

Compact Habitat Adapt

Responding to Densification Practices in the
Historical Centre of the Post-Apartheid City.





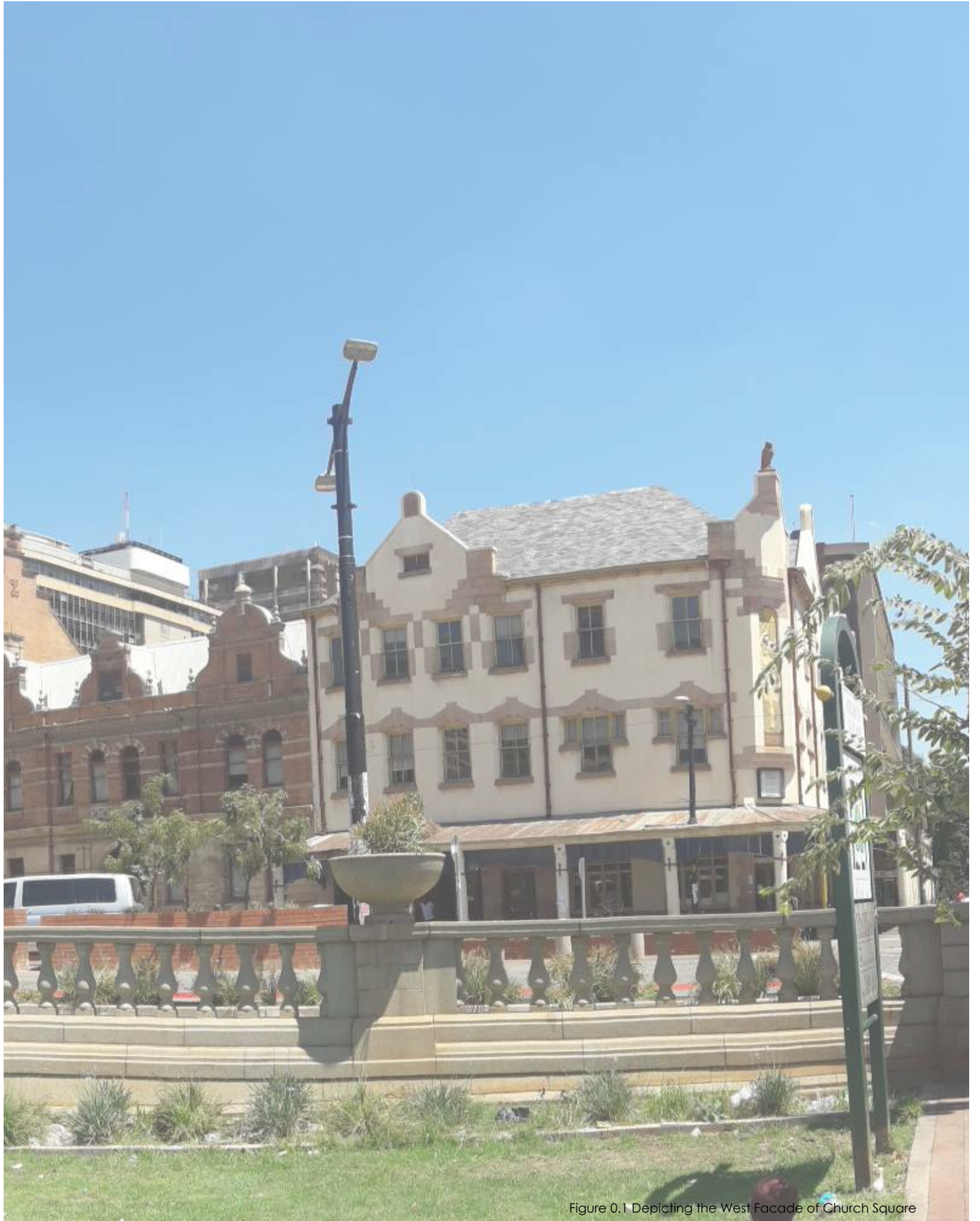


Figure 0.1 Depicting the West Facade of Church Square



Figure 0.2 Depicting the Market Space Infront of the Capitol Theatre (Author 2020)

In accordance with Regulation 4(c) of the General Regulations (G.57) for dissertations and theses, I declare that this thesis, which I hereby submit for the degree Master of Architecture (Professional) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution. I further state that no part of my thesis has already been, or is currently being, submitted for any such degree, diploma or other qualification.

I further declare that this thesis is substantially my own work. Where reference is made to the works of others, the extent to which that work has been used is indicated and fully acknowledged in the text and list of references.

Reginald Venter

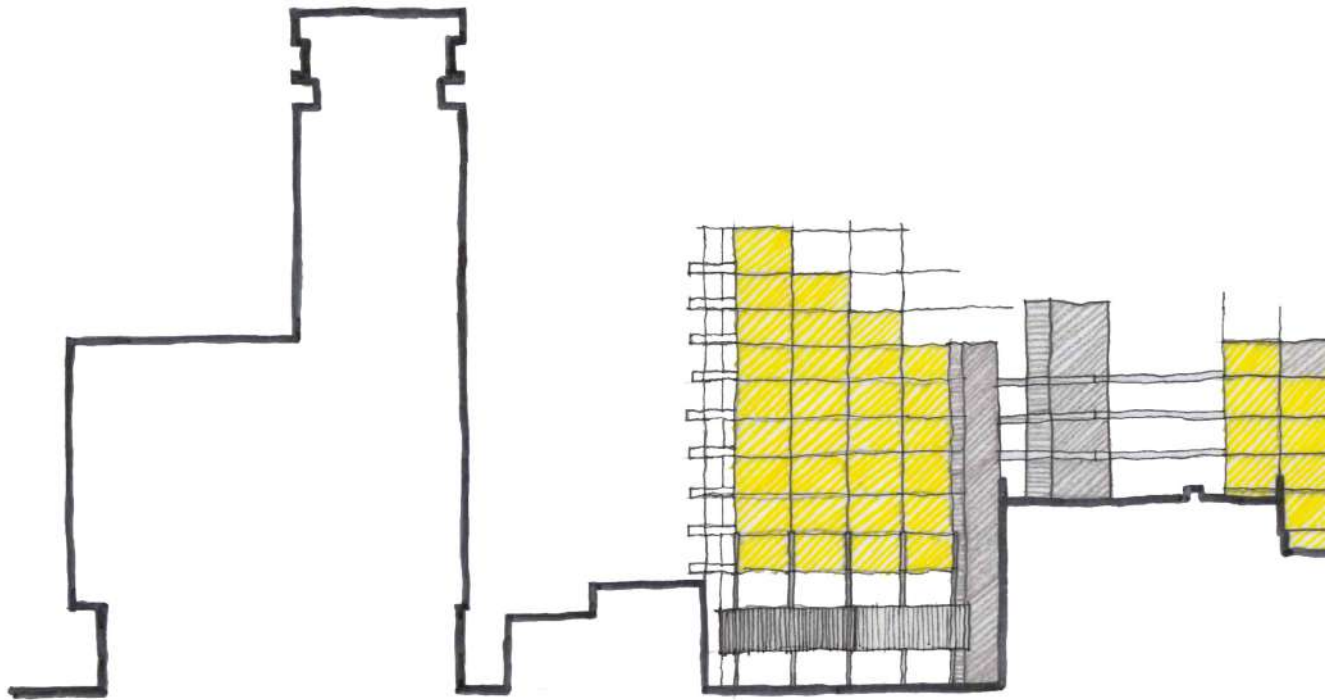


Figure 0.3 Compact Habitat Adapt Sketch (Author 2020)

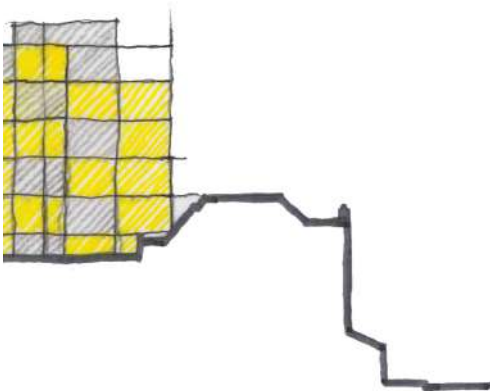
Abstract

Compact Habitat Adapt looks towards an urban development, which can re-establish relevance into the core of cities, through functionality and holistic sustainability.

Cities in South Africa share a complex history, one that is conserved in its architecture. The preservation and conservation of the built fabric have formed an assertive role in suburban sprawl and decentralization. The cities are left stagnant-unable to adapt or change to the needs and problems faced today, and very concerning problems predicted in the future. Vacancy and urban decay have become the identity of these cities as paradigm shifts occur. The obsolescence caused by the pursuit of a former identity of South Africa.

The dissertation looks towards an architectural realm of the future, where architecture can no longer serve as an object, but an adaptable habitat. One that does not become obsolete in time, but grows and transforms with the changing city. It does not follow the principles of new and standing alone but merges with the existing. It becomes a collection of components, much like a machine, filling in the spaces between. Repurposing and reinventing the existing towards spatial, social, and environmental sustainability relevant to the present and future needs.

Church square in the city of Pretoria translates the concerns of an urban fabric that has in some terms become irrelevant. The area shows an opportunity for further investigation of an architectural intervention that questions the current state of the city and its development policies.

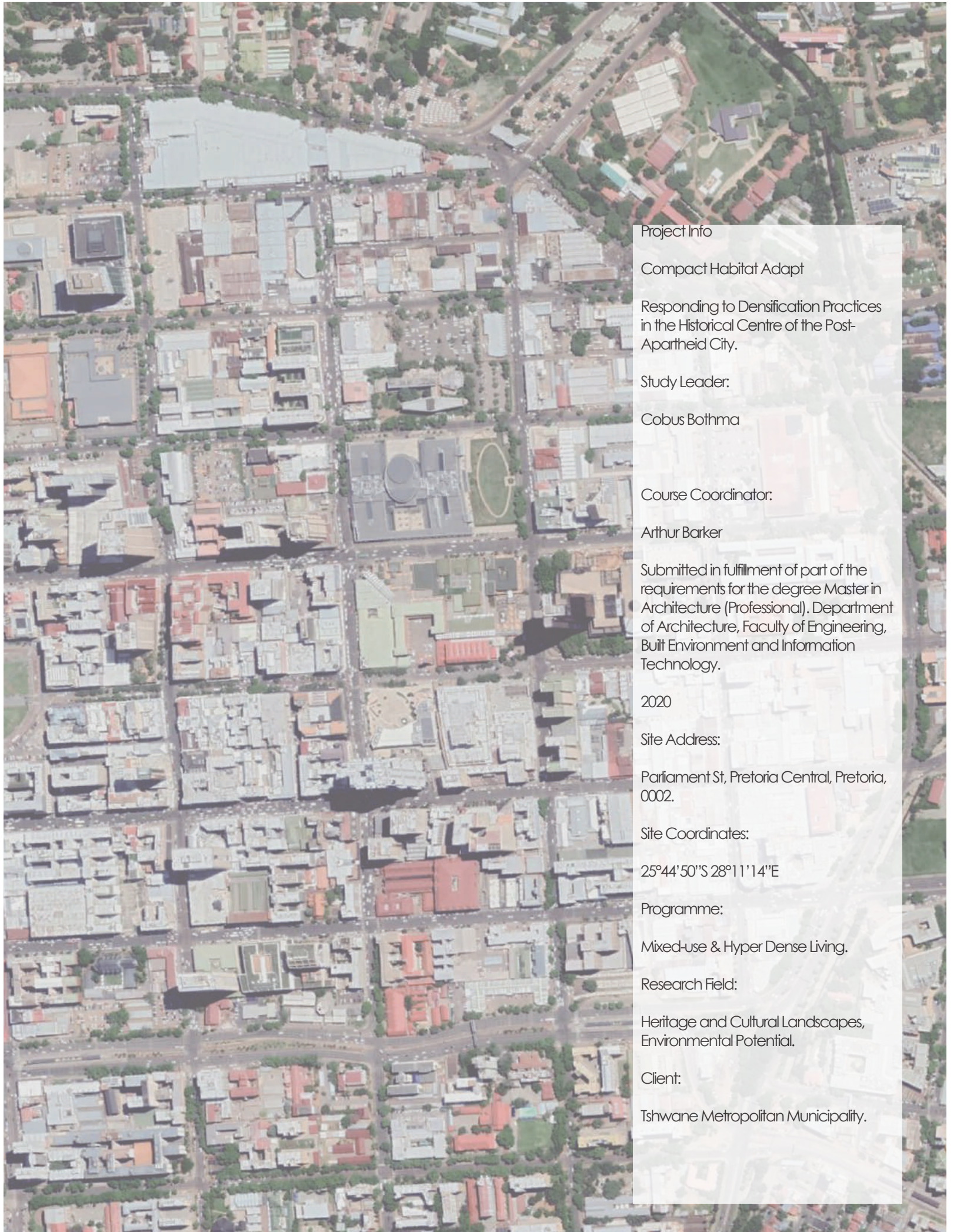




Project Location



Figure 0.4 Depicting the inner City of Pretoria (Adapted from Google Earth 2020)



Project Info

Compact Habitat Adapt

Responding to Densification Practices in the Historical Centre of the Post-Apartheid City.

Study Leader:

Cobus Bothma

Course Coordinator:

Arthur Barker

Submitted in fulfillment of part of the requirements for the degree Master in Architecture (Professional), Department of Architecture, Faculty of Engineering, Built Environment and Information Technology.

2020

Site Address:

Parliament St, Pretoria Central, Pretoria, 0002.

Site Coordinates:

25°44'50"S 28°11'14"E

Programme:

Mixed-use & Hyper Dense Living.

Research Field:

Heritage and Cultural Landscapes, Environmental Potential.

Client:

Tshwane Metropolitan Municipality.

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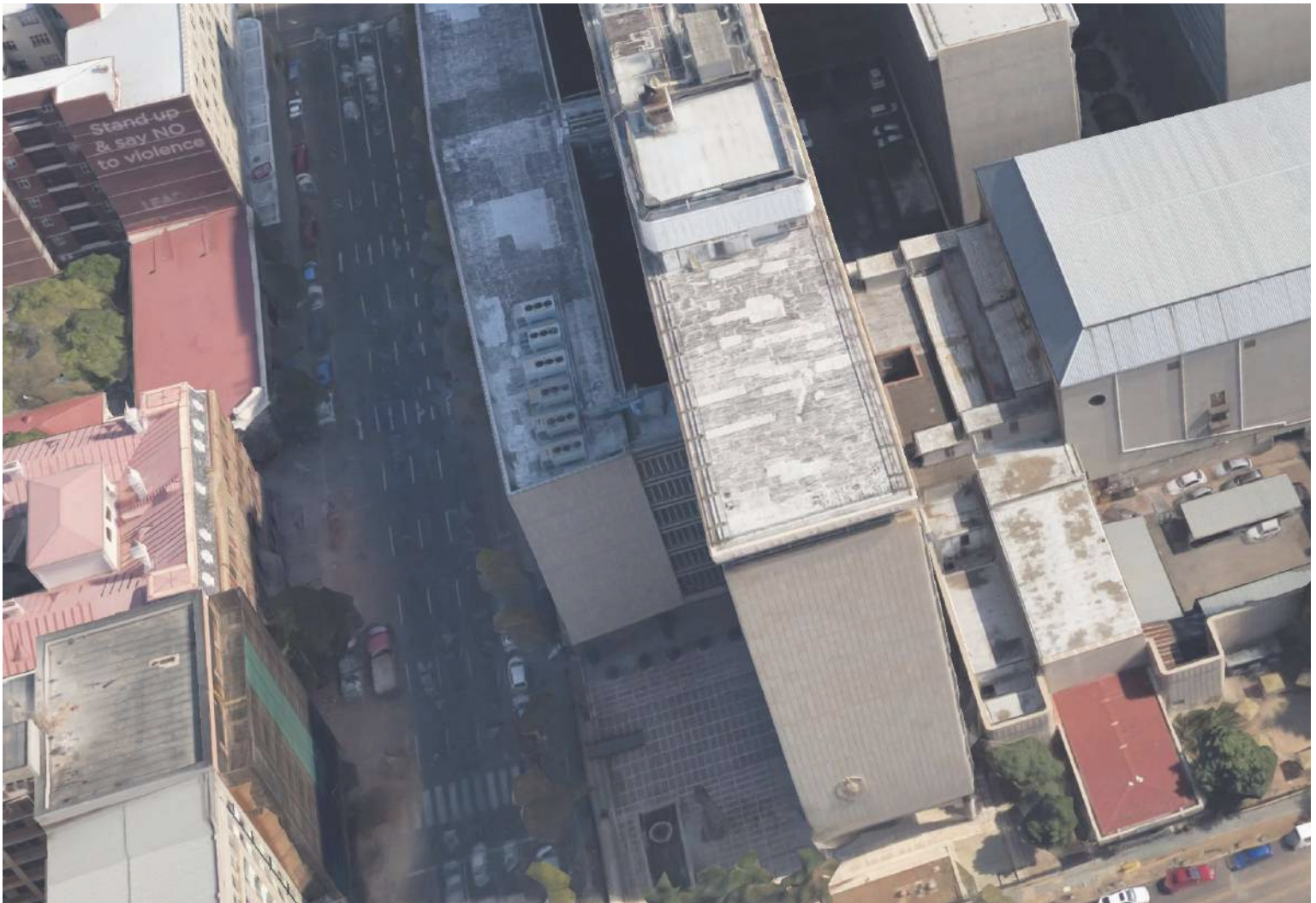
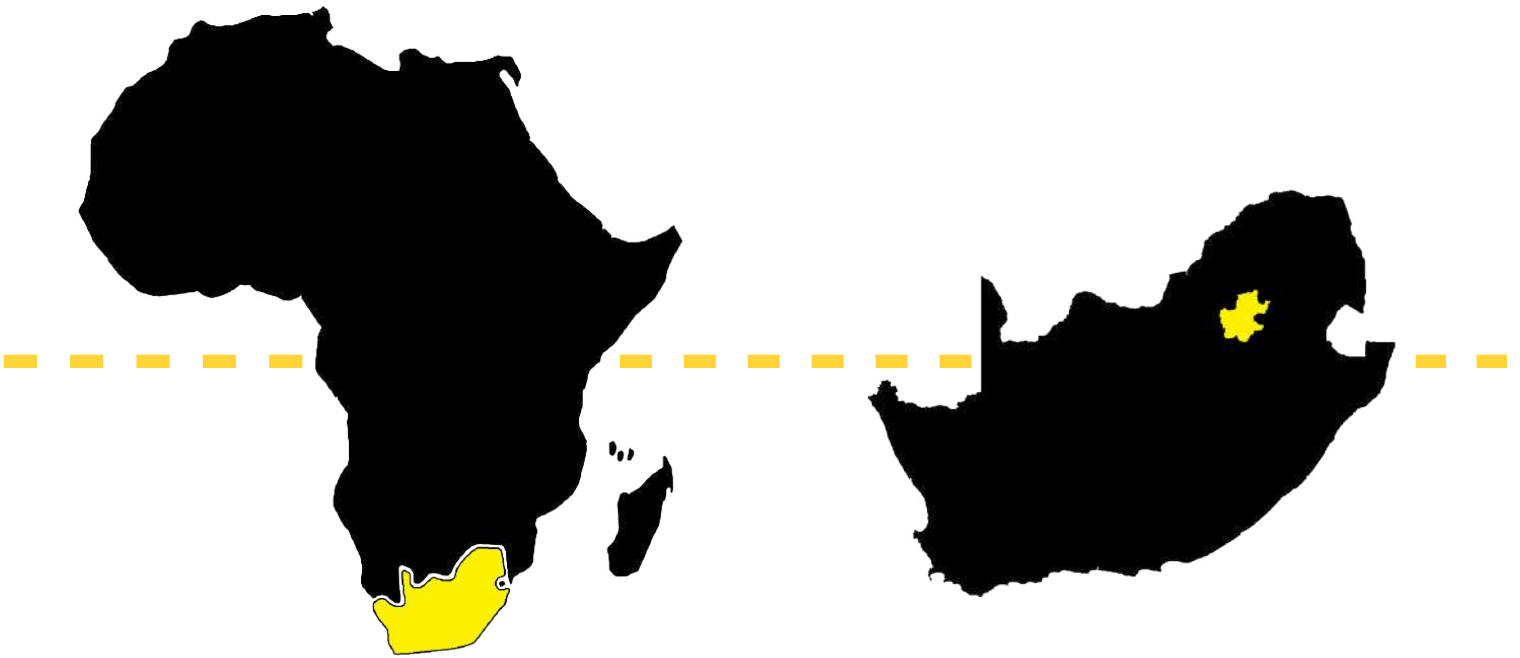
Figure 1.1 Church Square (Author 2020)

Chapter

01

INTRODUCTION





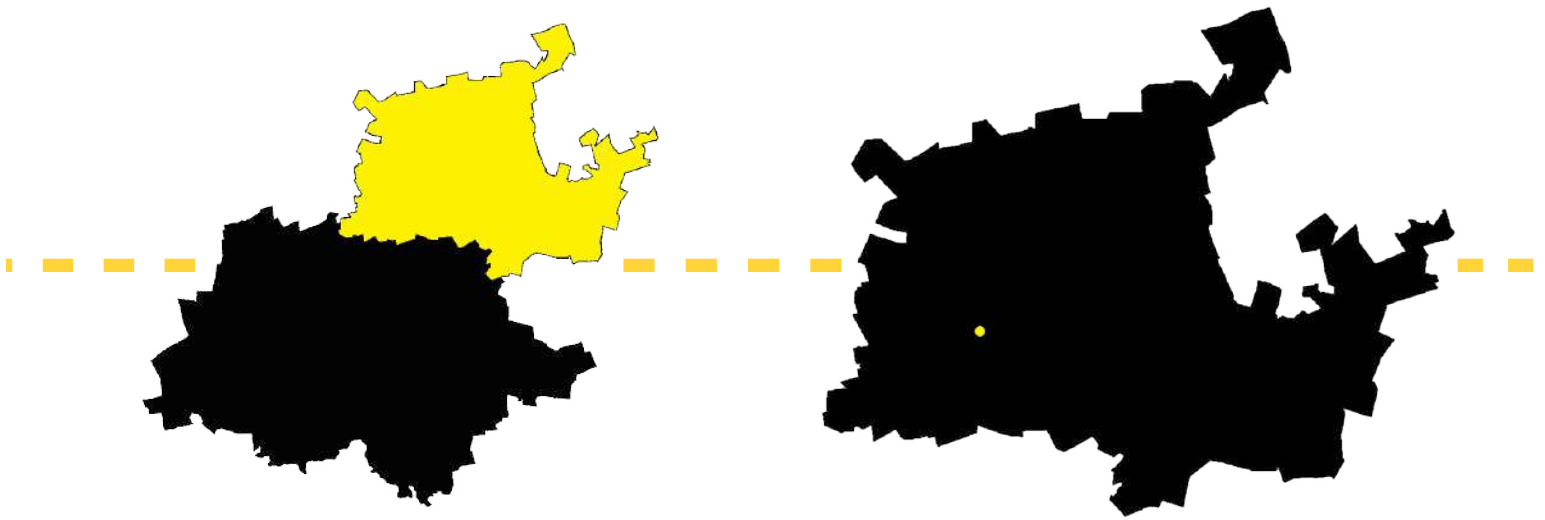


Figure 1.2 Locality(Author 2020)

