figure 132_ Hennops River Ecology (Author-2019)



Figure 133_ Building turning back on park (Author-2019)



Figure 134_ pedestrian bridge over Hennops river (Author-2019)



Figure 135_ Hotel overlooking Hennops river (Author-2019)



Figure 136_ Pedestrian Bridge over Hennops river (Author-2019)



Figure 137_ Need for comfortable pedestrian walks on Lenchen Ave (Author-2019)



Figure 138_ Lack of NMT infrastructure on Lenchen Ave (Author-2019)



Figure 139_ Unsafe onstreet parking next to Home Affairs Offices (Author-2019)



Figure 140_ Narrow sidewalks along the Home Affairs Offices (Author-2019)



Figure 141_ Narrow and inactive pedestrian walkway from West Ave to Park (Author-2019)



Figure 142_ 9 floor residential buildings on medium risk sinkhole hazard area (Author-2019)



Figure 143_ Main Pedestrian feeder route from Metrorail on Gerhard St (Author-2019)



Figure 144_ Main Pedestrian feeder route from Metrorail on Gerhard St (Author-2019)



Figure 145_ Lost spaces in the form of disused land on Gropius Street (Author-2019)



Figure 146_ Residentail Developments within the Study Area (Author-2019)

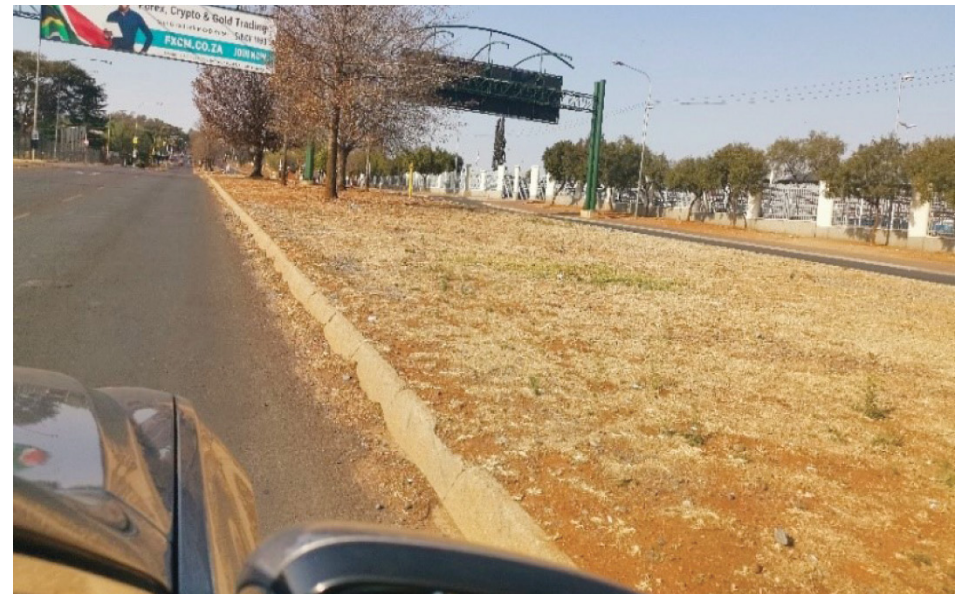


Figure 147_ Wider green structure in the middle of Gerhard Street (Author-2019)



Figure 148_ Main Pedestrian feeder route from Metrorail on Gerhard St (Author-2019)



Figure 149_ Non Active sidewalks on Jean Ave (Author-2019)

CHAPTER 6

CONCEPT DEVELOPMENT

McGlynn and Murrain (2007) alludes to the fact that good urban design can only exist relative to a set of values held by an individual, group or society in general. Furthermore, for an urban designer, good urban design is one that achieves environments that support the interests of the widest public who use them

VISION

by green infrastructure.

The precinct/ study area should contain a number of identifiable and integrated mixed-use developments with different nodes at specified areas, each with their own role and purpose and should be interconnected by pedestrian walkways or by mobility routes. The Gautrain station must be used as a catalyst for developing the study area, thus urban design principles as well as Transit Orientated Development Principles (TOD) must be applied to create an overall habitable, safe and self-sustainable urban environment. The distinct nodes that must be created include the following;

- Retail Node
- Business Node High
- Residential Node

The vision for Centurion Gautrain Precinct presented in this section. This vision aims at supporting economic, social, spatial and ecological imperatives at different scales. These scales include the Regional or Provincial, the metropolitan scale and the local scale that represents Centurion. The Gautrain station is used as a catalyst for development and the regeneration of areas abutting the study area. These scales are depicted on Figure 150.

The Centurion Gautrain Station falls within the Region 4 of the City of Tshwane Metropolitan Business Node. As such the vision is to tap into its accessibility advantages to make it a highly accessible civic, business, commercial, recreation and residential precinct and further strengthen its position within the economic triangle of Johannesburg, Ekurhuleni and Tshwane providing a high quality, safe and secure, convenient and attractive working and living environment supported

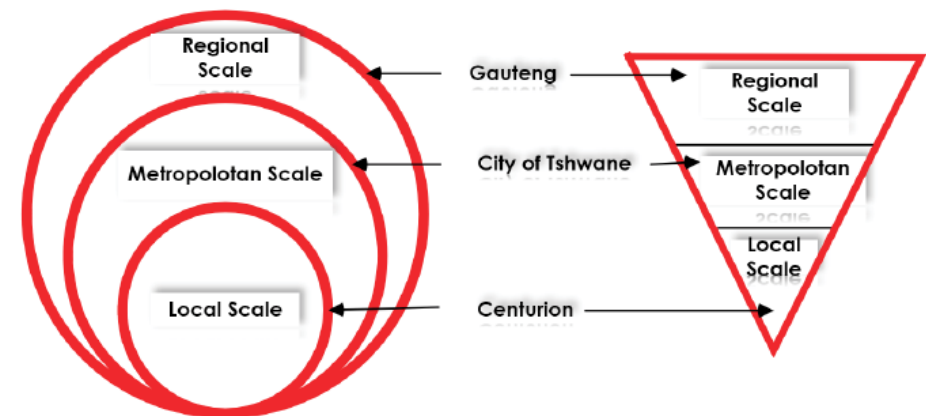


Figure 150_ Vision Scales

STRATEGIC OBJECTIVES

Prior to developing concepts and then ultimately selecting the best preferred concept, it is imperative to set out what the final design should set to achieve. The strategic objectives thereof are discussed below.

IMPROVED URBAN MOBILITY AND ACCESS

The chosen design must give priority to pedestrian movement and non-motorised transit. Regional accessibility of public transport should be maintained or even improved and the residential character that lies within the study area must be retained and densified. Transportation modal integration should also be given attention through design.

IMPROVED PHYSICAL APPEARANCE

Madanipour (1997) describes urban design as a process through which we consciously shape and manage our built environment, thus a multi-disciplinary activity of shaping and managing urban environments, interested in both shaping and the spaces it helps shape.

The design must aim to create a more responsive built

forms with different typologies, especially along the river and a strong focus more structured and functional public places and spaces. The natural landscape to be also be preserved and enhanced.

SELF -SUSTAINABLE AND RESILIENT URBAN ENVIRONMENT

The green structure proposals can be put forward to enhance the environment. The biodiversity that exist along Hennops river should be protected to ensure a vibrant ecosystem. The design must ensure that the study area promotes resilience the climate change and other climatic hazards that might occur.

OPTIMISE USE OF EXISTING INFRASTRUCTURE

As alluded to earlier, the study area has a robust network infrastructure which is currently underutilised. The broader or immediate area have all the road classes that transport different types of traffic into the study area. The road infrastructure and other related infrastructure make it conducive to create mixed use development, in the form of mixed land use and mixed-use buildings. The design should therefore strive for optimal use of infrastructure.

Coordinated development

Carmona Tiesdell (2007) points to the fact that the quality of urban design is the product of many different interests and individuals..

Using the Gautrain as a main catalyst for developing the study area, the design must strive to expand and enhance the mixed use with development intensified in the Gautrain area. Proposal must consolidate, expand and enhance the mixed use civic, retail and business CBD core. The development intensity in the Gautrain area must contain mixed use commercial and residential along West Avenue. The Hennops river must be a multifunctional river that caters serves as open space, an ecology area, cater for regional and local recreational activities and an ecological conservation area. The area around Hennops river must contain residential developments. The CBD area and the residential area must be connected through well-defined and safe pedestrian walkways with sufficient street furniture to ensure comfortable walking.

Responsive and Human Scaled Urban Environment

According to Bentley (2007), there are heroic form givers who propose form whilst other implement them.

The spatial restructuring of the study area must make the place liveable. Furthermore, it must achieve not only the Centurion spatial objectives but also the metropolitan objectives as well. By liveability, it entails that the study area must be comfortable, safe, secure, legible, and, requires the restructuring of the grain of the urban fabric across the study area. The introduction of more urban building typologies is critical.

The introduction of perimeter blocks with private garden should be made possible. These multi-storey buildings should have active ground floors, preferably with retail. The urban fabric must be refined to a finer grain that promotes movement and accessibility with choices of movement for both vehicles and pedestrians. However, points of conflict between pedestrians and vehicles must be minimised. Establishing human and urban scale to development in the study area and reducing the dominance of the car and prioritising the pedestrian is emphasised.

Gautrain as catalyst for development

As already stated, the Gautrain will be used as a catalyst for development. This is because the Centurion Gautrain Station is strategically located to be used by both the local and the regional people. This will aid in the economic development which should be managed such that it does not occur at the expense of the physical and social environments. The regional and local connectivity of the study area is shown on Figure 151. The ease of movement to and from the study area should be tapped into and used for commercial benefits. Furthermore, the design should improve accessibility, connectivity and efficiency. The connectivity routes should ultimately be integrated with the Gautrain station in a manner that does not compromise pedestrian movement. Beyond functional purposes of permitting people to get from one place to another and to gain access to property, streets- most assuredly the best streets- can and should help to do other things: bring people together, help build community, cause people to act and interact, to achieve together what they might not alone. As such, streets should encourage socialization and participation of people in the community". (Jacobs, 1993:312).

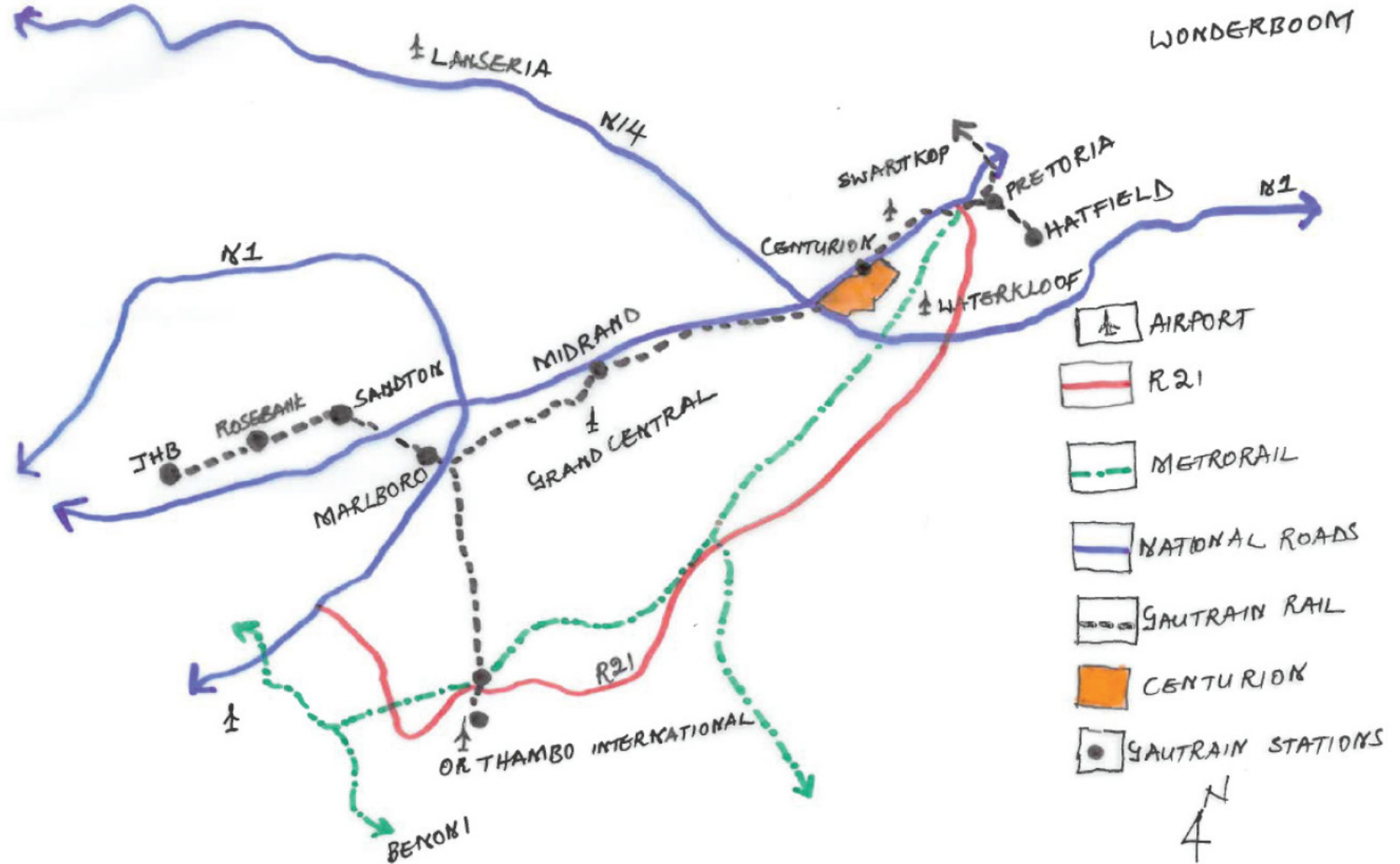


Figure 151_ Centurion Locality and Connectivity

Regional Access and Integration

Again, referring to study area connectivity depicted in Figure 151 it is critical to carefully integrate the study area to major corridors while mitigating the risk of the dominance of motorised transit. The major corridors that must be given attention are the N1 and N14. To further foster integration on a local scale, there must be consideration given to the improvement of the current pedestrian linkage and connectivity between the study area and immediately adjacent areas, as vehicular connections are sufficient. Urban design principles and transit-oriented principles must be applied to enable and reinforce the Transit Oriented Development initiatives in the study area.

Local Urban Connectivity

The design should strive to improve local connectivity, thus improve internal circulation and access to local level nodes and public facilities. The entire study area must be adequately served by public transport. The pedestrian network must be a robust network, especially from the

residential side of the study area, such that it facilitates social and economic activities.

Accessibility to services and facilities

There are a number of government owned and privately-operated public facilities that lay inside and in close proximity of the study area. These are accessed by people using both vehicles and on foot. The design should therefore increase mixed land uses in all high accessibility areas, access to social facilities must be improved.

Reduce the dominance of motorised transit

The robust road network that currently exists encourages the dominance of motorised transit. There is therefore no balance between motorised transit and non motorised transit. This can be attested by a high number of motorised transit movement that can be seen during peak periods. To circumvent the car dominance, the design to attempt to rationalise public transport routing, prioritise pedestrian traffic safety especially at intersections and also around public transport nodes, enhance the safety and comfortability.

The natural environment

“Start the design process by understanding and working in harmony with the natural drainage patterns of the site and apply the principles of Water Sensitive Urban Design (WSUD) so as to arrive at a layout that is water sensitive and space efficient, minimises the disruption of the natural hydrological cycle and works together with other related gravity systems such as sewerage” (Urban Design policy 2013:15)

Hennops river is an ecological corridor and as such measures must be taken to preserve it. It is currently inundated with pollution due a number of factors, one being that the park that runs along this river is largely inactive. Urban design in this instance should strive to protect and integrate the ecological environment and enhance the ability to contribute to eco services delivery. This will also aid in improving the air quality in the immediate environment as well as the quality of water in the Hennops river.

DEVELOPMENT OF CONCEPTS

In this section two concepts will be developed, thereby testing a number of urban design principles as well as transit-oriented development principles. Of the two concepts, one will be chosen and further developed to make the Centurion Gautrain Precinct a habitable, safe and self-sustainable urban environment.

Building Typologies and Forms

Most buildings in the study area are set back. On the residential side, most of the residential buildings are located inside security complex developments resulting in no activity along the streets. The design should therefore formulate proposals for the use of perimeter block buildings that provide active building frontages on public environment. Defensible spaces must be created through the use of building forms that overlook the public spaces. Lastly the building form must clearly define private and public spaces.

Concept 1

Concept one development is based on developing a well-defined pedestrian spine running from North to South of the study area. Over and above the pedestrian spine are nodes, which are public squares. The northern square is the represents the gateway to the precinct while the southern square is the southern gateway of the study area. this pedestrian spine is shown on Figure 152.

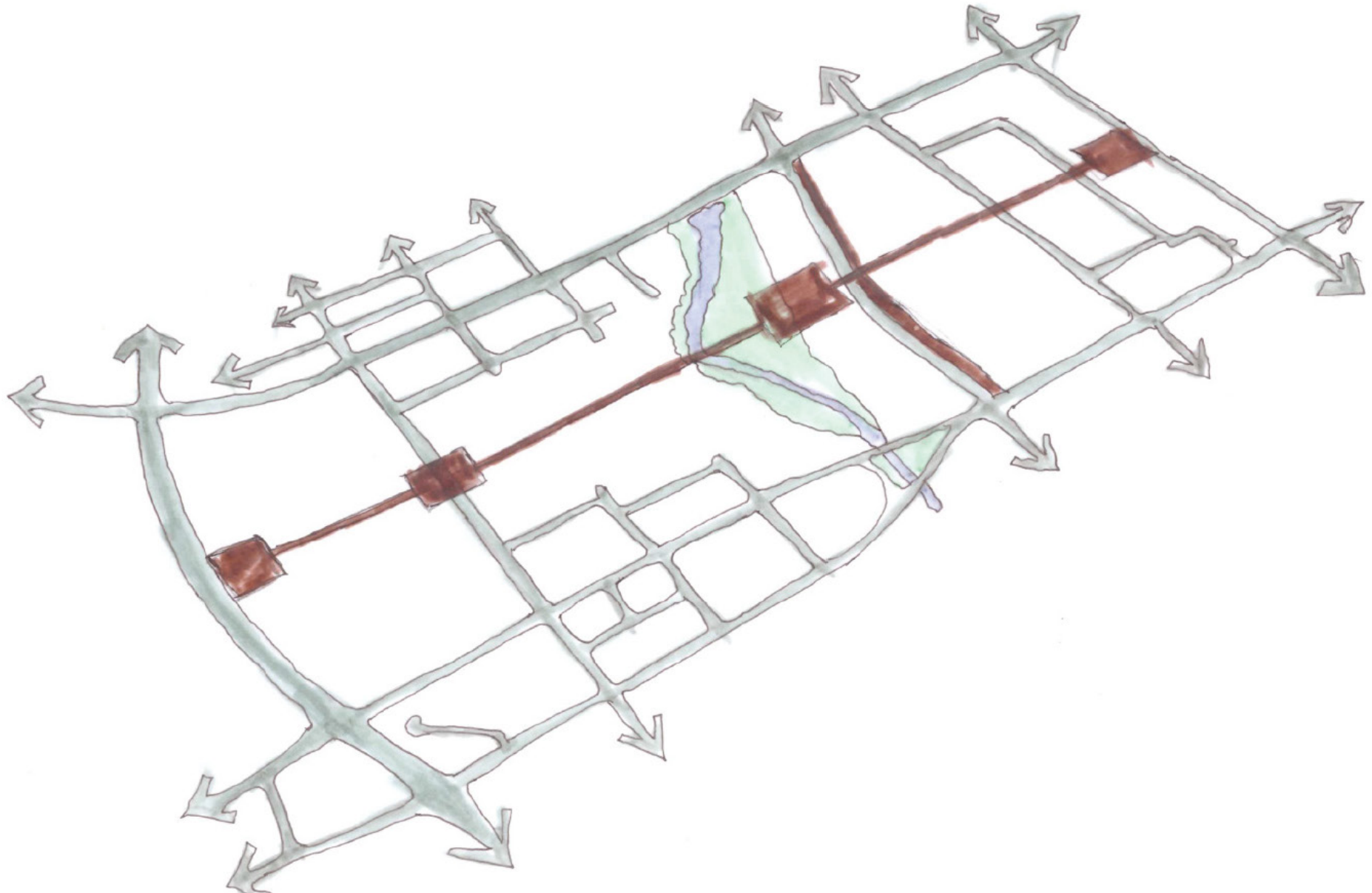


Figure 152_ Proposed Concept 1 Pedestrian Spine

Proposed land use

Figure 153 shows concept 1 land use proposals. These land use proposals do not restrict other compactible uses. The broad land uses are mixed use, retail/shopping, residential and offices.

The mixed-use land use is proposed on the northern and southern ends of the study area with offices occupying the space along west avenue where the Gautrain station is located. Residential land use occupies the space where most residential developments exist and finally the shopping/ retail occupies the space where there is the Centurion Mall.

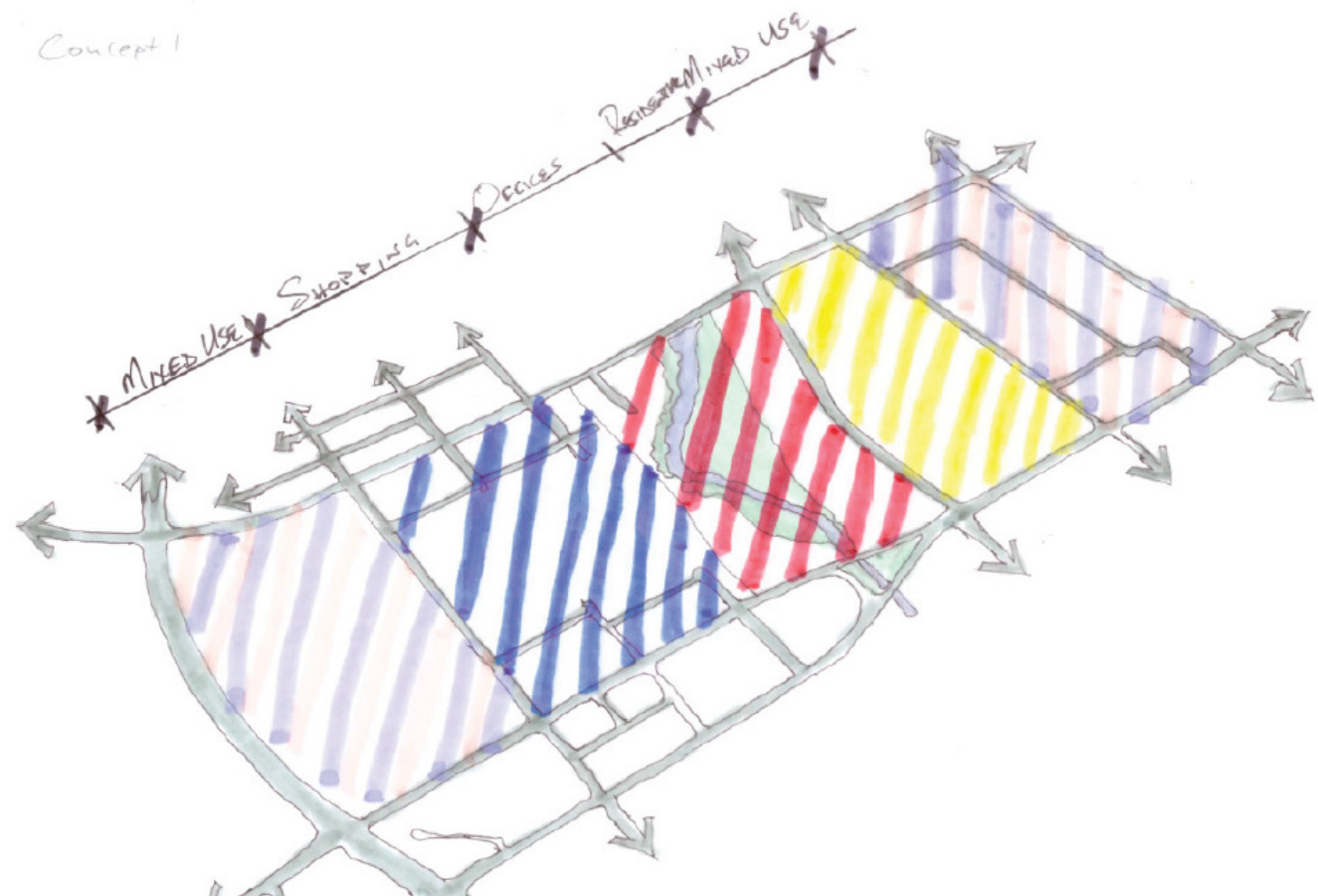


Figure 153_ Proposed Concept 1 land use proposals

Figure 154 further details and refines land use proposals presented in Figure 153. Where mixed land use is clearly should on the north and south of the study area, the civic node which should house all the public buildings currently existing at the study area is located at the intersection of the pedestrian spines. These public facilities include the Home Affairs offices, the South African Police Services, and the City of Tshwane Environmental offices. Some foreign embassies located within the study area can also use offices provided at the civic node. A transportation interchange is located next to the Gautrain Station and the proposed offices. It is also located in close proximity to some of residential developments.

Figure 155 details the proposed form and arrangement of buildings across the study area. This has been divided into four parts, that are zoomed into in detail. All the red blocks on Figure 155 are new buildings while the un shaded buildings are the only buildings that the proposal retains. This includes the centurion mall building and other heritage buildings. The design proposes to fully pedestrianize West Avenue and South Street and a bicycle lane around the study area.



Figure 154_ Proposed Concept 1 land use details

Figure 155 details the proposed form and arrangement of buildings across the study area. This has been divided into four parts, that are zoomed into in detail. All the red blocks on Figure 155 are new buildings while the unshaded buildings are the only buildings that the proposal retains. This includes the Centurion mall building and other heritage buildings. The design proposes to fully pedestrianize West Avenue and South Street and a bicycle lane around the study area.

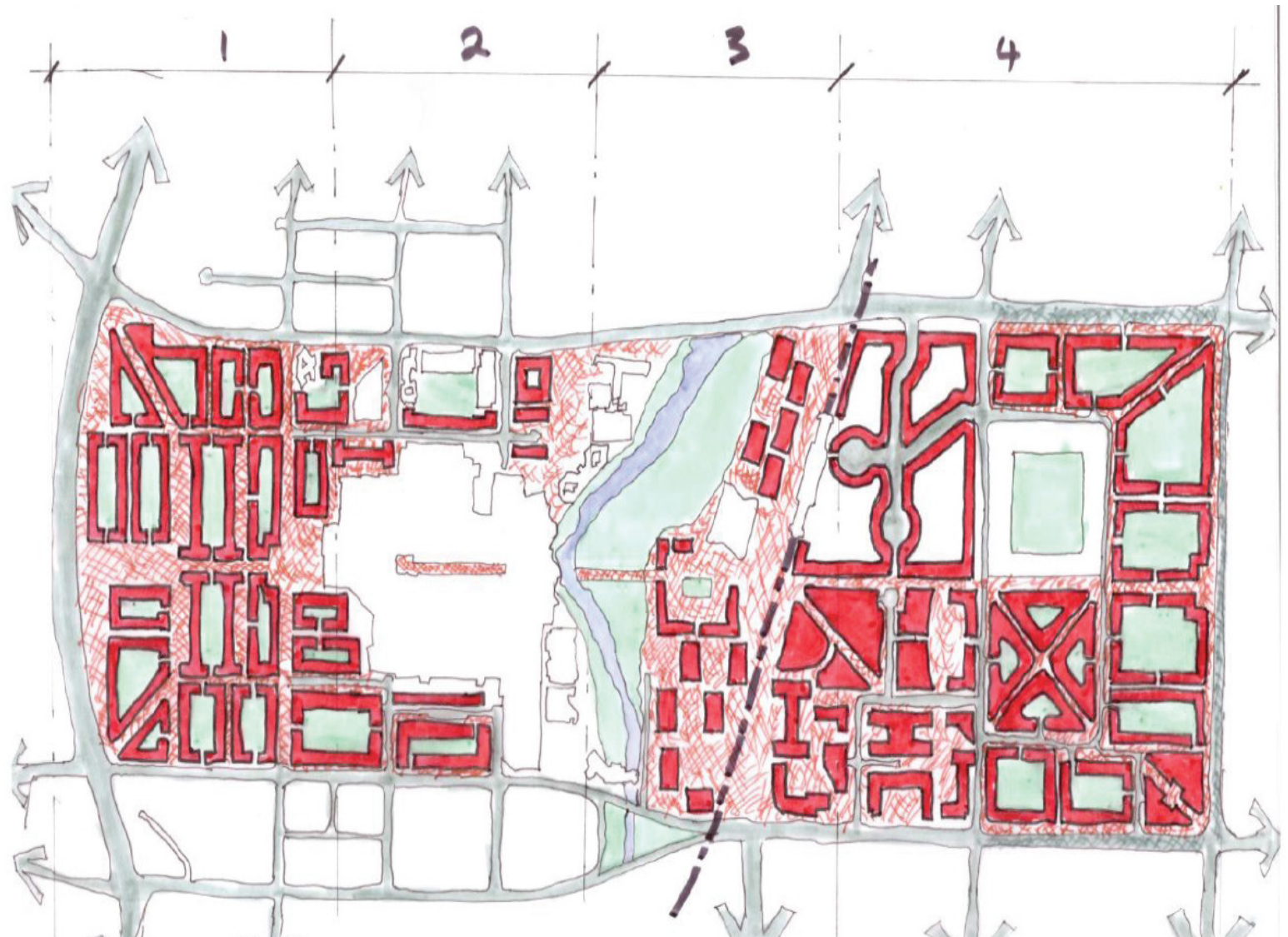


Figure 155_ proposed concept 1

Figure 156 shows the southern end of the study area which houses the southern gateway along John Voster Drive. This is a fully pedestrianised area with no vehicular traffic accommodated in this area. another public square exists on the southern end Centurion Mall. A bicycle lane runs on south street. Private or semi-private spaces are clearly shown.

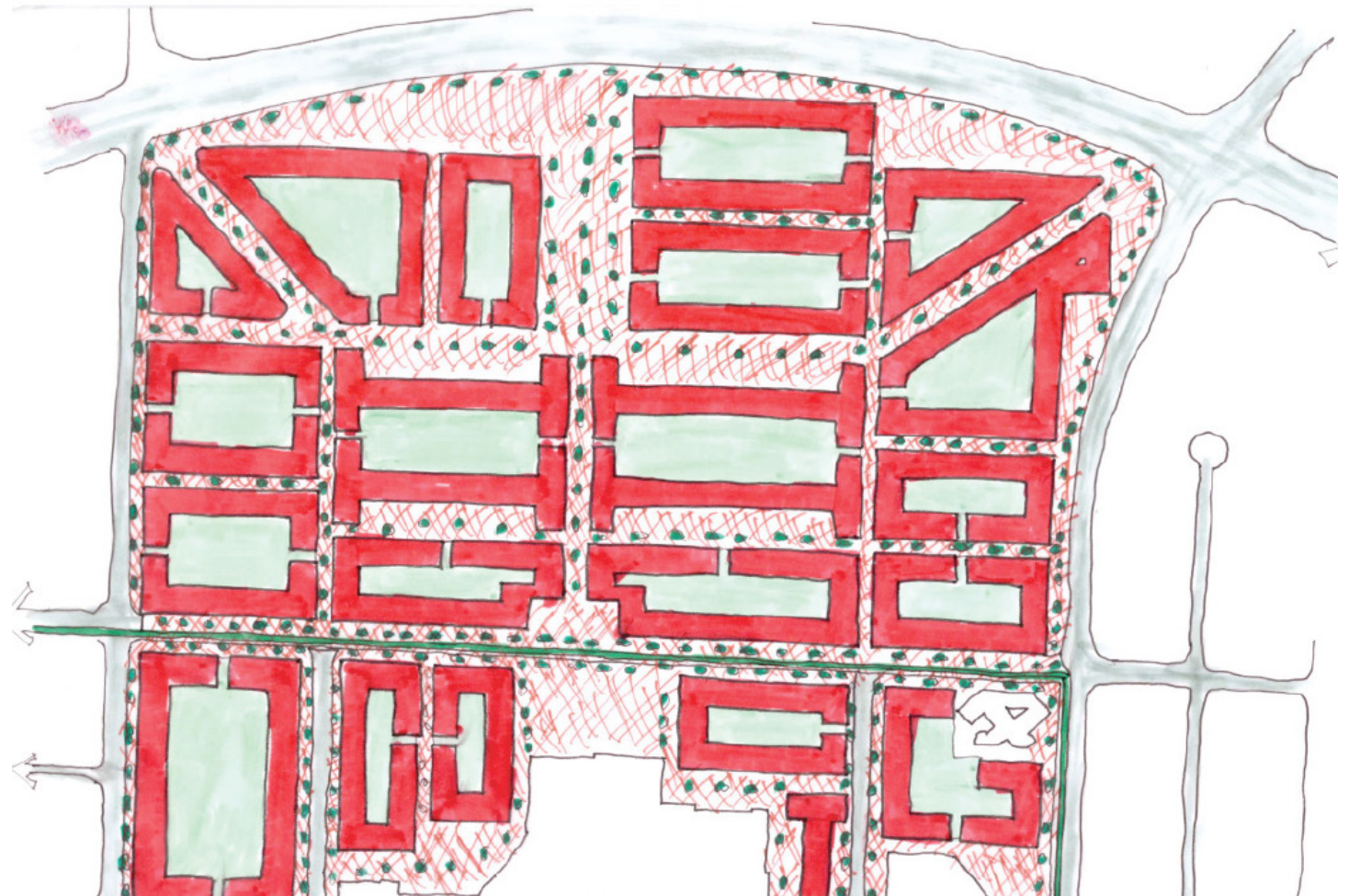


Figure 156_ proposed concept 1(part 1)

Figure 157 is a zoomed in part 2 as depicted by Figure 155. This part main house the commercial part of the study area. it also shows the Hennops river and the river crossing for pedestrians. A bicycle lane runs on either side, thus Lenchen Ave and Gerhard Street.



Figure 157_ Proposed concept 1(part 2)

Figure 158 is a zoomed in part 3 as depicted by Figure 155. This is the business/ offices part of the study area. it also houses the civic node with a proposed water feature at the centre. West avenue that runs across the area has been fully pedestrianised and a bicycle lane provided. Immediate to the Gautrain station is 5 floor the transportation interchange that has been further divided into four parts, thus taxis, buses, Gautrain parking and public parking. Next to the proposed transport interchange is offices, that will be supported by the transportation interchange. Mixed use development is proposed along the Hennops river and park with some of the buildings with shops at the ground floor and facing the park. Residential is introduced on the upper floors to create defensible spaces.



Figure 158_ proposed concept 1(part 3)

Figure 159 represents zoomed in part 4 as depicted by Figure 155. This is a predominantly residential development with active ground floors. A market for non-formal trading is proposed, this with a public open space in the middle. Perimeter blocks are prominent in this area with private/ semi private open spaces also prominent. A bicycle lane runs on four sides of the development, thus Von Willich Street, Lenchen Ave, Jean Ave and Gerhard Street. A gate way to the study area is proposed along Jean Avenue.

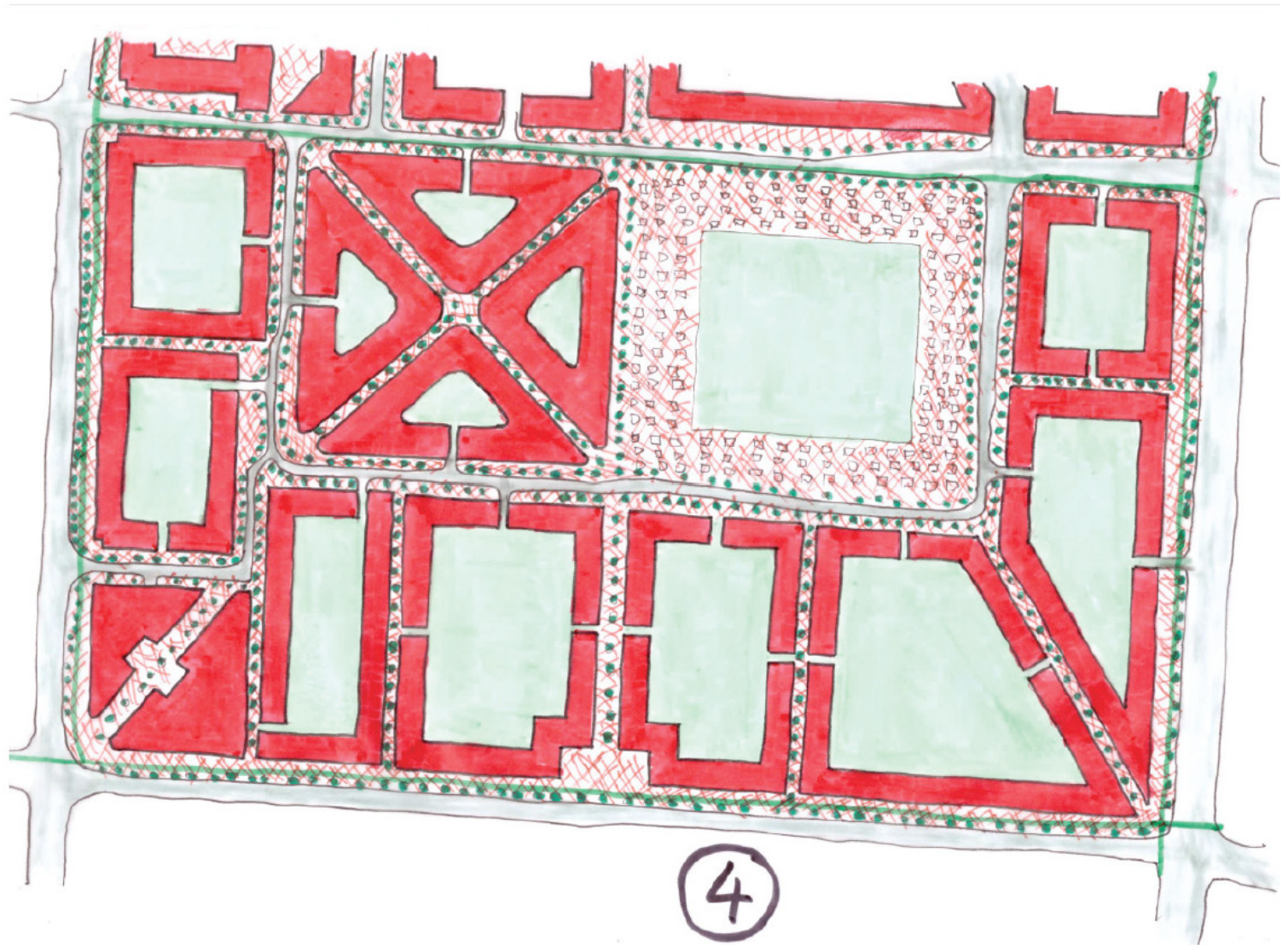


Figure 159_ proposed concept 1(part 4)

Concept 1 3D Visuals

Figure 161 is a representation of the proposed massing for concept 1.

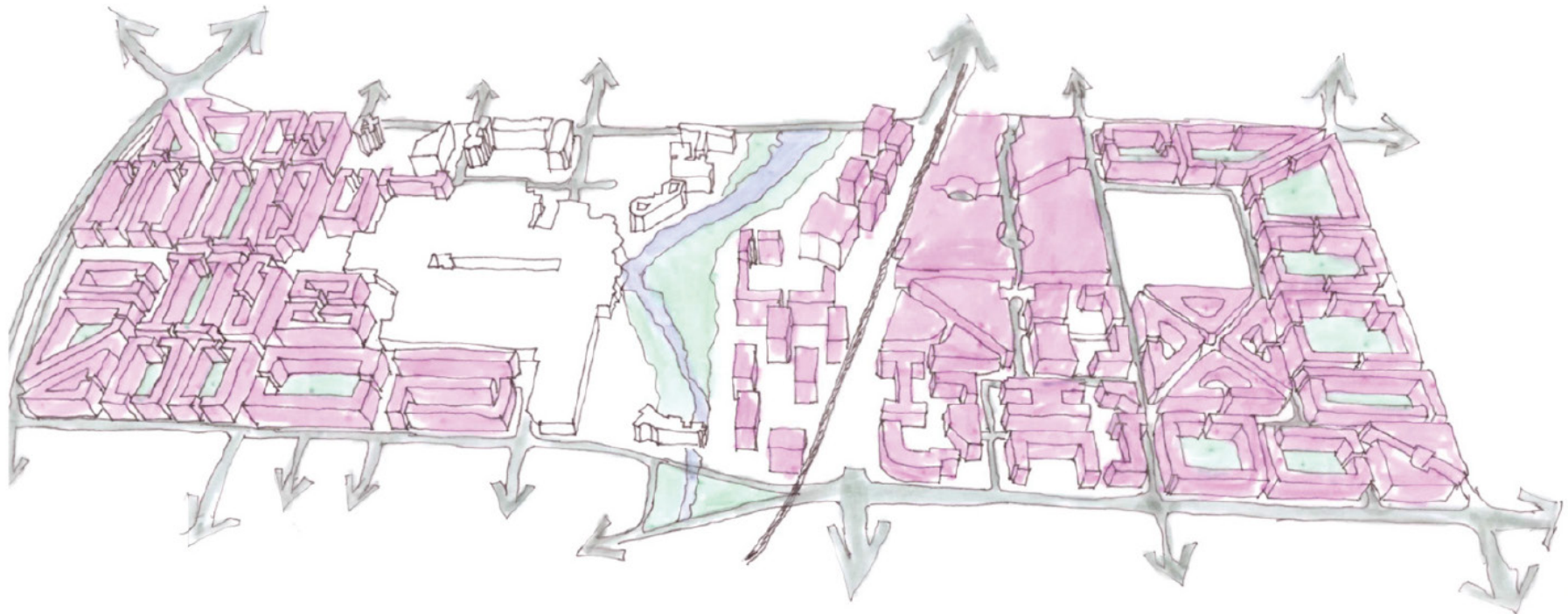


Figure 160_ proposed concept 1 proposed massing

Figure 161 and shows the grey scale proposed massing for concept 1.

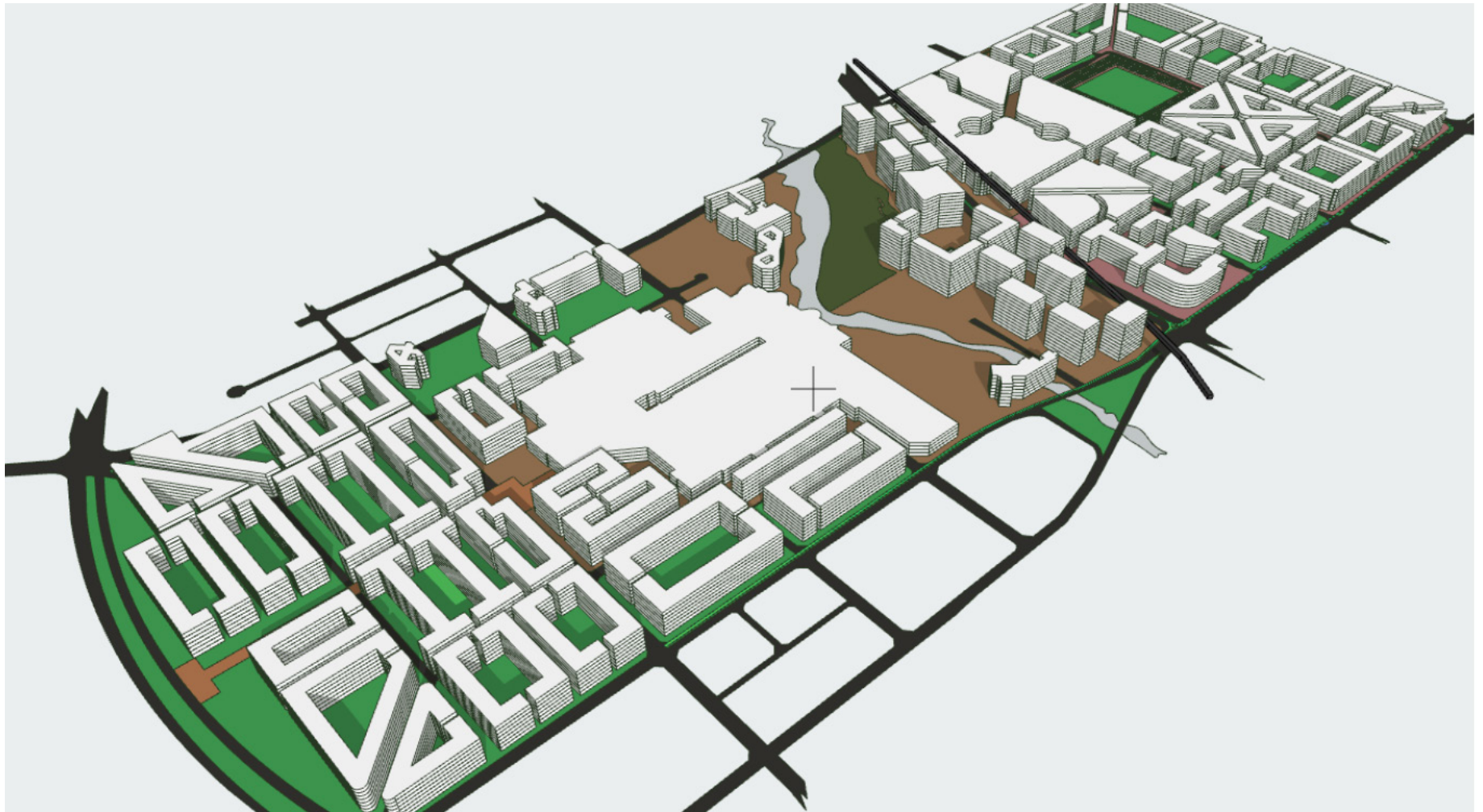


Figure 161_ Proposed concept 1 proposed massing (Grey Scale)



Figure 162_ Proposed concept 1 proposed massing (Grey Scale)

The following figures show the zoomed in grey scale massing for parts 1, 2, 3 and 4 depicted by Figure 155.

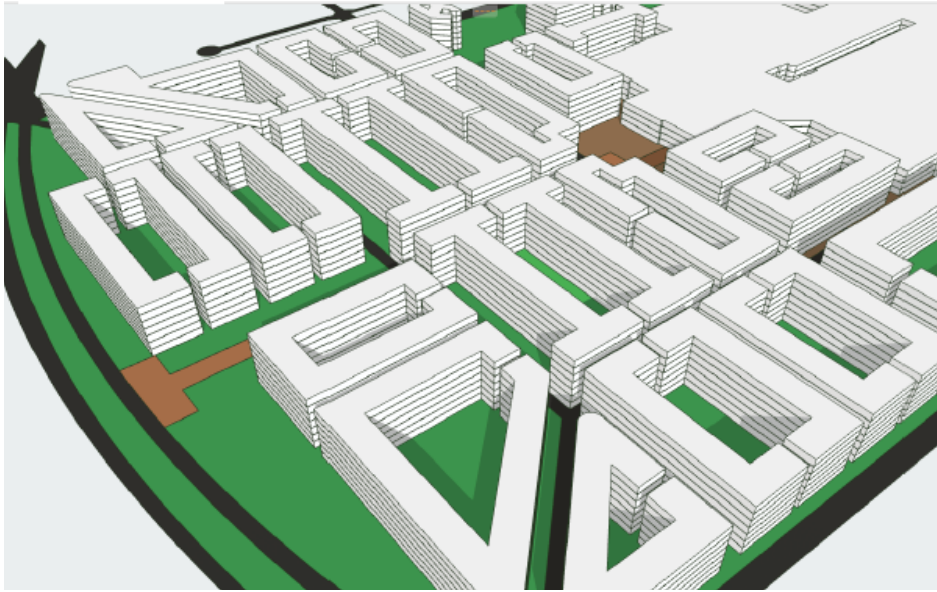


Figure 163_ proposed Part 1 grey scale massing

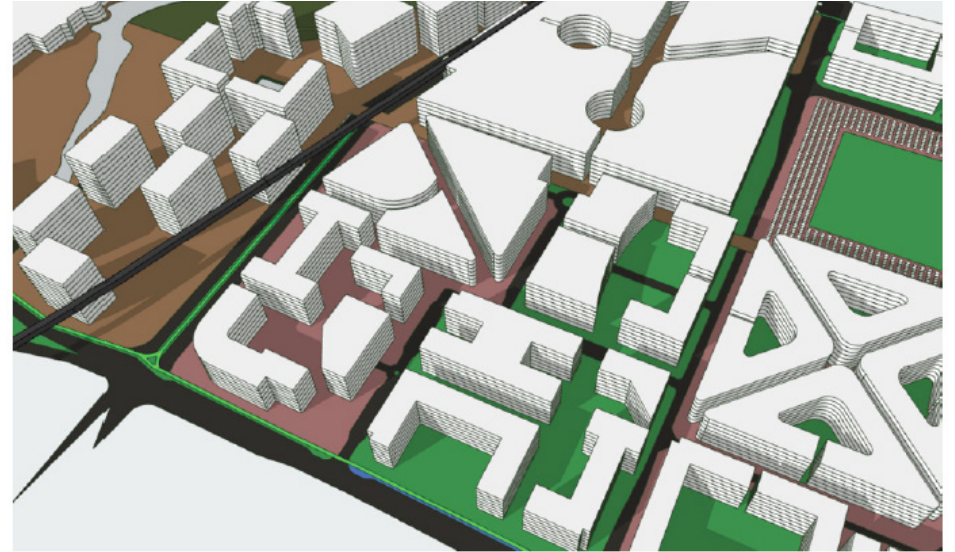


Figure 164_ proposed Part 3 grey scale massing

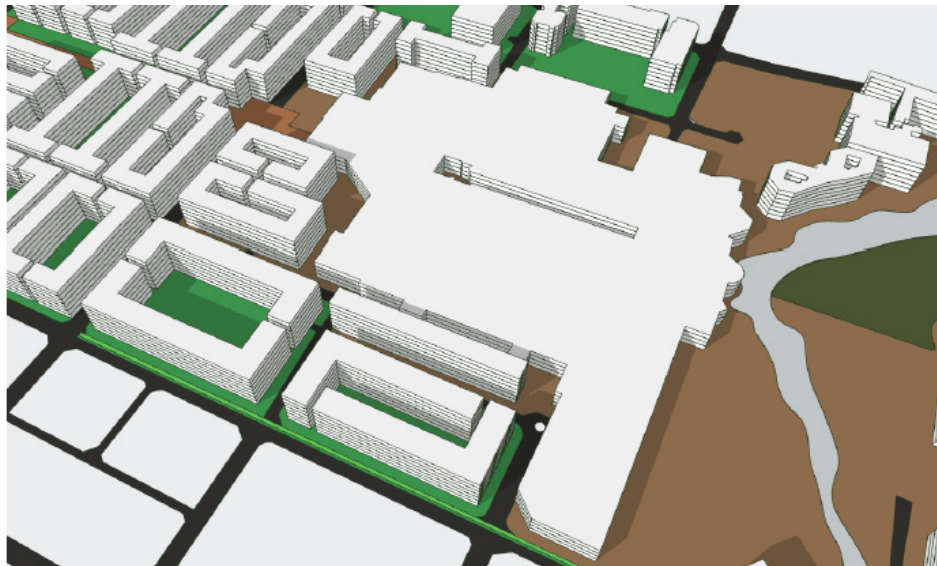


Figure 165_ proposed Part 2 grey scale massing

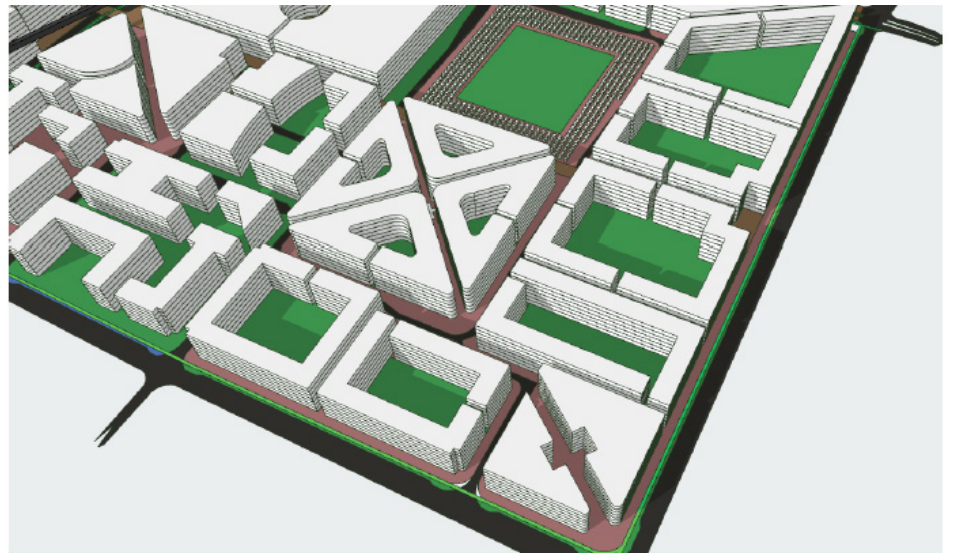


Figure 166_ proposed Part 4 grey scale massing



Figure 167_ Storey Heights

Concept 1 design proposes four different storey heights, with blue representing four storey buildings, yellow, six storey buildings and red being the highest with 8 storey buildings. The building storey heights are shown on Figure 167.

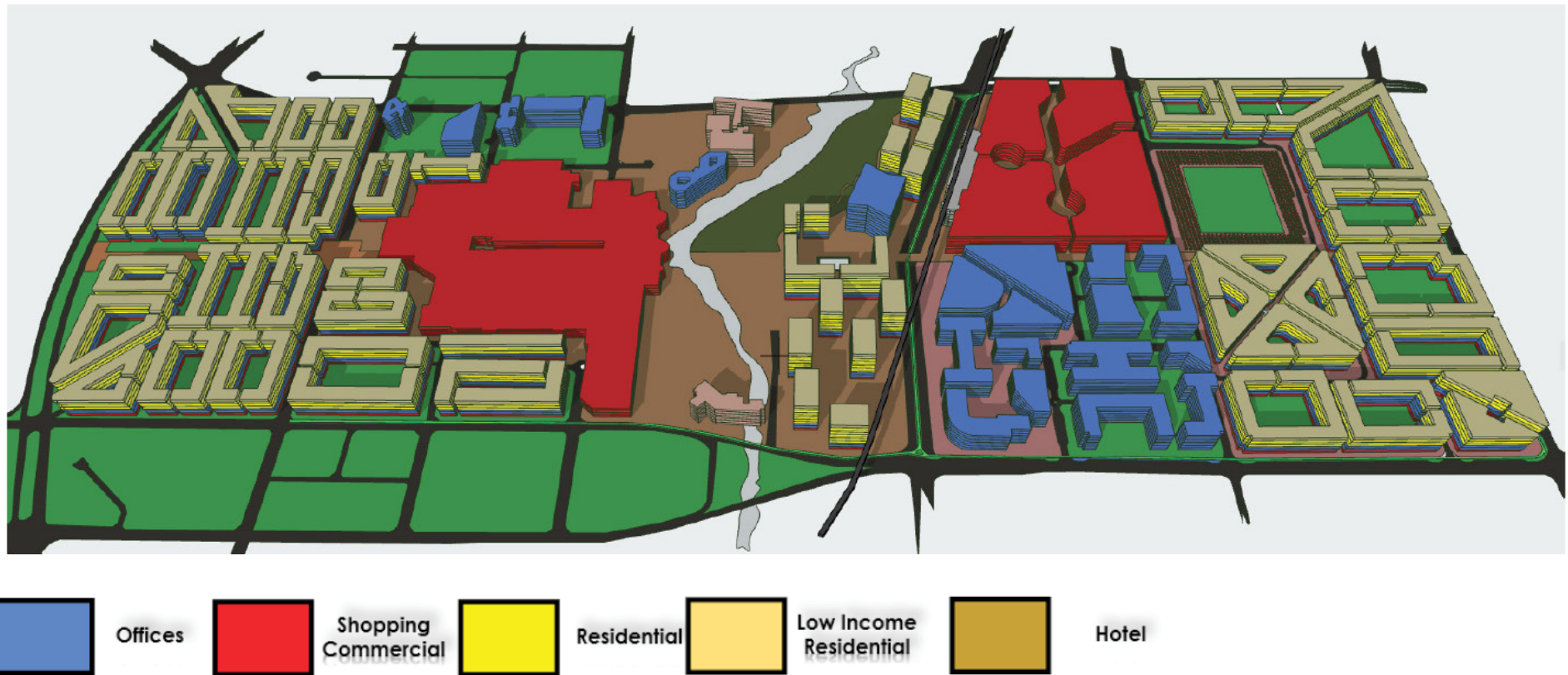


Figure 168_ Proposed concept 1 land use

Figure 168 shows the building use proposals for concept 1. Most of the use proposed on the concept is mixed use, thus especially on the south and north of the study area. the following figures show the zoomed in uses for the four parts as segmented in Figure 155.