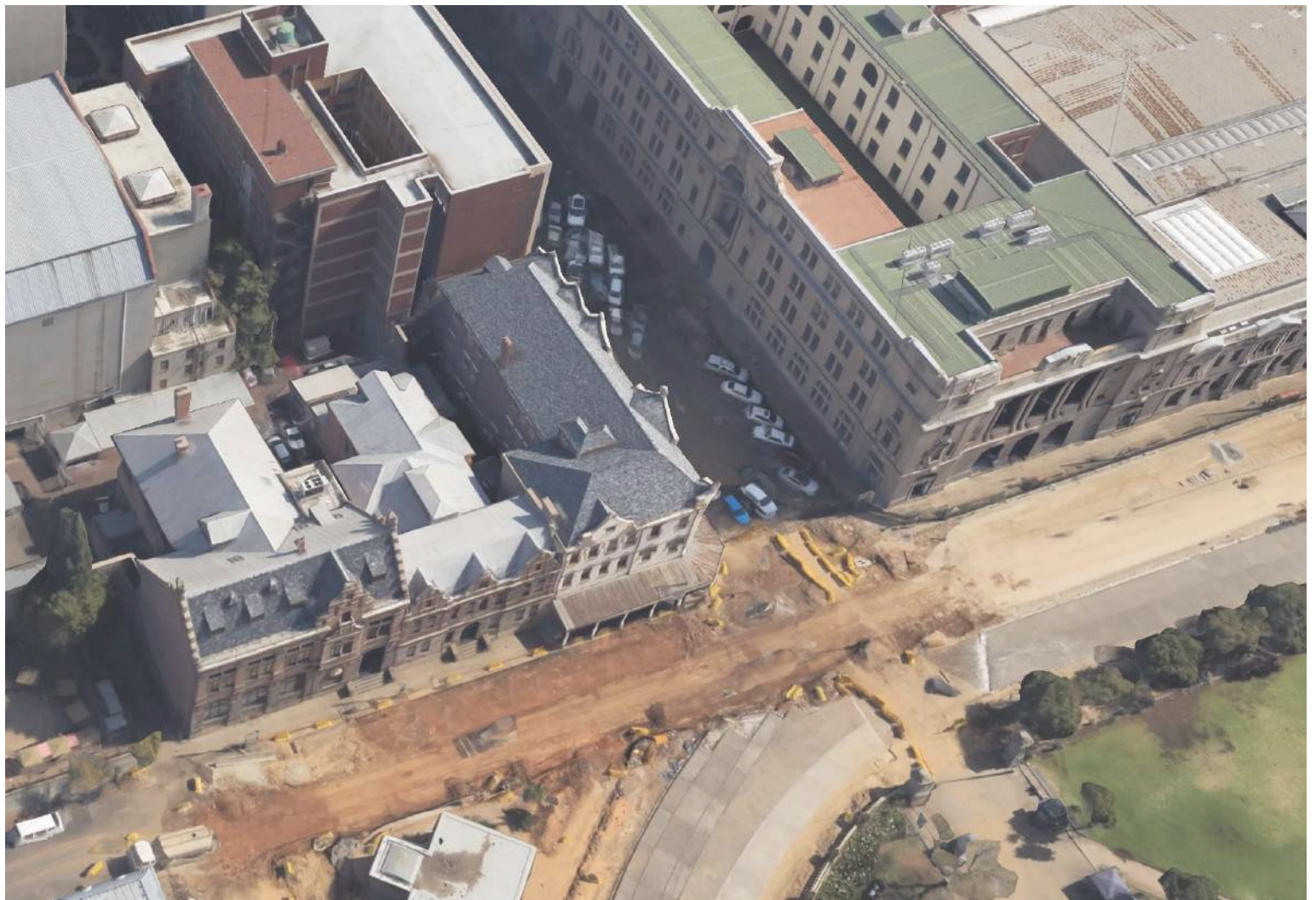


Figure 1.3 The Urban Block Site(Adapted from Google Earth)

1.1 History and Attributes to Pretoria as a City

Pretoria was founded in 1855 and was established as the capital city of the Zuid-Afrikaansche Republiek (ZAR). According to Holm (1998:59), the city was first conceived in the early 1800s by the Voortrekkers, who displaced the Matabele people and who in turn displaced the Ndebele (Corten et al 2014:107).

The agrarian settlement was established as a religious gathering and not a commercial one, surrounding a Dutch Reformed Church. A square formed beyond the church to allow space for farmers attending 'nachtmaal' (Holy Communion) to set up temporary 'tuisuisse' (cottages) and store their

wagons and oxen. The square was the first to formalize and was named Church Square and the cottages were eventually permanently inhabited by settlers. The quarterly Holy Communion offered the opportunity for trade and socializing, therefore the original Church Square was extended to form an additional Market Square (Holm 1998:59).

The settlement was further developed under a regulated order, through constitutions and regulations set out by the Voortrekkers, desperately in search of a permanent place to call their own (Corten et al. 2014:103). A simple grid system model was adopted by the planners with

wide enough streets to accommodate the farmers' ox wagon's turning radius. The grid system imprinted lines of order on the wild landscape, contrasting the civil to the natural. The settlement also serving as a representation of the Voortrekkers enduring a harsh lifestyle in the wild to a rational and civilized one, where the wilderness was seen as a real and constant threat (Corten et al 2014:103).

Settlers had to cope with many irregularities formed by the natural landscape around the settlement (Holm 1998:61) Choosing to settle in a valley well-watered by the Apies River on the eastern and the Steenoven spring on the western side,

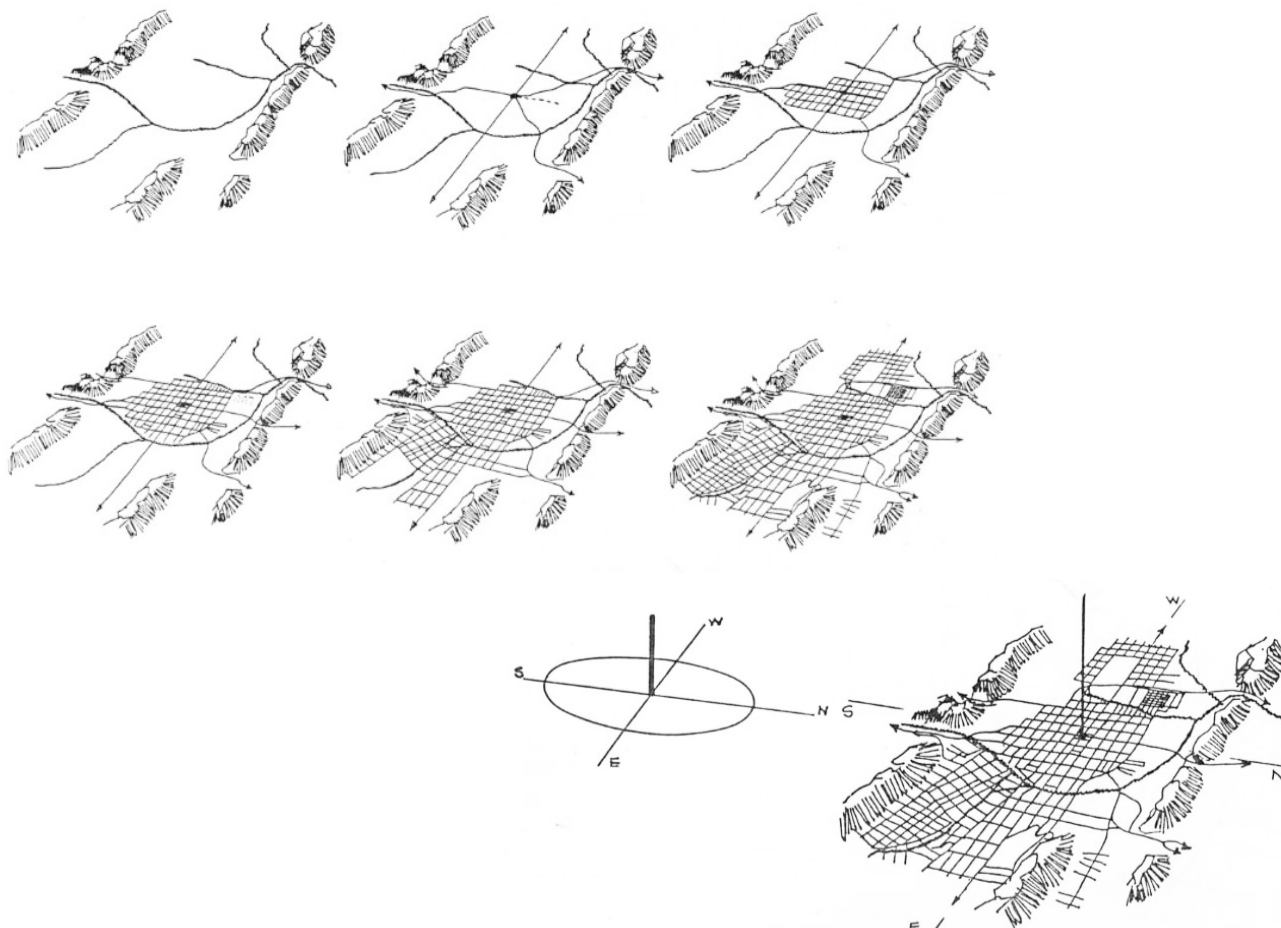


Figure 1.4 Pretoria's Development (Jordaan 1989)

and bordered by hills on the South and the Magaliesberg Mountains to the North. The town's boundaries, therefore, are defined by the natural landscape and development preferred between the water sources on arable land (Corten et al. 2014:107).

The initial regulations were simple but required residents to build on the street edges of their erven, erect boundary walls, cultivate their properties, and plant trees in front of their erven to create a shaded pavement and street edge (Holm 1998:60).

The early Afrikaner town layout was defined by these elementary unifying guidelines and further guided by socio-religious values visible in both the plan and silhouette of the established town,

which strived for an urban unity in its establishment as the capital city of the ZAR. In summary, the urban design was modelled from the Roman 'urbs quadrata', the Cartesian Grid system, the Northern Cape settlement of Graaff-Reinet, and Hausmann's Paris (Holm 1998:59,61,62,63, Corten et al. 2014:107). The models all reflecting the intentions of Paul Kruger's 'Eendracht maakt macht' into a built form, where the whole is perceived as more than the sum of the parts (Holm 1998:64).

1.2 Attributes to the city

According to Holm (1998:61), the grid was ordered around the church as its centre, relating to the cosmic order of the sun's path, to the openings in the Daspoort and Schurweberg mountain range and the waterways, thus defining

the town's genius loci (Corten et al 2014: 63). The historical centre of Pretoria therefore characterized by the strong grid street pattern with Church Street and Kruger Street forming the two main axes around which Pretoria developed (Corten et al 2014:103). The placement of buildings and boundary walls between cultivated areas, defined by the lining of trees and water channels produced well-defined streets and squares. The practical elements thus creating the attractive aesthetic of the city.



Figure 1.5 Market Square During Nachtmaal (Anon 1890).



Figure 1.6 One of the Churches that stood in the Square (Anon 1890).



Figure 1.7 Church Square (Anon 1910's).



Figure 1.8 Church Square Tram Service (Anon 1920's).

EVENTS:

ARCHITECTURE:

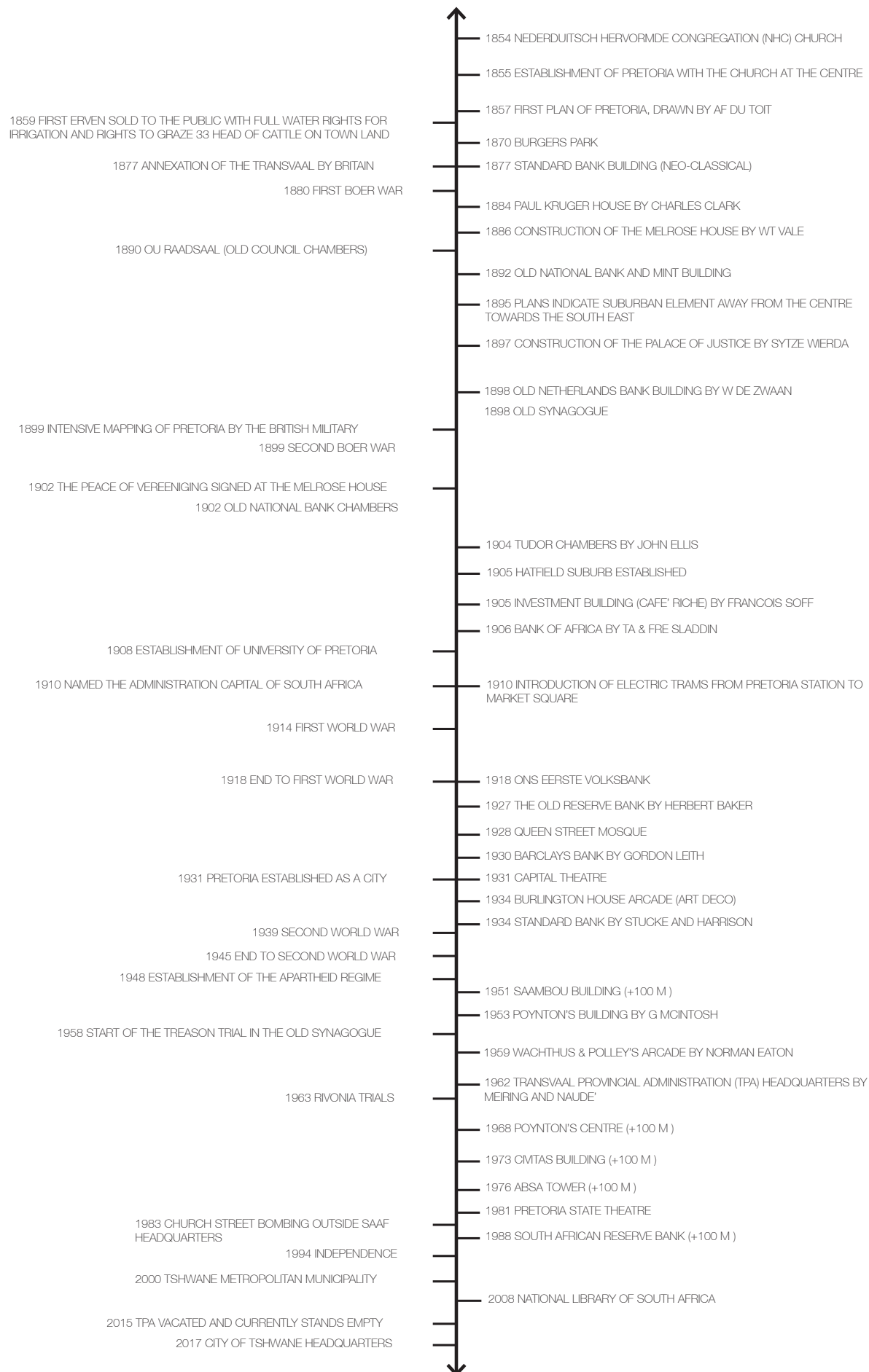
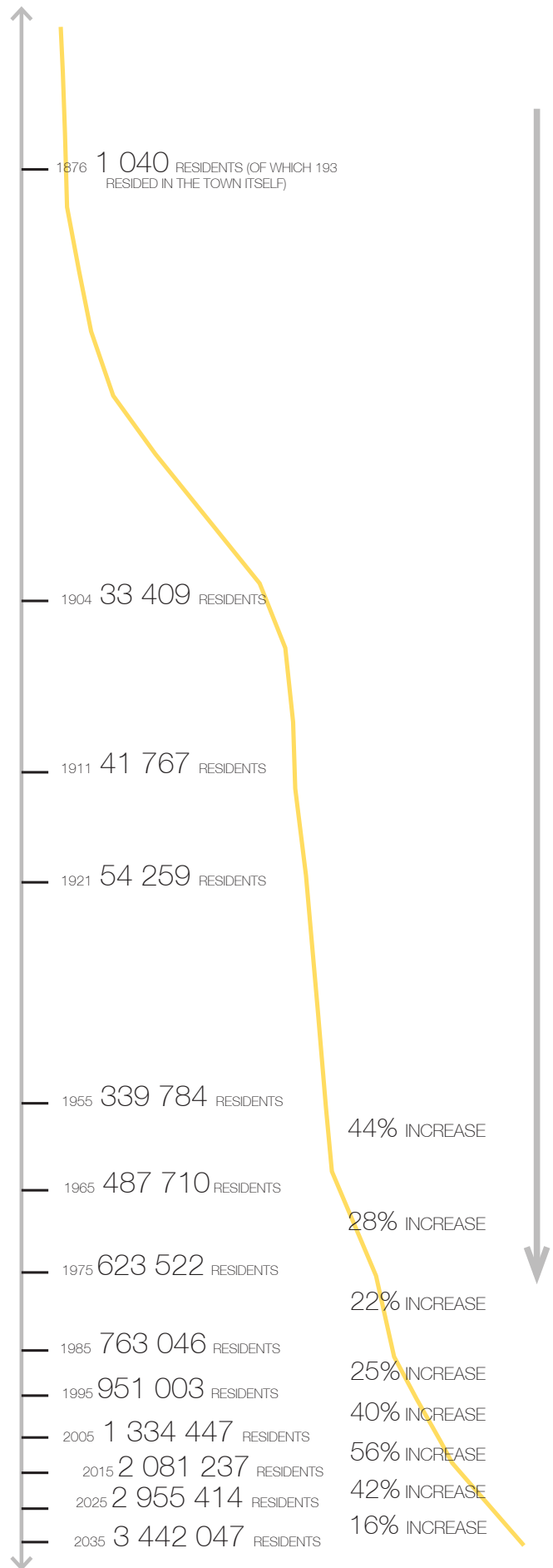
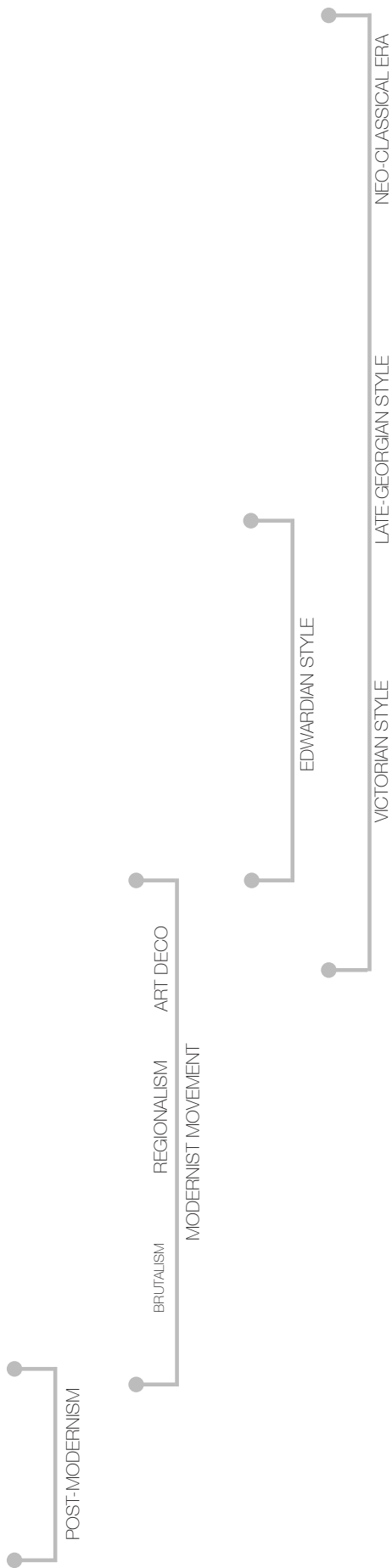


Figure 1.9 Study of Historical Events, Buildings and Population Growth of Pretoria (Author 2020).

ERA:

POPULATION GROWTH:



1.3 Pretoria as Case study

The city of Pretoria is currently one of three capital cities in South Africa and also the administrative capital of South Africa. The city itself has a population of 700 000 residents and the larger urban area, a population of 2 565 660 residents. The city occupies 687.54 km² and a population density of 1100 residents per km² (WPR 2020).

The Project focus is grounded around the historic city centre, Church Square. Pretoria forms the study area of this dissertation where the focus is placed on introducing hyper-densification into a historical fabric and dealing with the presence of the existing context.