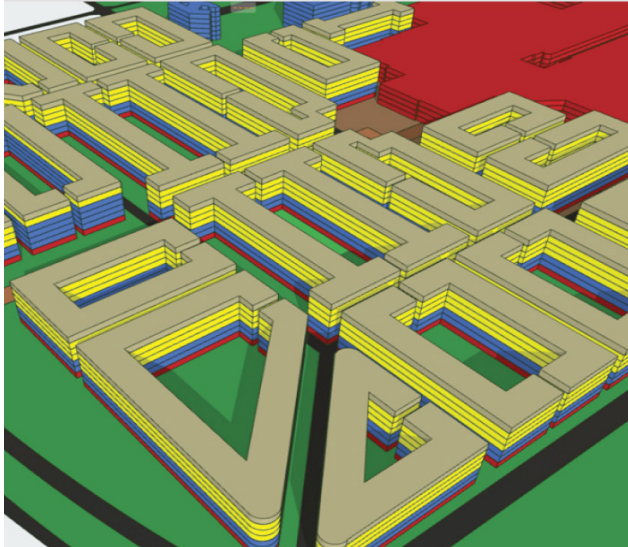


Figure 169_ Proposed Part 1 Land use

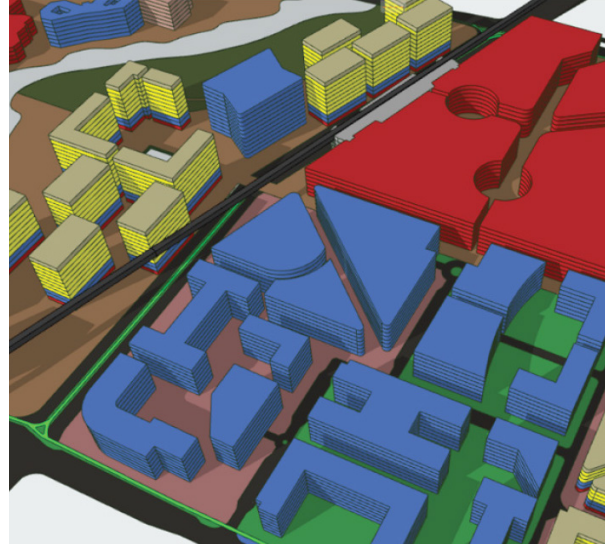


Figure 170_ Proposed Part 3 Land sue

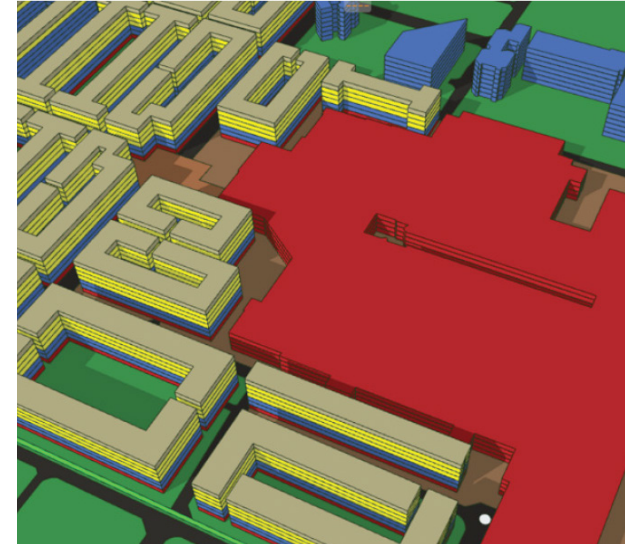


Figure 171_ Proposed Part 2 Land use

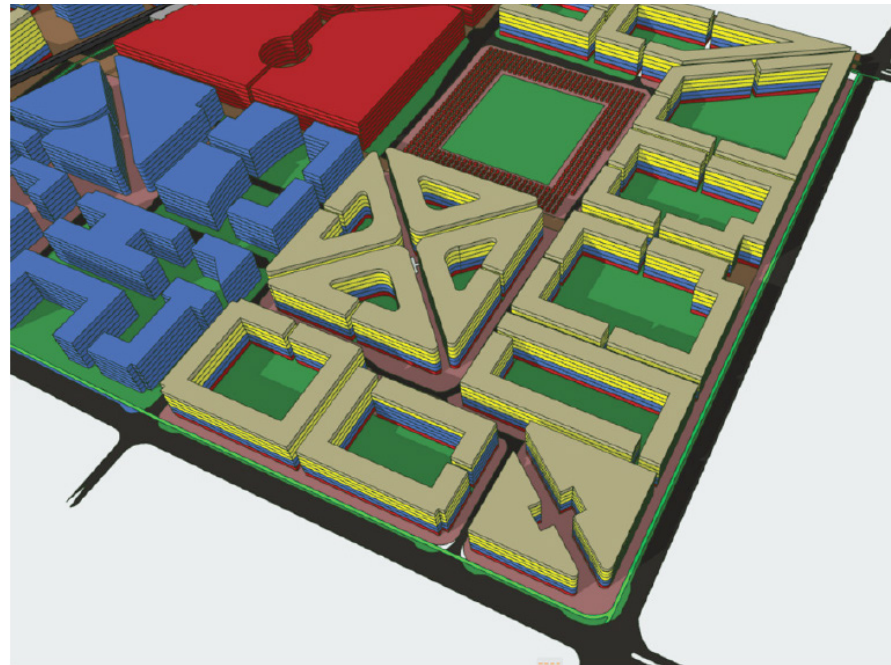


Figure 172_ Proposed Part 4 Land use

Concept 2

The development of concept 2 was based on identifying the causes of problems highlighted in the problem statement section of this document. The problem statement highlighted the following problems;

- safe public spaces,
- vehicular and pedestrian conflict,
- unclear and unsafe pedestrian walkways,
- high rate of crime,
- non-formal trading structures,
- insufficient public transport amenities and the lack of integration thereof, and
- fragmented development.

A number of causes of the above stated problems were identified and evaluated. It was noted that the above listed problems are caused by the underdevelopment of the Centurion CBD area and the surrounding areas. The research set on to establish why the Centurion CBD area is relatively underdeveloped. Variables such as the geology of the area were put to the fore and evaluated. Though the Centurion area has an inherent problem of dolomite making it difficult and expensive for high rise buildings to be developed, the research however concluded that the geology of the area is not the cause for under development, but rather non-functional pockets of land are the cause of the dysfunction of the study area. Of these parcels of land, some are planned, and some are not planned. The research then set to map out these pieces of

land with supporting reference of Finding Lost Spaces by Rodger Trancik. Through site visits and a vigorous mapping exercise, I then set out to map the lost spaces within the study area. In mapping the lost spaces, I discovered that there were two categories of lost spaces, thus land that is not in use and land allocated for specific uses that are dysfunctional (not working or grossly underutilised). The following figures depict the mapping of lost spaces.

Figure 173 and Figure 174 are map 1 and map 2 showing the mapping of lost spaces within the study area as shown below.

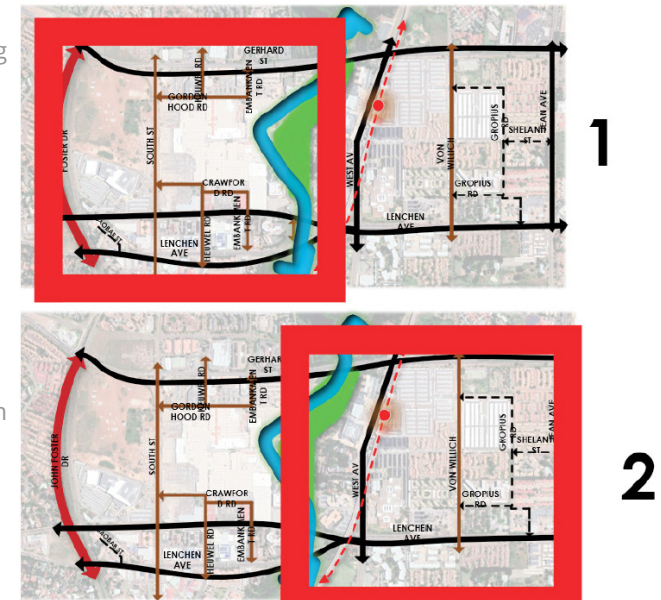


Figure 173 is map 1 showing the mapping of lost spaces for the study area. the biggest piece of land that has been mapped is an unused piece of land. And is shown on the picture below.



Source (Google.com)



Picture by Author (2019)



Figure 173_ Lost Spaces Mapping (Map 1)

Figure 174 is map 2 showing the mapping of lost spaces for the study area. some of the lost area, thus along the Hennops river are shown on pictures below.



Source (Google.com)



Source (Google.com)_

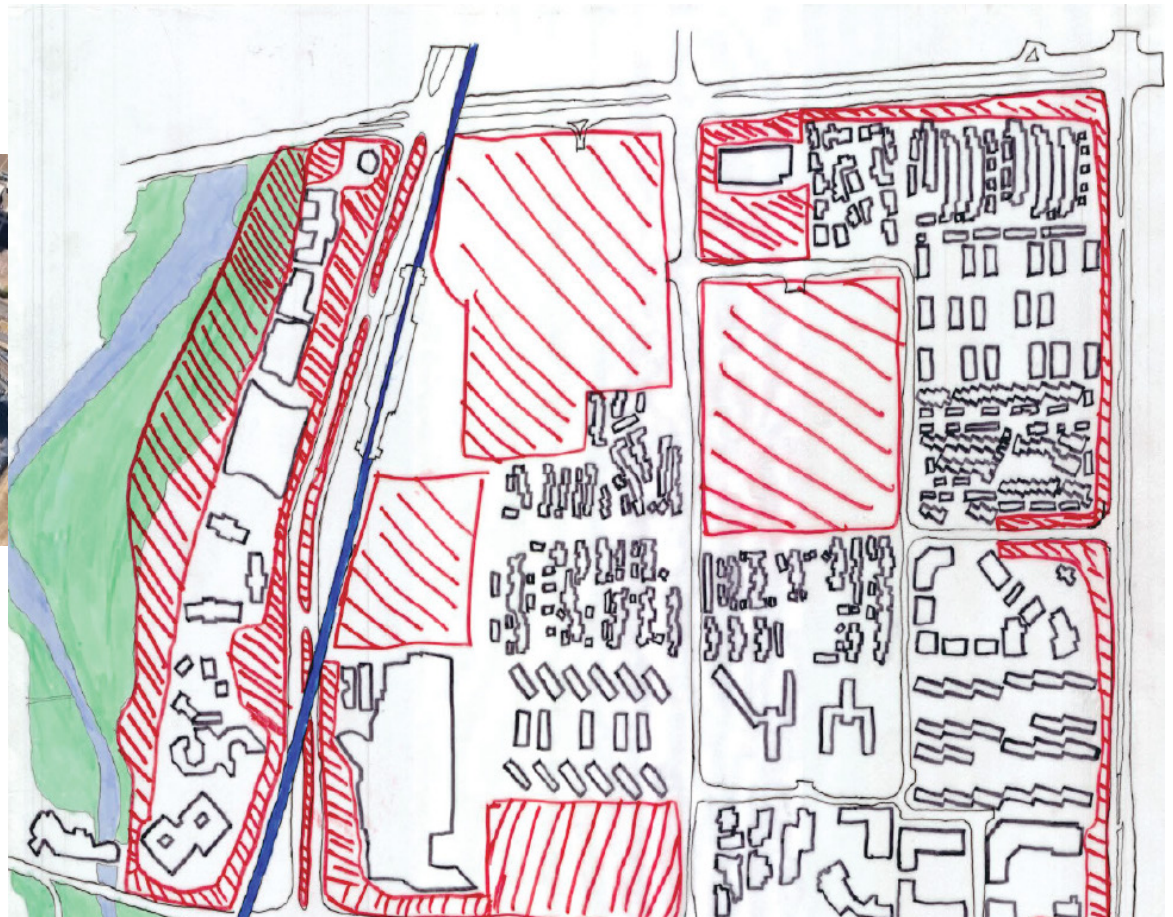


Figure 174_ Lost spaces Map 2

After the completion of the above task, the next step was to develop a concept two, that would address the lost spaces identified. The following are steps that were taken to develop concept two, which started with the development of a desired pedestrian network for the study area. .

The vision for Concept 2 aim at developing the Centurion Gautrain Precinct, into a high quality walkable public space (outdoor room) that allows shoppers, commuters, passers-by to pause, interact, engage or just sit comfortably. The study area is envisaged as a formal and informal mixed-use area to provide access to a diversity of affordable services and needs for different people.

DESIGN CONSIDERATION HIERARCHY



PEDESTRIAN

The pedestrian is at the top of the hierarchy and at the centre of the design process. The pedestrianised design of the study area is an attempt to reclaim the streets for the pedestrian and other non-motorised transit systems such as wheelchair users.



NON-MOTORISED TRANSIT (TROLLEY PULLERS AND CYCLISTS)

Urban recycling and trolley pullers come second in the hierarchy. The design also considers cycling, not only as a means of transportation but to also promote healthy lifestyles.



PUBLIC TRANSPORT (BUSES AND TAXIS)

Taxis are mostly probably the longest serving public transport system connecting Centurion to neighboring suburbs and townships. They are critical in bringing people from the outskirts where buses cannot reach and other transport systems are expensive.



OTHER MOTOR TRAFFIC

Cars are at the bottom of the hierarchy, but their relevance and importance is minimised on the design to make alternative more desirable, safe and comfortable to access and utilise.



DESIGN PRINCIPLES

ACCESSIBILITY/ PEDESTRIAN FRIENDLINESS

The study area should offer access to a wide variety of both motorised and nonmotorised travel alternatives. The design aims to partially pedestrianize Jean Ave, West Ave and South St this through the use of a cobbled surface that will allow for the slowdown of traffic to allow easy access by pedestrians and other non-motorised transit systems. It also aims to carefully consider the interface between the street and sidewalk to allow fluidity and integration between the street and sidewalk. Raise and pedestrianize Jellicoe street to slow down traffic and encourage drivers to use caution.

ROBUSTNESS (AMENITIES)

The Study area will have robust amenities or public furniture to make it comfortable for people to use. Bins and benches, which are comfortable to utilise on different weather conditions, will be placed on strategic locations. Pedestrian lighting will also be used to light-up all pedestrian walkways.

MIXED-USE DEVELOPMENT

A vertical and horizontal mix of high activity landuses such as retail along active pedestrian frontages on the ground floor, supported by passive recreation space, offices and residential use on the top floors.

LIVEABILITY

Develop the taxis transport terminal into a liveable centre for community life which offers a wide range of landuses to promote a mixed-use development with the usually forgotten recreational public spaces. The Study area is well located in close proximity to services and facilities that improve the quality of life by providing public transport, shopping, places of work, education and restaurants.

According to Gehl (2006), on ordinary day on an ordinary street, pedestrians are seen walking the sidewalks and children are seen playing closer to their front doors, people sitting on benches, passer-bys greet on the sidewalk and mechanics engaged in a conversation.

A desired pedestrian movement network was developed for concept 2. This desired pedestrian movement runs across the entire study area and is depicted in Figure 175. This proposed movement is based on 400 metres walking diameter, which then paved the way for the development of nodes.

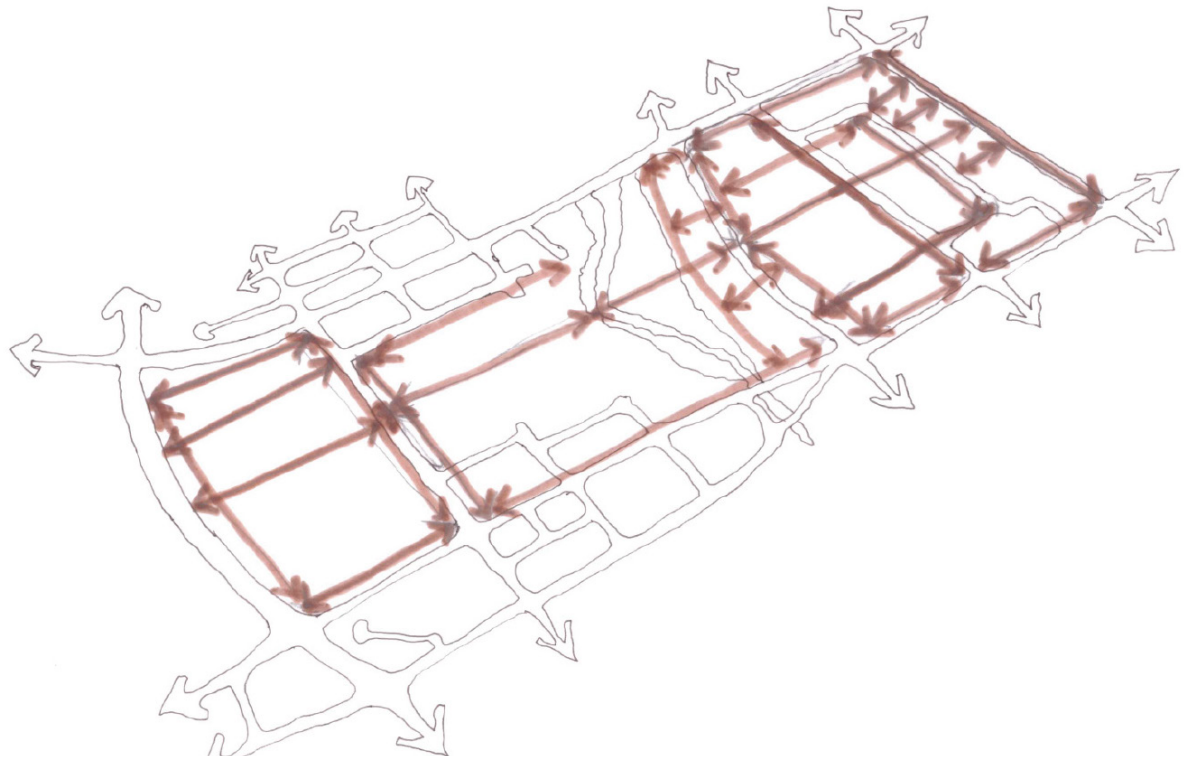


Figure 175_ Concept 2 desired pedestrian movements

Figure 176_ Walking Distances

From the desired pedestrian movements and the walking distances of 400 metres diameter, nodes were then proposed. As depicted on Figure 177, from the north of the study area, in these nodes consist of the following;

- Residential Node
- Offices and Public Square Node
- The Shopping Node
- A public Squares, and
- A civic Node.

Krier (1984) states that in formulating a typology in the urban space, spatial forms and their derivatives may be divided three main groups, thus the square, triangle or circle. These three are sometimes referred to as the spatial types

Residential Node

This is located in an area that is currently predominantly residential. The concept proposes to retain the residential character of the area and only proposes mixed use activities with shopping at the bottom, only where there are pedestrian sidewalks.

Offices and Public Square

This node lays in close proximity to the Gautrain station. To the south of West Avenue mixed use is proposed along the road, again with shopping at the bottom. The presence of the gautrain should enhance business and commercial activities in this node.

Shopping Node

This node lays on the already existing centurion mall which is predominantly shopping. A few other uses that support this node are then proposed around

this area.

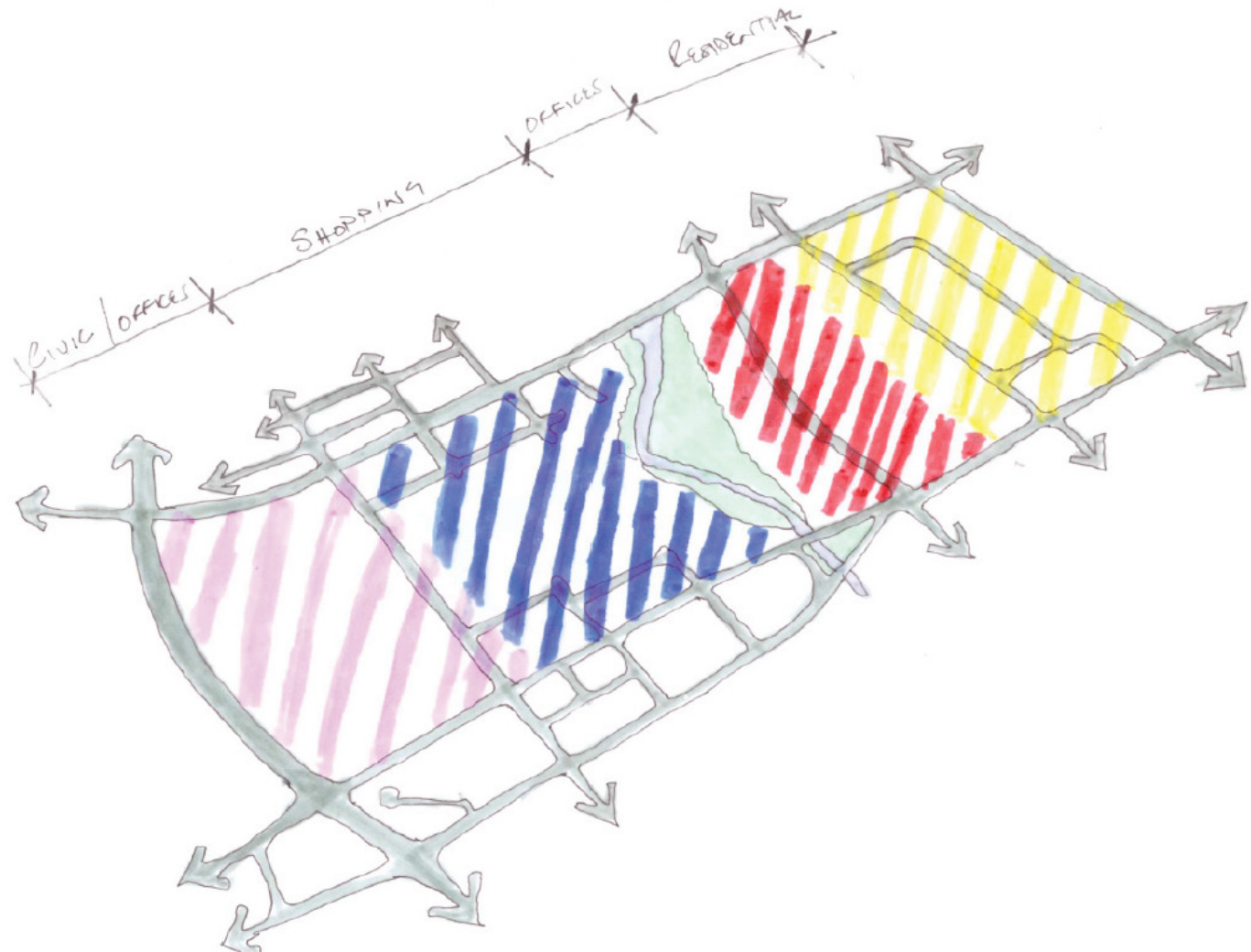
Public Squares

In between the shopping node and the civic node lays the public square. This is a piazza that is landscaped and leads to the civic node. Another public square is proposed along West Avenue, thus providing public space for business and residential developments that are in close proximity.

Civic Node

The civic node is to house all public facilities and public services that exist within the study area. these include the South African Police Services, Home Affairs, the City of Tshwane Environmental Offices, Foreign countries' visa processing offices, clinic and library.

After the creation of the above nodes, land use proposals were then developed. These proposals consist of the residential, offices, shopping and civic use. These are depicted in Figure 178.



After the desired pedestrian walkways had been established, the nodes identified and land use proposals formulated, details to address lost spaces then commenced. Figure 179 below depicts how the study area has been divided into four different parts and detailed designs shown in the preceding figures. The divisions of these has been informed by the nodes that each part contains.

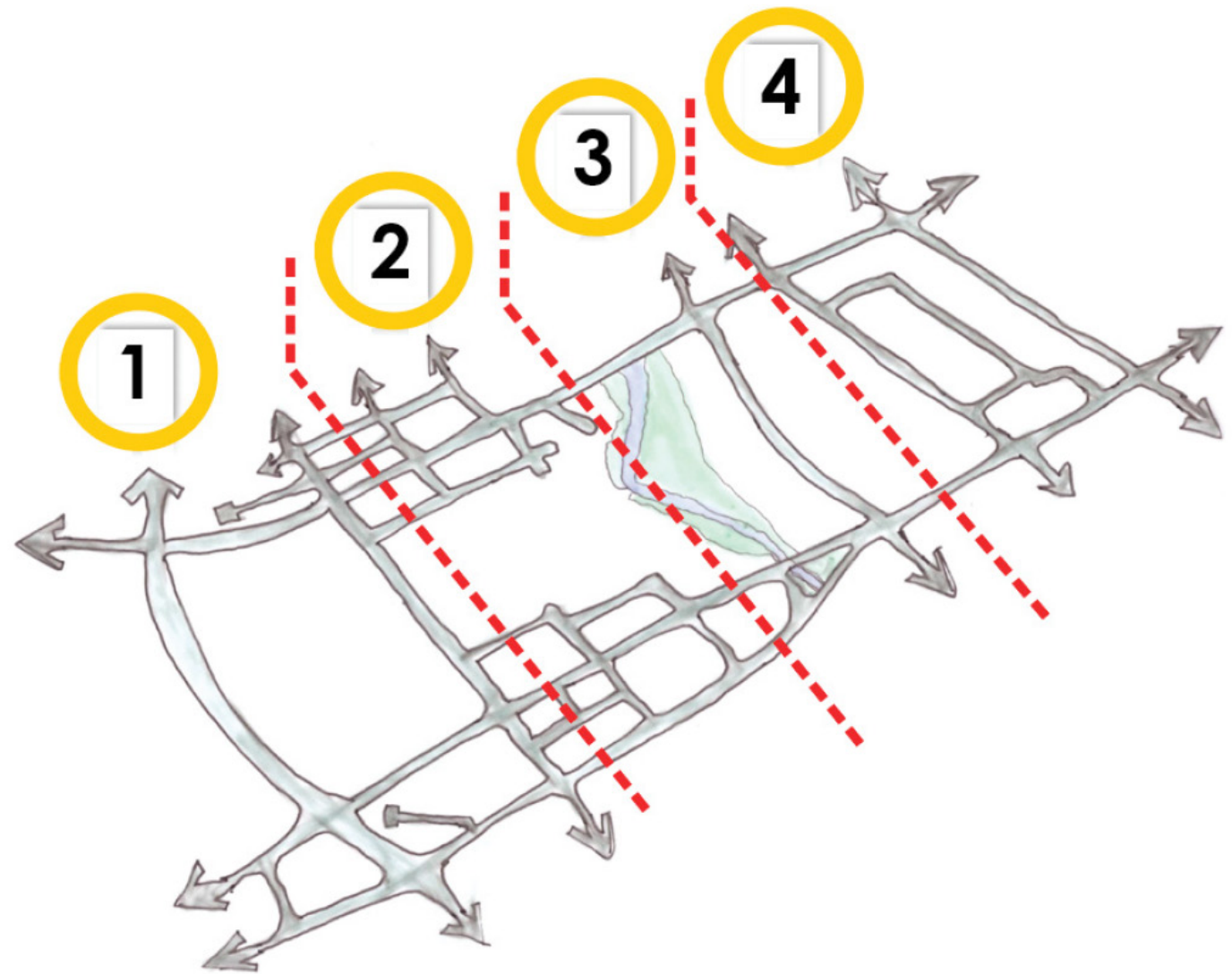


Figure 179_ Concept 2 Parts

Concept 2 Part 1

Part 1 of concept 2 is depicted in Figure 180. This part has two nodes in it, thus the civic node and the public square that is located at the exit of the mall. The civic node is home to public services and it also houses a taxi rank. In between the taxi rank and the civic node there are linear market stall and public facility building (public toilets). Huchzermeyer (2011) state that planning officials in Africa either remove informal settlements or provide formally planned and regulated environments or upgrade these informal settlements for incorporation into the city. A non-formal market has therefore been incorporated in the design. A four-level parking is also proposed so as to cater for the space taken up by the placement of buildings.



Figure 180_ Concept 2 Part 1

Concept 2 Part 2

Part 2 of Concept 2 is predominantly shopping is depicted in Figure 182. A new wider and more comfortable bridge is proposed over Hennops river thereby linking the North and South of the study area. The existing bridge will be retained. This will effectively give pedestrians a choice of pedestrian walkways to use. Thus, the Lenchen Ave side walk, the old bridge, the new bridge (with a bicycle lane) or the Gerhard street sidewalk. According to Gehl (2006), improved physical conditions will result in an increased number of pedestrians, which entails that the time spent outdoors is considerably higher.