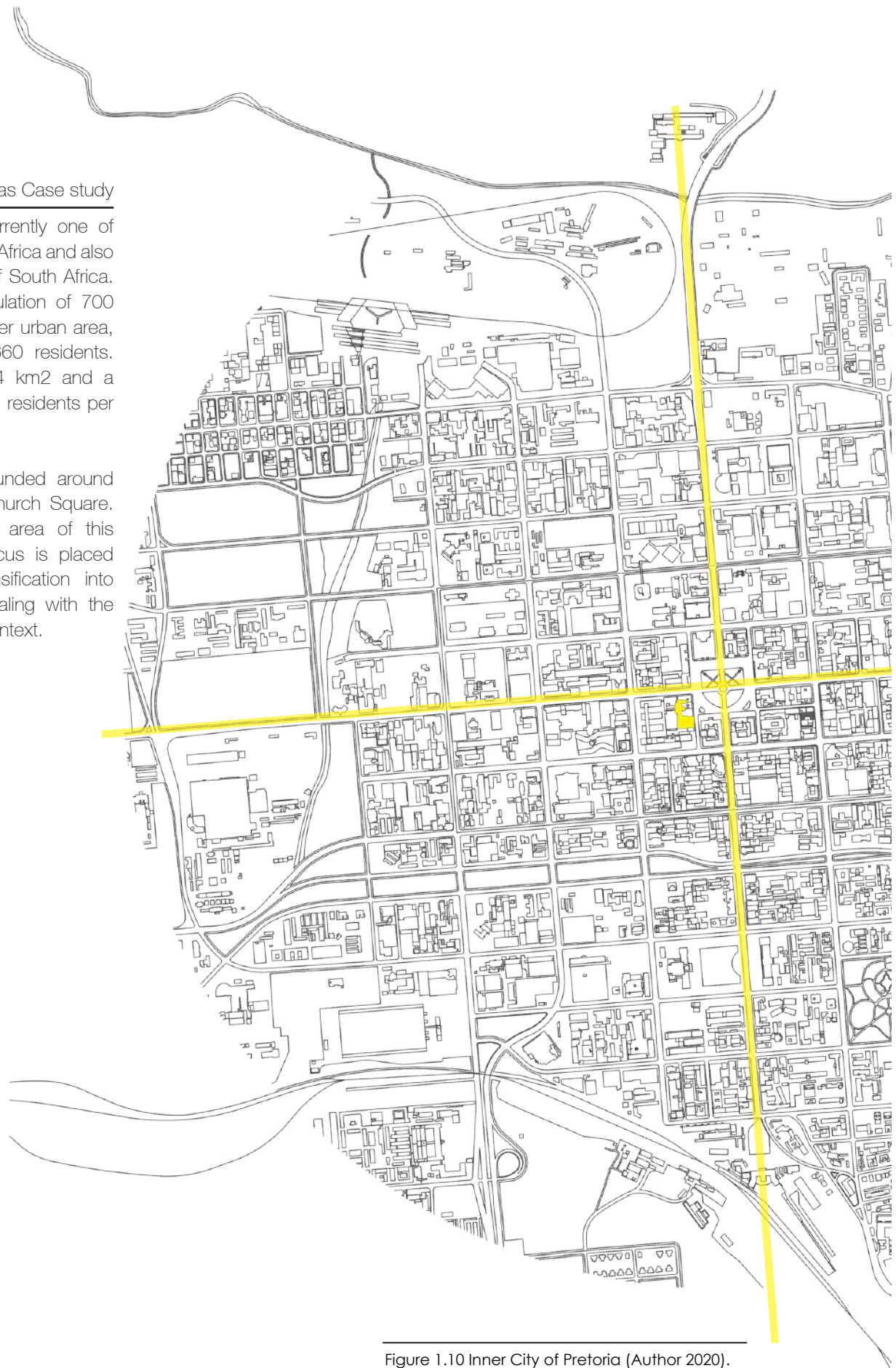
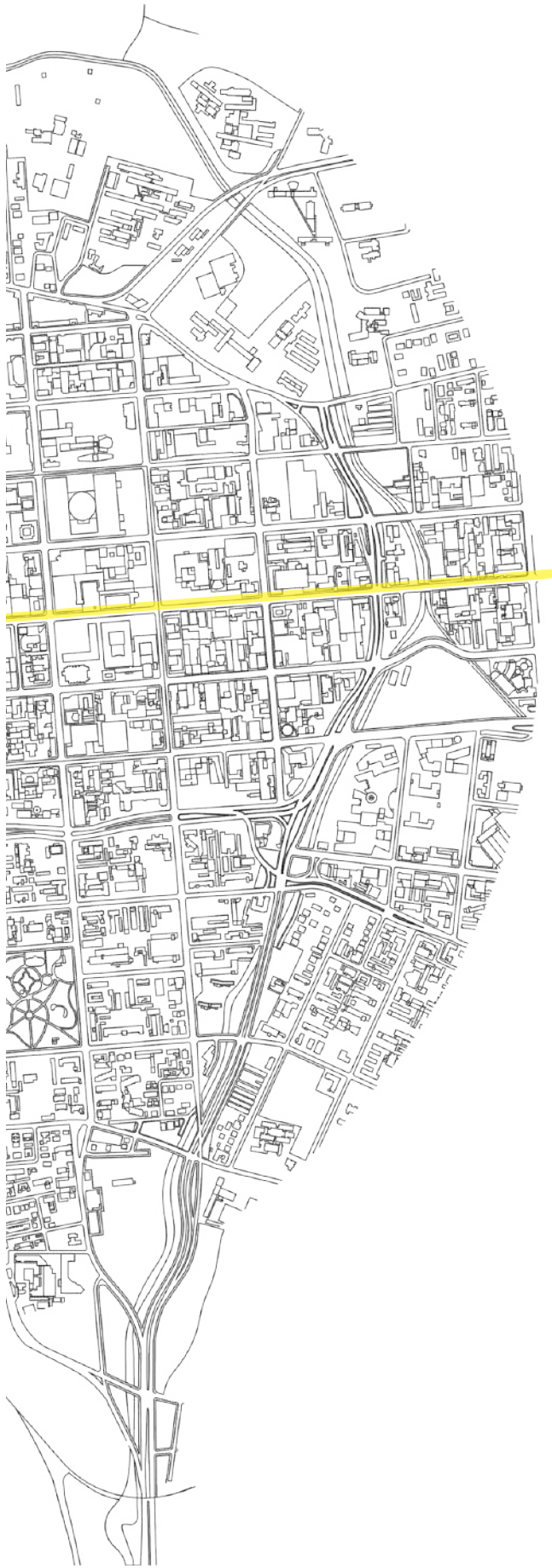


Figure 1.10 Inner City of Pretoria (Author 2020).



1.4 Introduction to Density

Density can refer to various measures of subject quantities in a given area. When referring to a human or spatial density then there are still more variables of measure. In the spatial sense, however, in simple terms, it can be defined as several units in a given area (Boyko et al. 2011). The measures then vary in scale, from city to single unit in terms of population.

1.4.1 Density as an Urban Concept:

Density as an urban concept has been widely accepted as a fundamental principle for sustainable urban form (Harper 2019). Densification or compaction of cities optimizes and reduces the use of resources, use less land, optimize the use of public transport, energy, and goods. The proximity between programs is increased and therefore demands fewer resources and produces fewer pollutants, creating a sustainable and liveable city.

1.4.2 Sustainable Urban Form:

Jenks et al. (2000) describes sustainable urban form 'as development that does not require resources beyond its environmental capacity, is equitable, promotes social justice, and is created through inclusive decision-making procedures' (Jenks et al. 2000). Sustainable urban form, in terms of density, can be influenced by various components including size, shape, compactness, intensity, mixed-use of land, the plan layout and type of buildings; and the use of green and open space.

1.5.1 Global Issues

Rapid population growth is a challenge faced globally. According to the UN (2019), more than half of **population growth** will occur in Africa in the next 30 years and the current population of 67 million in the Southern African Development Community(SADC) countries is expected to double by 2050.

South Africa, is the largest and most developed in Southern Africa. Therefore, South Africa will play a central role in shaping the expected rapid increase of the global population from **7.7 billion to 9.7 billion** by 2050 (UN 2019). South Africa is expected to gain **19-24 million** more residents in the next three decades and the vast majority will settle in cities (CSIR 2018).

Pretoria will experience some of the greatest population growth and unless this growth is effectively planned for and efficiently managed, it will place enormous pressure on infrastructure and already scarce resources and infrastructure.

Apart from rapid population growth, Pretoria is also faced with the impact **climate change** has on the cities' physical, biological, and human-managed systems. According to the IPCC (2014) report, Summer temperatures are expected to rise, causing more severe heatwaves and more intense precipitation events.

1.5.2 Urban Issue

Social and environmental problems as a direct result of the structure of the South African city suggest that the current urban fabric and its further development is entirely unsustainable (Jenks et al. 2000). In the South African context, however, there are concerns in regards to the viability of compaction and sustainability, in terms of the cultural and social implications. The City of Tshwane, to some extent, encourages densification along major transport corridors and creating a more accessible city to its citizens.

However, Pretoria has been shaped by both Apartheid and modernist town planning principles resulting in a city both segregated and mono-functional. The city can currently be described as decentralized, of low density, fragmented, and separated.

The current infrastructure of Pretoria does provide the opportunity for creating a sustainable compact city through densification of the built environment and residential populations; intensifying program and to manipulate urban size, form, structure, and systems in pursuit of environmental, social, and economic sustainability derived from the concentration of urban functions (Jenks et al 2000). However, the city continues to grow laterally through urban sprawl, spreading further into rural and natural environments.

1.5.3 Architectural Issue

The mono-programmatic nature of the city and the resultant residential typologies will be questioned in terms of its location, built density, and occupational density. These typologies include inner-city apartment blocks and suburban housing, township housing with informal infill, and informal settlements on the periphery of cities.

The inner city, in particular Church Square, consists of a majority of heritage buildings and landscapes of the colonial and apartheid era. Due to its heritage status and lack of funding for preservation; obsolete function and negativity towards its past use, the majority of the buildings stand neglected and in some cases vacant.

1.6 Research problems and questions

1.6.1 Research Question:

How can architectural intervention implement sustainable hyper-densification into the existing fabric of the inner city of Pretoria?

1.6.2 Sub Question:

How can social, spatial, and economic sustainability make possible the densification of the city?

How can the existing infrastructure of Pretoria be adaptively reused and repurposed for the 21st century?

How can spaces over time adapt to suit the changing needs of its users?

1.6.3 Keywords:

Density, Hyper-Density, Regeneration, Adaptive Reuse, Heritage, Heritage Management, Holistic, Sustainability.

1.7 Methodology

To find an appropriate architectural solution for the previously mentioned problem statements in this dissertation, the following methods are used from which conclusions could be established:

1.7.1 Theoretical Exploration

The first part of the research methodology is based on conducting in-depth qualitative studies by means of a literature review with regards to the relevant material discussed in this dissertation, such as: compaction of urban environments, hyper-density, urban regeneration, social, environmental, and economic sustainability, adaptive reuse, heritage, and heritage management. The rigorous review of relevant literature allowed for an understanding of the principles, uses, shortcomings, contributions, and sustainability in comparison to each topic, uncovering the collective possibilities when applied to the architecture.

1.7.2 Urban Mapping

The inner city of Pretoria and the Church Square precinct will be recorded through a series of mapping exercises to comprehensively understand the various historical and present layers that form the urban environment. The study will inform a precinct, urban block, and site framework in which the design will be situated. Mapping will include historical and existing city fabric, land use, pedestrian and vehicular patterns, infrastructure, and existing social conditions.

The second part includes a critical analysis and investigation of the existing urban fabric and history of the study area and comparative areas to establish a project site and program using the principles identified in part one.

1.7.3 Site Investigation

In order to understand the current conditions within the city, a series of city visits were conducted. Starting on the periphery of the city and walking inwards

towards the city centre. The various spatial and social conditions were recorded and incrementally narrowed down following the insight gained from the previous visit, leading to the discovery of the site.

1.7.4 Site Studies

Once the site was considered, further on-site investigation and photographic recording established the conditions of the site, its surrounding buildings, and the public space. Observations of users within the precinct revealed the current functions of the built environment, whether for its intended use or newly established functions. Site visits were conducted at various times of the day to understand the various conditions throughout the day.

1.7.5 Archival and Desktop Research

Through the departmental archives of the University of Pretoria's Department of Architecture historical photographs, literature, and newspaper articles were collected and studied to develop a detailed understanding of the city's history, in particular the Church Square Precinct. In conjunction with site visits, desktop studies were conducted to understand the current social, topographical, and environmental conditions. Thus forming an understanding of both the historical and current urban environment to inform the design process.

The selection of a site location as a case study allows for an in-depth literature study of both international and local examples, which can be categorized and compared to the principles established in part one.

1.7.6 Precedent Studies

To understand the potential impacts of the urban framework on the existing social and spatial conditions an urban precedent was assessed. In addition, precedents for adaptive reuse, program, and structure were also assessed to gain an understanding of how the architecture

can respond to the local conditions.

The formulated theoretical premise, derived from the investigations, will serve as guidelines for alternative design strategies for compact living environments.

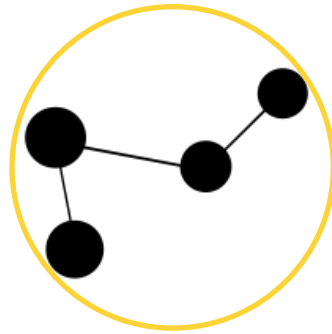
1.7.7 Design Development

The initial design will be guided by the principles previously established and subjected to an iterative process to refine the design, program, services, and structure articulation.

To find an appropriate architectural solution for the previously mentioned problem statements in this dissertation, the following methods are used from which conclusions could be established:

1.8 Delimitations and Assumptions

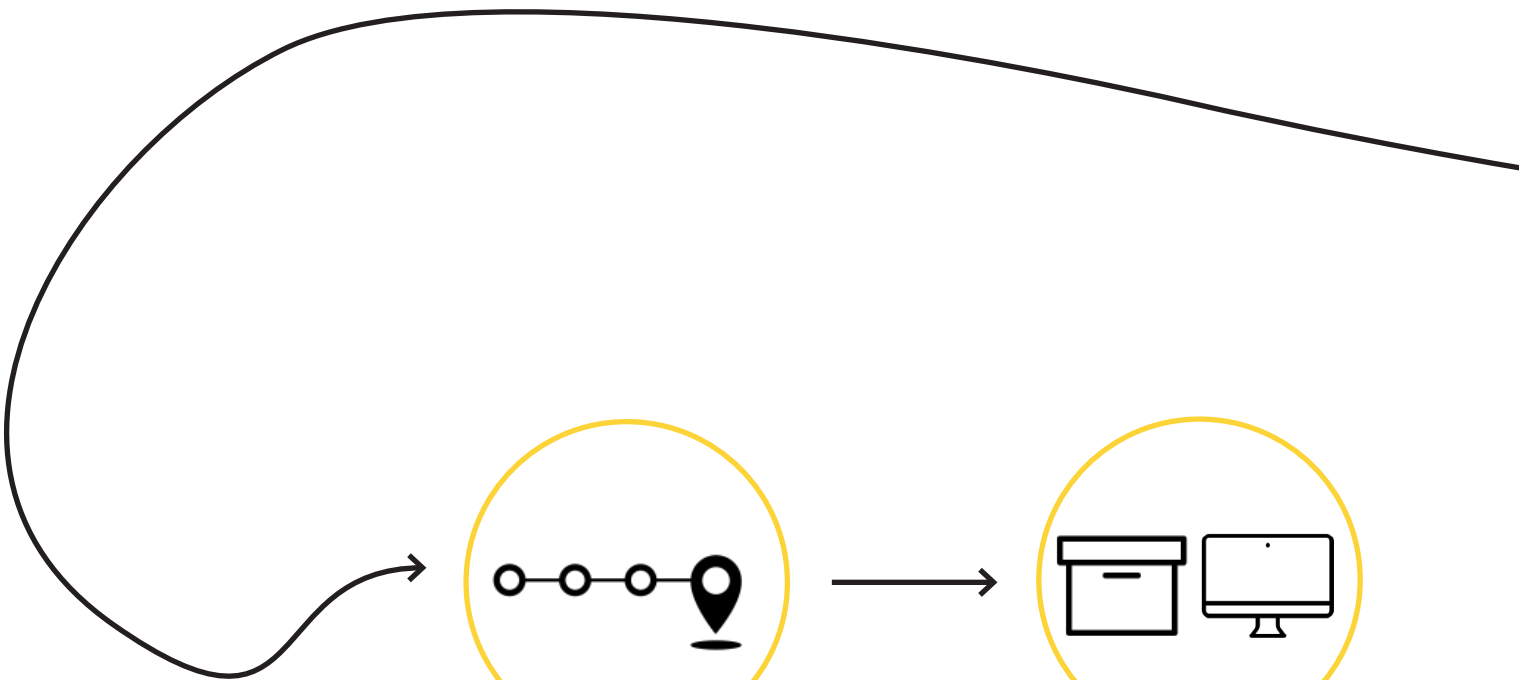
Taking a heritage approach within South African Architecture in highly sensitive areas, such as Pretoria Central, creates perceptual, political, and responsive complications. Within executing this dissertation, it is found that many people are against creating heritage responses in the Pretoria CBD, or have their set ways of thinking. Architectural conservation and the adaptation of historic buildings to more used and relevant formats are a fairly "new" topic in the architectural field.



Theoretical Exploration



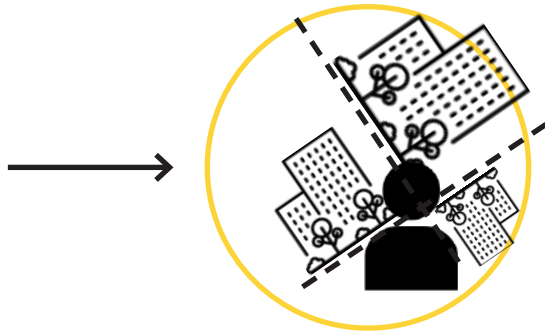
Urban Mapping



Site Studies



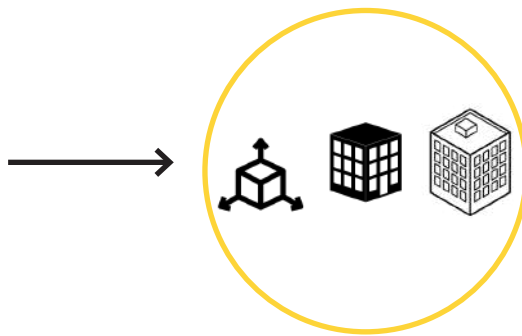
Archival and Desktop Research



Site Investigation



Precedent Studies



Design Development

Figure 1.11 Methodology Diagram (Author 2020).



Chapter

02

THEORY

As specified in the previous chapter density, population growth and heritage are the main focus areas of this investigation towards an architectural approach. Therefore, the investigation is set to firstly understand the development of mass housing and the concept of density and how it was formulated as a response. Secondly, cities are investigated as case studies to understand their reactional development and adaptation to rapid population growth.

2.1 The Conception and Criticism of Density

2.1.1 Density as Model

During the period of the industrial revolution, high-density living became a common occurrence in working-class housing, to the point of overcrowding. Workers lived as close to factories as possible in terrible conditions. In London, the population density was at 15 750 people per km², many workers sharing small spaces in sublet houses and tenements. However, from the 1850s, it was recognized that the living conditions had affected public health immensely (Harper 2019). People moved to cities in search of work, but the increased workforce also caused a shortage of housing and food availability. Thus poverty also increased within these conditions (Figure XX).

density living illustrated in figure XX set out quotas for the proper arrangement of the individual buildings and the limitation on the area of building to open space (Harper 2019). The spatial planning proposition suggests a new model for towns, with restrictions on population and densification with a population density of only 125 residents per km². The low-density principles proposed, focused on the intent of optimizing living conditions for the inhabitants. At this point, densification had a negative connotation in terms of spatial planning principles and was related to overcrowding and the condition of the poor (Jenks et al. 2000).

In 1898, as a reaction to the overcrowded living conditions of the time, Ebenezer Howard published the **Garden Cities of To-morrow**. Howard's model for low-



Figure 2.1 'Over London-by Rail' engraved by Gustav Doré (1872).

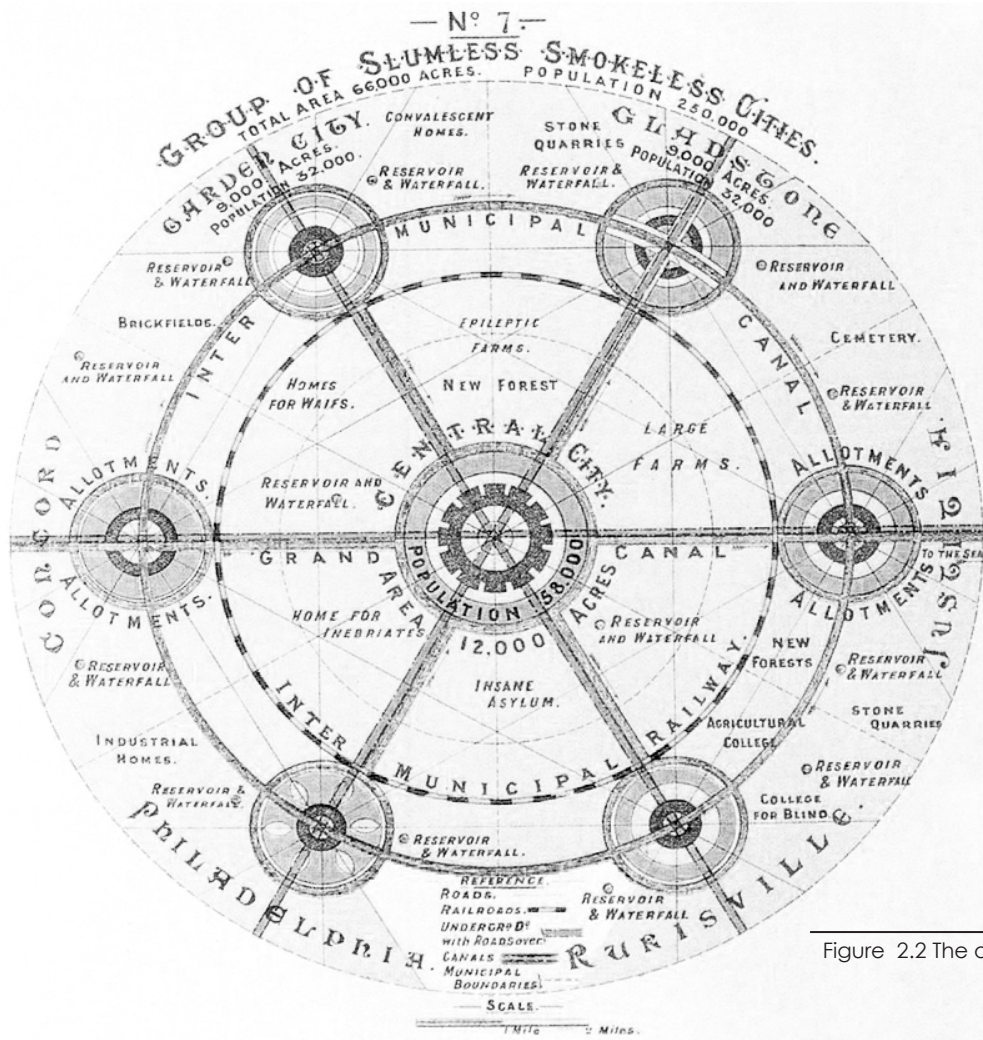


Figure 2.2 The original Garden City concept by Ebenezer Howard (1902).

The next shift in the thinking of density came in the early 1920s, as a response to the need for liveable environments, and was led by the pioneers of modernism in central Europe. The City of Tomorrow, by Le Corbusier, was published in 1929 and included the city planning project,

Plan Voisin. The famous proposal for a new Paris presented densification as a means of optimizing productivity. Plan Voisin would not only have increased the density of an already dense city but proposed quadrupling it from a population density of 55 000 residents per km² to a staggering 300 000 residents per km². The increased densities would have been achieved through high-rise buildings, which was a fairly new concept in residential architecture at the time. The high-density, high-rise typologies freed up ground space for wider roads and more green space in closer proximity to

the residences. The housing models also facilitated services to residents which would have been otherwise considered unaffordable. Unite' d'Habitation, a concentration of apartments in one building, made possible the distribution of internal plumbing and heating to all its residents, who would otherwise not have been able to afford it.

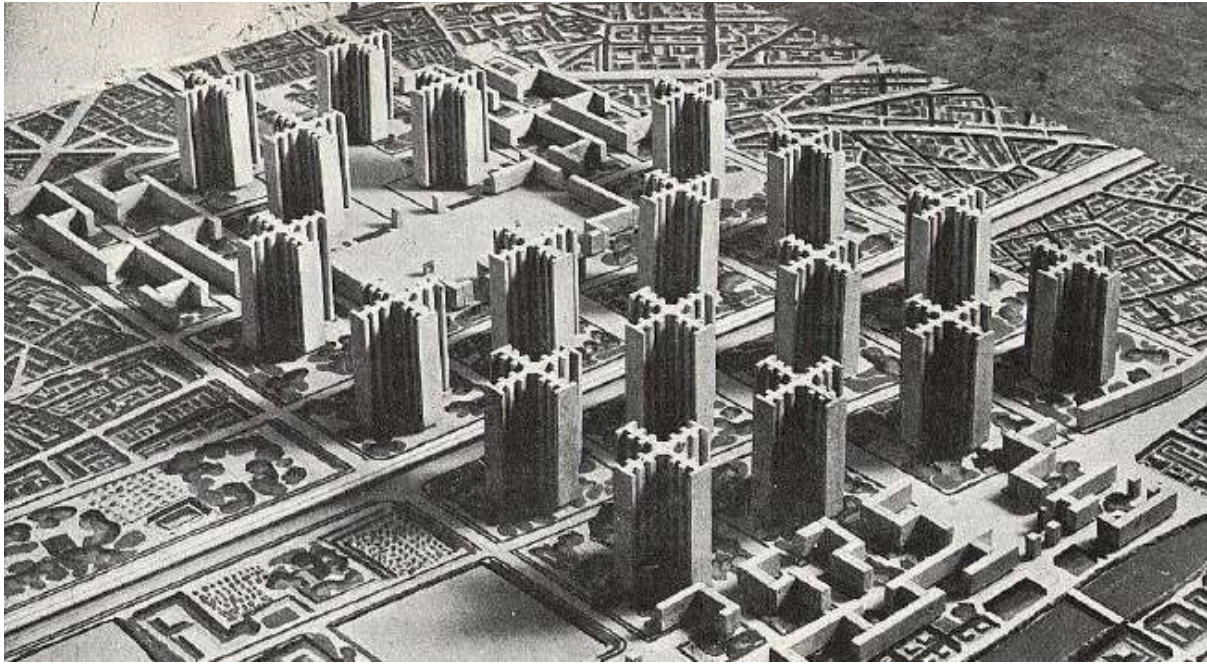
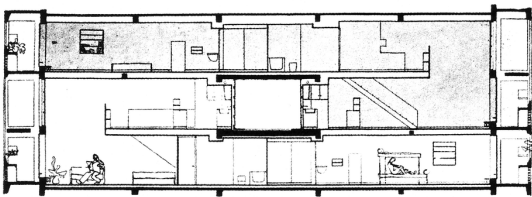
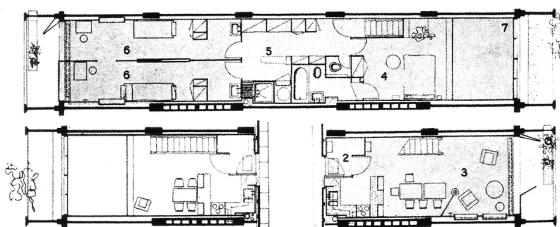


Figure 2.3 Le Corbusiers' Plan Voisin scaled model (Le Corbusier 1925).



Section

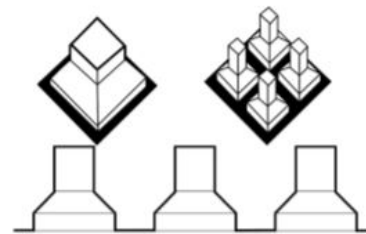
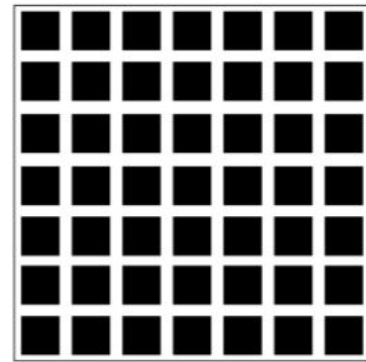


Floor Plans

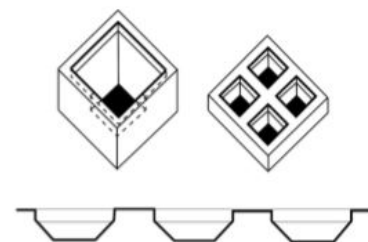
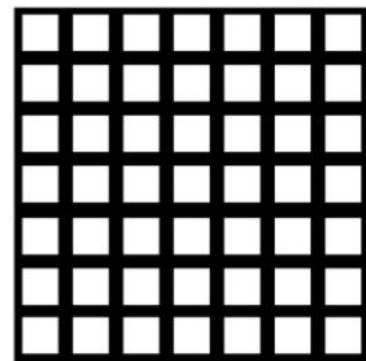
Figure 2.4 Photo of Unite de Habitation (Archdaily 2020).

Figure 2.5 Unite de Habitation in section and plan (Le Corbusier 1952).

In 1935 Walter Gropius published *The New Architecture* in which he presented morphological studies testing the relationship between **density, built form, and sunlight** (Harper 2019). The diagrammatic studies illustrated principles for achieving higher densities through taller housing blocks set further apart that also made more efficient use of the site and allowed for higher site capacities. Gropius's proposal of a model that would have fixed components in site planning, building height, distances apart, number of dwellings, and sunlight created design instruments that were in favour of high or even hyper densities (Harper 2019). The negative connotations to densification were reconsidered, given the recognition of the health, sunlight, and ventilation benefits offered by the new models.

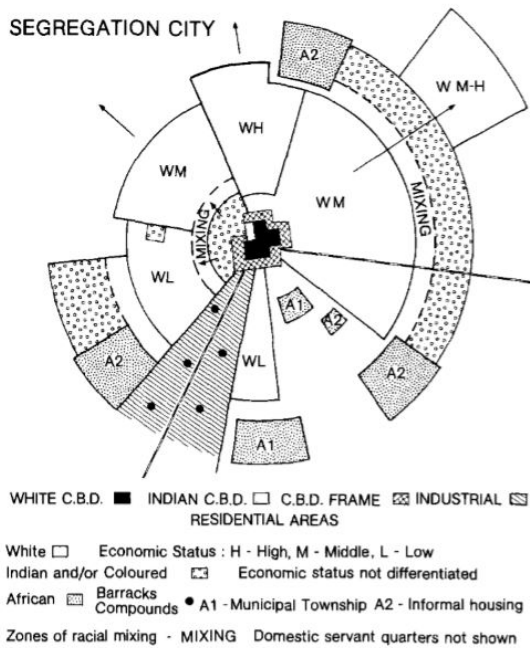


The Pavilion...



...and it's Anti-Form

Figure 2.6 Gropius's Morphological Studies (Harper 2019).



2.1.2 The Modernist City and South Africa

However, in the 1960s in South Africa, segregation through the Apartheid Regime was implemented. The principles of the modernist city and apartheid's principles of segregation were conveniently compatible. The emphasis on separation in Plan Voisin meant that urban planners of the Apartheid regime eagerly adopted and manipulated the concept and applied it to the spatial planning of cities. Land uses, urban areas, and racial groups were separated leading to the mono-functionality and control of populations (Jenks 2000).

Figure 2.7 The Apartheid City Model (van der Waal Collection 2020).

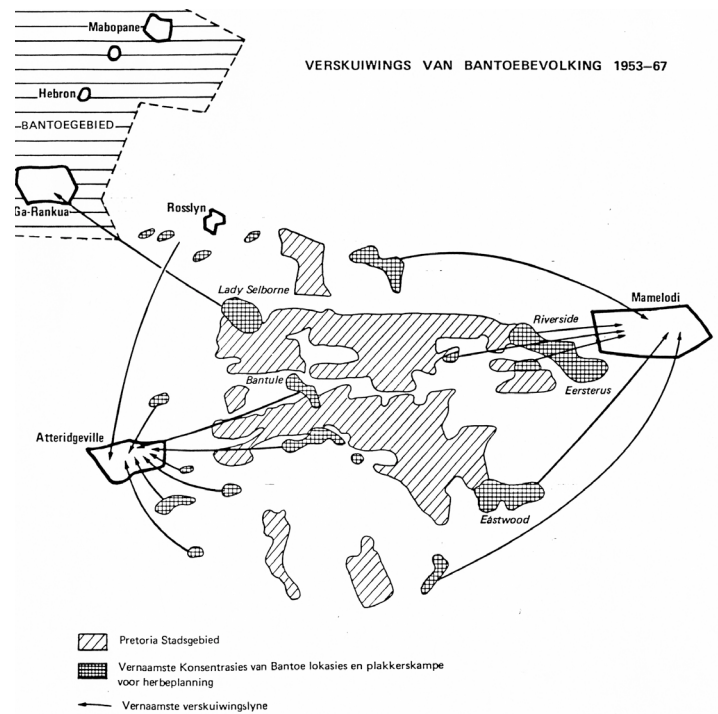


Figure 2.8 Forced Removals in Pretoria 1953 - 1967 (van der Waal Collection 2020).

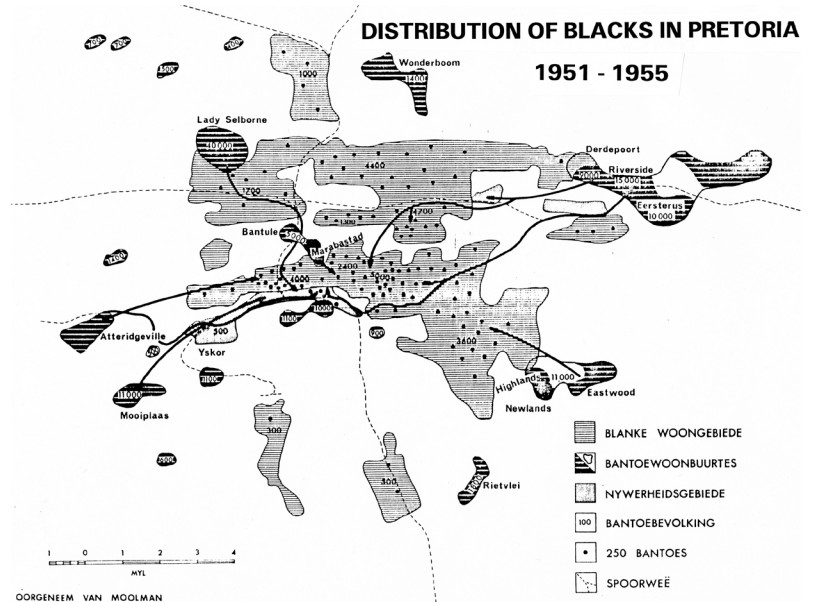


Figure 2.9 The segregation of Pretoria (van der Waal Collection 2020).

2.1.3 Modernist Densification in Living Economies

The principles of the modernist densification models are also compatible with expensive living economies. Hong Kong is one of the most densely populated cities in the world (LSE 2012) that experienced severe urban sprawl in the 1950s. The rapid population growth created a widespread housing shortage and given the major spatial constraints of the city, due to topography and extremely expensive land prices, the only viable solution to the demand in housing was to develop high-rise-hyper-dense residential buildings (Chan 1999).

The housing crisis in Hong Kong led to the increase in an apartment typology referred to as coffin cubicles, which can only be referred to as extreme hyper-density.

The coffin homes are described as minuscule rooms lived in by Hong Kong's poorest population. The rooms are defined by beds sealed by wire mesh or wooden planks and measure a mere 1.5 m². Standard 37 m² apartments are subdivided into twenty cubicles so small that residents are unable to lay down or stand up straight in their own space (Lam 2018).

The coffin cubicles highlight the reality of the cramped conditions of hyper-dense living, that residents are subjected to as space is considered a luxury they cannot afford.



Figure 2.10 Photo of Hong Kong Hyper Dense High-Rise (Wolf 2019)

2.2 Current Forms of Dense Urban Fabrics-Globally

Cities are expressed, explored, and described through the following case studies. These cities were chosen for their extreme population densities and the urban-architectural responses to these densities. The city characteristics are described and summarized as urban profiles to establish clear comparisons between these profiles:



Figure 2.11 Hong Kong Skyline (Wolf 2019)

2.2.1 Hong Kong, CSAR



Hong Kong is one of the most densely populated countries in the world, with a population density of 6,659 residents per km². The former independent country, now a Chinese special administrative region has a population of 7.5 million in an area of 1 110 km² (WPR 2020). As a mega-city, Hong Kong faces countless and daunting urban planning challenges. With the 1 110 km² divided by 240 islands, there is merely 42 km² of viable residential land; of which 7 % is occupied by non-marketable low-density rural homes (Sinclair 2019:2).

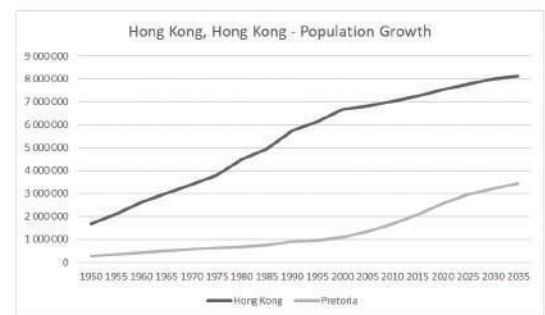
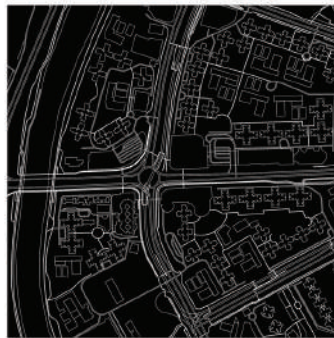


Figure 2.12 Hong Kong City Diagram and population graph (Author 2020).

Hong Kong has developed as a hyper-dense and tall urban environment in most part due to a difficult geographical location and a unique economic and political setting (Nowek 2012). Hong Kong's hyper-dense and tall building typology reach peaks of over 100,000 people per km². The city planners implemented an urban model that clusters the already extremely high-density developments around public transport (LSE Cities 2012).



Figure 2.13 Coffin Apartment (Wolf 2019).



Figure 2.14 Coffin Apartment (Wolf 2019).



Figure 2.15 Coffin Apartment (Wolf 2019).



Figure 2.16 Coffin Apartment (Wolf 2019).



Figure 2.17 Coffin Apartment (Wolf 2019).

2.2.2 Barcelona, Spain



The city traces back to the 15 BC Roman Era. A small city surrounded by a wall with Roman grid perpendicular streets (Roberts 2019). According to Roberts (2019), the city was defined by two characteristics that would define its future development:

First, it began and still is a city that is constrained, compressed, and compact from its establishment. And secondly, it has always been a deliberate city, planned and built according to the architects. Unlike cities in the developing world, Barcelona has not sprawled. Each new growth of the city was on purpose, planned that way.

The historical city of Barcelona has a population of 1.7 million in a city area of 101.9 km². Barcelona is one of Europe's most densely populated cities (WPR 2020). The city has an average population density of 16 000 residents per km², a 36 000 residents per km² density in the historic Eixample area (urban model implemented by the architect Ildefons Cerdà), and 50 000 residents per km² in the La Sagrada Familia neighbourhood. The city has developed over the centuries, transformed by various city planner visionaries implementing their ideas into the urban fabric. The most notable architect Ildefons Cerdà considered one of history's great urban planners (Roberts 2019). As a reaction to the overcrowded and unhygienic conditions of the city, Cerdà then designed a new extension to the city, known as the Eixample – a model that offered a clean and safe lifestyle. He wanted to provide each person, with enough water, clean air, sunlight, ventilation, and space. Orientating each block to maximize daily sun exposure. Each block, or *Manzana*, was to be almost identical proportions in height, spacing, and majority green spaces. Roberts (2019) states that the ground floor was allocated commerce, and the upper floors

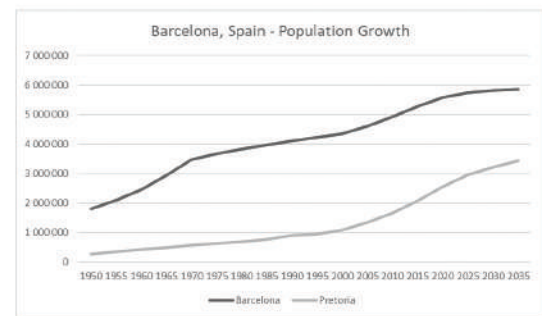
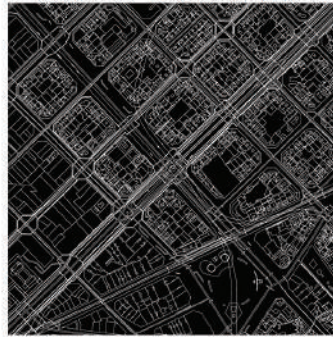


Figure 2.18 Barcelona City Diagram and population graph (Author 2020).

residential with upper, middle, and lower-income groups living in the same building or block. In this way, public space would be shared among the groups, reducing inequality, and encouraging social diversity (Roberts 2019).

Cerdà envisioned each urban block to be largely self-sufficient, with its commerce, retail, and public facilities. Whereas hospitals, parks, and squares would be shared within the city, encouraging equality on an urban scale.

The urban scheme was and still is successful due to its short and regular blocks, derived from the Roman Hippodamian city plan. The characteristic of the block in combination with the orthogonal streets encouraged a diverse and vibrant street life. The regular grid is easy to navigate and comprehend, but diverse in multiple routes and regularly spaced choices. An underlying uniformity that's endlessly adaptable (Roberts 2019). The intention was to combine the advantages of rural living: open green space, fresh food and air, and close communities with the advantages of urban living: intense commerce, social and cultural activity, the interaction between various scales of people and programs, accessibility to a range of goods, and innovation.

However, today the city is faced with various problems as it becomes too crowded and is faced with the need for another transformative model, one that is designed around the well-being of people and not its cars.

A new urban planning visionary, Salvador Rueda, looks to providing this radical transformation of the city, yet again.

He envisions a city that's pedestrian orientated and of mixed-use, termed "superblocks,". Each resident has access to all superblocks within the city and can navigate through these pedestrian spaces without having to cross vehicle dominated streets. Roberts (2019) states that if it is fully realized (over multiple generations), it could make Barcelona the first major pedestrian orientated city (Roberts 2019).



Figure 2.20 Bird's Eye View of the Courtyard Typology (The Guardian 2016)

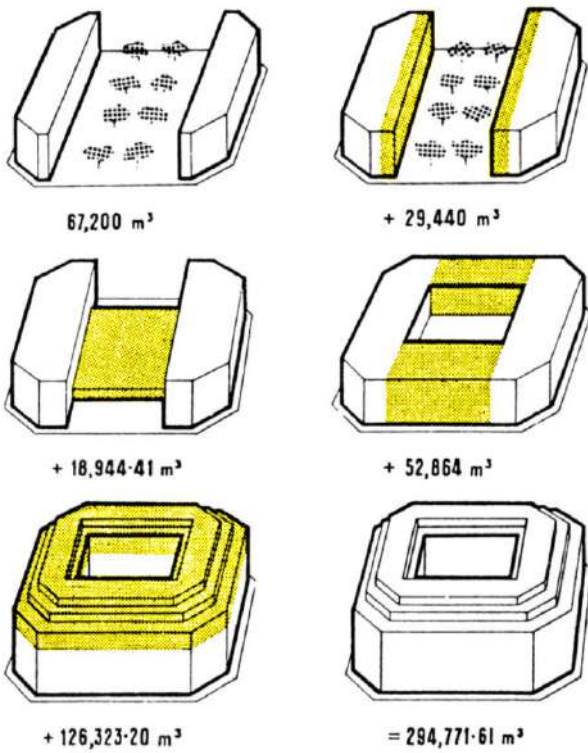


Figure 2.19 Superblock infill (Wynn 1979, edited by author).



Figure 2.21 Pedestrian arcade (Vox 2018).



Figure 2.22 Superblock interior courtyard (Vox 2018).

2.2.3 Ho Chi Minh City, Vietnam



Ho Chi Minh City, once known as Saigon is the largest city in Vietnam with a population of 8.6 million over a 2061,2 km² area of which 494,01 km² is urbanized. The city is dense at an average of 4097 residents per km² and 40 000 residents per km² within the inner city, however, it continues to grow rapidly (WPR 2020).