The proposed bicycle lane on the new bigger and wider pedestrian bridge is shown on Figure 181



Figure 181: Pedestrian bridge (Source: Google.com)



Figure 182_ Concept 2 Part 2

Concept 2 Part 3

Part 3 of concept 2 is shown on Figure 183. This part houses the business/ offices of the study area. a public square with space for a land mark feature is provided for. There is potential for land mark features on either side of west avenue. On concept 2, some existing buildings and new buildings will face the public park area and overlook the Hennops river. These buildings will consist of shops at the bottom, offices and residential on top. This will ensure eyes on the currently unsafe and disused park thereby providing defensible urban space. It is anticipated that the proposal will also protect the ecology of the area from pollution as street furniture sun as bins will be provided. The width of West Ave will be reduced through the removal of the disused central pedestrian walkway. This will push the new edge of West Avenue toward the Gautrain station direction as a result creating space for new buildings with active ground floors.

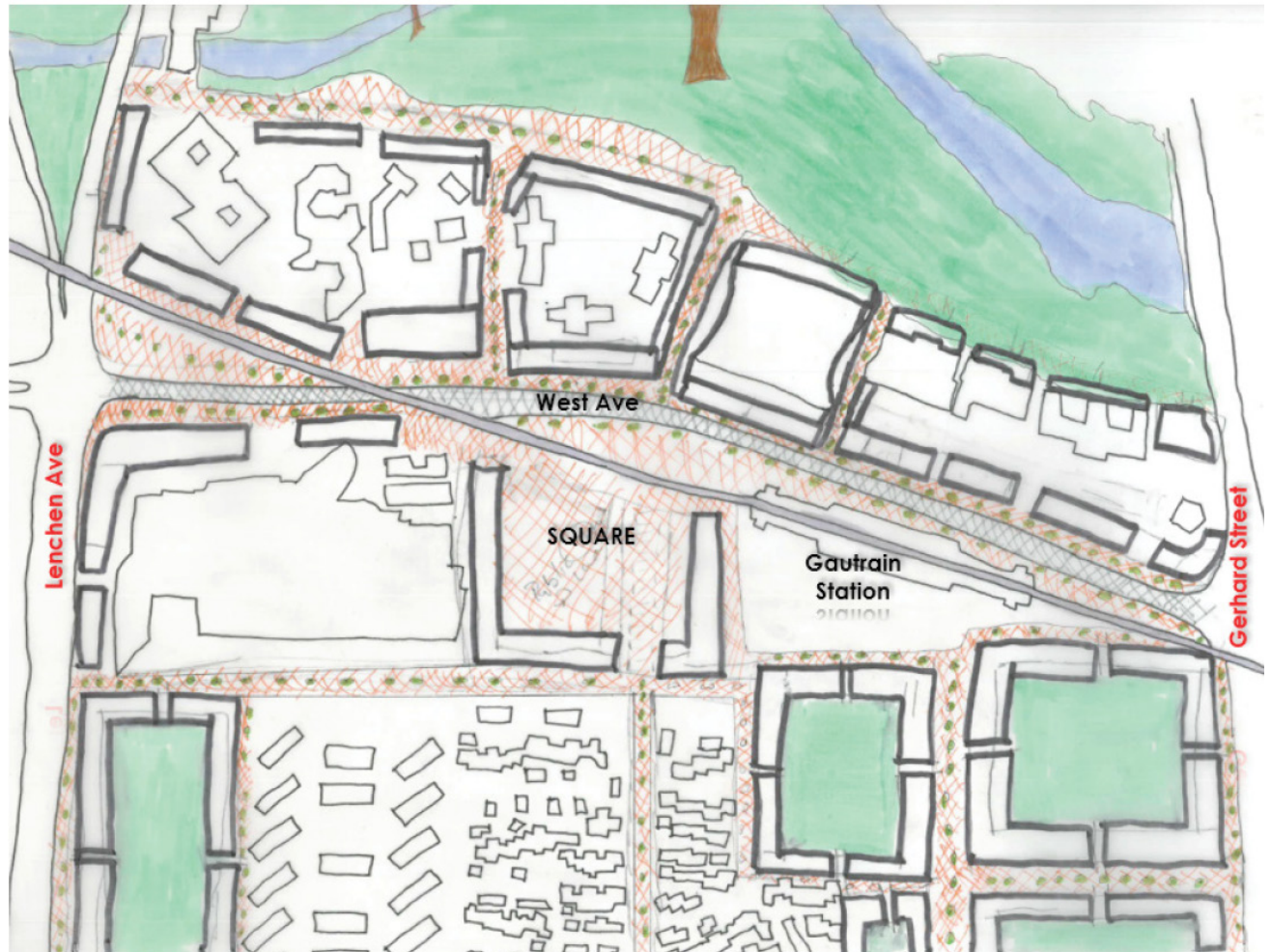


Figure 183_ Concept 2 Part 3

Concept 2, Part 4

Part 4 of concept 2 is shown in Figure 184. This is the residential part of the study area. The main predominant feature is the bicycle lane which has a network created so as to give residents the option of cycling to and from places of economic activities, leisure and shopping. Jean Ave width and lanes have been reduced and a road riding surface that will reduce the speed of traffic is proposed. The reduction in the number of lanes has enabled the creation of a bicycle lane along Jean and buildings with an active ground floor. New buildings with mixed uses are proposed on areas where there are lost spaces in an attempt to activate these spaces so as to create activity.



Figure 184_ Concept 2 Part 4

Concept 2, 2D Overall Design

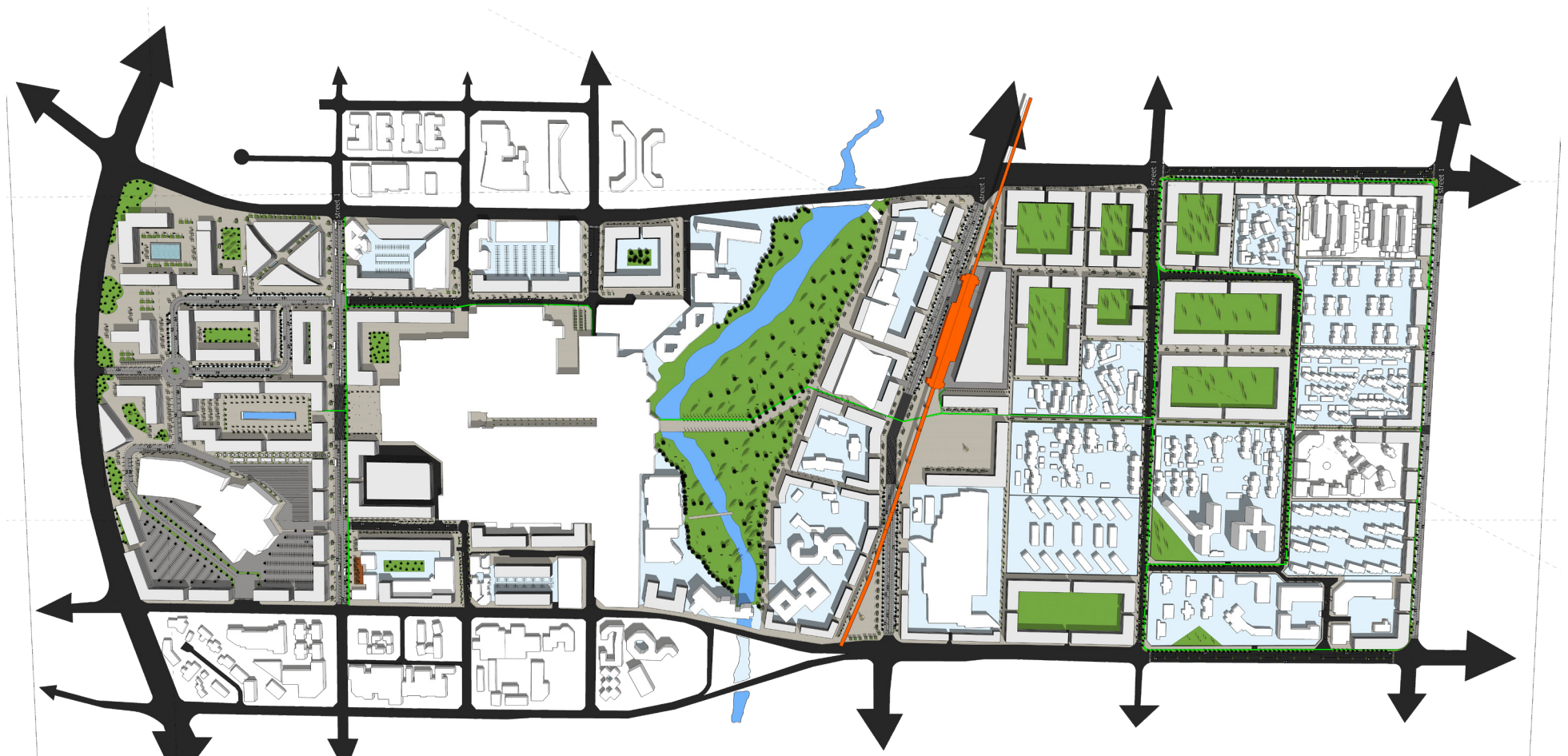


Figure 185_ Concept 2 2D

Concept 2, 2D Part 1 Design

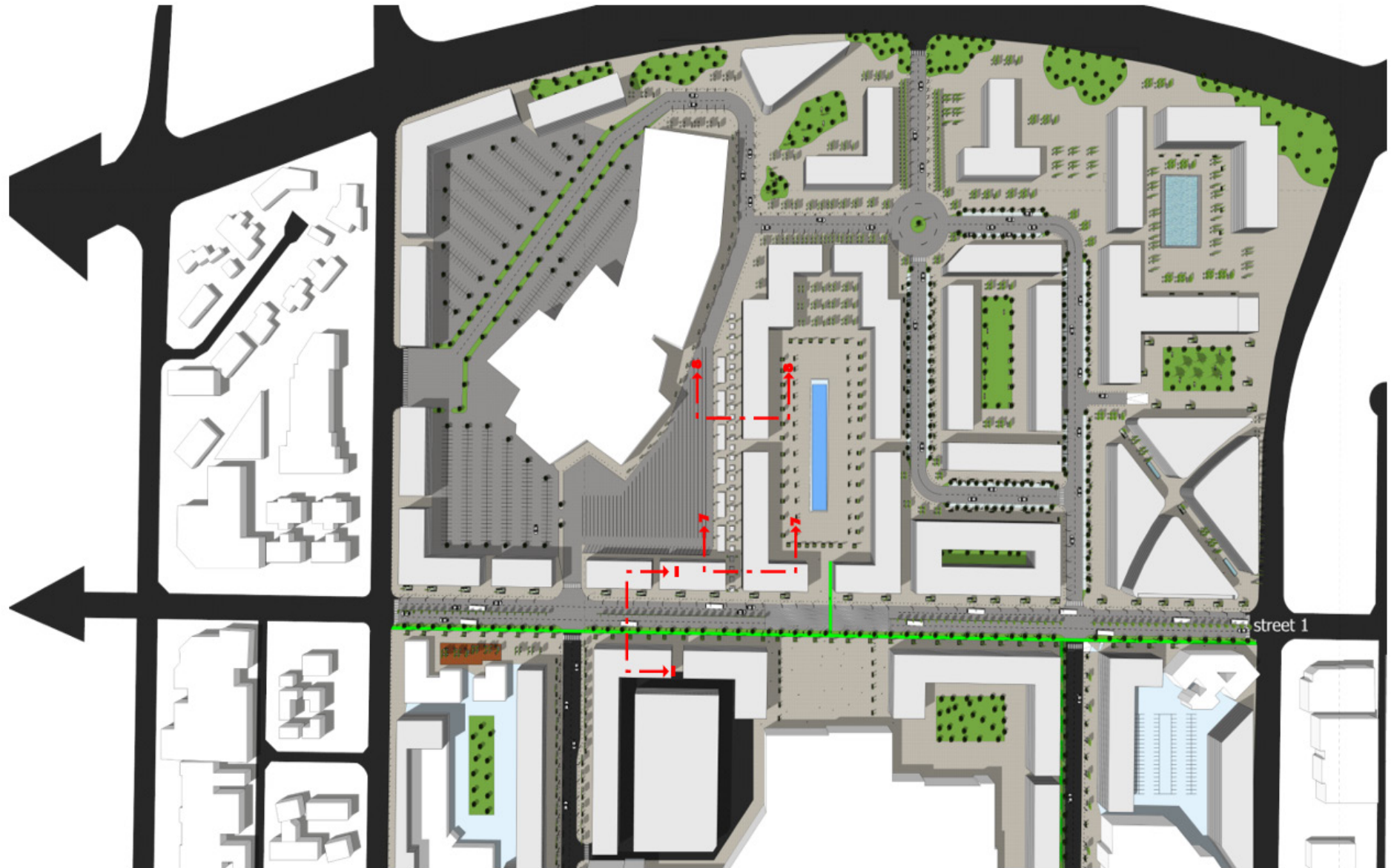


Figure 186_ Concept 2, 2D Part 1 Design

Concept 2, 2D Part 2 Design



Figure 187_ Concept 2, 2D Part 2 Design

Concept 2, 2D Part 3 Design

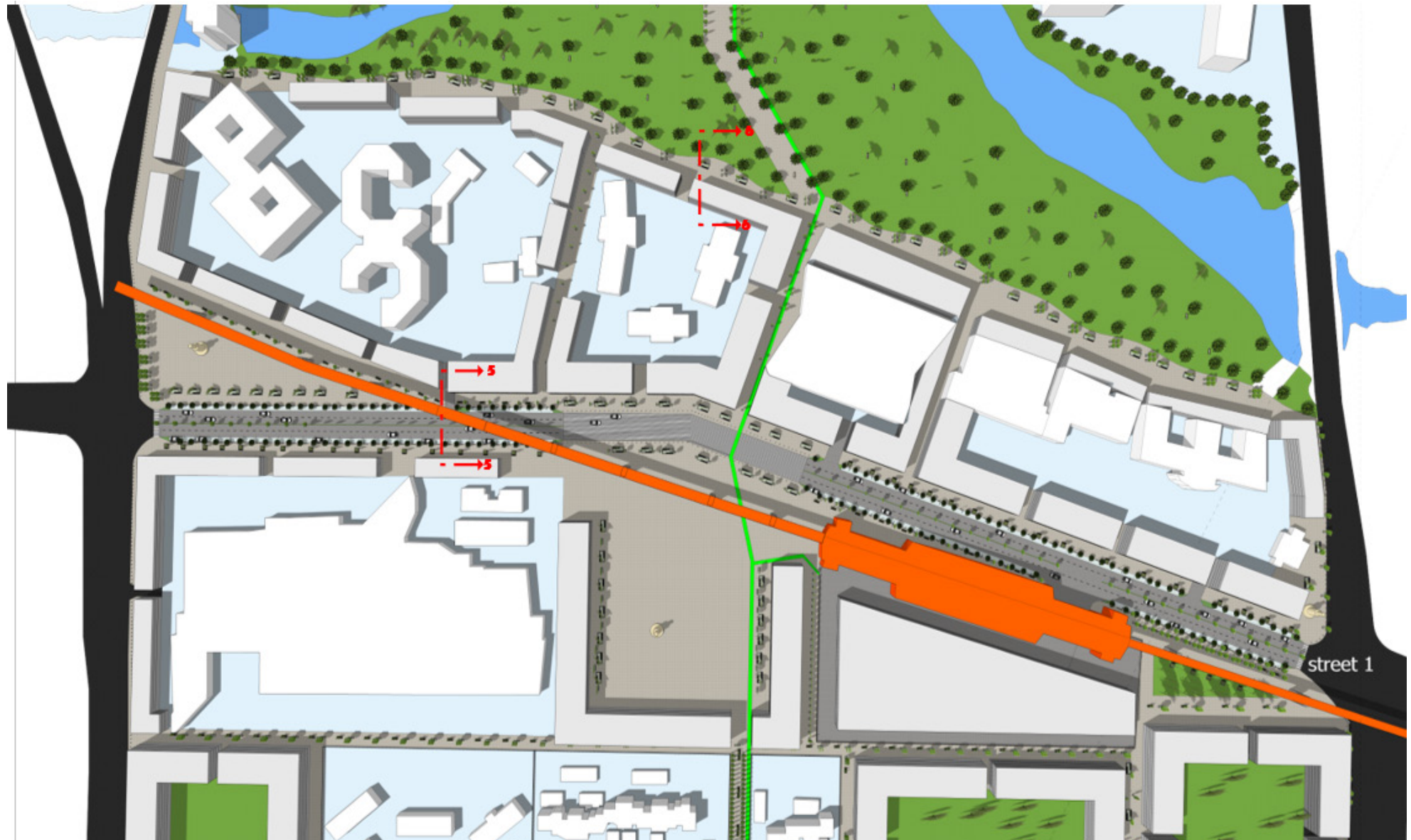


Figure 188_ Concept 2, 2D Part 2 Design

Concept 2, 2D Part 4 Design

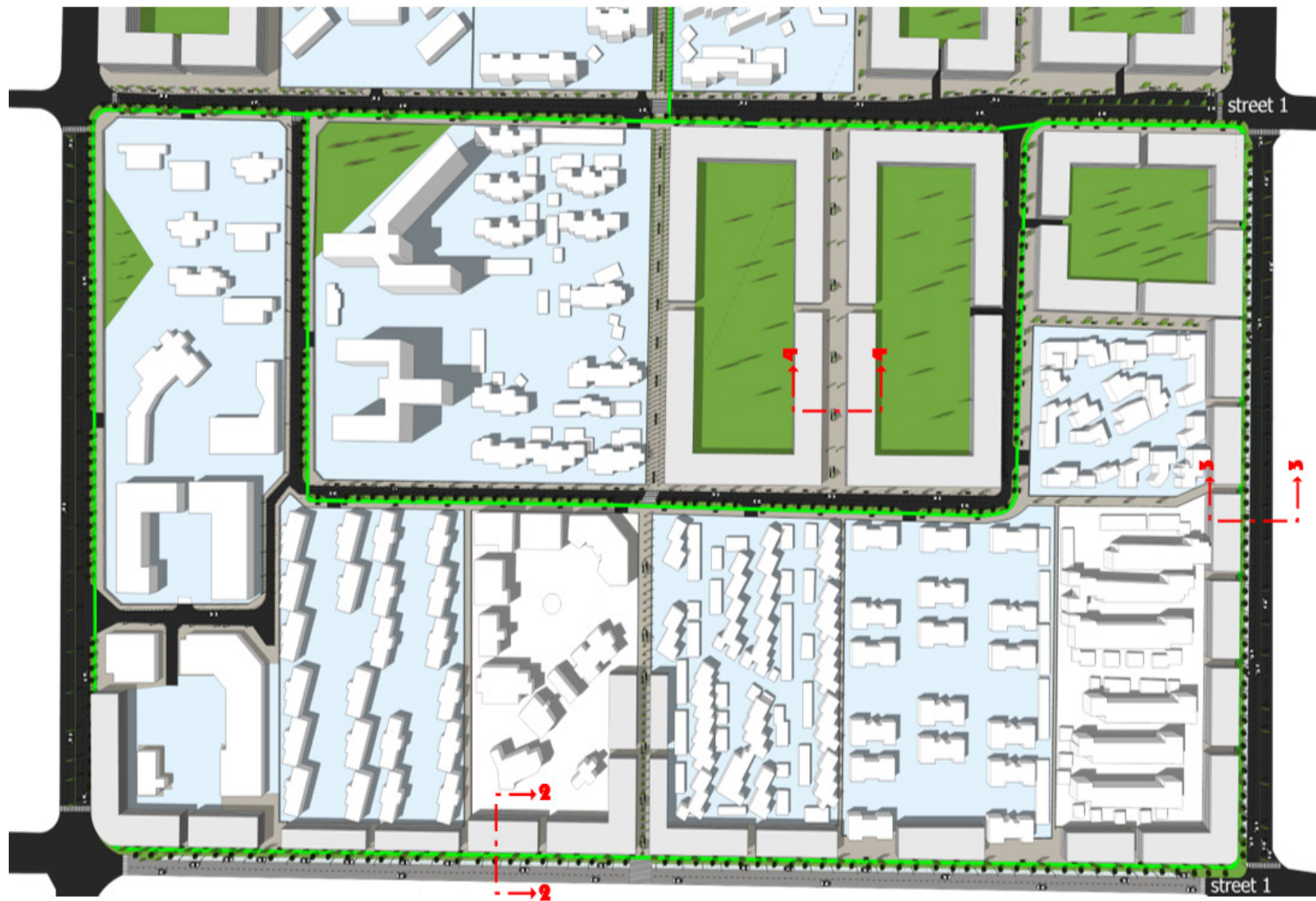


Figure 189_ Concept 2, 2D Part 4 Design

Concept 2 Grey Scale

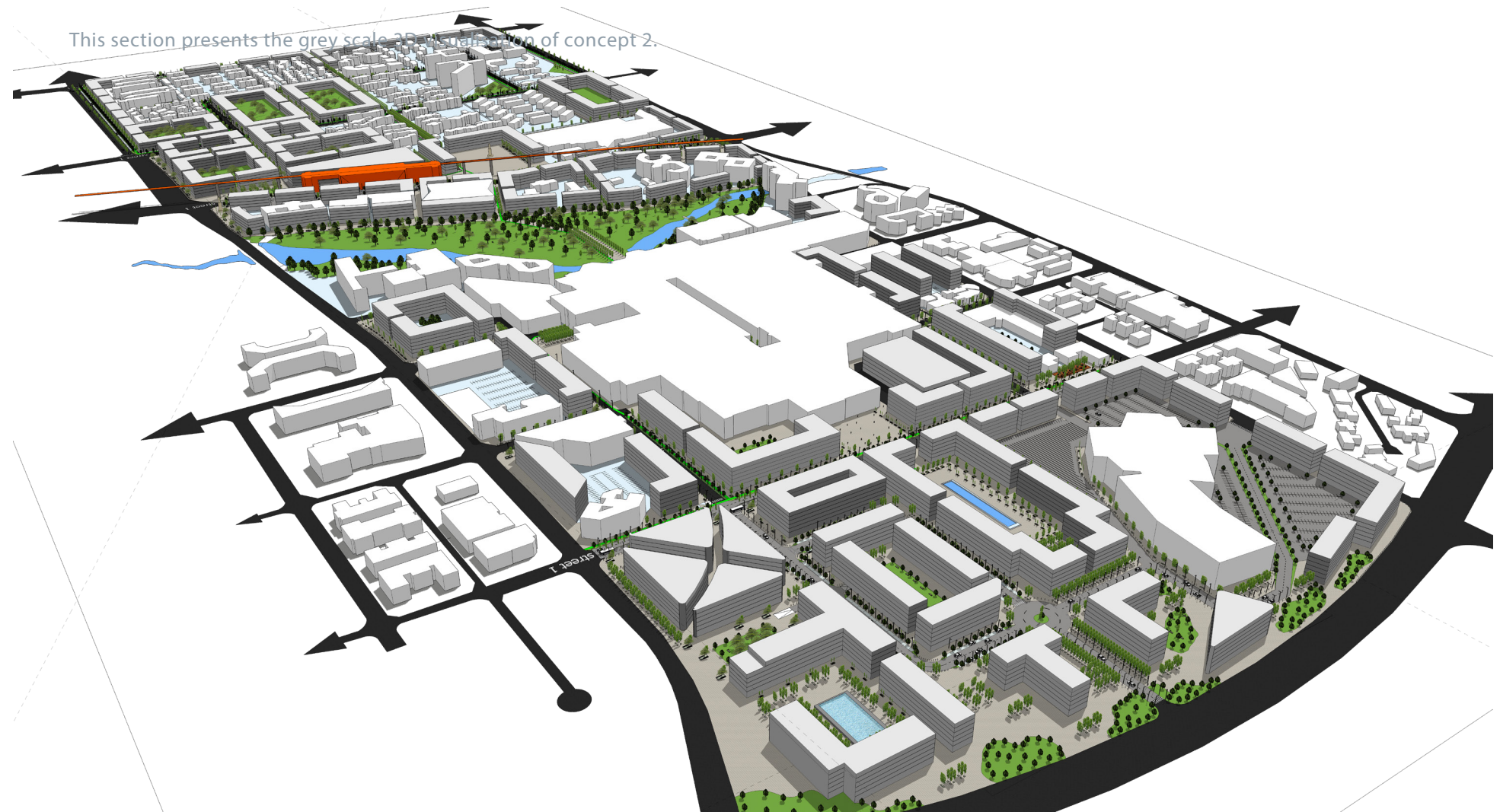


Figure 190_ Concept 2 Grey Scale Visualisation (View 1)

Concept 2 Grey Scale

This section presents the grey scale 3D visualisation of concept 2.



Figure 191_ Concept 2 Grey Scale Visualisation (View 2)

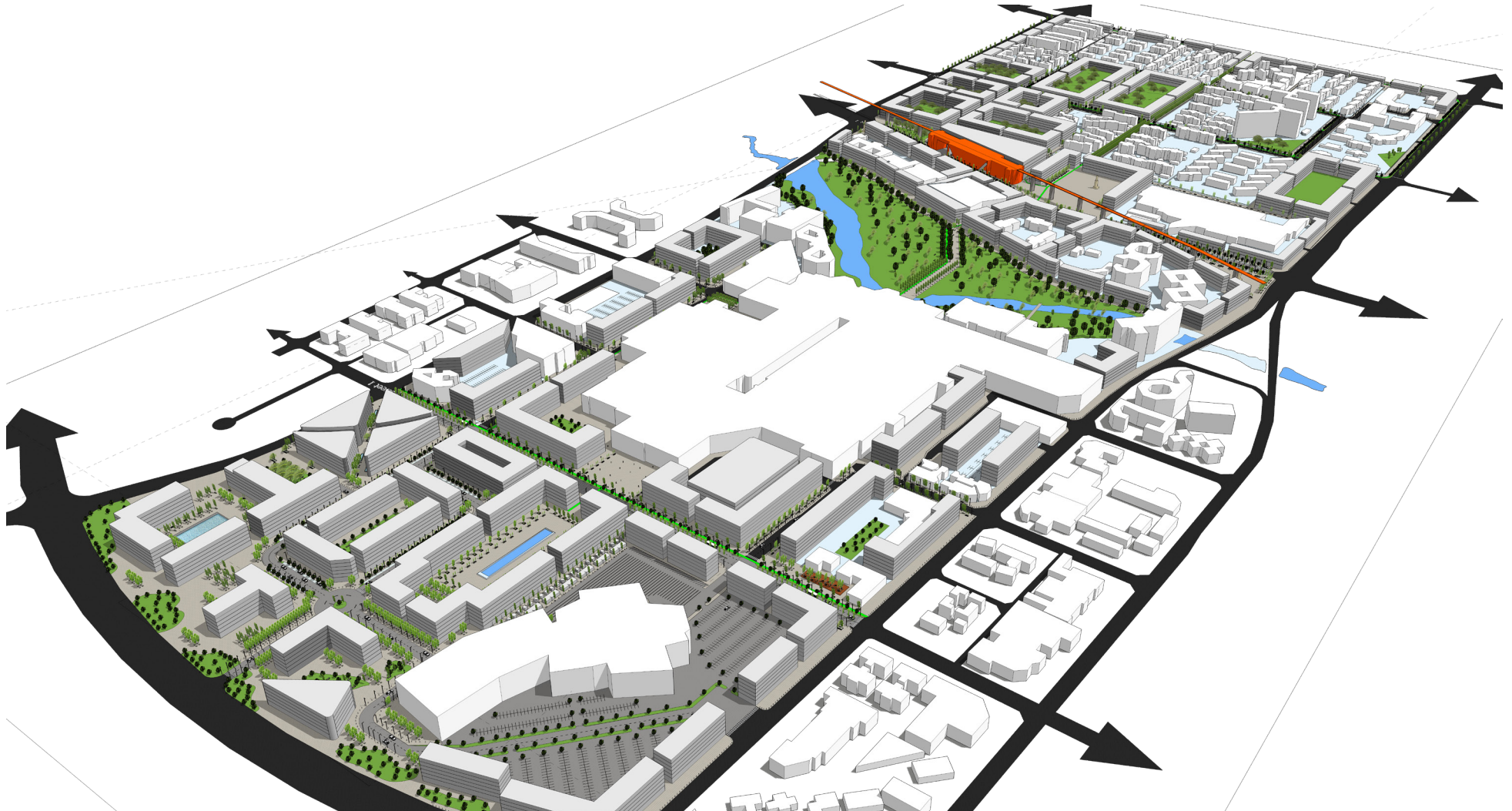


Figure 192_Concept 2 Grey Scale Visualisation (View 3)

Concept 2 3D Parts

Figure 193 show in 3D the four parts that will be zoomed into, so as to show massing details as well as the land use details.

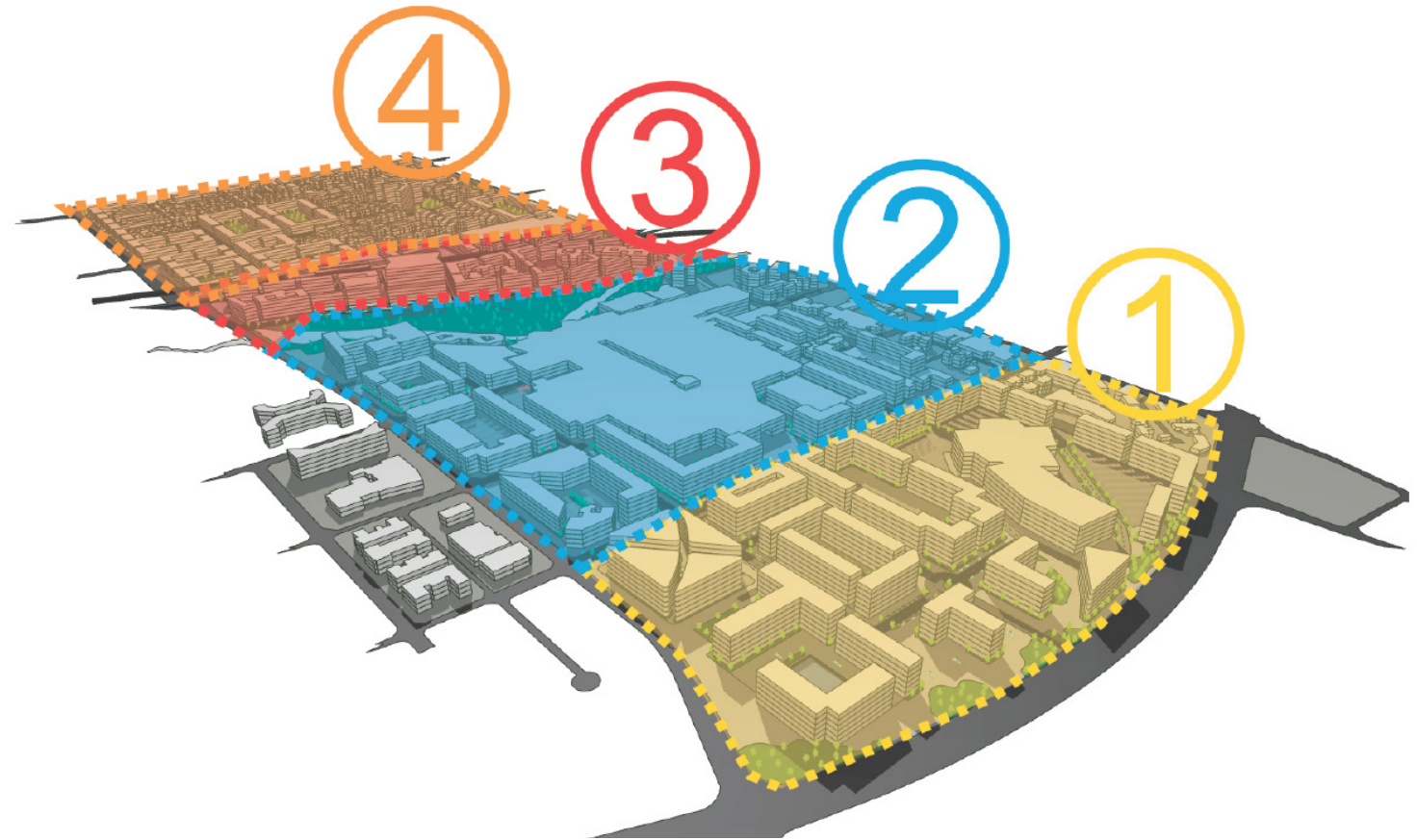


Figure 193_Concept 2 3D Parts

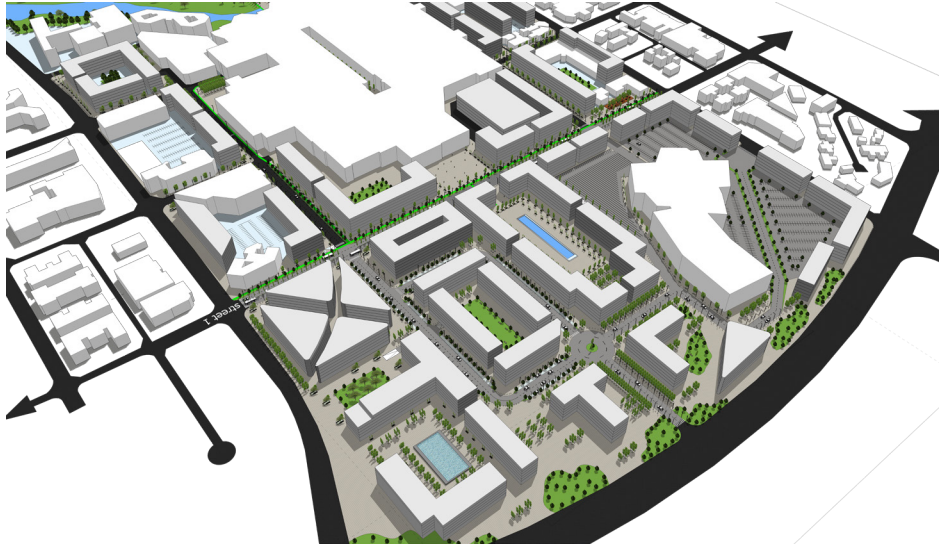


Figure 194_ Concept 2 Part 1 Grey Scale Massing

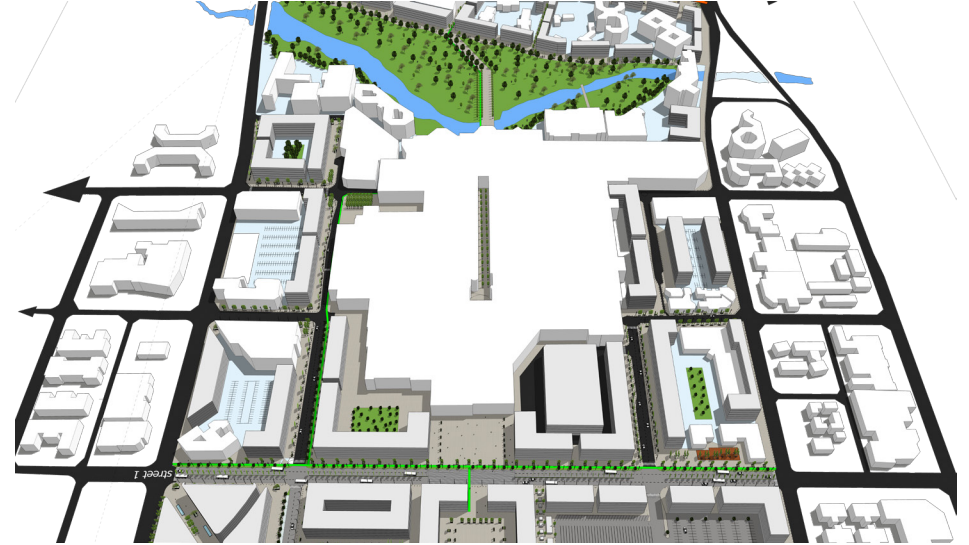


Figure 195_ Concept 2 Part 2 Grey Scale Massing



Figure 196_ Concept 2 Part 3 Grey Scale Massing



Figure 197_ Concept 2 Part 4 Grey Scale Massing

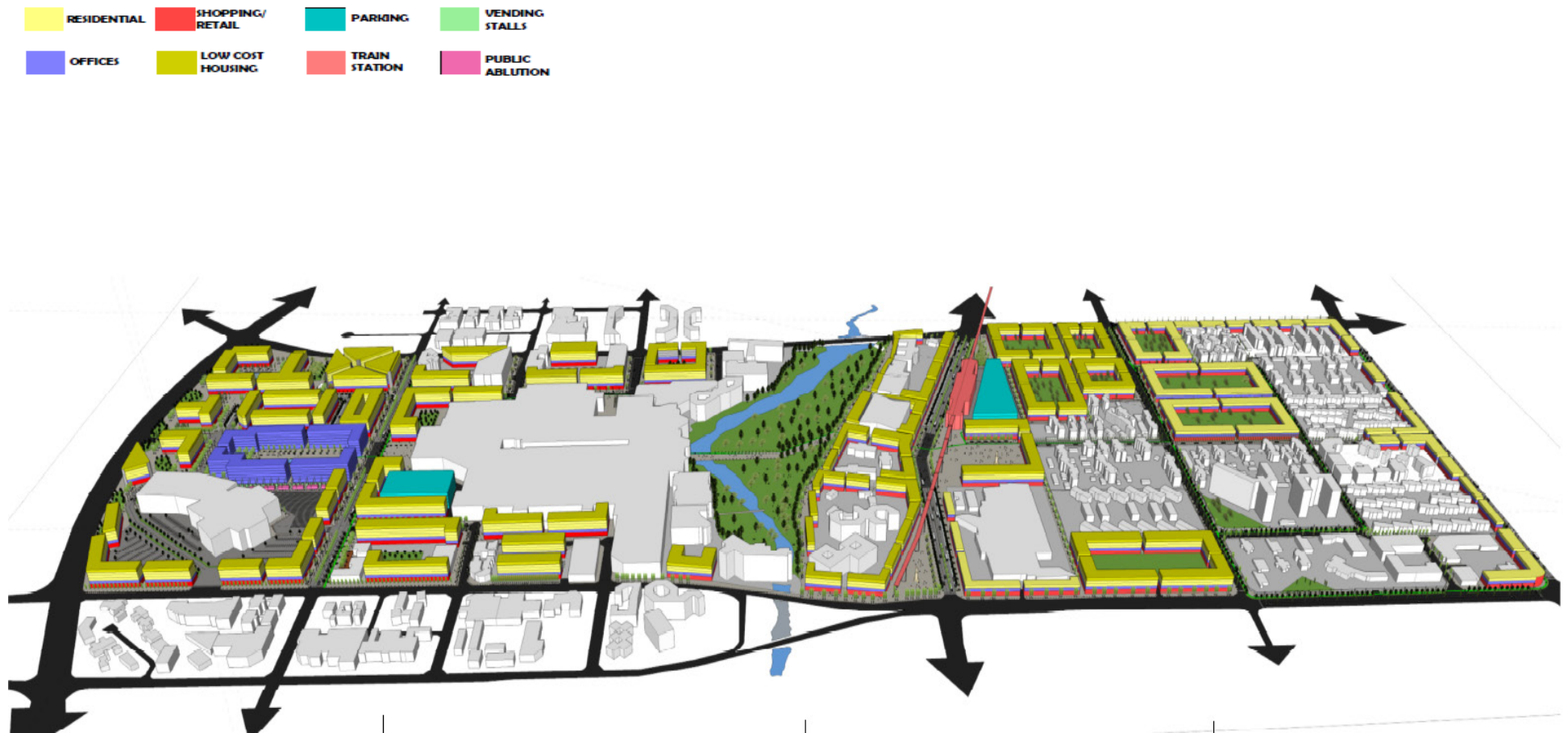


Figure 198_ Concept 2 Proposed Land use (view 1)

Storey Heights

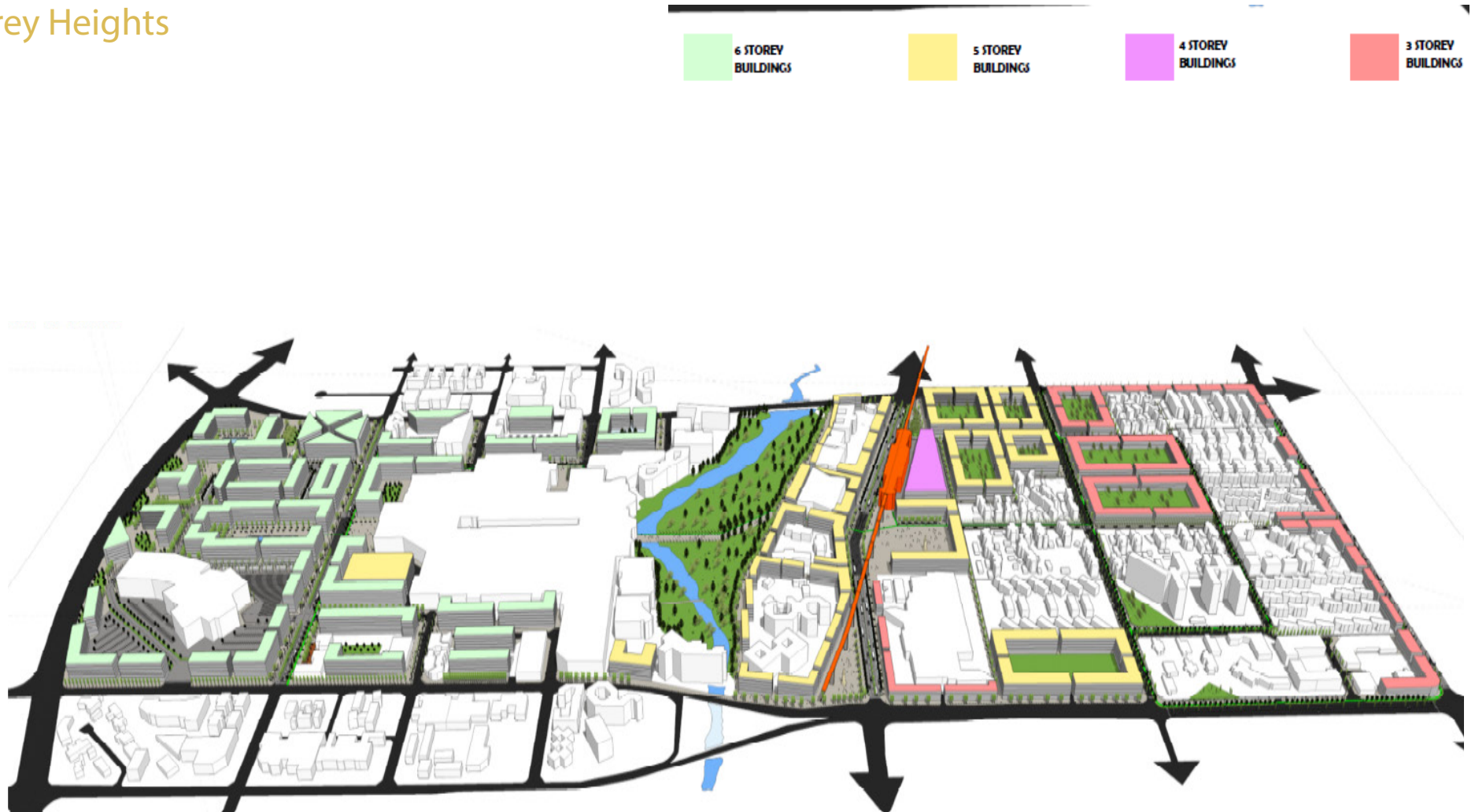


Figure 199_ Concept 2 Proposed Land use (view 2)

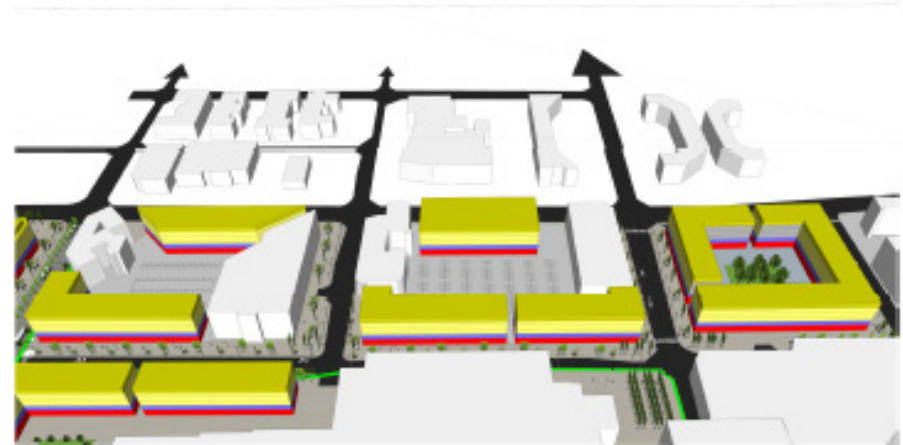
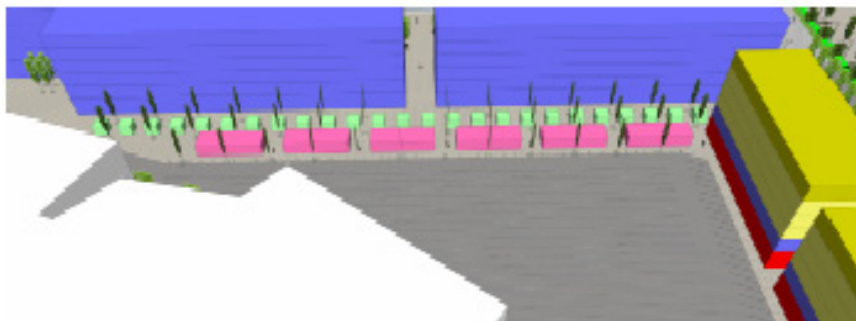
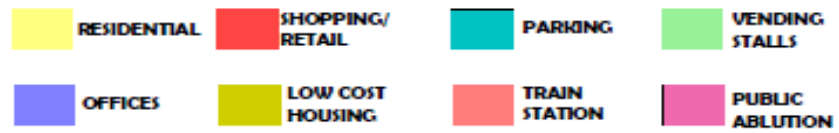


Figure 200_ Concept 2 Proposed Land use (view 3)_

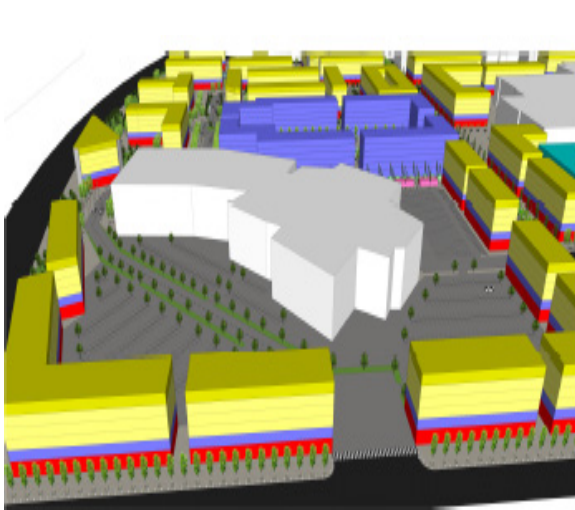


Figure 201_ Concept 2 Part 1 Land use

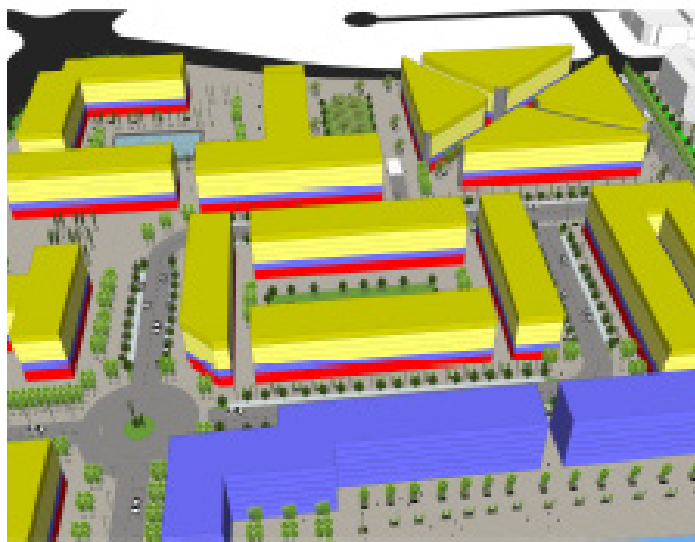


Figure 202_ Concept 2 Part 1 Land use

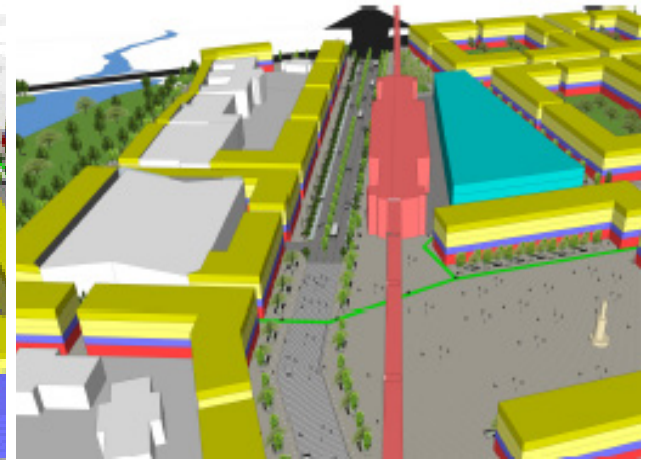


Figure 203_ Concept 2 Part 1 Land use

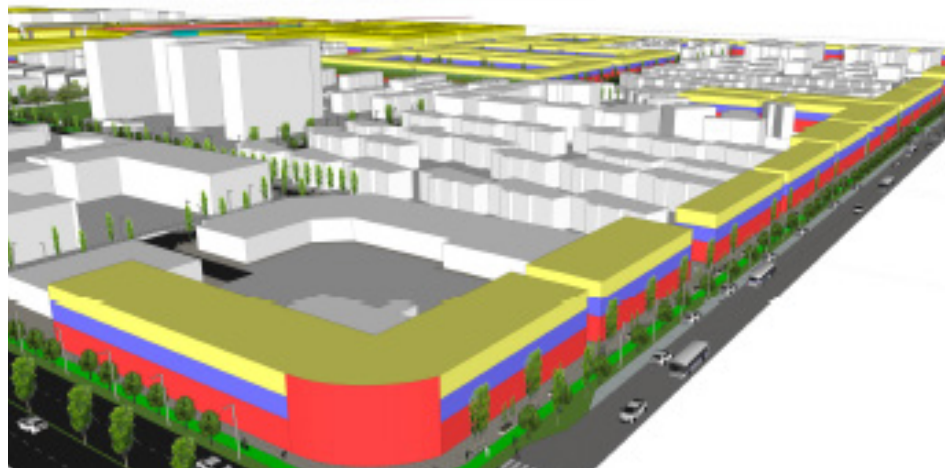


Figure 204_ Concept 2 Part 1 Land use_



PREFERRED CONCEPT

Concept 2 is the preferred concept over Concept one for the following reasons;

- It retains the predominant character of each the identified nodes, thus offices, residential and retail;

- It retains most of the existing buildings, making it more practical;

- It places more emphasis on the movement of pedestrians, and has two transportation nodes one in the north and the other in the south that substantiates the need for a pedestrian spine;

- It places emphasis on addressing dysfunctional vacant spaces through infills rather than total redevelopment of the entire study area;

- It prioritises non-motorised transit;

- The concept is primarily based on a desired robust pedestrian movement framework;

- It retains all the uses that currently exist in the study area;

- It preserves the residential character of the study area;

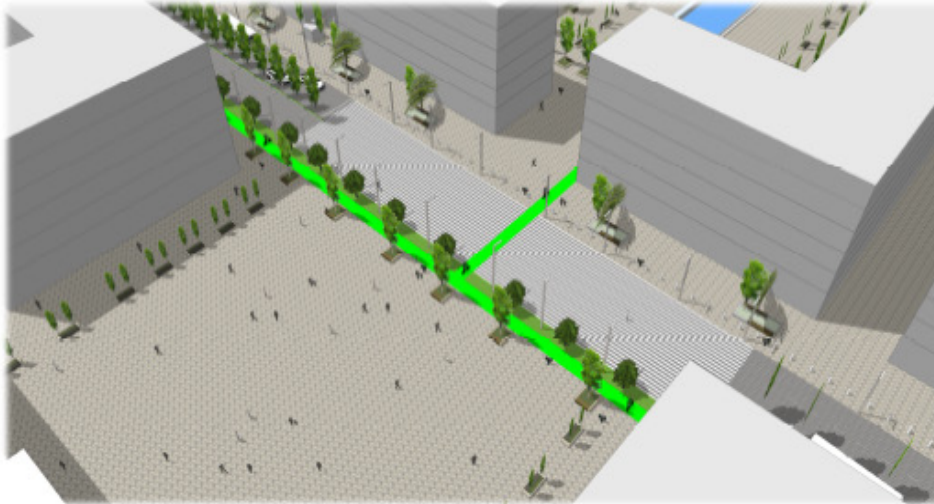
- Has proposals for ecological preservation;

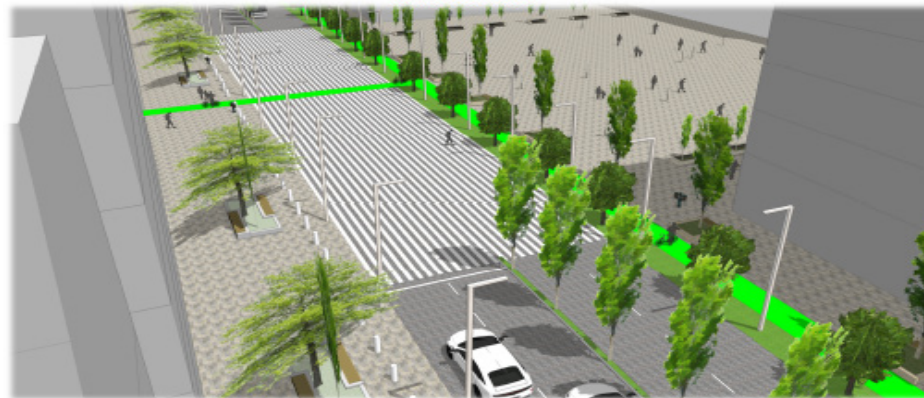
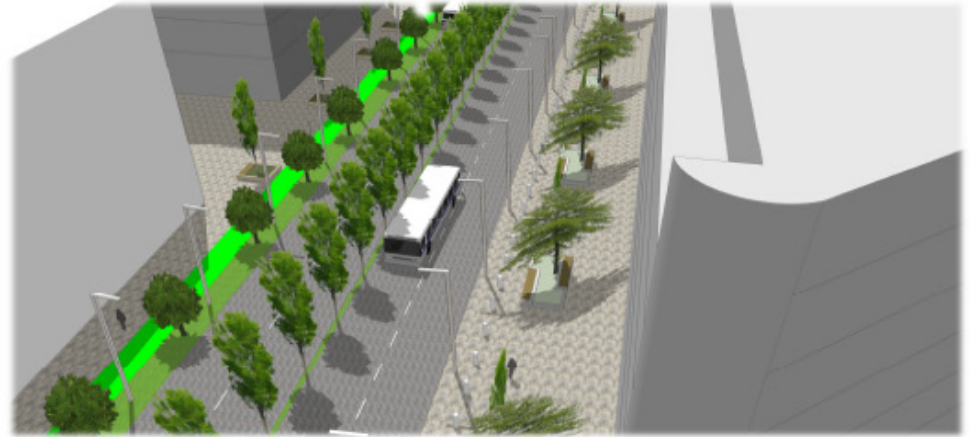
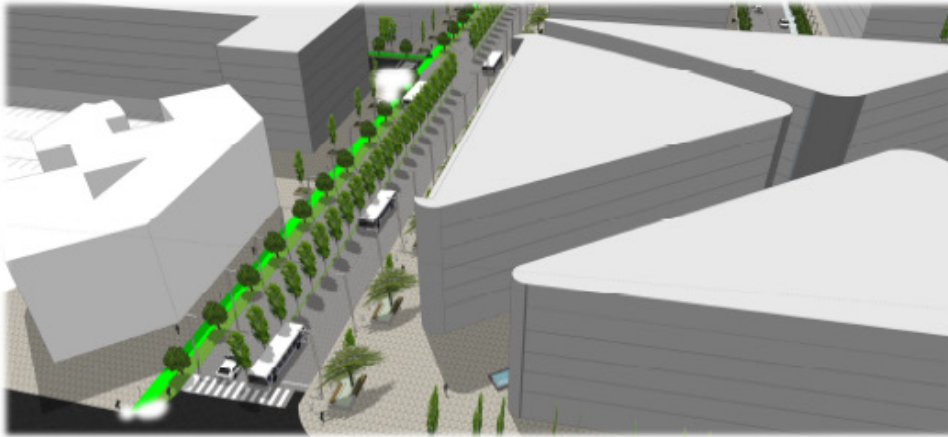
- Has proposals for safe and secure public places;

- It is based on the theory of finding lost spaces, and

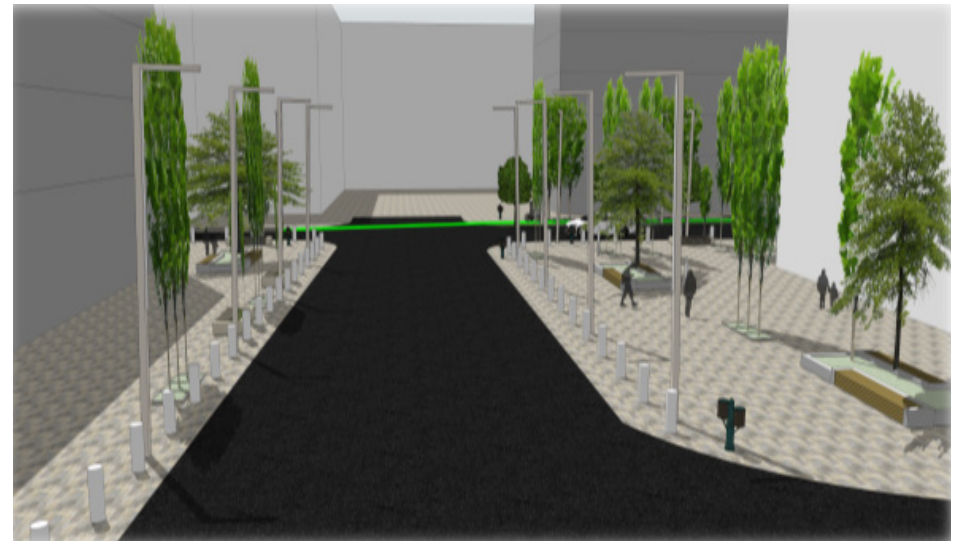
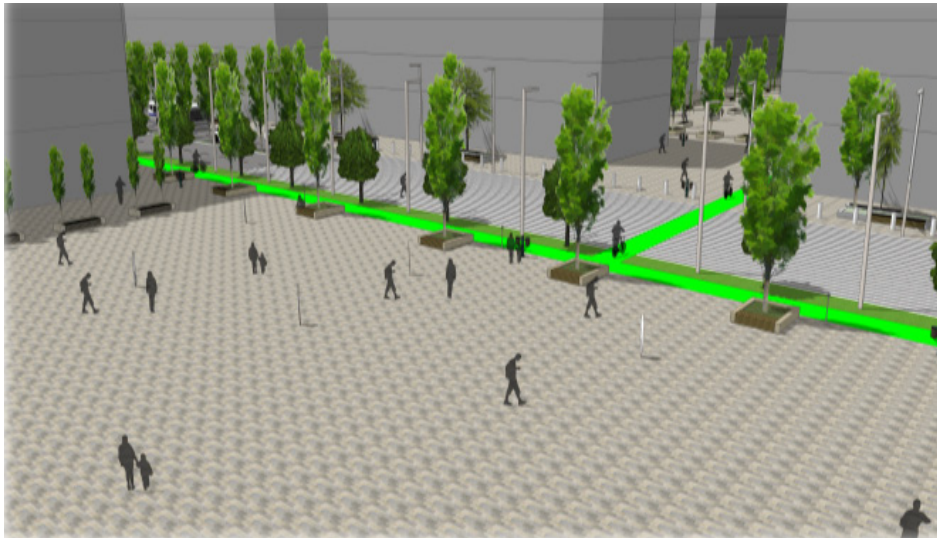
- It is based on the theory of defensible spaces.