Between 1954 and 1975 Vietnam was divided by civil war during which millions of immigrants fled into HCMC to avoid the war (Nguyen, T. B. et al. 2016:16). The rapid population growth created serious overcrowding issues, resulting in many slums along its river. Following the end of the war in 1975, the Socialist government took responsibility for providing housing for those working for the state, however little spatial development took place (Nguyen, T. B. et al. 2016:17). By 1986, the central government introduced the Doi Moi policy aiming to create a more market-orientated economy, in which a new land law allowed for the grant of land to individual landowners as opposed to the socialist collective land ownership policy.

Since 1986, land policies have changed several times and are now immensely complicated as the state has had a limited understanding of urban management (Nguyen, T. B. et al. 2016:20). The policies have affected the city in two major ways. First, the individual land ownership rights have encouraged residents to upgrade their homes, thus increasing their home value, and secondly, the allowance of foreign investment has increased the inner cities development. Thus, the economy has seen improvement and available real estate within the city has quickly become rare and expensive (Nguyen, T. B. et al. 2016:21). The increase in density has changed the city to a capitalist urban



Figure 2.23 Saigon skyline (Author 2018).

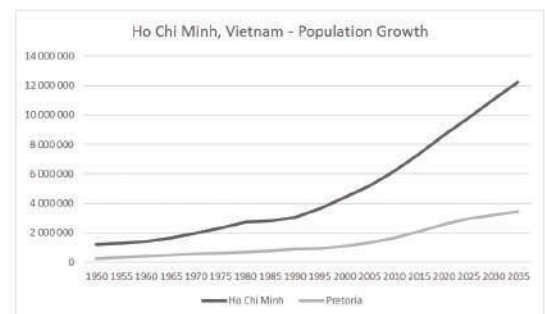


Figure 2.24 Ho Chi Minh City Diagram and population graph (Author 2020).

model where residents are taxed based on the width of their buildings, therefore changing its morphology (Cox 2012). The new taxation system within the core of the city has resulted in a morphology of incredibly slender, but tall buildings, where there's no separation between residential and commerce (Nguyen, T. B. et al. 2016:20, Cox 2012). Instead, a very thin typology of commercial ground floors forms a consistent street edge with residences above, resulting in the incredibly dense inner city (Nguyen, T. B. et al. 2016:20).



Figure 2.25 Motorcycle dominated streets (Author 2018).



Figure 2.27 Narrow Saigon building typology (Author 2018).



Figure 2.26 Residential blocks (Author 2018).



Figure 2.28 Active pedestrian streets (Author 2018).

2.2.4 Caracas, Venezuela



The city is not only the capital but also the largest city in Venezuela with a population of 2 million in a 777 km² area and an average population density of 28 490 residents per km² (WPR 2020). Over 1.25 million people live in informal settlements (barrios), representing 60 % of the cities' total population, with no functioning urban planning framework in terms of land use and housing. The barrios represent high informality and illegality in structure and land occupation, lack of infrastructure, public space, and health facilities (Falco et al. 2019:2).

In 2007, a group of residents turned to an abandoned and unfinished bank building within the inner city of Caracas. The 45-storey high-rise had been standing empty and incomplete for 18 years. Due to a housing crisis and the precarious conditions in the barrios, the occupation of empty buildings became common practice in the city, with an estimated 155 offices, apartments, and government buildings already occupied by 'squatters' at the time (Tian 2012:5). Gradually more families moved in, cleaning and removing rubble from each floor. As Torre David continued to grow in occupancy the complex became more extensively modified through the construction of balustrades, communal spaces, and private apartments. By 2009 the tower was estimated to house 200 families and continued to grow.



Figure 2.29 Caracas, Venezuela (U-TT 2012).

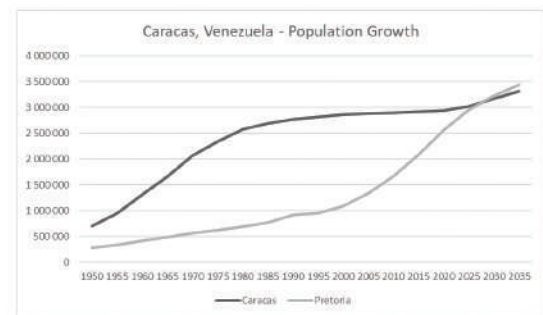


Figure 2.30 Caracas City Diagram and population graph (Author 2020).



Figure 2.31 Tower of David (U-TT 2012).



Figure 2.32 Facade infill (U-TT 2012).



Figure 2.33 Resident using the rooftop (U-TT 2012).



Figure 2.34 Children visiting their local kiosk (U-TT 2012).

2.2.5 Lagos, Nigeria



Lagos is the largest city in Africa and is still rapidly growing. The rapid population growth and urban sprawl experienced by Lagos is unmatched by any other city in Africa, increasing from 325 218 in 1950 to its estimated 17.5 million residents, however, this figure is disputed within the Nigerian government with some believing it already exceeds 21 million residents (WPR 2020).



Figure 2.35 Lagos, Nigeria (Mitchell 2017).

Fourchard (2011) argues that Lagos' urban, planning management and conditions are a direct result of political interference and a long history of disagreement between political parties and the elected government, since the end of colonialism (Fourchard 2011:40,41).

This goes against the portrayal of the city depicted by Rem Koolhaas and the Harvard Project on the City team (Fourchard 2011:41, Koolhaas et al. 2000). Koolhaas states Lagos is the 'paradigm and the extreme and the pathological form of the West African city' (Fourchard 2011:41, Koolhaas et al. 2000: 652). Lagos continues to function as a city despite lacking in all the basic amenities and public services. It functions because it exists as a series of self-regulatory systems not managed or controlled by town planning regulations (Fourchard 2011:41).

Koolhaas and his team suggest that: 'rather than viewing the conditions of dysfunctionality as African ways of becoming modern, it is instead possible to argue that Lagos represents a developed, extreme paradigmatic case-study of a city at the forefront of globalized modernity' (Koolhaas et al. 2000:653).

The Harvard Project on the City, according to Fourchard (2011:41), envisions an African city, that has not achieved urban

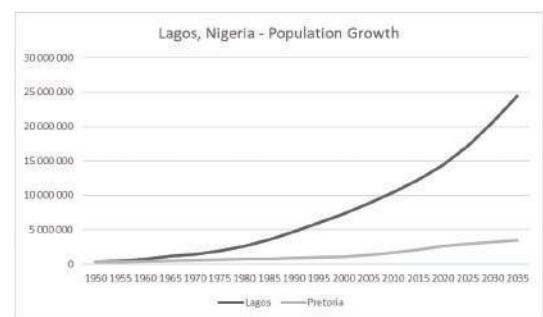


Figure 2.36 Lagos City Diagram and population graph (Author 2020).

development in accordance to the west, but rather an icon of West African urbanity in de-historicizing the city (Koolhaas et al. 2000:652). Other academics that have taken a historical perspective of the colonial and independent periods have presented a city suffering under a worsening infrastructure crisis that is less capable of dealing with the informality, the now identity of Lagos (Gandy 2006, Fourchard 2011).

The informal economy is often seen as a weakness in the African city, illustrated by the infrastructure crisis and general chaos, however, Rem Koolhaas still considers Lagos a city that has formulated its own urban identity by escaping the modernist town planning principles of its former colonists (Koolhaas 2002: 183).



Figure 2.37 Daily congestion throughout the city (Mitchell 2017).



Figure 2.38 Commerce spills into the pedestrian orientated streets (Reuters 2017).



Figure 2.39 Fisherman's informal settlements occupy the river bank (Reuters 2017).

2.2.6 Nairobi, Kenya



Nairobi is the capital of Kenya and its largest city, dating back to 1899. The city is consistently growing and currently covers an area of 696 km² resulting in a population density of 4850 residents per km². The city is one of the fastest-growing in Africa, growing at a 4% rate annually due to its high birth and immigrant rates, it's expected to continue on its upward trajectory in terms of population growth, reaching 5 million by 2025 (WPR 2020).

Nairobi is also known for Kibera, the second largest informal settlement in Africa, originally established in 1912 as a soldier camp (Mukeku 2018:21). Since Kenya gained independence post-1945, the settlement quickly grew with cheap makeshift structures as people migrated to the city in search of work opportunities. The settlement is within walking distance of the inner city, offering access to socio-economic activities within the city. Most Kibera residents living within 5 km of the city centre, supported by government institutions, schools, and medical facilities around the settlement, it has grown to an estimated 700 000 to 1 million residents, although the government claims only 140 070 residents (Mukeku 2018:21).

Housing in the settlement is characterized by spatial inadequacy, insufficient shelter, lack of infrastructure, and unhygienic conditions (Mukeku 2018:23). The average dwelling unit comprises of one-roomed structures measuring less than 9 m², but housing families of six. The spaces between dwellings have no formal order or planning layout and the housing is densely arranged with few in-between spaces. It is estimated there are 250 housing units per hectare compared to 25 housing units per hectare in middle-class neighbourhoods (Mukeku 2018:24).

Kibera is characterized by its lack in the differentiation of individuals involved in



Figure 2.40 Kibera informal settlement, Kenya (The Guardian 2019).

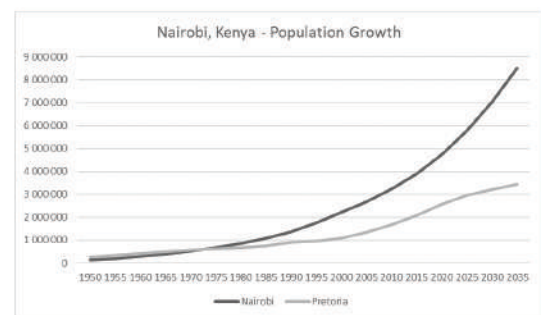


Figure 2.41 Kibera City Diagram and population graph (Author 2020).

the building process, as the resident generally plays the part of designer, builder, and dweller. Thus, according to Mukeku (2018), allowing for a process of rapid decision making to feedback. This results in a built environment that evolves continuously, based on informal mechanisms of construction and alterations by the residents themselves.



Figure 2.42 Daily conditions within the settlement (The Guardian 2019).

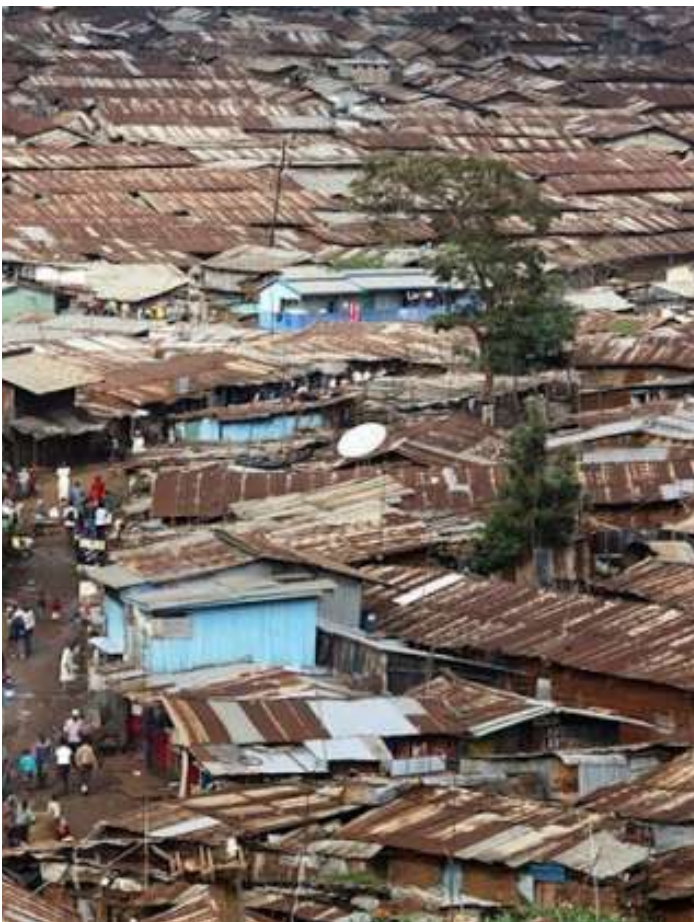


Figure 2.43 Kibera roofscape (The Guardian 2019).



Figure 2.44 Resident ballerina (The Guardian 2019).



Figure 2.45 Resident children walk to school (The Guardian 2019).

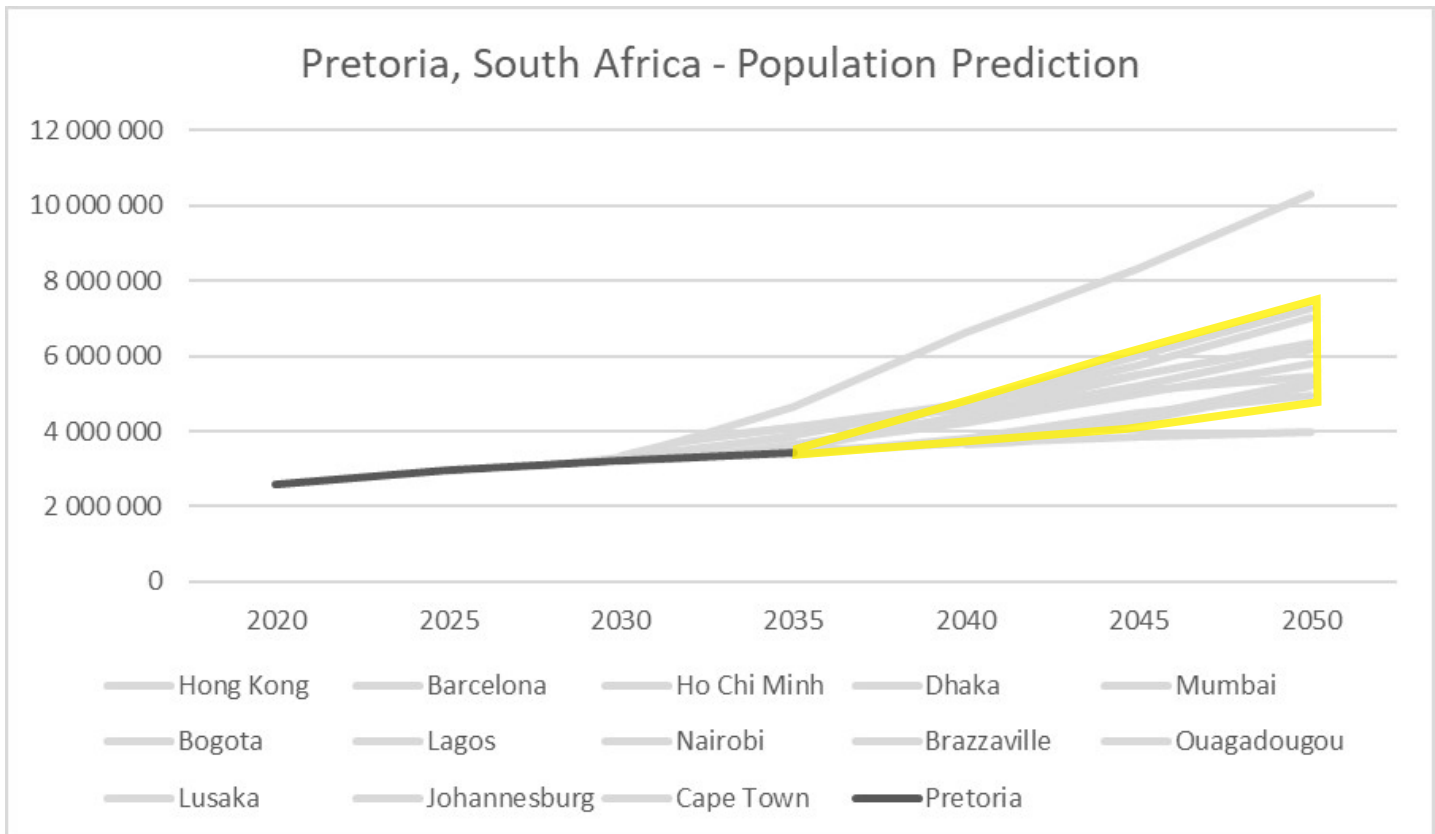


Figure 2.46 Population Increase Prediction Graph (Author 2020).

2.3 Populations Compared

The population prediction graph showing a rapidly rising population for Pretoria from 2035 to 2050, when compared to various developed and developing cities globally.

The current population of Pretoria predicted to increase from the current 2.7 million population to between 5 to 7.8 million.

- Quantitative and programmatically determined buildings and settlements,
- the promotion of the neighbourhood unit, and the private vehicle as to the primary and dominant mode of transport, commuting users in and out of the city.

2.4 The Case for Density in South Africa

The structure and form of South African cities have been shaped by two ideologies, modernism and segregation.

Modernist city planning policies for South Africa are adapted from European and United States models. The principles for these modernist or rather segregated, low dense, and mono-functional cities included:

- a strong anti-urban or pro-suburban philosophy,
- emphasis on the separation of living, working, playing, and movement,

• Design principles for the effective densification of a South African city should then include:

- a strong pro-urban philosophy,

the inclusion and connection of living, working, playing, and movement spaces,

the design and construction of buildings considered from both a qualitative and quantitative philosophy,

- the promotion of a multi-programmatic city and providing for easily accessible, safe, and efficient public transport, and

- pedestrian and bicycle lanes.

• The population density of units in relation to square meters should be considered when designing for compact development, however, the principles of a sustainable urban form and an effective density should be used as the guiding design philosophy.

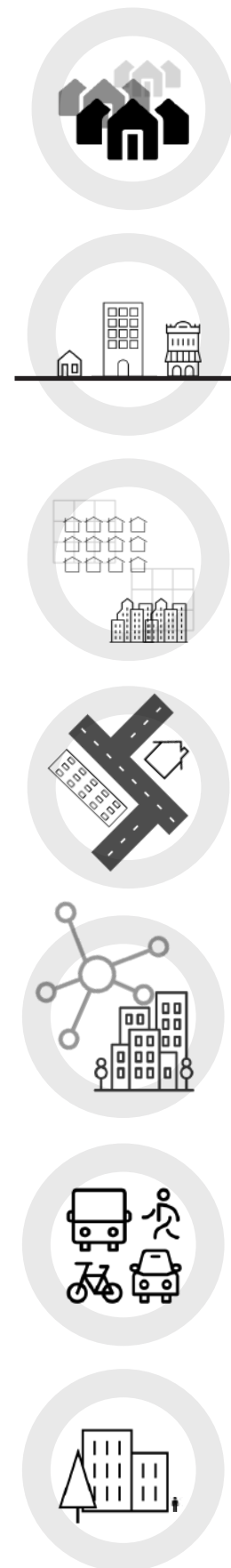
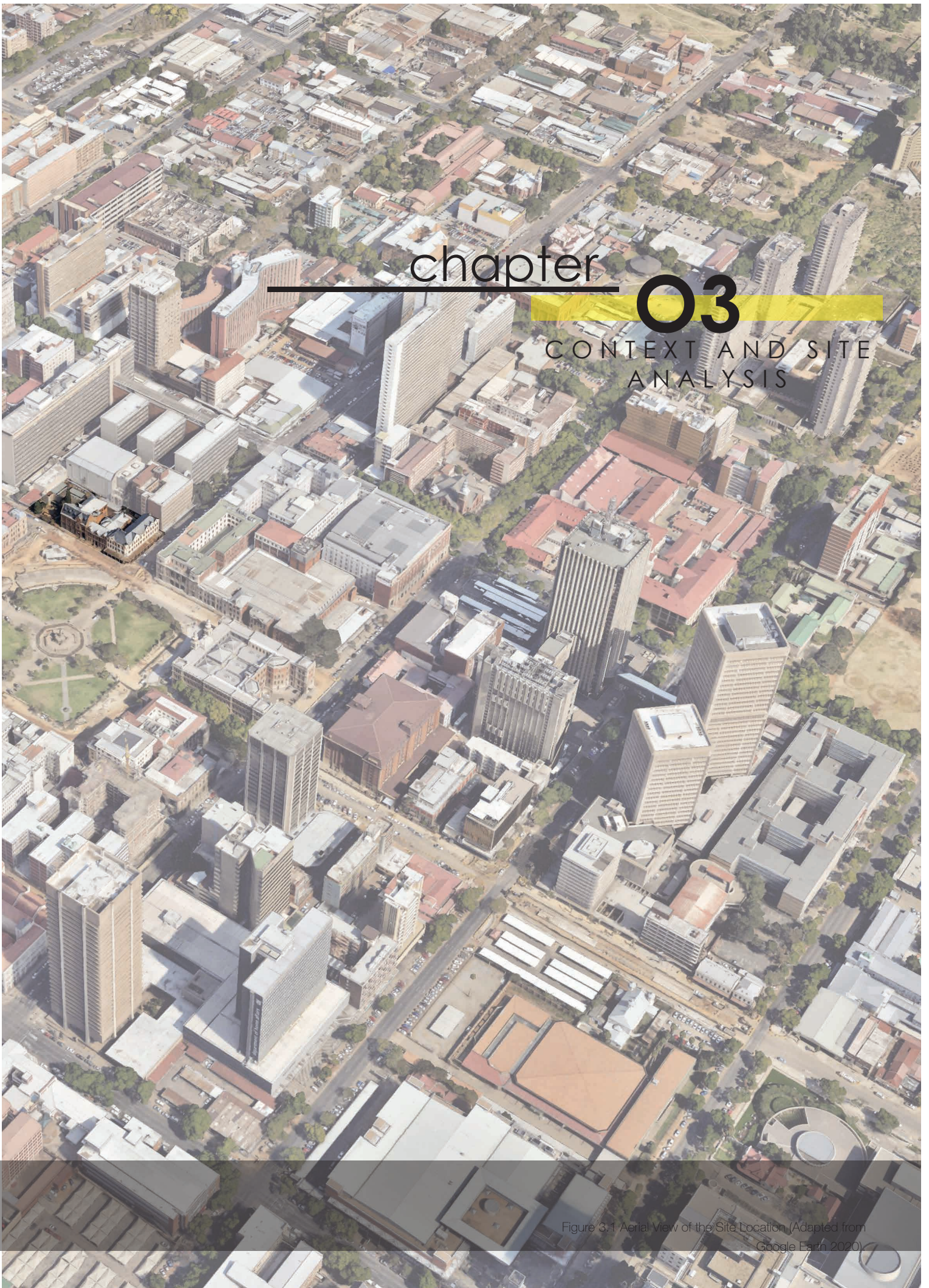


Figure 2.47 Density Design Principles (Author 2020).





chapter

03

CONTEXT AND SITE
ANALYSIS

Figure 3.1 Aerial View of the Site Location (Adapted from Google Earth 2020)

3.1 Theoretical Framework

Measuring density should extend further than the human population measure, numbers per unit, or built form in a given area. A third measure is needed. Considering the qualities of sustainable urban form, the measures should also include regenerative strategies of the existing.

Therefore, the precinct is explored and studied through various theories on different scales to establish a framework within the respects of an existing heritage fabric but also theories delving into the existing social and political constructs of the city. The various strategies are formulated to form a regenerative response that satisfies the existing heritage constraints, the identified spatial needs in terms of a hyper-density, and also the social, cultural, and political needs.

The theories are categorized into three parts: macro, meso, and micro theories. The macro theory looks towards the works of three urbanists to define general

principles in the understanding and designing of good urban environments. The principles of the 2055 Vision developed by the City of Tshwane is combined to form coherent urban design principles and a guideline to how Pretoria is expected to develop as a city of various nodes. The meso theory compares the heritage and conservation acts of South Africa and internationally, namely the Burra charter. The response to the architectural heritage derives from principles developed by F. Bollack and the social constructs are understood through an Emancipatory or critical realist philosophy to derive a more appropriate social understanding of the causes of urban decay and vacancy faced in the precinct.

The micro theory looks towards regeneration as a social and spatial response. Using conservation principles adapted from Gabriel (Gawie) Fagan, where the principles are used as a connection between the new and the existing.





Figure 3.2 Pretoria City (Adapted from Tshwane GIS 2020)

3.2 City Analysis [uncovering the hidden urban potentials]

The existing conditions of the city are mapped within a 1.5 km radius from the historical centre to understand the existing infrastructure that could contribute to a regenerative inner-city framework. The cities' attributes are expressed in layers through mapping to uncover interconnected networks within the urban fabric of the inner city.

The analysis depicts the mono-programmatic nature of the city, divided into functional districts. Government departments are scattered throughout the inner city incremented by commerce and retail. The industry defines the west, whereas retail and commerce define the east and residential the south-east. Paul Kruger Street forms the arterial route along the north-south axis while Madiba and Pretorias Streets form the east-west arterial routes of the inner city.

The city has five major transport options, consisting of various bus and taxi services; and private transport. These systems offer public transport from the south to the north of the metro area between two train systems-the Metro and Gautrain. The railway systems forming hard boundaries to the north and south of the city. The inner city is, therefore, well serviced in terms of transport options between the north and south train stations. However, the analysis depicts a vehicle dominated inner city as opposed to a pedestrian orientated city. The metro area is therefore difficult to navigate between urban blocks and public spaces as streets are wide and difficult to safely cross.

The spaces that are most often overlooked are those not visible from the streets, however, Pretoria has a large network of pedestrian arcades on a north-south axis. Although these spaces are relatively unknown, they do have their regular users (Swart 2019).

The majority of inner-city urban blocks are subdivided by pedestrian arcades. The arcades were included in the cities' initial urban scheme, however many have been lost to urbanization or forgotten and neglected over the years as vehicular transport has become the main form of movement in the city. Some arcades have seen a revival, forming new found pedestrian routes and creating an opportunity for commerce, retail, and recreation along these routes, while others still lie dormant.

A defining feature of Pretoria is its exceptionally large city blocks and wide streets. The blocks developed from smallholdings with backyard food gardens, which were divided into long, narrow properties and further developed to form the densely built-up environment of the inner city today. The urban blocks have been pierced over time with a network of arcades that increase pedestrian connectivity and retail activity along these routes within the inner city.

The Islamic community meets at the Queen Street Mosque for their daily prayers. Built in 1928, the mosque has been enclosed by a series of large buildings, making the mosque accessible only via a small passageway. Owners of small bespoke shops serve passing customers as they stroll along the historical passage of the Burlington Arcade. Burlington House was built in the 1930s. The Art Deco building included the city's first shopping arcade and is still in use today. Polley's Arcade serves as a shortcut from Francis Baard to Nana Sita Street with a unique floor finish and a glimpse at the vast libraries of the police records. Designed by Norman Eaton in the 1950s.

The arcades are located within a small radius of the city's historical centre, where most lead to pedestrian zones, namely the market in Church Street, within the Church Square precinct. Apart from the

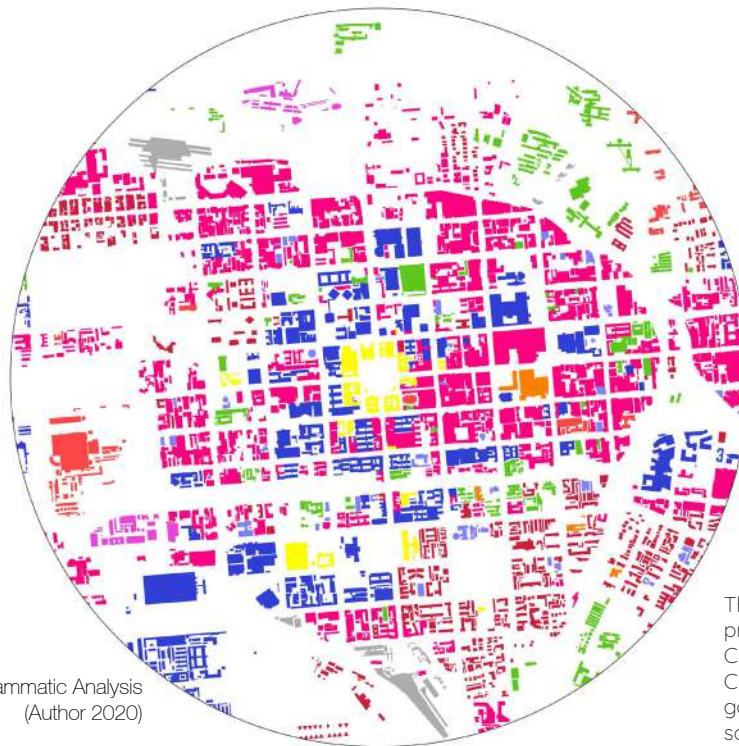


Figure 3.3 Programmatic Analysis
(Author 2020)

The study depicts the mono-programmatic nature of the city. Currently the buildings surrounding Church Square are of majority government administrative and some commerce with very limited residences within the inner city.

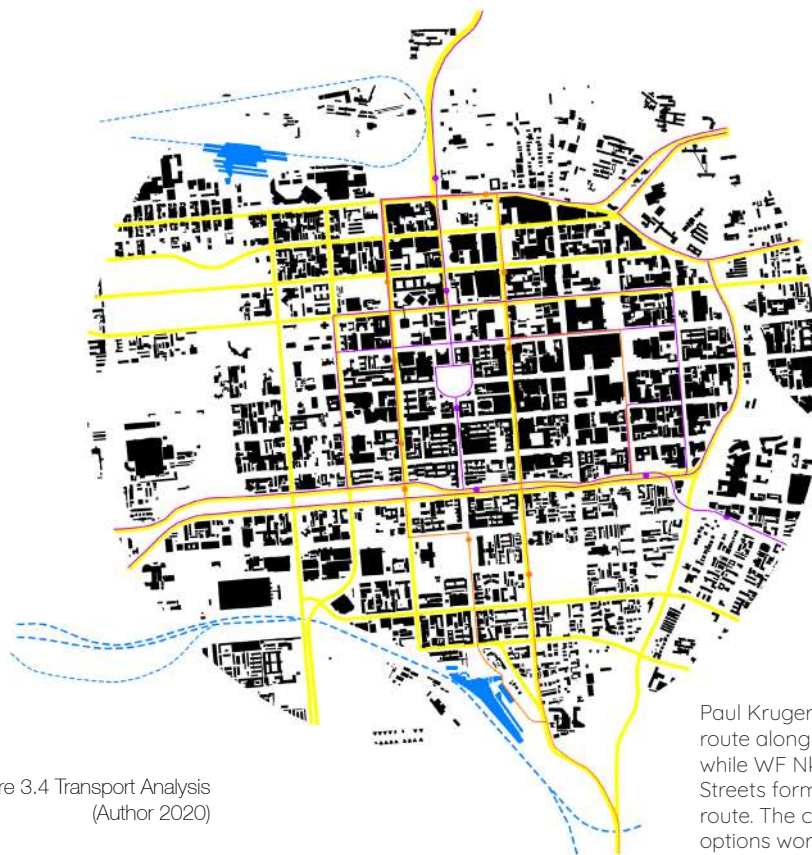


Figure 3.4 Transport Analysis
(Author 2020)

Paul Kruger Street forms an arterial route along the north-south axis while WF Nkomo and Stanza Bobape Streets form the east-west arterial route. The city has five major transport options working in the city, consisting of various bus and taxi services; and private transport.

main arcades, there are also internal arcades, namely Noordvaal, President, Koedoe, and Van Erkom, and smaller secondary passageways that form an additional pedestrian network.

Recent urban renewal projects that have incorporated previously latent thoroughfares include the 012 Central precinct and the secondary pedestrian arcades of the One on Mutual residential project. Some of the cities historical arcades are actively used as retail and commercial corridors, where others have lost their retail and commercial activity, but retained their function as a circulation route.

The network of intimate, pedestrian spaces hidden from the rest of the city holds a great deal of potential in the development of a pedestrian-friendly city. However, Pretoria will have to move away from its lateral and monotonous developments and focus on the already existing spaces between. Future developments should gain inspiration from its past towards developing humane urban environments where different needs are designed for.

A great deal of green space can be found within the city, in the form of Colonial-era parks, spaces along the Apies River and its tributaries, and pockets of green spaces throughout the city. Although the majority of the spaces are still popular amongst residents, few are maintained or even utilized for its benefits offered as a public space. The majority are unsightly, unsafe, and generally in a poor state.

Some of the major green spaces within the city include Burgers Park and Church Square both of which are in a state of decline but still frequently used by city inhabitants.

Burgers Park is located between Church Square and the Pretoria Station. The park was opened to the public in the 1870s as a botanical garden, housing a wonderful greenhouse, tree-shaded walkways, and

fountains frequented by resident ducks and swans. The park later also served as the approach to the Melrose House, constructed in 1886 and owned by a wealthy businessman. Today the park is enclosed by mostly residential apartment blocks. Although the park is in disrepair, it's still regularly frequented by residents during evenings and weekends.

Church Square is located in the historical centre of Pretoria, and served as the location where the city was initially conceived in the 1850s, and developed outwards. Today the square is more used by daily commuters moving through the space, as opposed to residents and tourists visiting the historical site. Although the square was recently 'renovated', it has gone into a dilapidated state due to a lack of maintenance of the lawns, water features, and newly introduced trees, therefore creating an unattractive and unusable public space. The public space will be further discussed in chapter four.



Figure 3.5 Greenspace Analysis
(Author 2020)

There are a great deal of green spaces within the city and along the Apies river, however few are maintained and utilised for public use. Many are in poor condition.



Figure 3.6 Arcadial Analysis
(Author 2020)

The arcades are located within a small radius of the city's historical centre, where most lead to pedestrian zones, namely the market in Church Street, within the Church Square precinct.

3.3 City of Tshwane Regenerative Frameworks

The Tshwane Vision 2055 consists of various component frameworks that aim to restructure the current city model. The strategy proposes a ceremonial boulevard on the east-west axis and a government boulevard on the north-south axis. Thus promoting linear development along these routes and along with the entrances to the city, formalized by prominent buildings serving as gateways.

In response to the withdrawal of vital functions and investment from the inner city (Corten et al. 2014:112), the National Department of Public Works together with the Department of Public Services and the City of Tshwane Metropolitan Municipality presented the Re Kgabisa Tshwane Strategic Plan (2005). The framework forms a component part of the Tshwane Vision 2055 strategy and focuses on the inner city of Pretoria.

Along with the strategy an inner-city development by law was implemented, namely the 'ito Sect 13 of Local Govt: Municipal Systems Act, 2000 and

Sect 162 of the Constitution'. The act's purpose is to ensure the regeneration of the inner city through the formalization of a commission whose purpose is to develop guidelines, regulations, criteria, and incentives to promote sustainable investment in the Tshwane Inner City (Cot 2013).

The City of Tshwane is considered a polycentric city comprised of various nodes, where each possesses several opportunities. The framework foresees a city as liveable, resilient, and inclusive, where residents can enjoy access to social and economic opportunities equally (CoT 2013). The envisioned liveable environments will be established through principles namely: compact urban form, encouragement of diversity in residents, promotion of public, bicycle and pedestrian transport, better suited public and spatial infrastructure achieved through restructured urban design strategies.

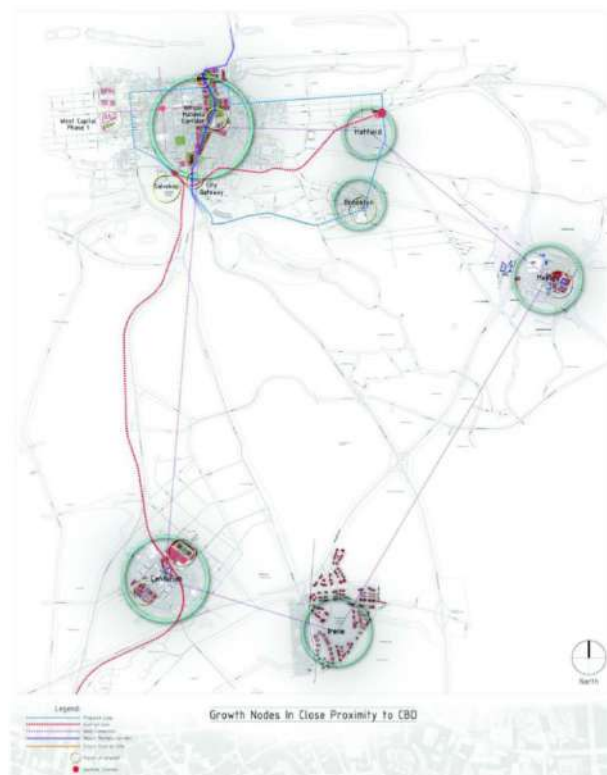


Figure 3.7 Pretoria as Nodal City (Tshwane 2055 Vision 2015)



Figure 3.8 Tshwane 2055 Vision
(Author 2020)

Tshwane 2055 Vision: The urban framework proposes a ceremonial boulevard on the east-west axis and a government boulevard on the north-south axis, thus promoting linear development. The entrances to the city will be formalised by prominent buildings serving as gateways.

The metro area shows reasonable built area, however with few buildings exceeding a 100m, specifically only seven buildings. Unbuilt/ inbetween space fragment city blocks significantly, both on the ground level and with regard to facades and edges.



Figure 3.9 Density Analysis
(Author 2020)





Figure 3.10 The Inner City Mapped Between the North and South Train Stations (Adapted from Tshwane GIS 2020)





chapter

04

PRECINCT
CHURCH SQUARE

Figure 4.1 Aerial View of the Site Location (Adapted from Google Earth 2020).

4.1 The Narrative of Church Square

After the discovery of gold in Witwatersrand, Pretoria rapidly transformed from a rural to an urban settlement. Small cottage dwellings and wagons were replaced by larger permanent buildings. The old Cape Dutch-style church in the square was replaced by a larger early Gothic style church (1882), known as the 'Verenigde Kerk'. Followed by the new government building (1887), the 'Raadzaal' and other larger buildings, banks, hotels, and offices all built around Church Square formalizing the square as a place (Corten et al. 2014:107).

Urban growth was slow during the Second Anglo-Boer War but prospered after the war ended in 1902. The cities' importance grew as the administrative capital of South Africa, generating further urbanization outwards from the historical centre.

The church was demolished in 1905 and formalized as an Edwardian square with a cast-iron fountain at its centre. The Tudor Chambers (1906) and the new post office (1910) followed and Pretoria became the capital city of the Union of South Africa under the British Empire (Corten et al. 2014:107). Over time the square was defined by neo-Gothic, neo-Renaissance, Wilhelmiens, Art Nouveau, Art Deco, and Modernist buildings.

In 1961 South Africa gained independence, and Pretoria was reshaped according to Apartheid planning policies. As the historical centre of the administrative capital, Church Square and its architecture were earmarked for major redesign and demolition to serve as the new identity of the Afrikaner government in the 1960s (Swart 2019:150).

By the 1970s design proposals ranged from a subterranean bus station excavated under Church Square, to various high-rise buildings replacing either Capitol Theatre, the Old Netherlands Bank Building, the Old Law Chambers, the Café Riche building, or all of these historic buildings

on the western façade. Although many residents felt that Church Square needed to be renovated, they did not agree with the government's proposals to demolish the existing and after a decade's worth of protesting and negotiating by the residents and the government's lack of funding due to political tensions, they withdrew their proposals for a new Church Square (Swart 2019:150). Although the demolitions were prevented, the government had already acquired the city block, using any latent space as secondary parking for government employees working in the area (Swart 2019:150).

Architecturally the historical centre of Pretoria is a well-established and diverse urban environment with museums, parks, and public spaces all framed by historical and new civic buildings. The urban blocks are well serviced by wide streets shaded by large Jacaranda trees, qualities that could make for successful pedestrian boulevards.

Over the decades since South Africa gained Independence and established the City of Tshwane Metropolitan Municipality (2000), where Pretoria lies at the core, the city has experienced an urban decline from its historical centre (Corten 2014:103). The majority of residents moved out of the city to the suburbs and commerce soon followed, forming new suburban business districts and retail centres outside of the city (Corten 2014:103). The administrative capital suffered the most severely once the government also withdrew investment from the inner city and focused it towards the newly formed nodes. As a result, the historical centre of Pretoria is characterized by vacancy and unemployment resulting in a built environment of urban decay and poverty (Corten et al. 2014:103). Some buildings have recently had restoration work, however, the majority are neglected or inappropriately used and occupied.

4.2 Selecting and Assessing the Site

The historical centre has not been utilized for its heritage as an attraction and catalyst for urban development. The heritage should be considered as an urban asset when proposing renewal and regeneration strategies when designing for density and population growth. However, according to Corten et al. (2014:113) Pretoria's architectural heritage has very little political support and few consider it as an opportunity for revitalizing and redeveloping the city.

However, Church Square remains an important public space within the city. The built fabric defining the square consists of mainly prominent historical buildings of public service, state departmental, offices, and large banks. The east of Church Square is defined by majority commercial and retail activities along an active pedestrian route that extends from Church Square to Lilian Ngoyi and Sammy Marks Square towards the east.

Few buildings towards the west of Church Square are accessible to the public and lack the same pedestrian and resident activity as the east. The vibrant public activity of the east needs to orientate towards the west to reverse the effects of urban decay and vacancy, prominent in the western blocks.

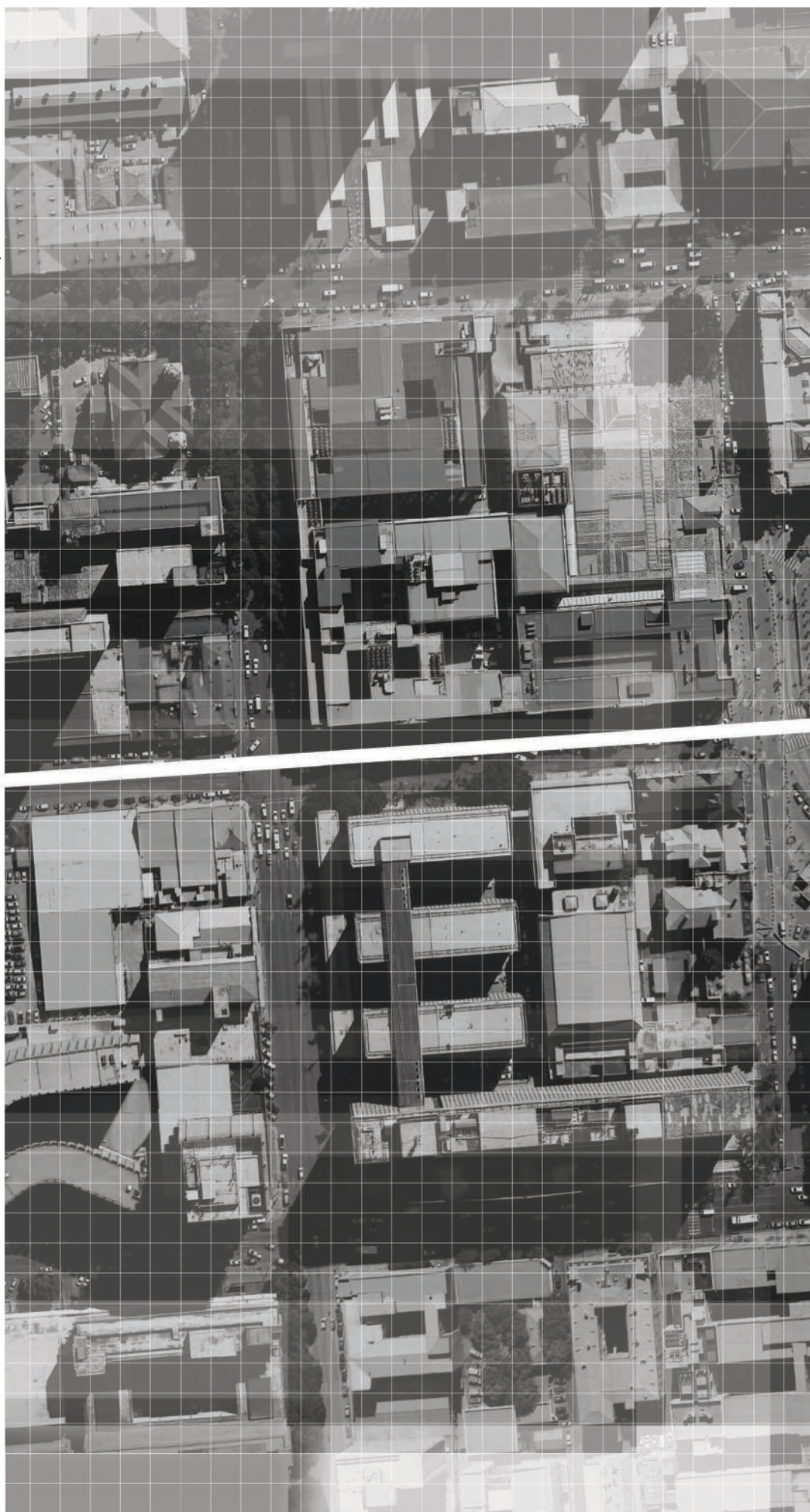
The south-western block serves as the mediator between the active east and the vacant west and has been established as an integral part of the square and Pretoria's identity. The entire block has been developed, however, it currently stands vacant, apart from some informal use.