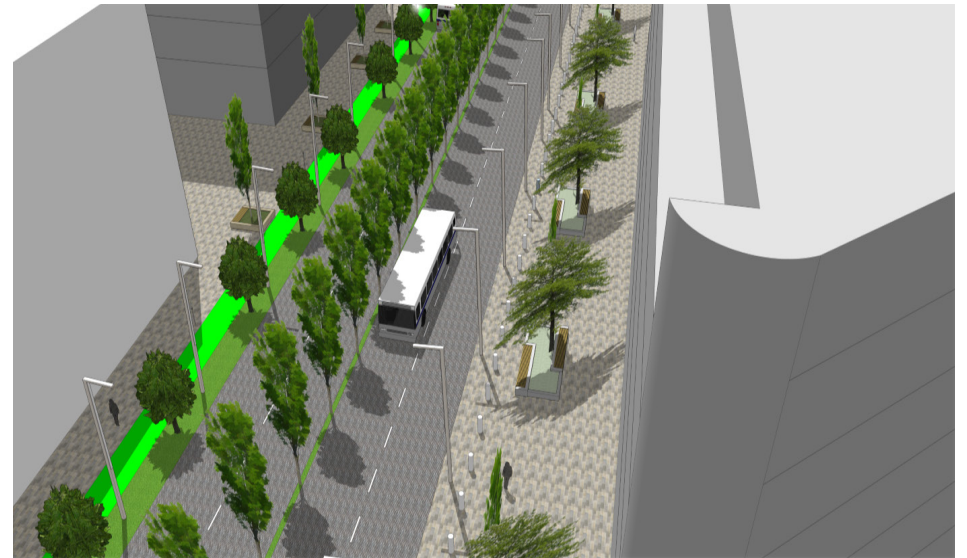
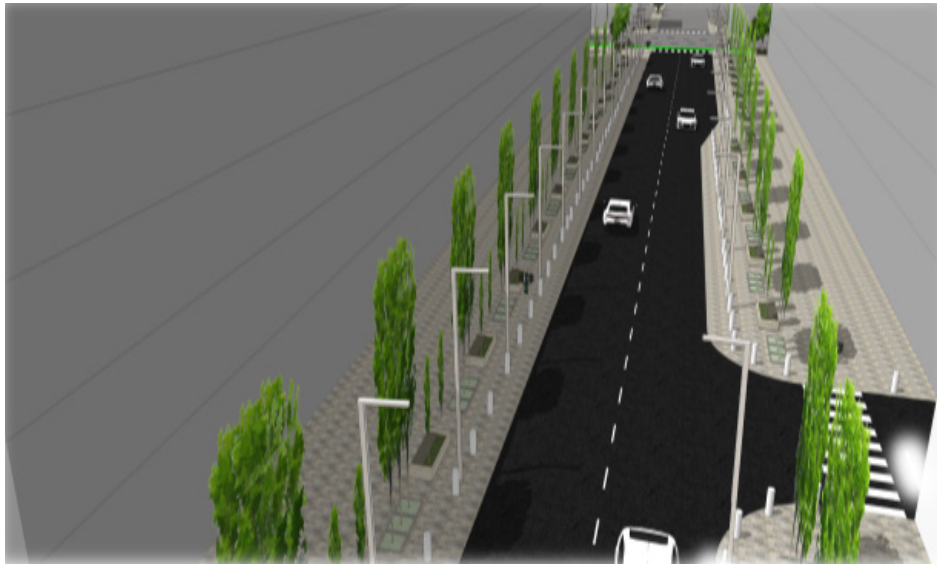
Chosen Concept 3D Visualisation (Civic Node)



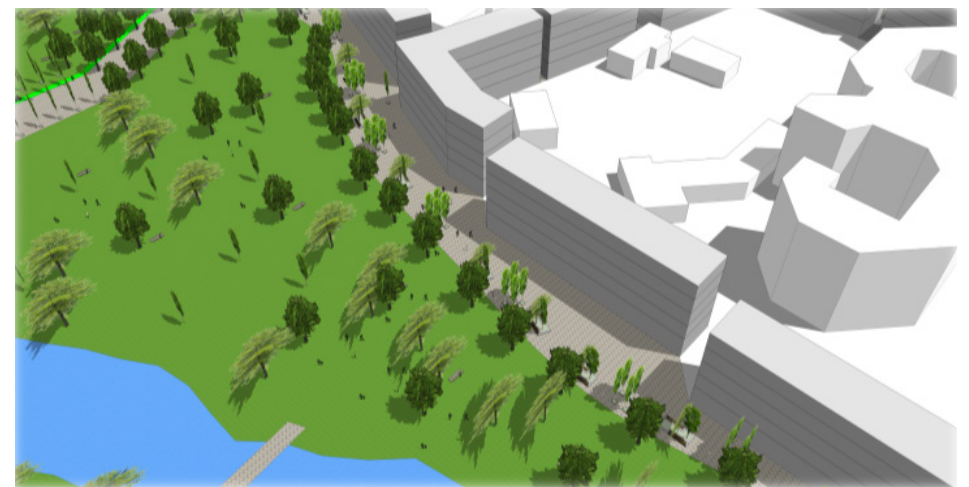
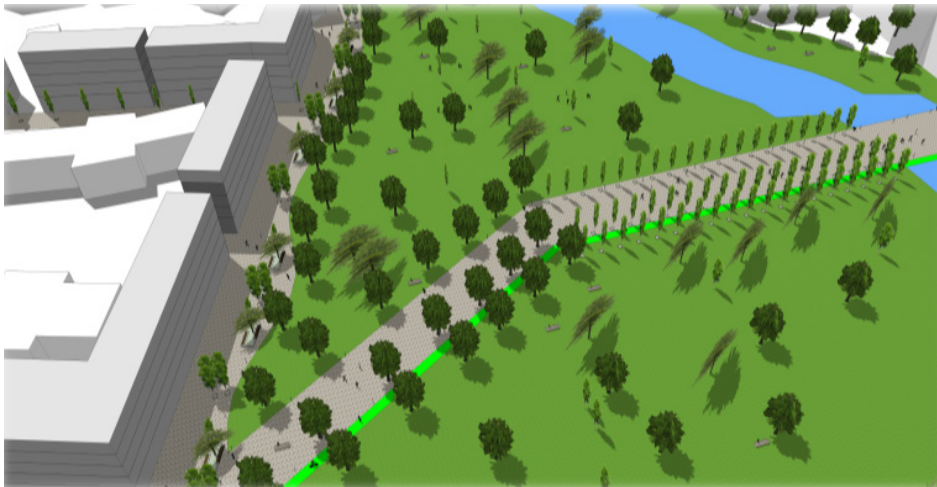


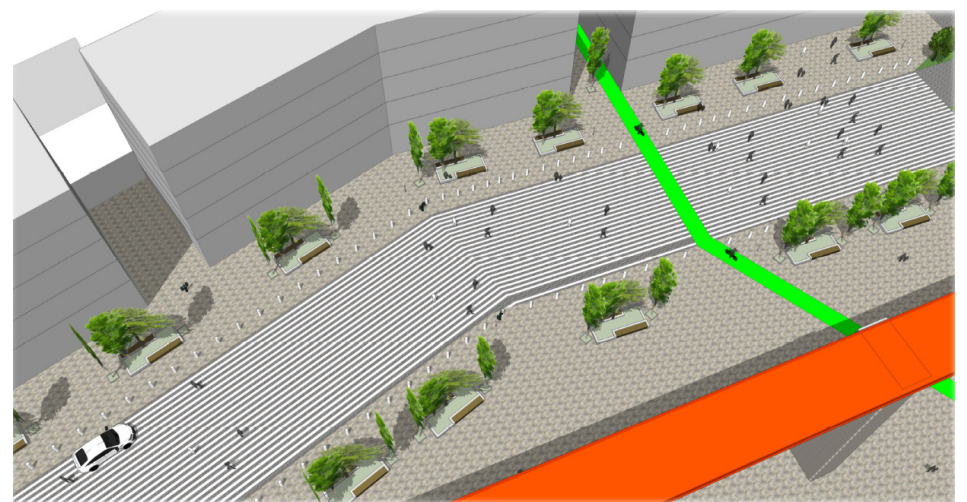
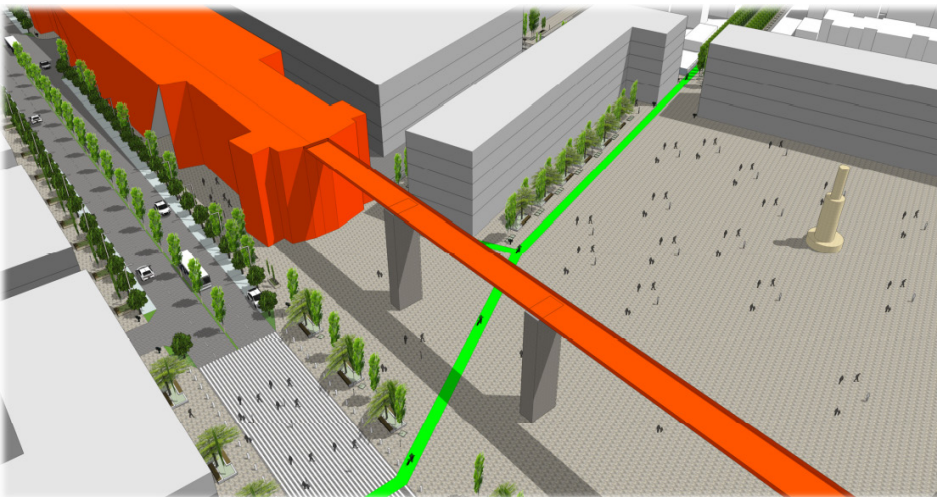
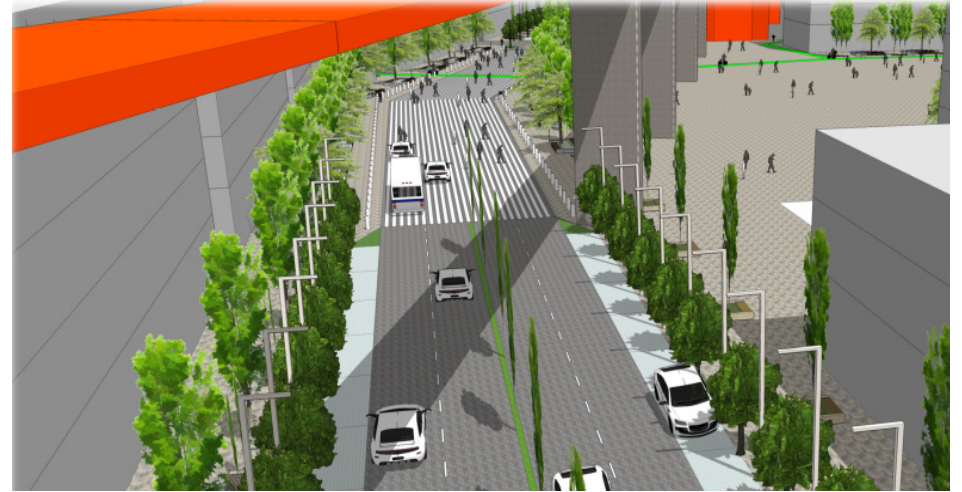
Chosen Concept 3D Visualisation (Shopping Node)



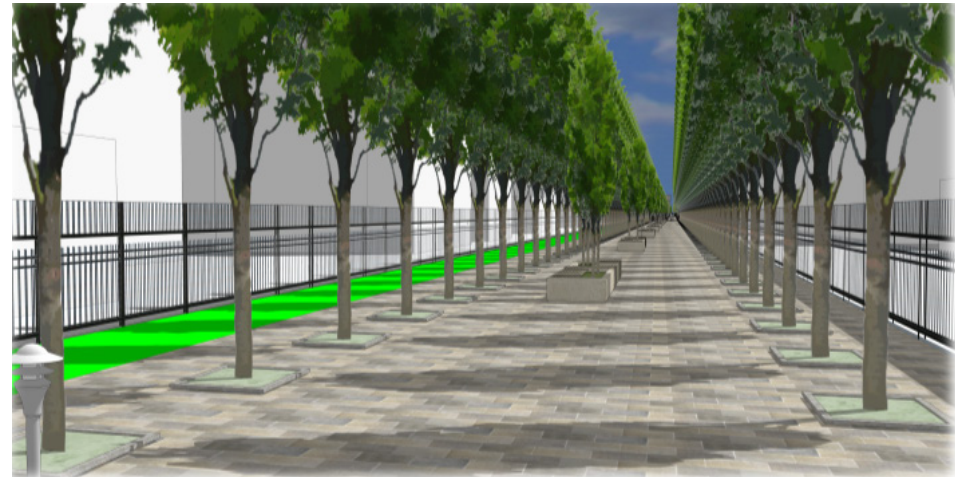
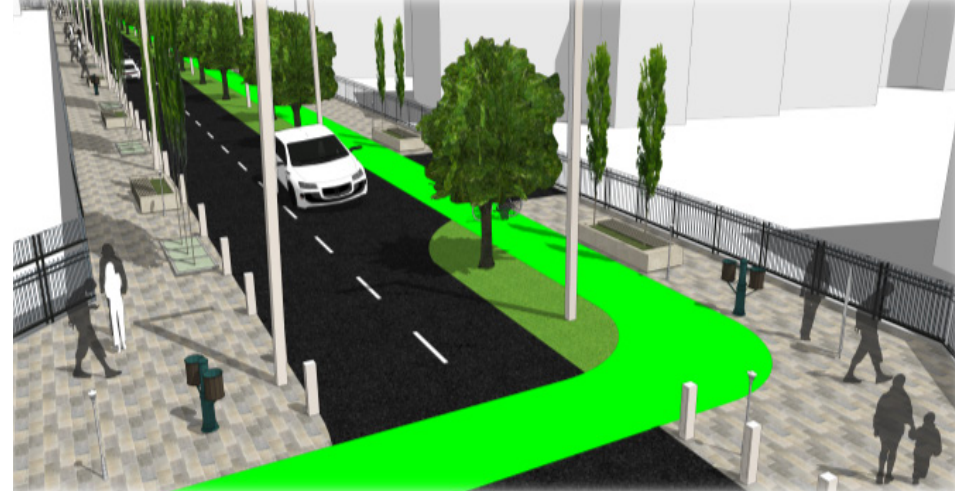
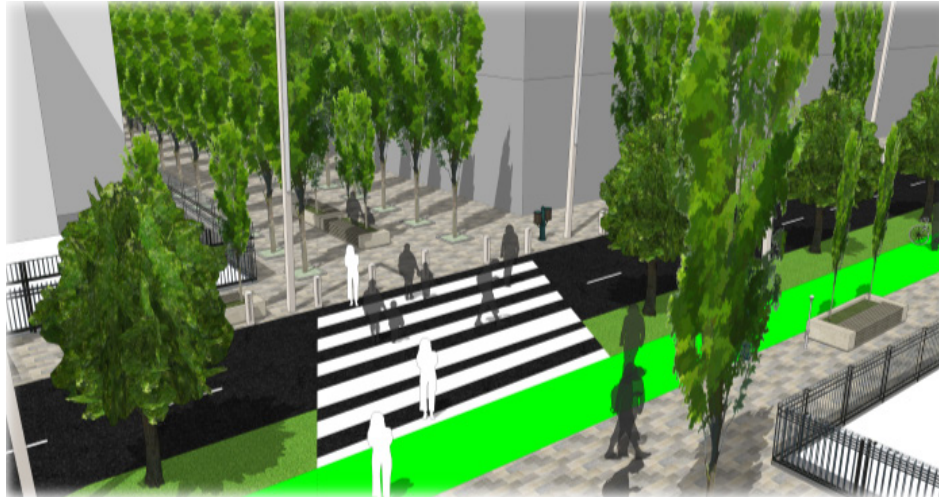


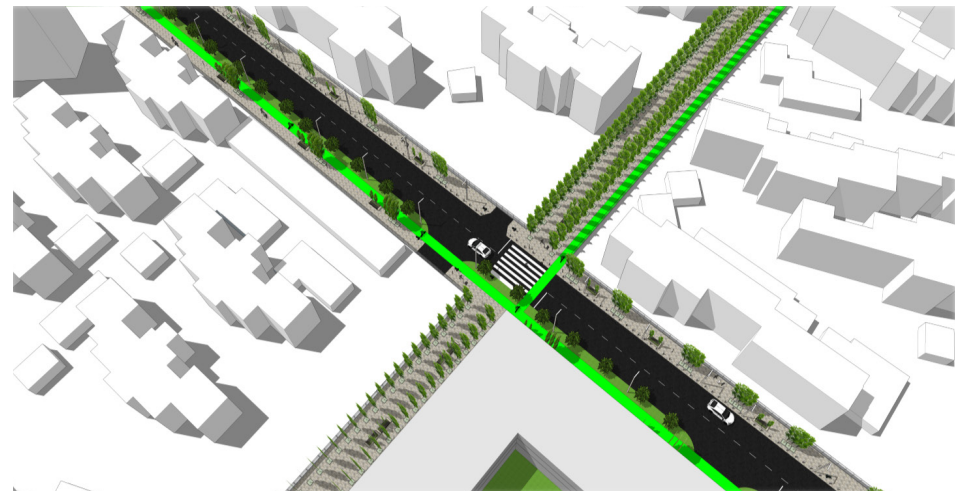
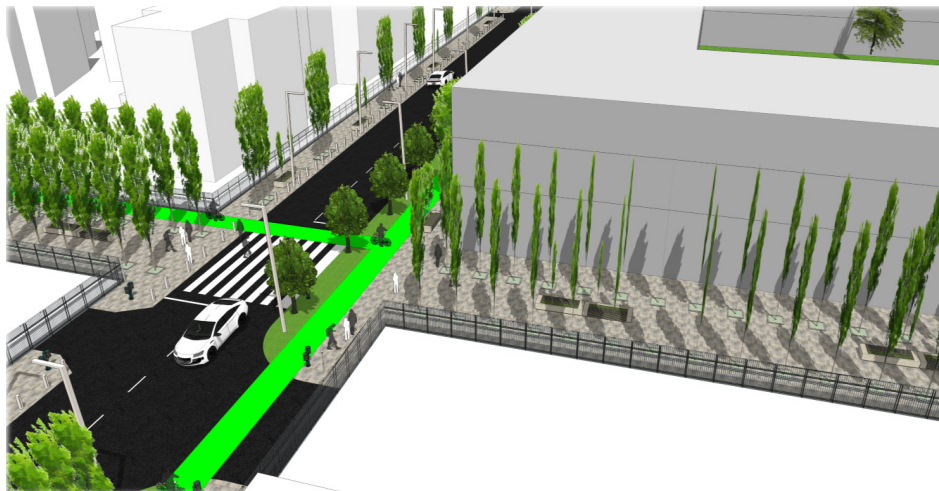
Chosen Concept 3D Visualisation (Offices/Business Node)





Chosen Concept 3D Visualisation (Residential Node)