In an attempt to activate the urban block and encourage densification towards the west, the current parking and in-between space of the eastern side of the block will be considered as the site. Further site analysis will be conducted to provide an architectural solution.

4.3 Analysis of Church Square

The site is largely impacted by church square, the narrative and the architectural value of the buildings in church square. Therefore, this study comprises the wider church square precinct to unpack the various layers impacting the site.

4.3.1 The Cardo and Decumanus



 Axis Lines Formed Along Kruger and Church Street

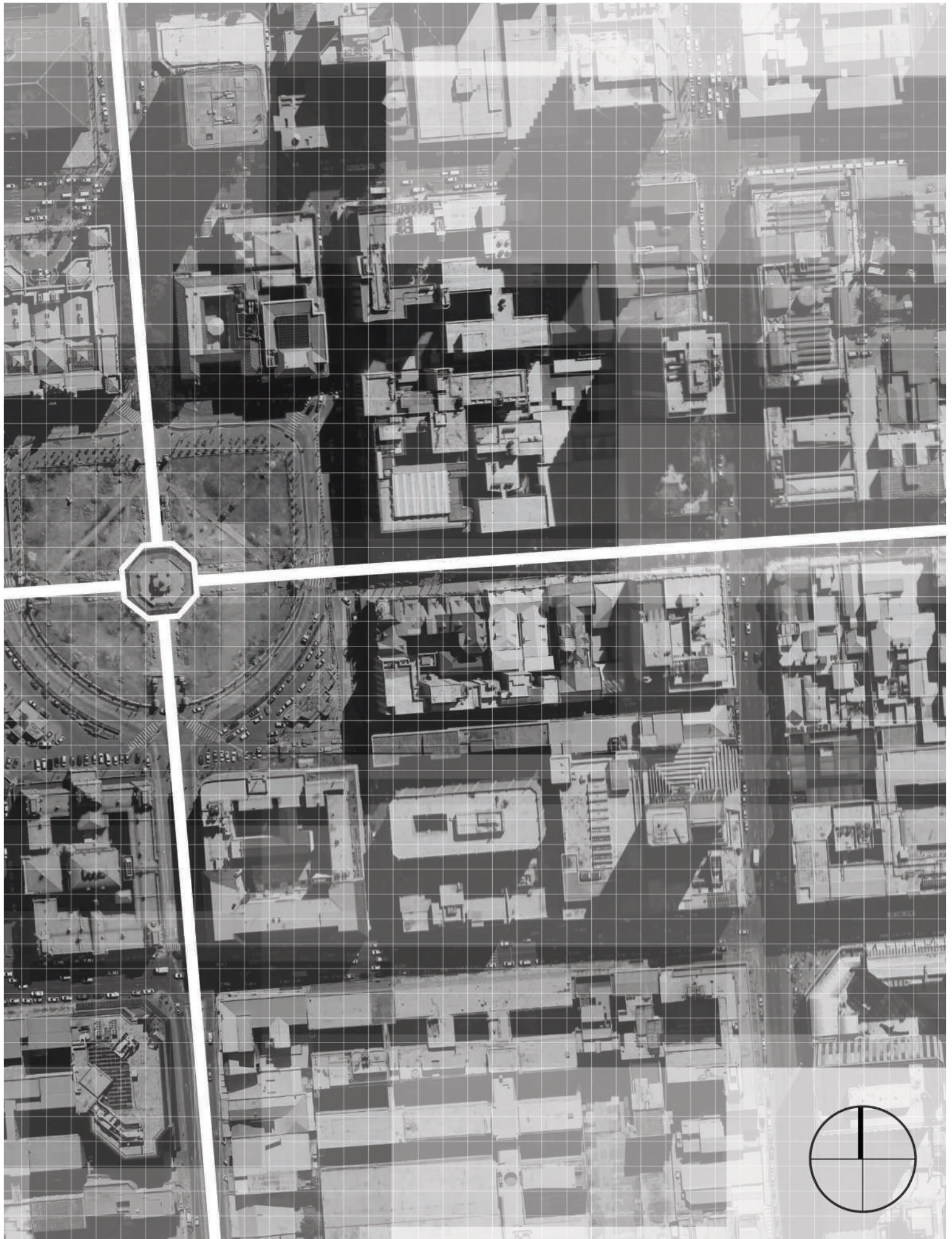


Figure 4.2 Precinct Site Analysis (Adapted from Tshwane GIS 2020).

4.3.2 Pedestrian Intensity



 Pedestrian Intensity



Figure 4.3 Precinct Site Analysis (Adapted from Tshwane GIS 2020).

4.3.3 Current Uses and Vacancy

-  Retail & Commerce
-  Museums & Monuments
-  Religious
-  Government Administrative
-  Vacant
-  Educational

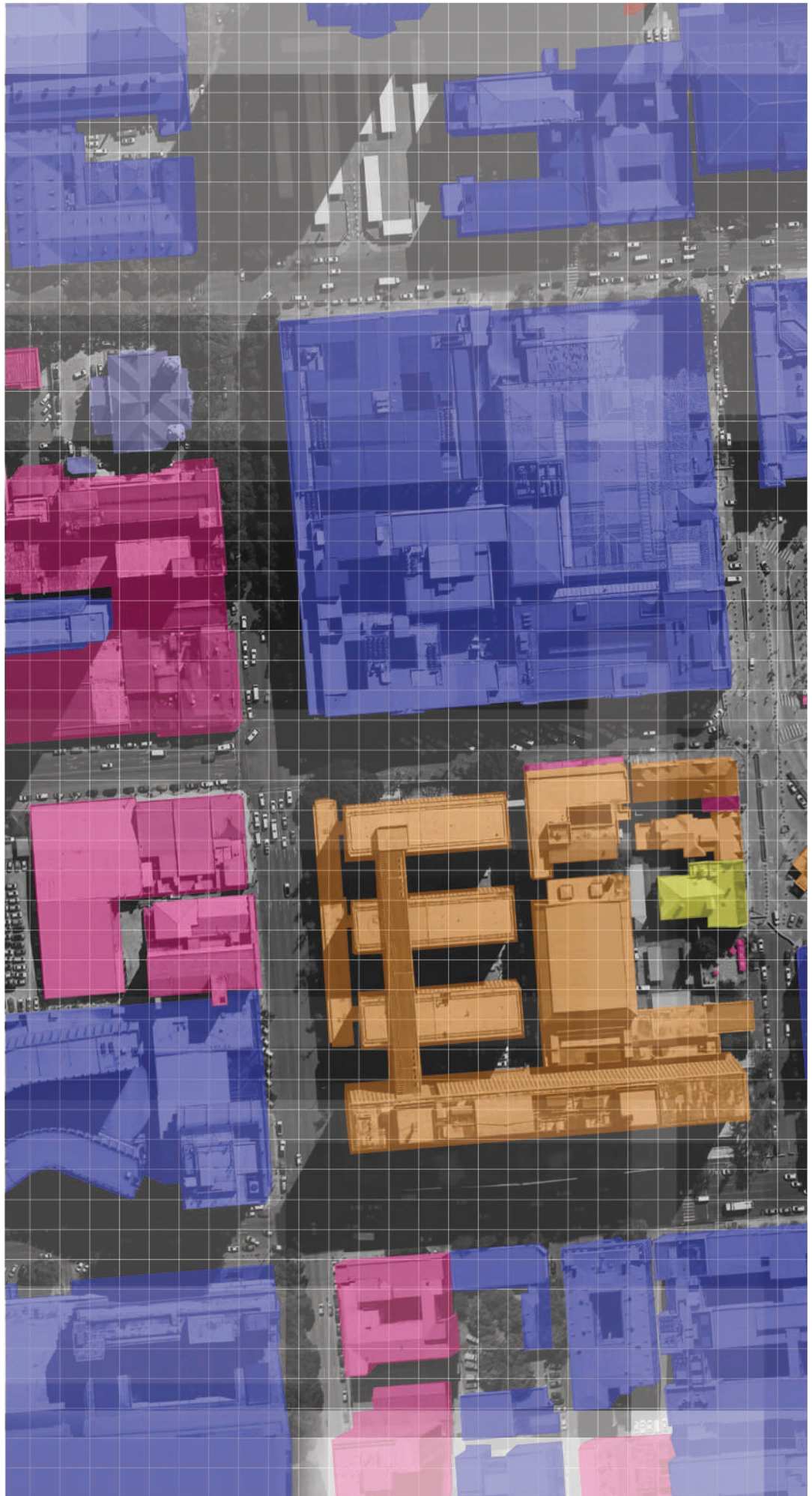
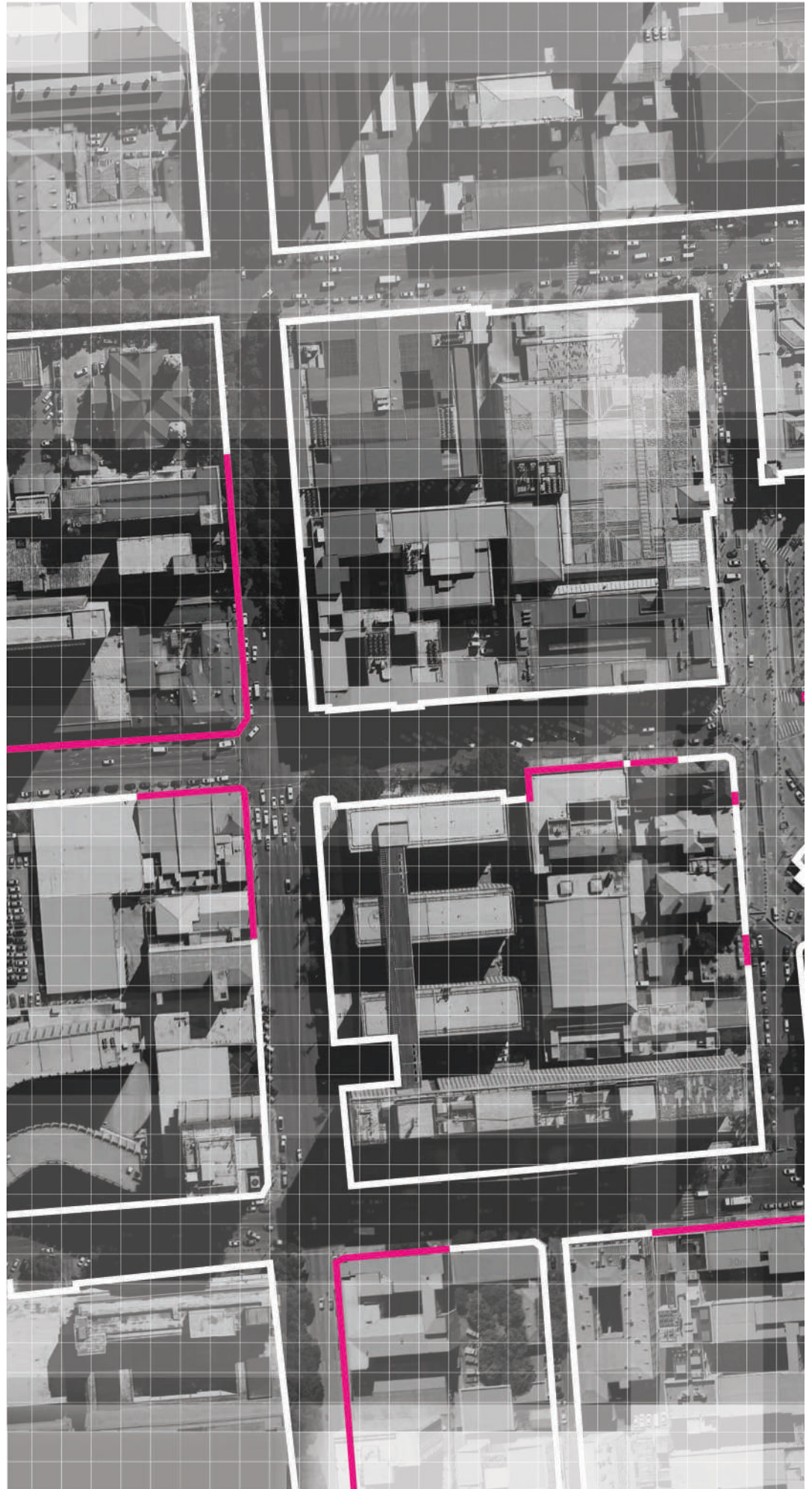




Figure 4.4 Precinct Site Analysis (Adapted from Tshwane GIS 2020).

4.3.4 Active & Inactive Street Edges



Active & Inactive Edges

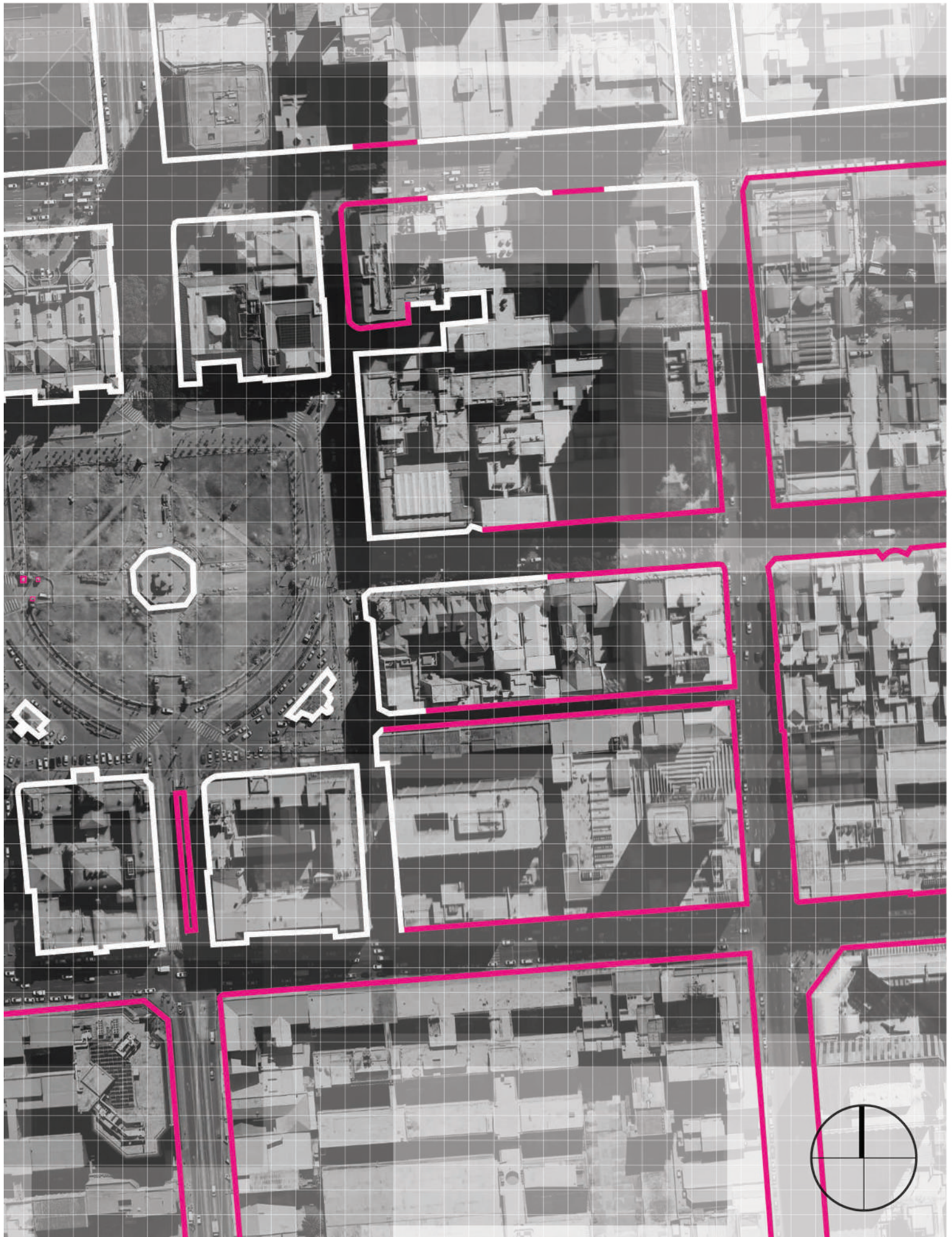
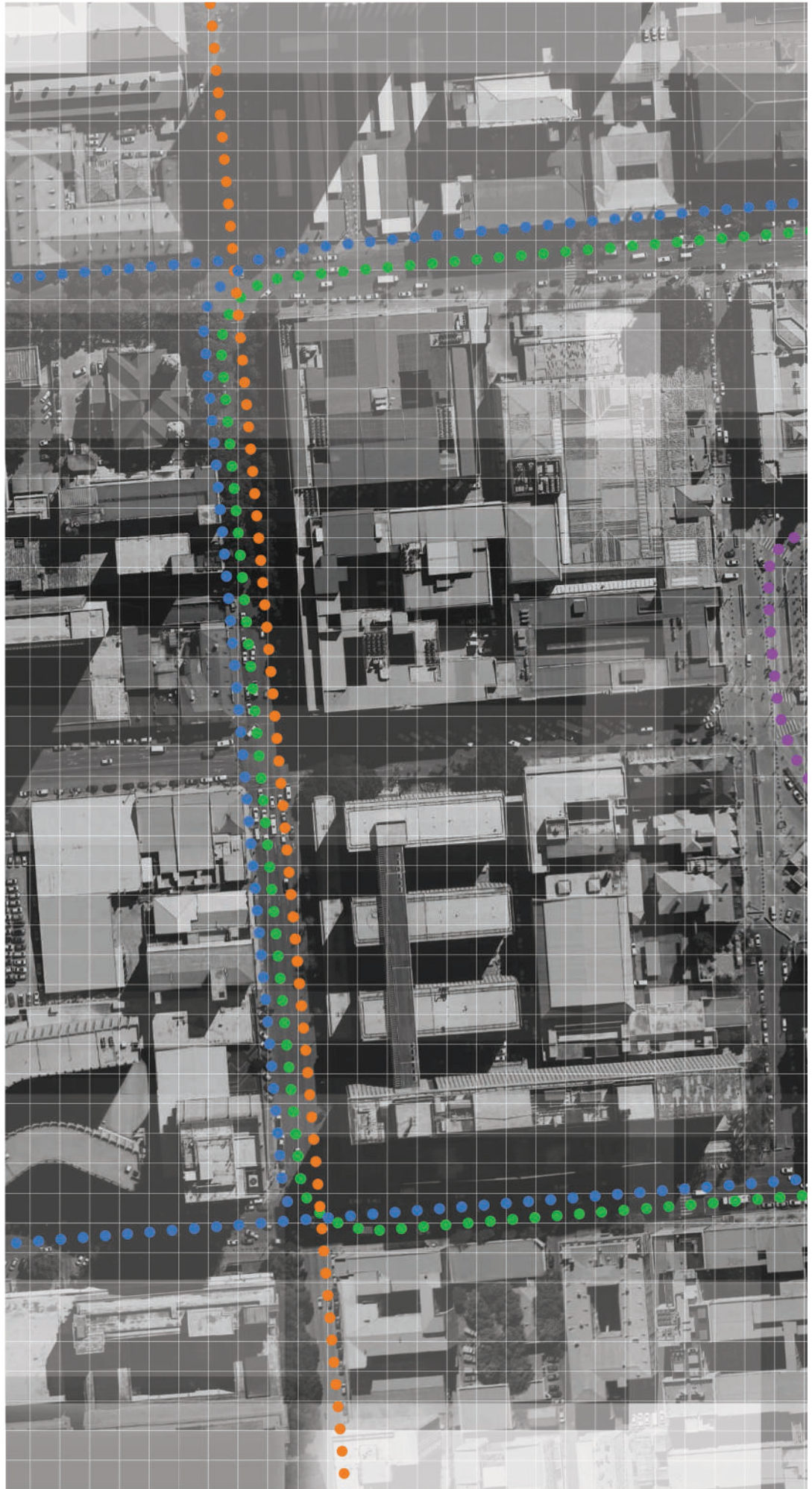


Figure 4.5 Precinct Site Analysis (Adapted from Tshwane GIS 2020).