SECTIONS FOR CHOSEN CONCEPT

Section 1

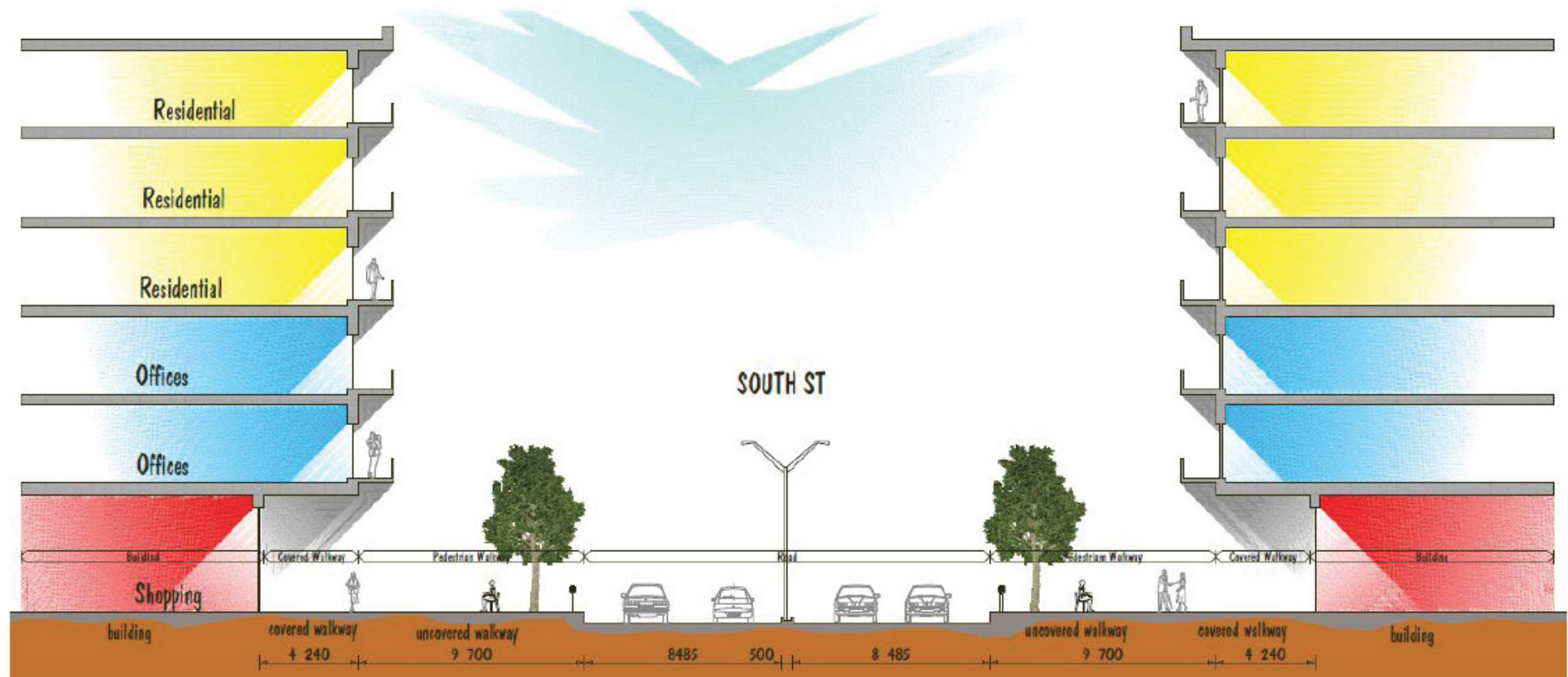


Figure 205_ South Street Cross Section

Section 2

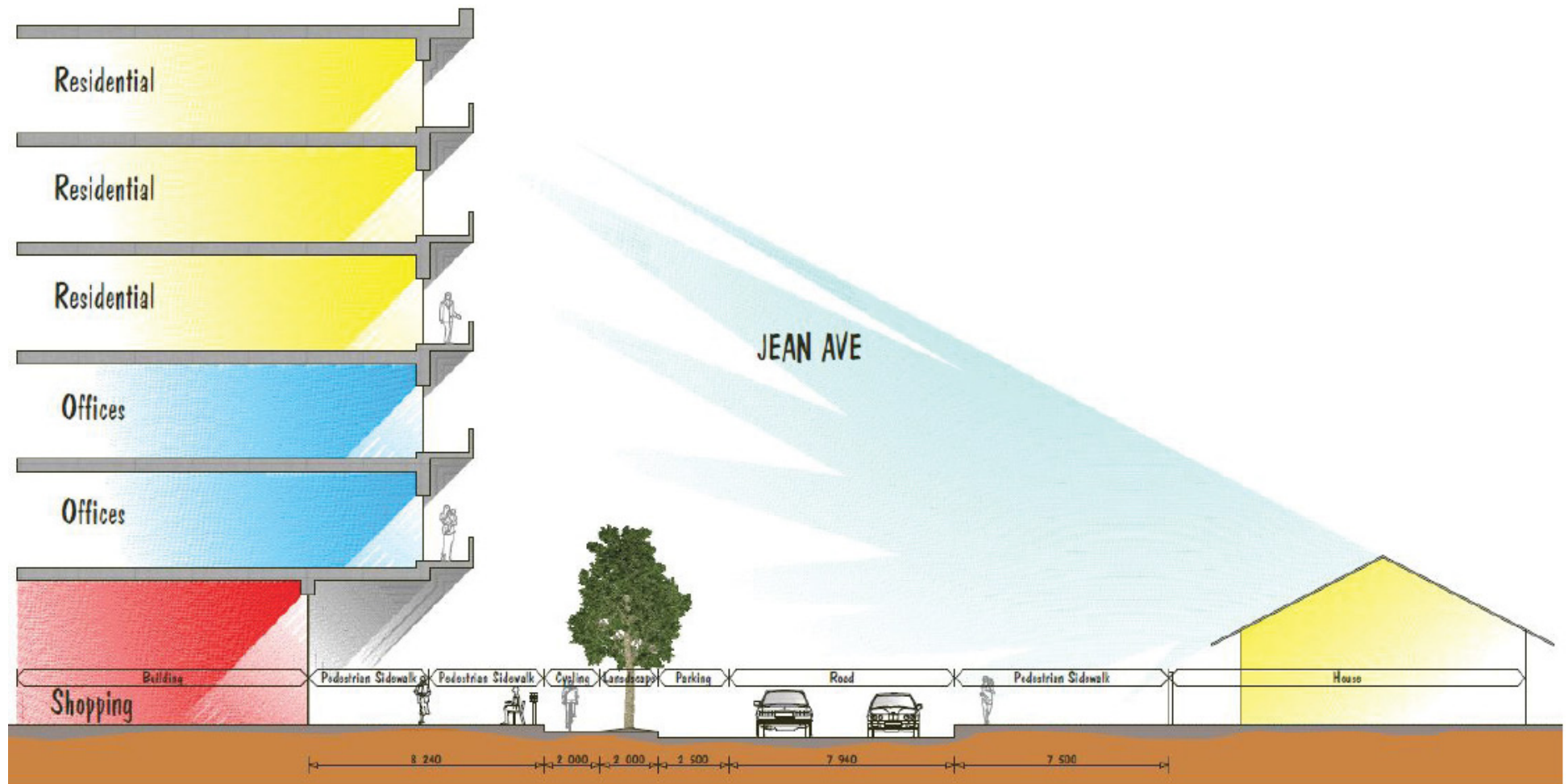


Figure 206_ Jean Avenue Cross Section

Section 3

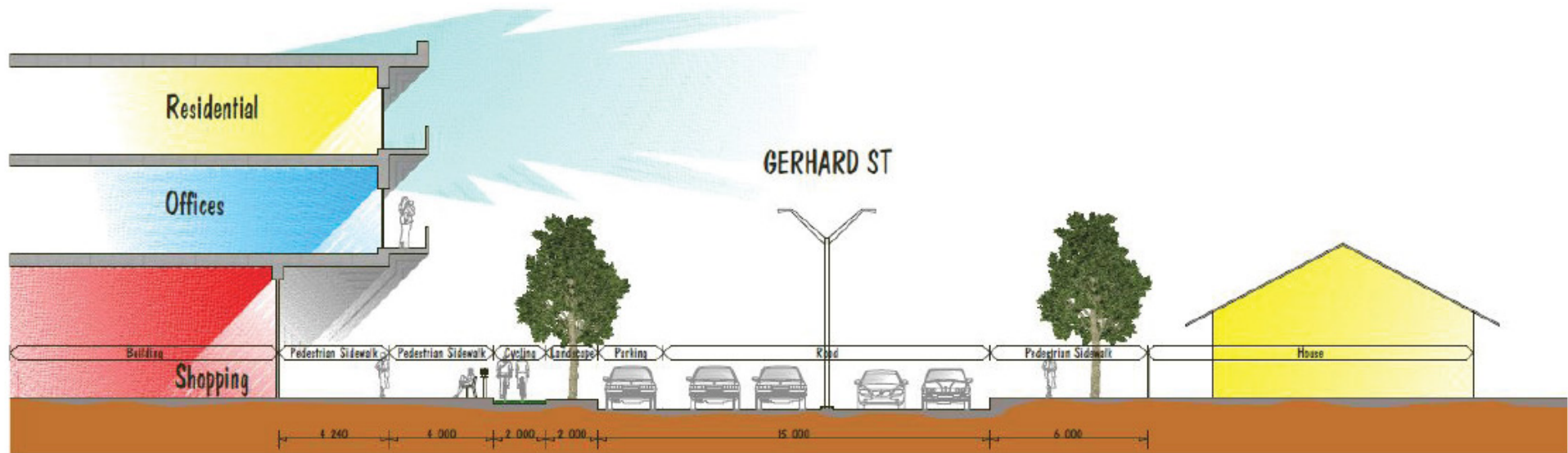


Figure 207_ Gerhard Street Cross Section

Section 4

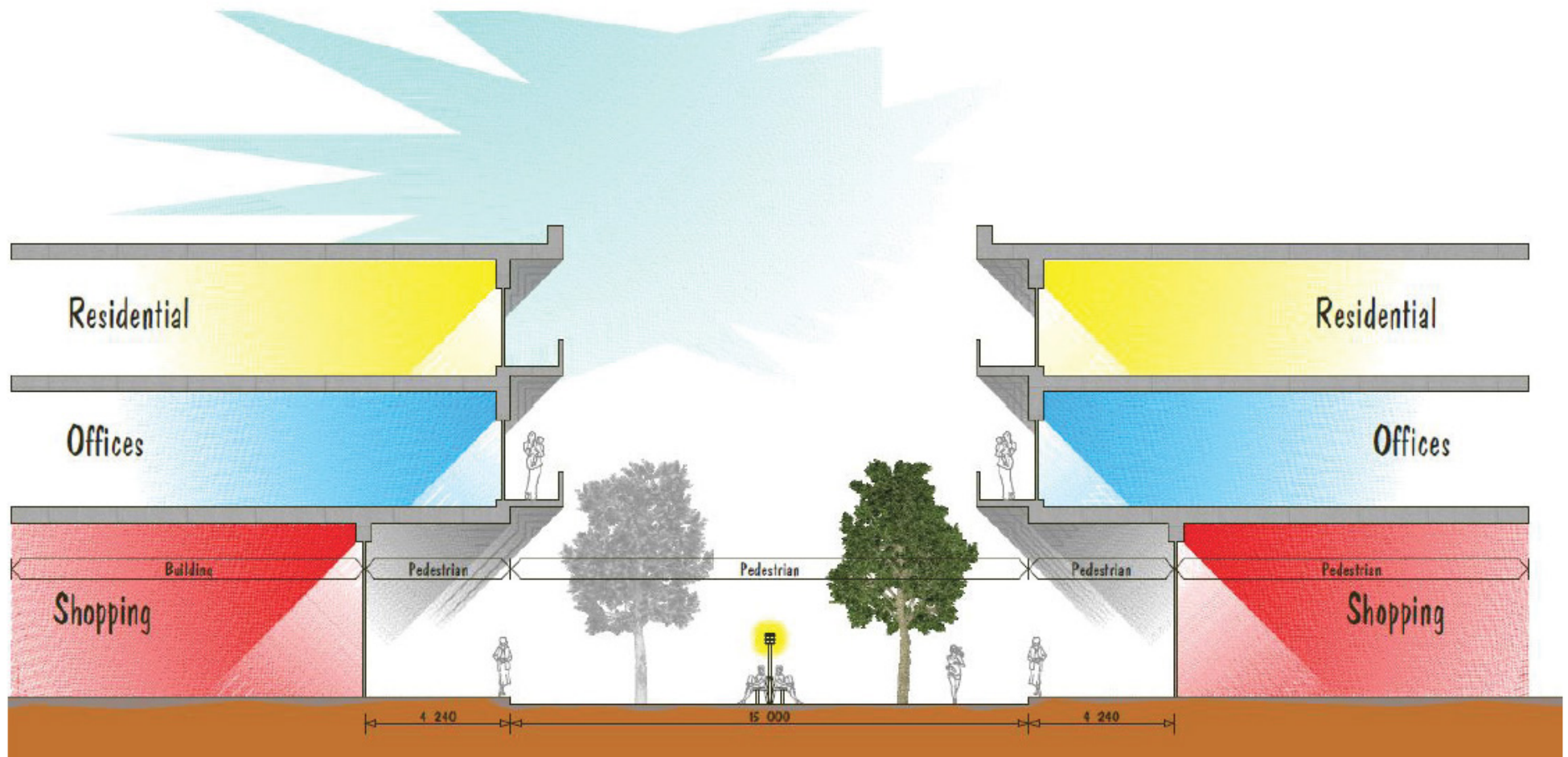


Figure 208_ Cross Section 4

Section 5

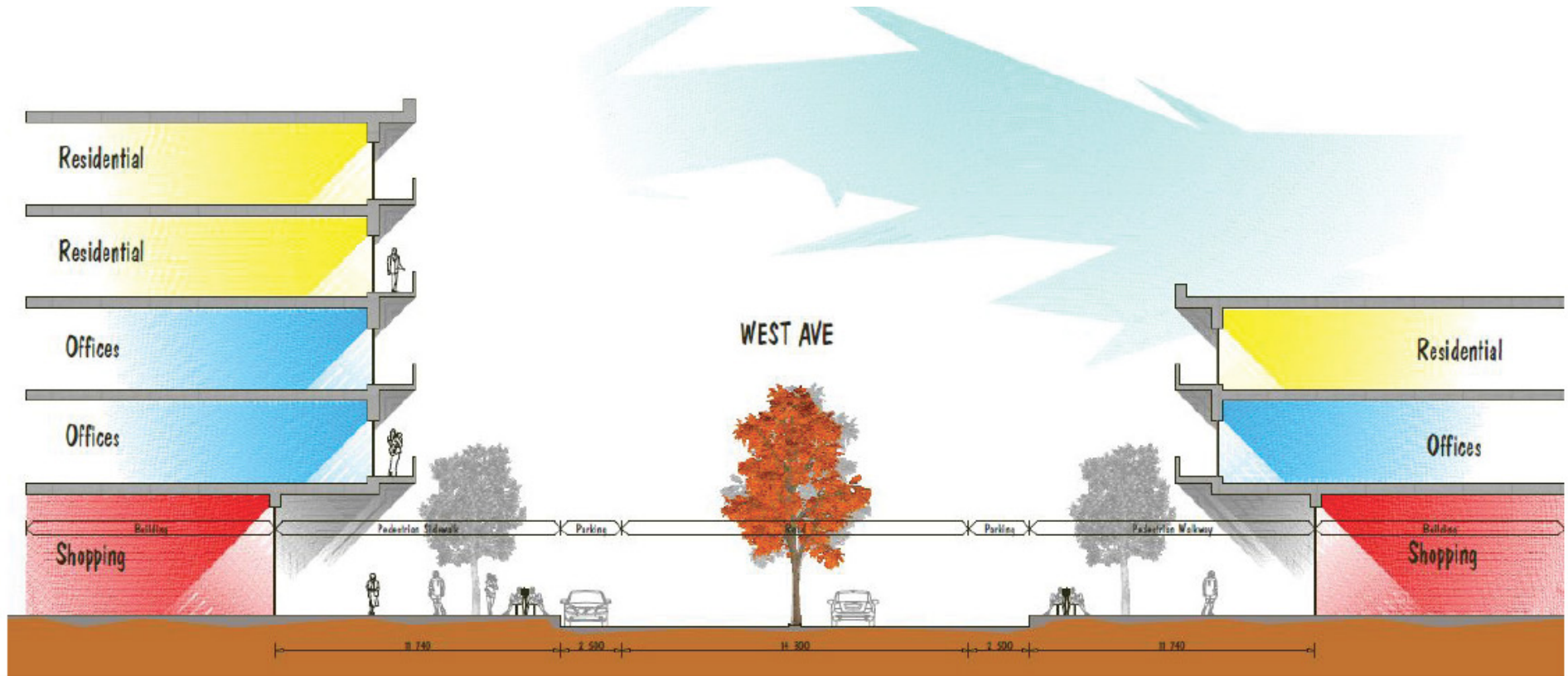


Figure 209_ West Avenue Cross Section

Section 6

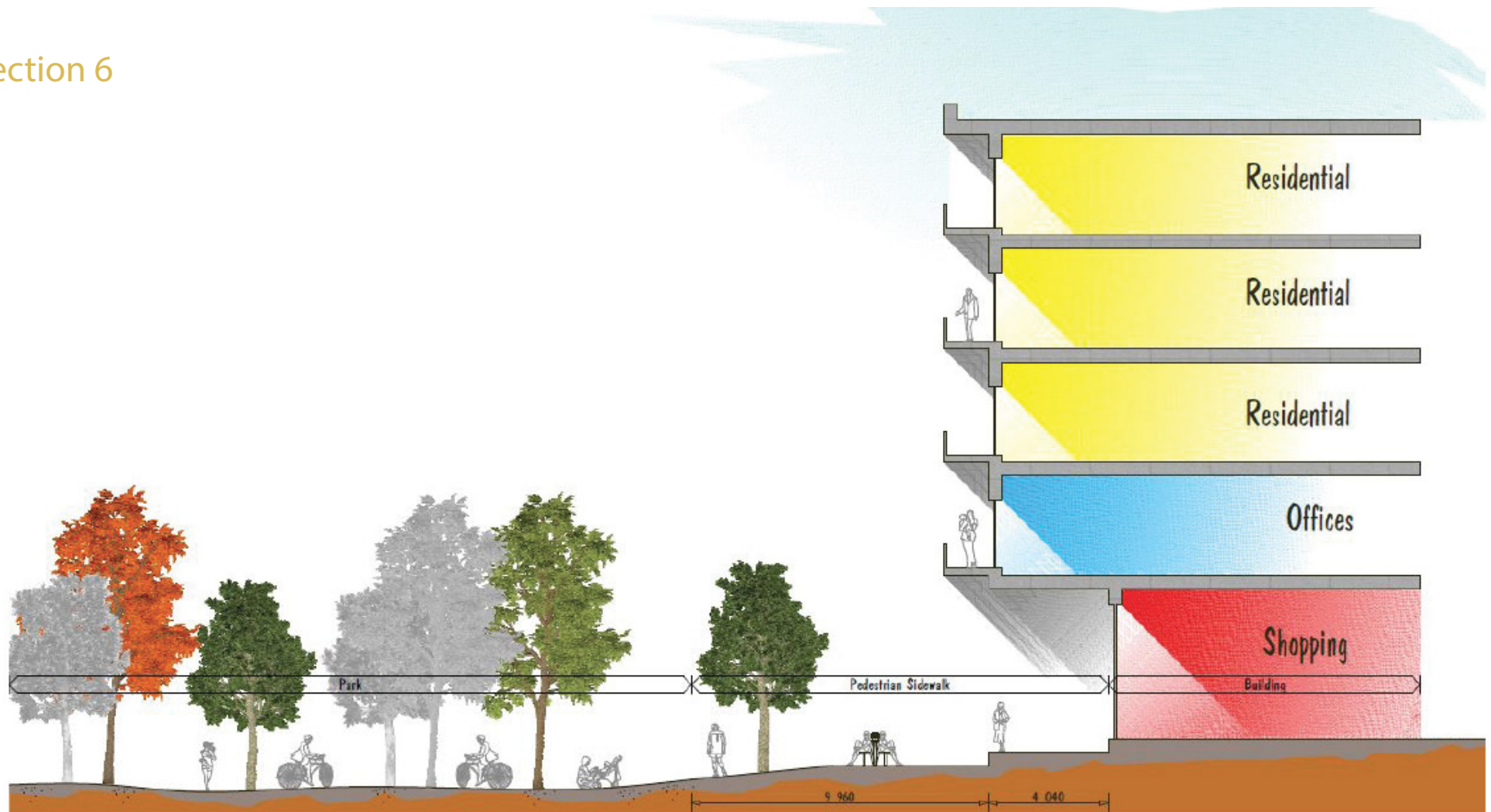


Figure 210_ Cross Section 6

Section 7

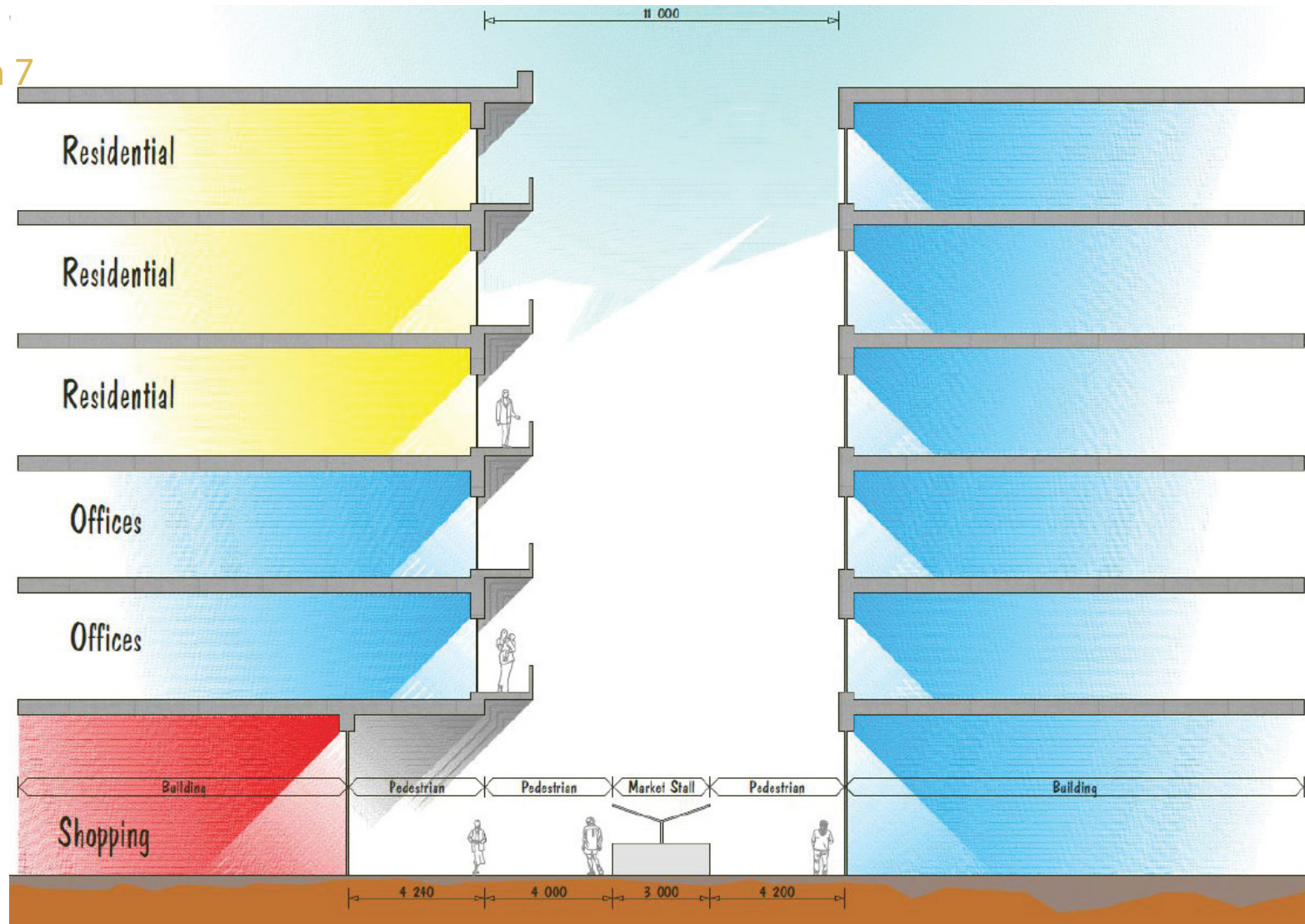


Figure 211_ Cross Section 7

Section 8

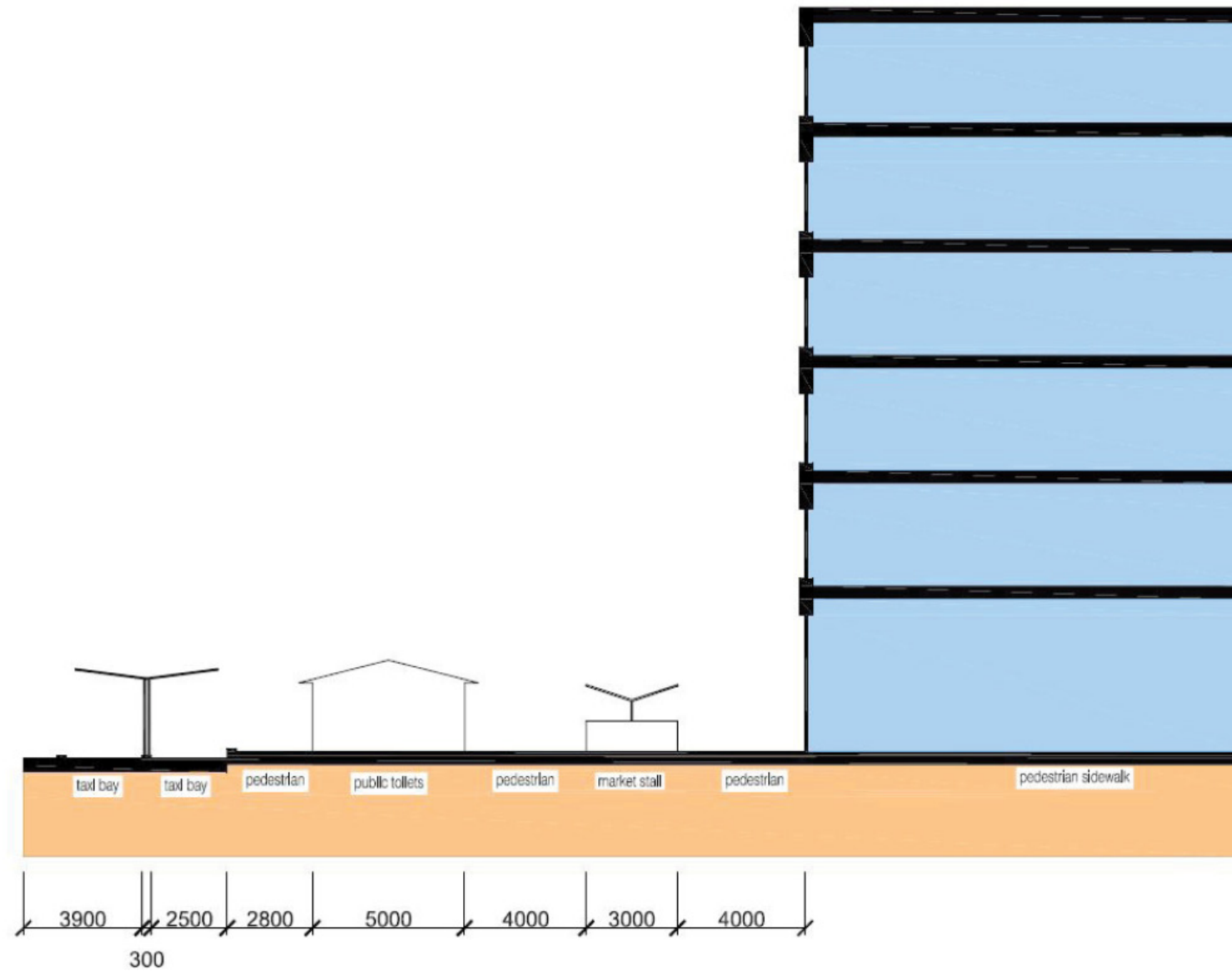


Figure 212_ Cross Section 8

Concept 2 Land use Objectives

Gehl (2006) states that life between buildings comprises the entire spectrum of activities, which combine to make communal spaces in cities and residential areas meaningful and attractive. The resultant design has seen a shift from a predominantly suburban mono functional land use mix and unresponsive built form to one which is more urban, integrated and sustainable.

This inadvertently supports the transition from the dominant use of privates to Transit Oriented Development, thus around the existing Gautrain station and the proposed new taxi rank.

As the core of the City of Tshwane Region 4 business node, the design has seen significant change in land use mix that promotes higher urban diversity. The created higher intensity urban areas will create more sustainable thresholds for economic activity, public transport, and other public facilities. The design mainly addressed the urban challenges raised through interventions on infills, thus in the form of land that is undeveloped are land that is perceived to be non-functional. In these spaces, a range of mixed-use commercial, residential has been created, furthermore mixed -use nodes for the study area have been created.

Concept 2 Transportation Objectives

Concept 2 aims at discouraging the use of private car to non-motorised transit pedestrian movement. This objective ties in the land use objective in that the design seeks to restructure the current land use so as to enhance pedestrian movement. The two transportation interchanges, that is, the proposed taxi rank and the existing Gautrain station are connected by a pedestrian network that cuts across the centurion mall. In between the two interchanges, there is variety that causes/ forces/ entices people to walk. This is supported by transit-oriented development principles. The introduction of the different transporting modes, including bicycle will improve the local circulation of pedestrians, furthermore the design integrates pedestrians with the various modes of transport, thus train, bicycle and the taxis. Safer pedestrian crossings that are slightly raised with a different riding surface acting as traffic calming measures are proposed all intersections with pedestrian crossings. A typical example is depicted in Figure 200.



Figure 213_ Typical example of pedestrian crossing at intersection. (Author_2018)

The figure above also highlights the prioritisation of pedestrian movement brought about by the design (concept 2)

Concept 2 Non - Motorised Transport

The densification of the study area will obviously create more pedestrian traffic as pedestrian trips will be generated by the mixed used new nature of the study area. The pedestrian infrastructure and the supporting street furniture has therefore been planned for. This consists of trees not only to green the area and clean the air, but also to provide comfortable pedestrian walks. A cycle lane has also been proposed throughout the study area, with origins (mainly being residential areas) and destinations, being the Centurion mall, the Gautrain station and the civic node. Bicycle parking facilities have also been provided for.

Street furniture such as benches, public lights and litter bins are also provided across the study area. The urban blocks, especially in the business node have been designed to be smaller such that they now promote pedestrian permeability and convenience.

Concept 2 Environmental Objectives

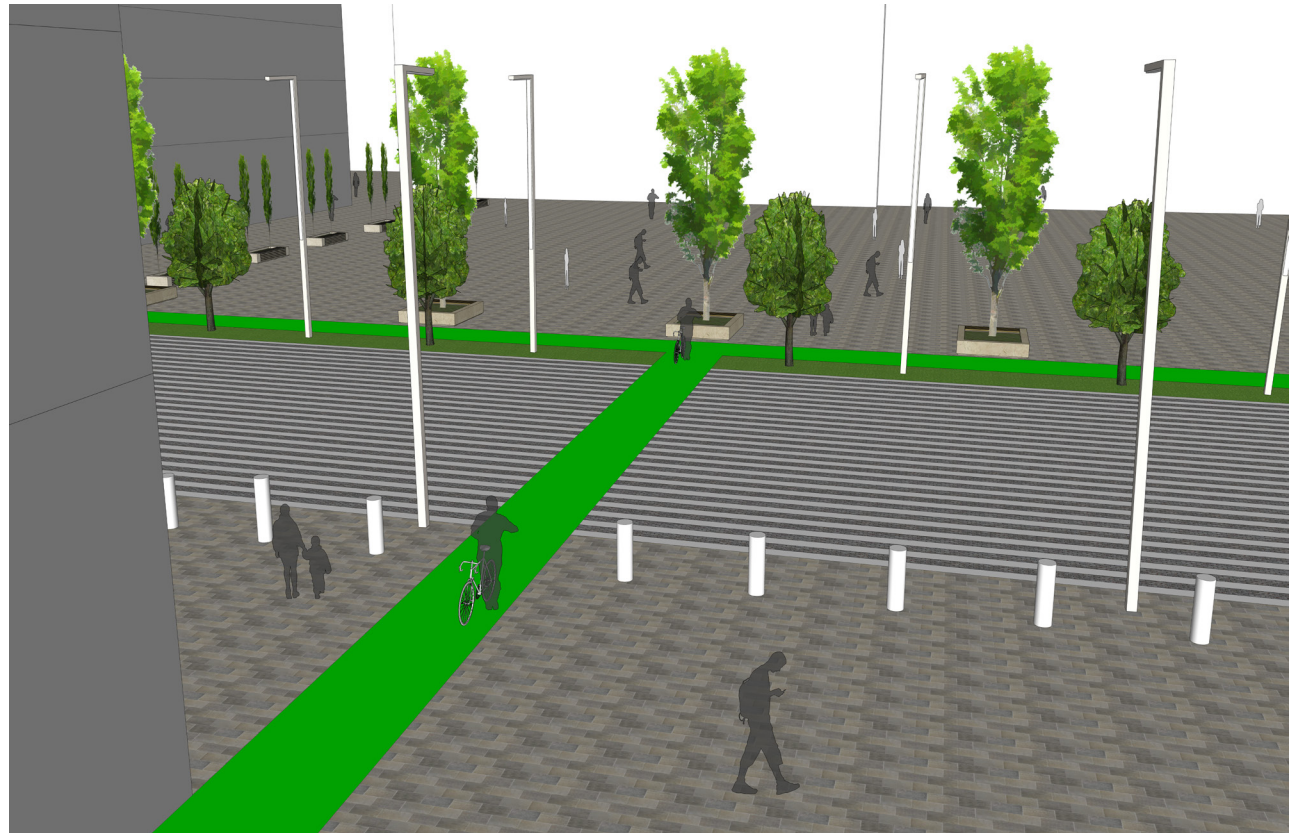


Figure 214_ Bicycle lane at the civic node

Rouse (2013) states that the introduction of green infrastructure in the built form can promote a healthy lifestyle, improve environmental conditions, provide places for people to gather and improve the aesthetics of urban developments. The design introduced new a new form of green structure within the study area. This by introducing perimeter blocks with private/semi private gardens. This is to enhance that natural environment and to add on to the already existing green structure. More trees have been proposed along pedestrian walkways and bicycle lanes mainly for the comfort but at the same time forming a green structure network within the study area. "Urban design should also ensure the continuity of the city's open space network by arranging development and new open spaces in such a way that they become viable and meaningful spatial connections which support biodiversity" (Urban Design policy 2013:15). Measures have been put along Hennops river to ensure that developments are in harmony with the natural environment. This is through waste management, where waste collection bins have been provided, mixed use proposed that includes residential has been proposed on the buildings along Hennops river as means of providing defensible urban

spaces thus mitigating environmental pollution through the 24hr surveillance. According to Baxter and Associates (2000) urban designer must make it easier for humans to live apart while being closer to nature reserves. The tolerance of human activities along the Hennops river must be monitored and any dire effects resulting from human activities must be mitigated or eradicated completely. According to McHarg (1995) the most reasonable approach would be to investigate the tolerance or intolerance of various environments to human use in general and to some particular uses.

The proposals that have been put forward by concept 2 will ensure resilience of the study area from environmental shocks and climate change through the reduction of the carbon footprint mainly from cars. The green structure network and the proposals along Hennops river will ensure that ecological services and the biodiversity are preserved. The proposal generally improves the environmental quality and the quality of lives of the inhabitants as there is maximum access to open space systems.

"Planners can play an equally vital role by integrating green infrastructure concepts and approaches into all levels of planning, from visioning the plan and policy

development to implementation mechanisms such as regulations and capital improvement programs" (Rouse 2013:28)

Concept 2 Built Form Objectives

The proposed built form aims at transforming the predominant low residential on the northern of the study area to block buildings that will have active ground floor. This is through introducing mixed use that will have a component of both commercial and residential. The mix of uses will also address the lack of human scale and insecure and unsafe spaces that are for public use. The ground floor will greatly interact with the pedestrian environment.

Concept 2 Building Scale and Massing

Massing talks to the shape and size of buildings, thus height vs floor area. the massing proposed by concept 2 maintains the human scale. This can be seen at street level in relation to the pedestrian environment. Enclosures have been created through massing, much where there was previously disused land. Some buildings that were previously set back have been extended or new buildings constructed to wrap the existing buildings to frame the streets to help define the streets. Some building with a blank wall and inactive wall facing the street will be opened to make active frontages to contribute to the human scaled grain.

The wrapping of existing buildings is proposed mainly along West Avenue.



Figure 215_ Building scale and massing

Concept 2 Building Edges

The quality of public spaces is determined by its interface with the surrounding buildings. Active ground floors make safe and secure streets and public places. The design has therefore created active ground floors across the precinct, this by introducing entrances, retail and providing glass frontages. Furthermore, buildings have been made such that they front boundary lines and collectively form a continuous human scaled street facade along streets. Street corners have been observed and defined, Canopies that provide a suitable pedestrian environment have also been provided.

Mixed Use Buildings

The new urban blocks created have mixed use to ensure the following;

- high levels of neighbourhood
- street activity,
- urban diversity
- vibrancy
- safe and secure.

Though mixed use is encouraged, in the northern side of the study area where its predominant residential, not much of mixed use has been introduced so as to preserve the residential character. Noncompatible uses are not encouraged.

Sustainability

Sustainable, in general terms means to be able to maintain a certain level, or to be able to uphold and defend. One of the aims of this research was to create self-sustainable urban environments. Pieterse (2011) identifies five dimensions of sustainability. The first one is economic sustainability where economic activities are such that they do not damage the natural resource base. The second one is social sustainability where a set of policies aimed at improving the quality of life are developed and implemented. The third one is ecological sustainability, which looks at the impact of production and consumption on the global carrying capacity. With ecological sustainability, human activities that impact the environment negatively are mitigated, and ones that impact the environment positively are encouraged. The fourth one is physical sustainability, which looks at the ability of the urban built environment to support human life. Lastly, there is political sustainability, which looks at the governance systems, democratisation and the public participation in decision-making.

Of the above, through design, environmental shock from climate change have been mitigated, an economic self-sustainable urban setting has been created through the introduction of mixed use, ecological preservation has been ensured along Hennops river and a built form that can support human life has been created.

Street Furniture

Gehl (2006) states that the more residents are outdoors, the more often they meet, and the more greetings are exchanged and conversations develop. This

substantiates the fact that public spaces must be pedestrianised and equipped with public amenities to render them usable by the public. Street furniture has therefore been provided for. This includes benches, street lights, pedestrian lights, litter bins, and trees. Gehl (2006) again indicates the importance of space for ease of walking. In addition, pavement surfaces are an important element to take into account as they may have a negative influence on pedestrian travel in general.

Transit Oriented Development

Concept 2 makes use of the existing mobility routes, thus the N1, N14 and R21 thus connecting the study area to the immediate area as well as areas that are further. The air base that is situated about 4km from the study area also plays a part in supporting its connectivity though the amount of pedestrian traffic it generates is relatively low.

The development of business and office developments around the rapid rail transit (the Centurion Gautrain Station) will enhance economic activities that will ultimately benefit the entire study area.

Furthermore, the design ensures that the benefits of transit-oriented development are realised. This through the application of the following TOD components;

- Creation of a walkable design that prioritises pedestrians;
- The train station has been used as a prominent feature of the study area;
- A public square has been proposed in close proximity to the train station;
- Support system to the train has been provided for, thus in the form of sidewalks, streets and public transport integration.
- Mixed land uses such as offices, residential, retail and civic have been

provided for, adjacent, and in close proximity to the train station;

- Cycle lanes have been provided across the precinct, and this network connects well to the train station; and
- Bicycle parking areas within the train station and the civic node are proposed.

Upon the application of the above components, the following benefits should then be realised;

- Higher quality of life with better places to live, work and play;
- Greater mobility with ease of moving around;
- Increased transit ridership;
- Reduced traffic congestion, car accidents and injuries;
- Healthier lifestyle with more walking, and less stress;
- Increased foot traffic and customers for area business;
- Reduced incentive to sprawl, increased incentive for compact development; and
- Enhanced ability to maintain economic competitiveness.

Gender Sensitivity

Urban design is a discipline that designs neighbourhoods, towns, and cities for all who use them. Within the urban spaces are public space, facilities, transportation, street elements and the environment that are used and enjoyed by all to support everyday life.

The design has therefore taken into account that it is important to recognize that everyday life is performed in different spheres, productive (paid work), reproductive (caring for people and the home), personal (leisure, sport, and self-care), and community (improving society or the community where one lives). These have been catered for in the design of the study area, thus taking into cognisance that the city is not experienced or lived the same way by men, women and children. To address this, the design of the study area has taken due care to the following

- Creation of an all-inclusive urban form;
- Universal accessibility;
- Providing social and economic opportunities;
- Addressing urban fragmentation;
- Mobility;
- Access to facilities (including distances to work and schools);
- Healthy environment;
- Attractive, safe & secure housing;
- Polycentric urban structure;
- Social facilities, community infrastructure;
- Lighting, street signage;
- Neighbourhood public spaces (perimeter blocks);and
- Public spaces (meeting places, social places, places of political action),



Gender Sensitivity: Source (Google.com)

Planning Standards

Planning standards are a set of approved requirements that guide the physical development of the places that we live in. These standards are set to prevent the development of slum and urban disfigurement. In the context of South Africa, the “CSRI Guidelines for the provision of Social Facilities in South African Settlements 2012”, and the Red Book 1 & 2 are some of the planning guidelines that are used in both urban and engineering planning. These maintain a balance between regulatory practices which benefit society at large and facilitation in order to ensure vibrant and healthy communities and settlements. Furthermore, they achieve a wide range of spatial, environmental, social, economic and cultural outcomes that are valued by society as a whole by planning, facilitating and regulating land use and development. Lastly, they promote sustainability by creating efficient and environmentally, socially and economically sustainable human settlement.

In the research, in some instances, the provision of social facilities that are provided for in the design were guided by the “CSRI Guidelines for the provision of Social Facilities in South African Settlements 2012” these are presented in the tables below.

RECREATION PROVISION (SPORTS AND PARKS) (CONT)				
Total provision for all facilities below is approx 0.5 ha/1 000 (ongoing research is being conducted on the desirability of reducing this; current indications are that for users quality is more important than quantity). The land should be consolidated in developing the facilities below. Thresholds are approximate. Approximately 40% of this allocation is for strategic (regional) and district facilities and 60% for community, urban and neighbourhood parks, play lots, etc.				
Strategic Park	500 000 - 1 000 000	50 km	C/D	Site-specific location
District Park	60 000 - 100 000	10 km	C	Recommended that hard all-weather surfaces be provided within parks for ball games, skateboarding, kick-about spaces, etc. and for ease of maintenance
Community Park with play equipment	60 000	5 km	C	
Urban Park	Variable	1 km	C	Central location in areas of high activity/employment/retail
Local/Neighbourhood Park (includes play equipment)	3 000 - 15 000	1 km	C	May be redundant if district/community park located within reach. Recommended that hard all-weather surfaces be provided within parks for ball games, skateboarding, kick-about spaces, etc. and for ease of maintenance
Play Equipment at other facilities	Variable	Variable	D	Only provided where are no parks; placed at e.g. clinics, libraries

Source (CSIR Guidelines; 2012)

The table above provided a guide for the provision of public parks, where a main public park is provided along Hennops river which serves as a community park.

SOCIAL AND CULTURAL (PUBLIC SERVICE FACILITIES)				
Performing Arts Centre – major	Variable	100 km	D	Site or purpose specific
Community Performing Arts Centre	50 000	10 - 15 km	R	Unfunded and demand-driven
Museum – medium/small	Variable	Variable	D	Site-specific demand
Regional Library – Reference	450 000	50 km	C	
Regional Library	200 000	15 km	C	
Local Library	20 000 - 70 000	8 km - 10 km	C	Discretionary provision if regional library is within 5 km
Mobile Library	Variable	Variable	D	Needs-based for isolated or special categories, i.e. homes for the aged or people with disabilities

Source (CSIR Guidelines; 2012)

A number of public facilities have been proposed in the study area. amongst these public facilities is a local library which is located in the civic node of the design. This type and size of the threshold from which the design draws from is guided by the table provided.

Home Affairs Office

POPULATION THRESHOLD RANGE	40 000 – 400 000 people
ACCESS DISTANCE	1.5 km or less preferred; 2.5 km maximum to at least one facility category
SITE SIZE	0.006 ha (office space as part of Thusing Centre – PPDC 2008); 0.02 ha or larger if standalone building.
<i>[Mobile/periodic Home Affairs Offices to be used if threshold not met]</i>	

PLANNING
National Department of Home Affairs
IMPLEMENTATION
Provincial Department of Public Works
See table below for different office prototypes and populations served

Description

Providing a service-delivery point where the public can access Home Affairs services, information and/or transact services.

Home Affairs Office prototypes

HOME AFFAIRS OFFICE TYPE	MINIMUM POPULATION SERVED	MAXIMUM POPULATION SERVED
Regional Office – large	-	200 000
Regional Office – average	-	140 000
District Office – average	80 000	140 000
District Office – small	40 000	80 000
Permanent service point	20 000	40 000
Thusing Service Centre	20 000	40 000

(National Department of Home Affairs, 2009)

Source (CSIR Guidelines; 2012)

A home affairs office has already been provided for in the study area, this according to the table provided above is a district office average.

Local Market

PLANNING
Private
Municipality
IMPLEMENTATION
Private
Municipality

POPULATION THRESHOLD	5 000 people
ACCESS DISTANCE	Variable
SITE SIZE	Varied: demand-driven, site-specific; 0.02 ha - 4 ha

Description

Accommodates the informal sector and fresh produce sector. Includes a roof, washing areas, lock-up storage for traders, ablution facilities, and refuse area. Some include permanent trading stalls.

Site Requirements

Depends on demand – space required for loading and off-loading; aisles wide enough for delivery carts.

Threshold Issues

Demand depends on socio-economic profile of community (higher demand from lower income but higher income communities also use these). Traders prefer areas with higher thresholds and accessibility.

Location Factors

Planning should include research that confirms a reasonable economic basis for a market. Markets should be strongly connected to outside pedestrian flows to encourage people to walk through the area.

Source (CSIR Guidelines; 2012)

As alluded to earlier, the study area already has non formal markets that currently exist. The design has therefore incorporated these in the design. These markets are in the civic node of the study area, next to the proposed taxi tank. The size of the site that they occupy measures 1 230 square meters, which translates to 0.123 ha.

STUDY AREA FUTURE PROPOSALS/ INNOVATIONS

This section presents the anticipated future for the study area. the spaces that have been provided are dynamic spaces, with uses and functions that can change from time to time. This adoptability makes it possible for the use of the spaces to change from time to time. The proposed future innovations are further discussed below.

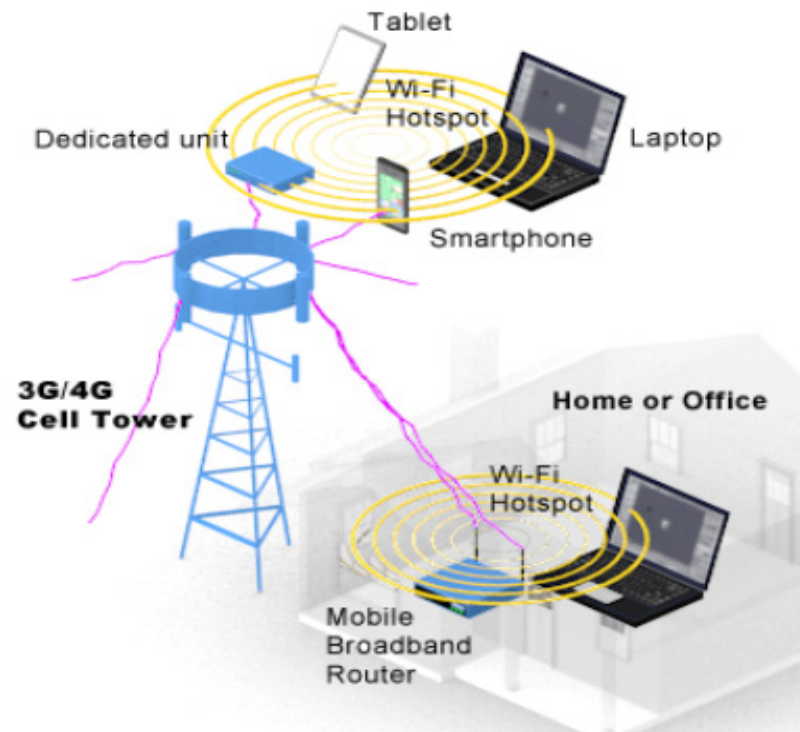
Urban Agriculture

This refers to the cultivation, processing and distributing food in or around urban areas. The study area has pockets of land in the public and semi-private realms (perimeter blocks) that can be used for urban agricultural purposes. High rise buildings roof tops can also be used for urban agriculture. There are a number of potential benefits that the study area can benefit from, these include;

- The vegetation will act as carbon sink;
- Employment creation (production and processing of the produce);
- Reduction of surface water runoff, thus mitigating the risk of flooding;
- Creation of sustainable food systems;
- Aid in the recycling of urban waste;
- Strengthens the study areas' resilience to climate change;
- Promotion of healthier lifestyles;
- Food security; and
- Promotes social and economic development.

Wi-Fi Hot Spots

With the rapidly digitising world, it is imperative for the study area adopt so as to keep up with the modernising world. One way could be through the provision of Wi-Fi hot spots across the study area. Wi-Fi hosts are areas with wireless internet network. The area has sufficient land on the road reserves that would enable the construction of an Optic Fibre network, which is a cable that is used for high speed internet.



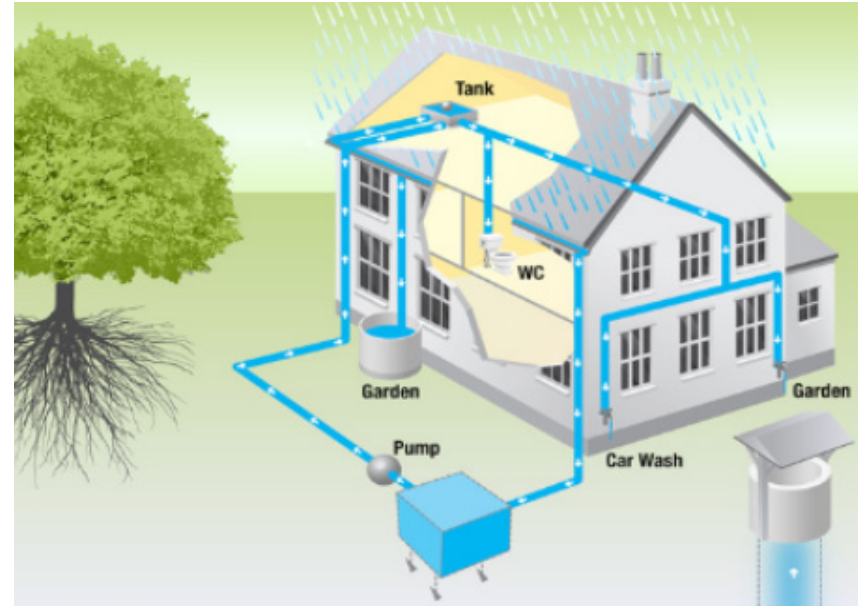
Wireless Internet -Source: Google.com

Rainwater Harvesting

Water harvesting refers to the capturing rainwater, where it falls and capture the runoff from, catchment, streams, roof tops etc. This water can then the stored and/ or used for domestic, commercial or urban agricultural purposes. The study area has a numbers of buildings, stormwater network and a river where rainwater harvesting can be done. The presence of dolomite in the Centurion area presents limitations on the possible sources of water as the sinking of boreholes is not permitted. Rainwater harvesting then becomes a pragmatic option. This will ensure the sustainability of the area in that soil erosion will be mitigated, urban agriculture will be supported, water is conserved, and reduces pollution of water bodies.

Grey Water

Grey water refers to the wastewater from baths, sinks, and machines. With the densification that will take place in the study area, the grey water outflows will increase. In future, this water can be put to good use for agriculture, toilet flushing etc.



Rainwater Harvesting-Source: Gooogle.com

Waste to Energy

This refers to the process of generating electricity from waste. As highlighted in the context analysis, one of the challenges experiences in the study area is one of wastes, especially along Hennops river. This waste can also be put to good use with the innovation use of technology. The development of portable plasma mobile units that makes it possible for this units to be placed in any type of setting, be it residential, commercial etc. the study area is a big generator of solid waste, instead of transporting these wastes to landfills, they can rather be fed into the portable plasma units where one cubic meter of wastes generates 5kW of electricity. This electricity can then be used to light up traffic lights, streetlights, pedestrian lights and public spaces. This will further enhance safety within the study area.

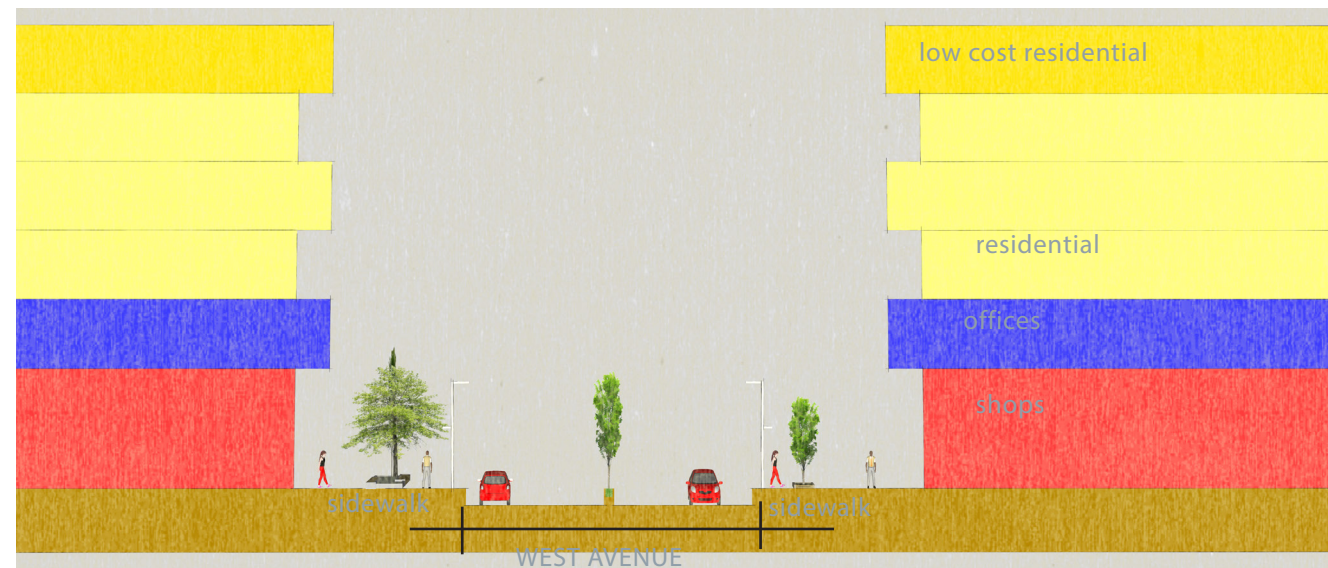
Densification

The figures below depict the envisaged future as the study area get urbanised. This with reference to west avenue, where the train station is located.

2010



2020



2040



Form the presented sections, it can be seen that West avenue with time with densify and street activities increase. The centre pedestrian walkway is removed, vegetation is more prominent, and street furniture is provided for. Road width have been but still wide enough to carry vehicular traffic. Activities introduces along sidewalks (commercial activities).

HENNOPS RIVER, PARK INTERVENTIONS

A number of interventions have taken place along Hennops river, where the public park is located. This, in an attempt to make this public space safe for use by everyone. These interventions are discussed in the following sections.

Mixed use

Mixed use building with shops on the bottom floor, offices and residential will generate pedestrian activity thereby reclaiming the previously unsafe space. Furthermore, the introduction of residential land use will ensure 24 hr surveillance to the area.

Furniture

Street furniture such as trees, lights and benches have been introduced to the park to increase its usage, safety and comfortability.

Bicycle Lane

A cycling lane has been introduced to further increase activity in the park and also to encourage a healthy lifestyle.

Sidewalks

Several sidewalks have been introduced to the park area, providing pedestrians with choice as to which sidewalk to use. These further integrate the park with the rest of the study area. activities in the form of active shop frontages are also present on the sidewalks.

Safety

The introduction of activities, provision of street furniture previously, mixed use buildings, residential developments alluded to will enhance safety of the park. .

Walkability

The study area has four distinct nodes all with comfortable walking distances within them. The distance from the train station to either the residential node or the civil node remains largely walkable with distances of 500 meters and 700 meters respectively. Side walks with trees for comfortability, and active ground floors have also been introduced to make the study area walkable.

Identity

Identity tells the context of modernity, history and the politics of representation. Concept 2 does not obliterate any existing form, meaning no existing structures are demolished. Furthermore, the social constructs that have evolved as a result of historical determinism have been kept intact. As alluded to earlier, the study area is divided into four distinct area, thus the civic node, shopping node, business node and the residential node. None of these nodes' identity have been diminished, but rather the proposals are cognisant to the nodal identities. All heritage buildings that exist in the area have been retained and are not wrapped by any proposed developments. The urban character, neighbourhood character and local character have not been compromised.

Urban design principles applied on concept 2

Several urban design principles were applied to the Centurion Gautrain Precinct in order to make it habitable/ liveable, safe, and self-sustainable. These are discussed below;

Permeability

Bentley et al., (1985) allude to that fact that a permeable environment offers a number of alternative ways through and an environment and is central in making responsive places. In this research, the permeability principle was used extensively, with particular attention paid to pedestrian walkways, where a number of alternate walkways are made to link the north and the south of the study area.

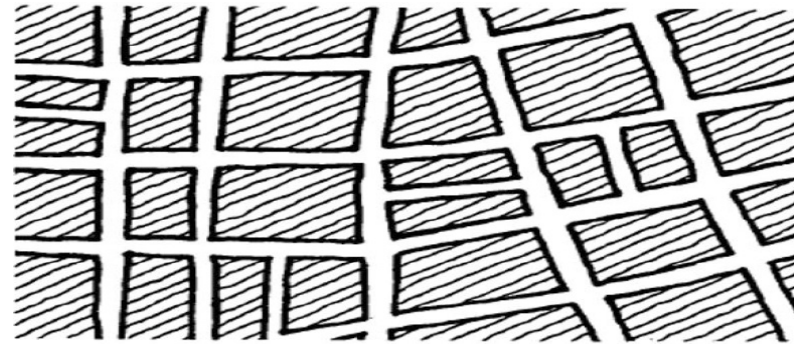


Figure 218: Permeability (BENTLEY et al., 1985)

Variety

Variety of experience implies places with varied form, uses and meaning (Bentley et al., 1985). The take of point of the design was to identify different nodes (places with varied form), different uses where then applied to parcels of land as well as buildings thereby increasing choice for the people.



Figure 219: Variety (BENTLEY et al., 1985)

Enclosure

Enclosure refers to an environment where public spaces and streets are framed or visually defined by buildings and street elements such as trees to create a room-like environment. Enclosure was again applied in the design. All the squares are framed by buildings and all the new buildings that are proposed are such that they frame the streets. This has in essence made these spaces safer as residential developments have been proposed to create 24-hour surveillance.



Figure 220: Enclosure (Source: Google.com)

Robustness

Places which can be used for many different purposes offer their users more choice than places whose design limits them to a single fixed use (Bentley et al., 1985). Public spaces have been provided in the design. No specified activities have been made for each of the spaces. This entails robustness of the study area as these spaces can be used for any activities. Similarly, the buildings in the study area should be such that their use can change from time to time (small scale robustness).



Figure 221: Robustness (BENTLEY et al., 1985)

Livability/ Personalization

According to (Bentley et al., 1985) it is important for people living in a specific environment to personalise it so that it bears the stamp of their own values. The design has facilitated liveability in a number of ways. This is through the provision of transportation choices, provision for low cost housing, and enhancing the economic competitiveness. This was done in order to accommodate diversity within the study area



Figure 222: Liveability (Source: Google.com)

CHAPTER 7

CONCLUSION



The research has presented a framework that has set a foundation for the development of two or more precinct plans. Each of the nodes, or two combined, identified in the research can constitute a precinct plan. The study has investigated and tested urban design principles using two designs concepts. This has proven that, certainly any urban setting with the application of urban design principles can be transformed to a habitable safe and self-sustainable urban setting as with the case with the study area in Centurion.

With reference to the research question and sub-questions;

What role can the urban design principles play in transforming undesirable urban spaces to desirable urban spaces?

In the case of the study area, urban design principles restructure and appropriated the public spaces that are used by people. The unsafe and dysfunctional spaces were transformed, pedestrian vehicular conflicts mitigated, more choice provided for services and pedestrian furniture, infrastructure and movement prioritised.

What are urban design principles and what are they set to achieve?

Urban design principles are guidelines that are used to design spaces between buildings so as to enhance these spaces for the people to use. The objective of principles is to shape and give form, character to public spaces. These are done at both macro and micro scale.

What are the physical conditions that make urban spaces safe and usable by everyone?

With reference to the study area, areas with no activity, dysfunctional, vehicular orientated and unused spaces are spaces that are perceived as unsafe spaces.

What are the key urban design instruments, interventions, elements or tools to consider when transforming or re-imagining undesirable urban precincts?

From the urban design principles identified and applied in this research, the ones that explicitly focus on the basic needs of people in any environment. An example of such principles are liveability and accessibility/ pedestrian. In my opinion, those are key in transforming any urban precinct.



Findings

From this experience, it is essential for one to determine the root cause of urban problems prior to prescribing any remedies. A thorough interrogation and understanding of the context is critical including the history thereof.

The study revealed that the undesirable state of the study area was as a result of under development. The causes of underdevelopment were further investigated on as to ascertain why developments are fragmented. Initially it was thought that the geology of area was the major cause. But upon intense surveys and investigations it was found that lack of integration between the north and the south and dysfunctional spaces is the cause of urban problems identified in the problem statement. This problem is spatial in nature and was therefore mapped and remedies, in the form of the application of certain urban design principles proposed.



Recommendations

In conclusion it is recommended that the proposals made to the study area be applied so as to create the “Centurion Gautrain City”, which will use the Gautrain station as its catalysis for development, be applied. This can be in the form of detailed precinct plans, for each of the for segmentations made to the study area. This framework has given direction for the study area that directs future development that enable the creation of sustainable urban environments. The precinct plans will further give guidelines for land use mix, distribution and intensity, as well as, for built form, public space and landscape that will lead to a high quality and a high-performance urban environment.

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