4.3.5 Vehicular Routes

-  Pretoria City Bus Route
-  Gautrain Bus Route
-  Shuttle Bus Taxi Route
-  Areyeng Bus Route



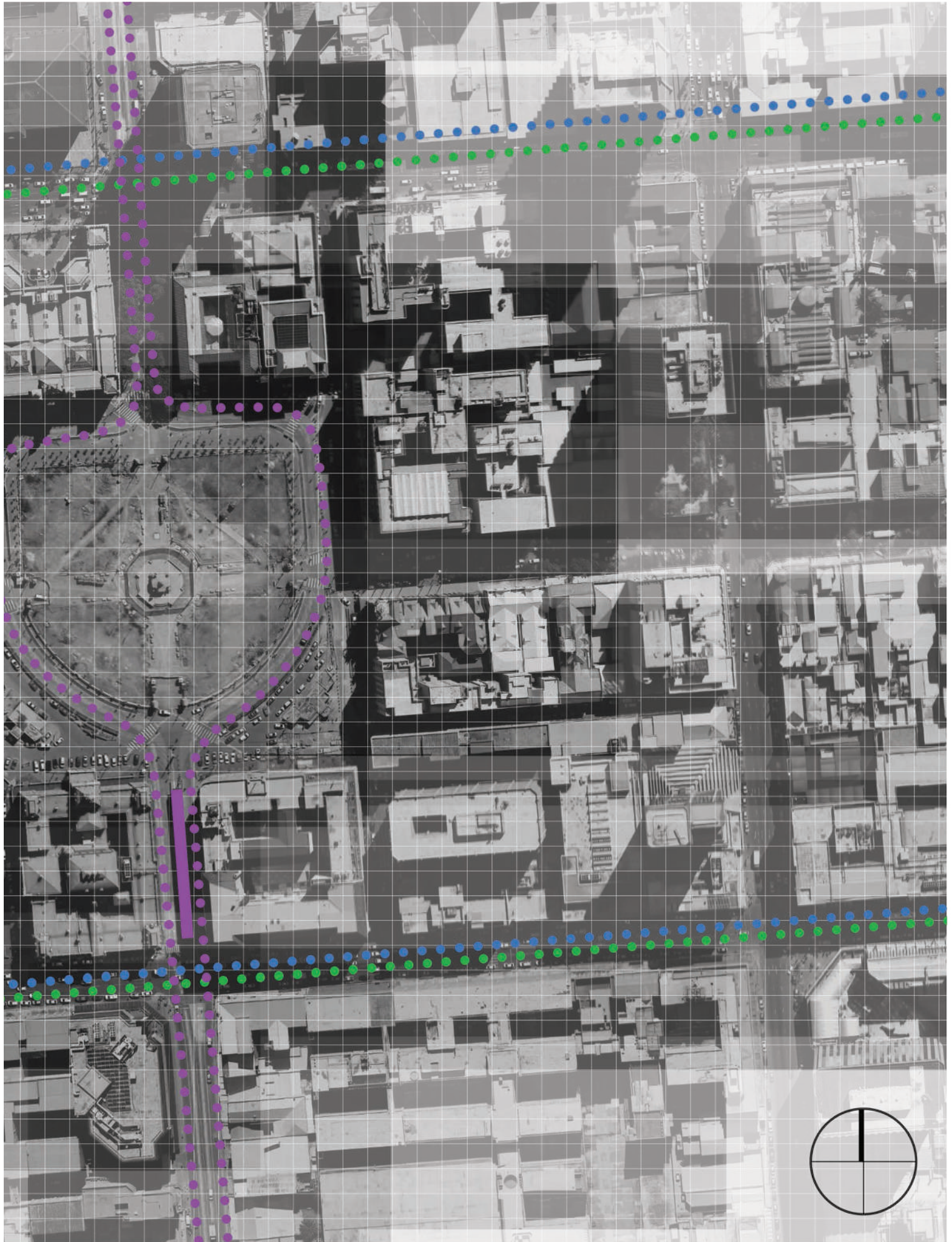
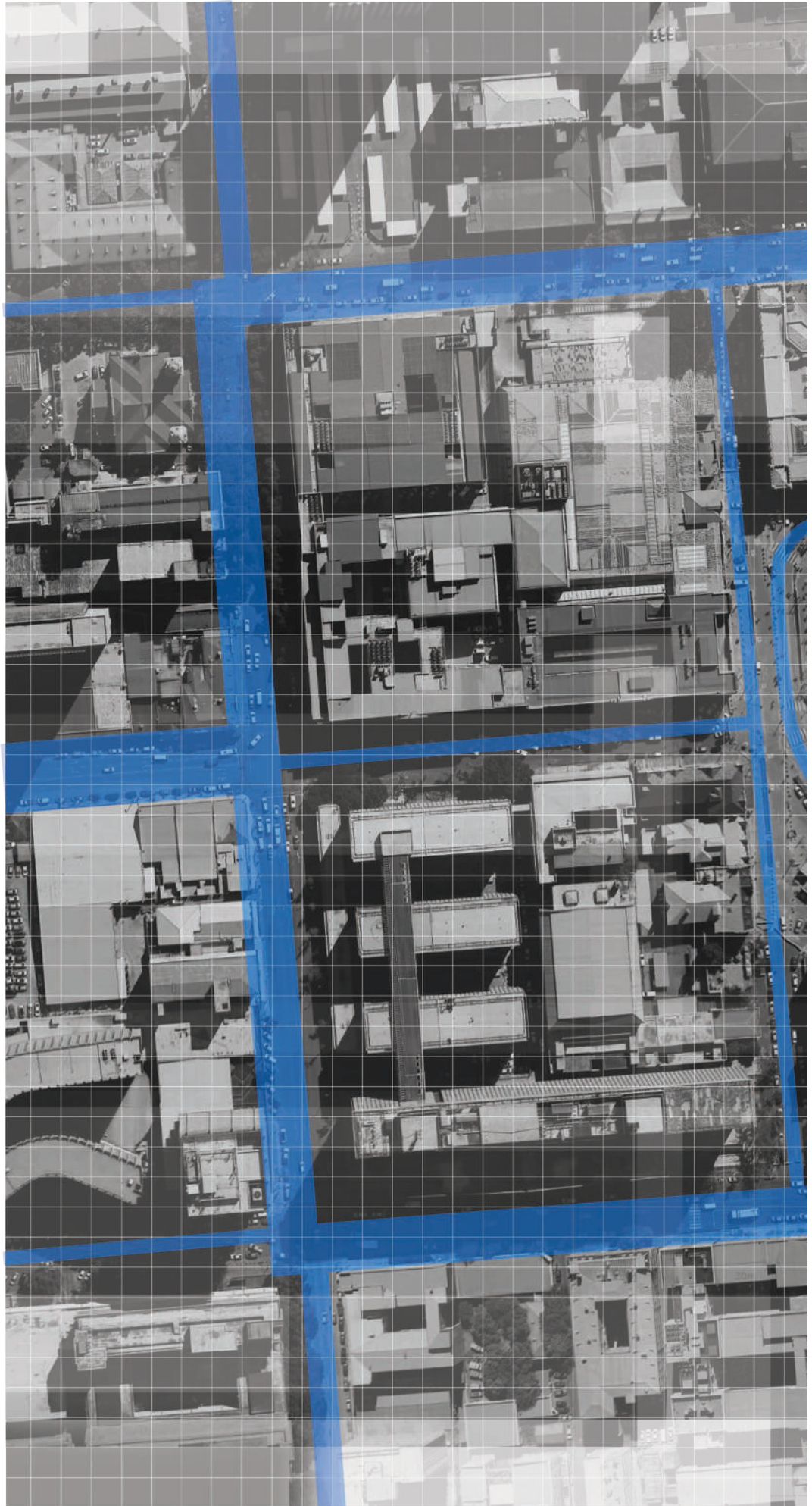



Figure 4.6 Precinct Site Analysis (Adapted from Tshwane GIS 2020).

4.3.6 Vehicular Intensity



 Vehicular Traffic Intensity

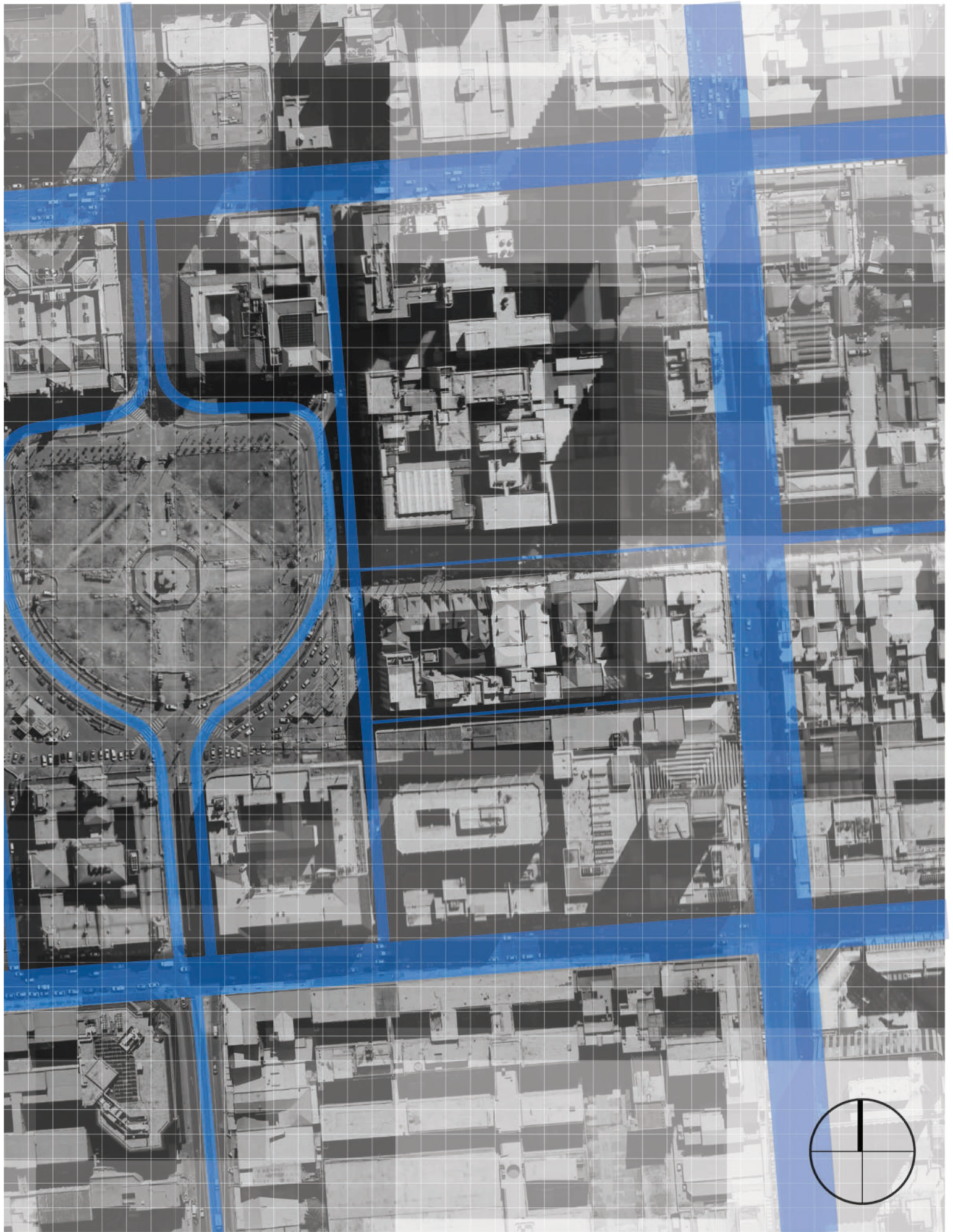
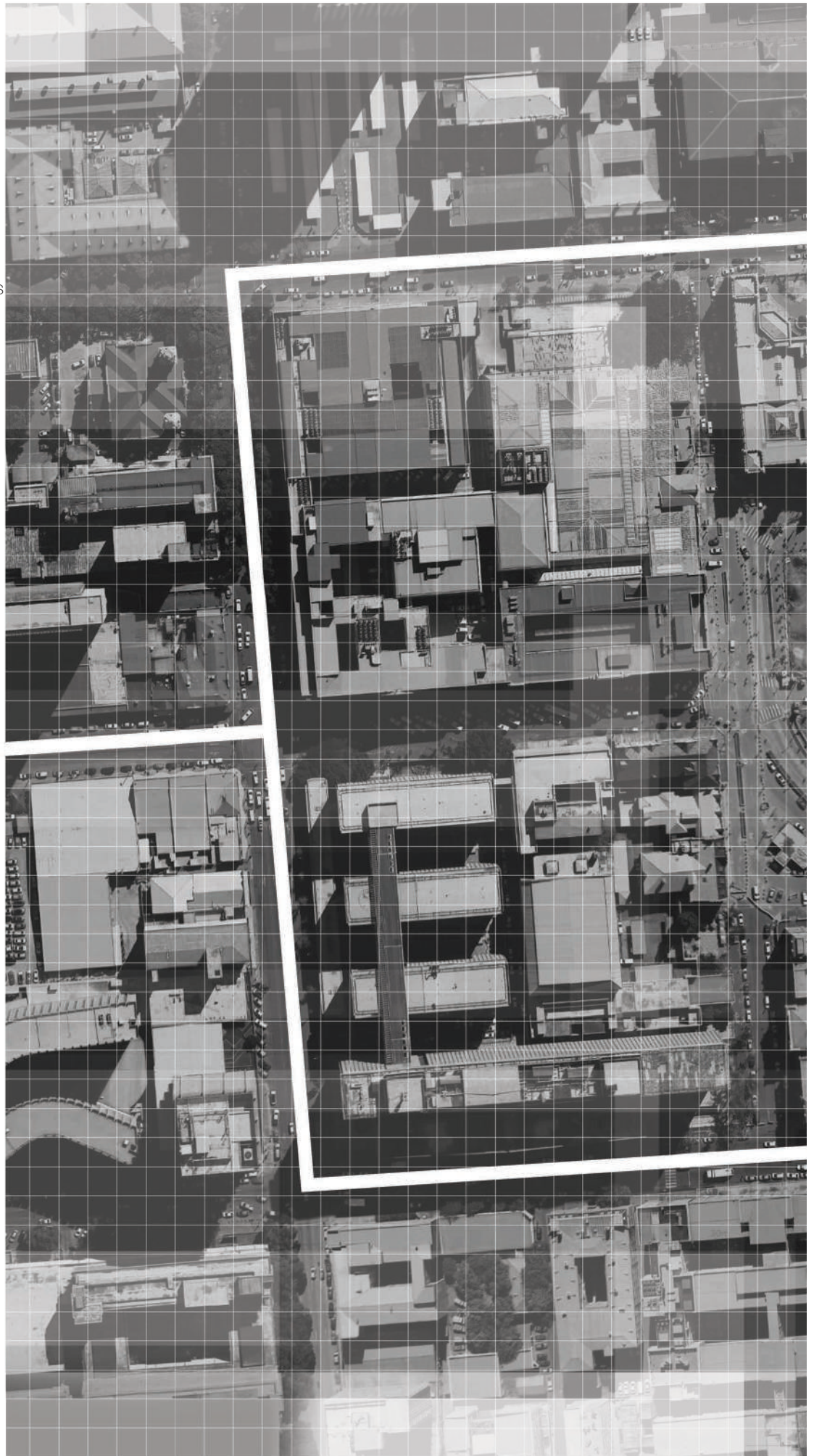



Figure 4.7 Precinct Site Analysis (Adapted from Tshwane GIS 2020).

4.3.7 The Cardo and Decumanus reinterpreted to existing conditions.



 Axis Lines Reintepreted following Urban Analysis Findings.

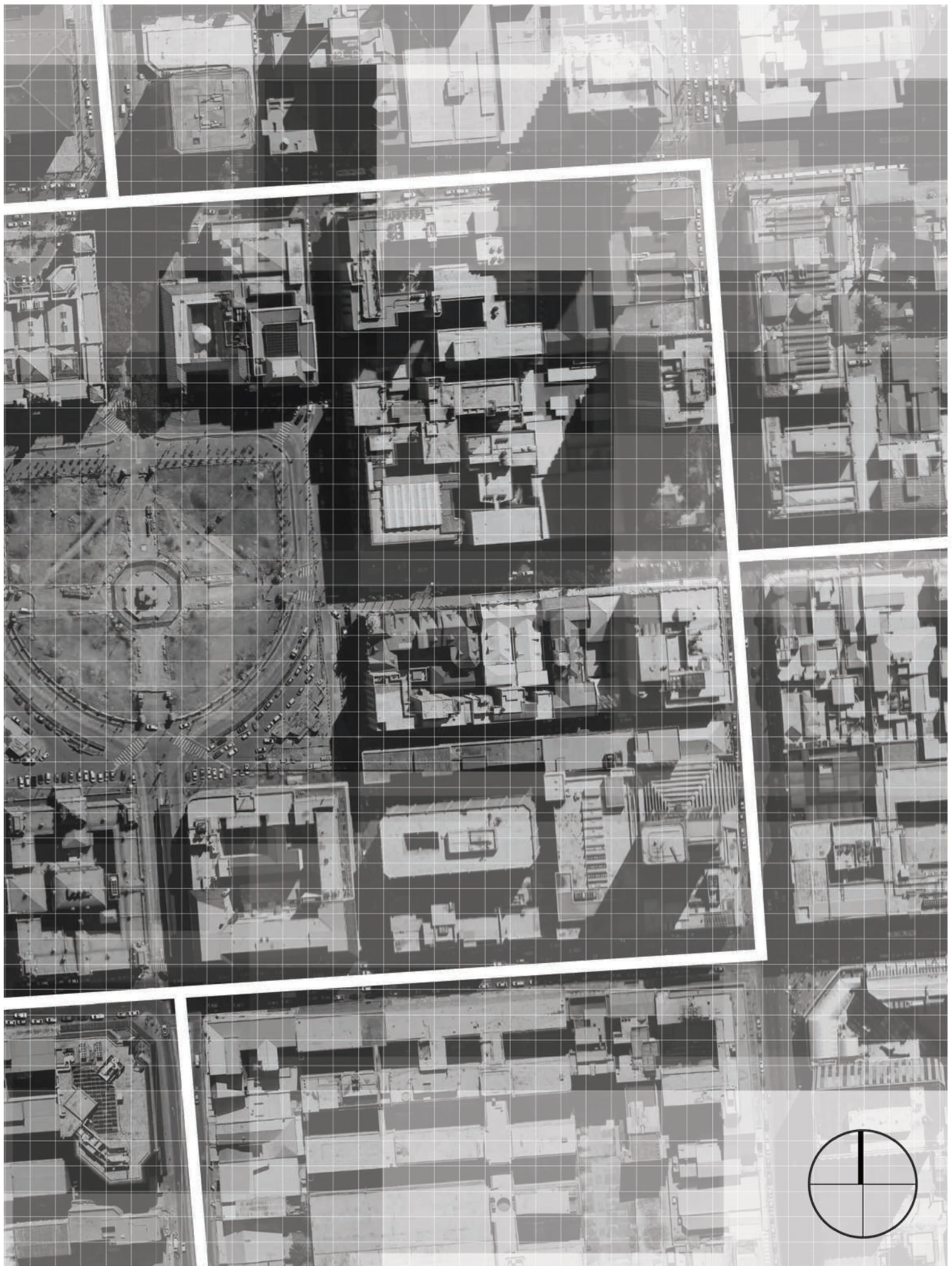


Figure 4.8 Precinct Site Analysis (Adapted from Tshwane GIS 2020).

4.3.8 Intervention Locations



1. Major Transit Route Intervention - Pretorius Street

2. Public Square Intervention - Church Square

3. Arcade Reintroduction - Fountain Arcade

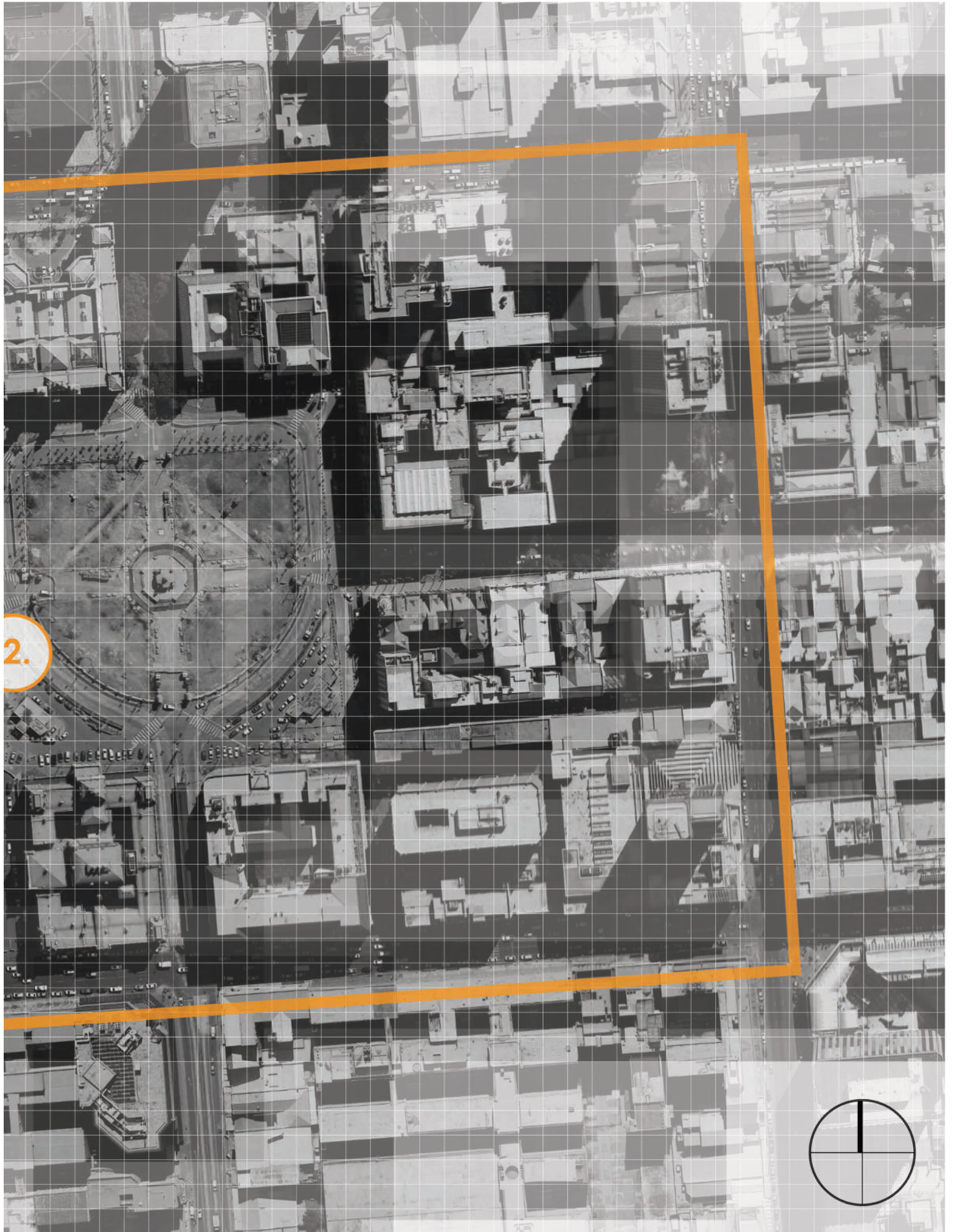


Figure 4.9 Precinct Site Analysis (Adapted from Tshwane GIS 2020).



NO STREET INTERACTION

INACTIVE SHOPFRONT

Vehicle Dominant Space

1.

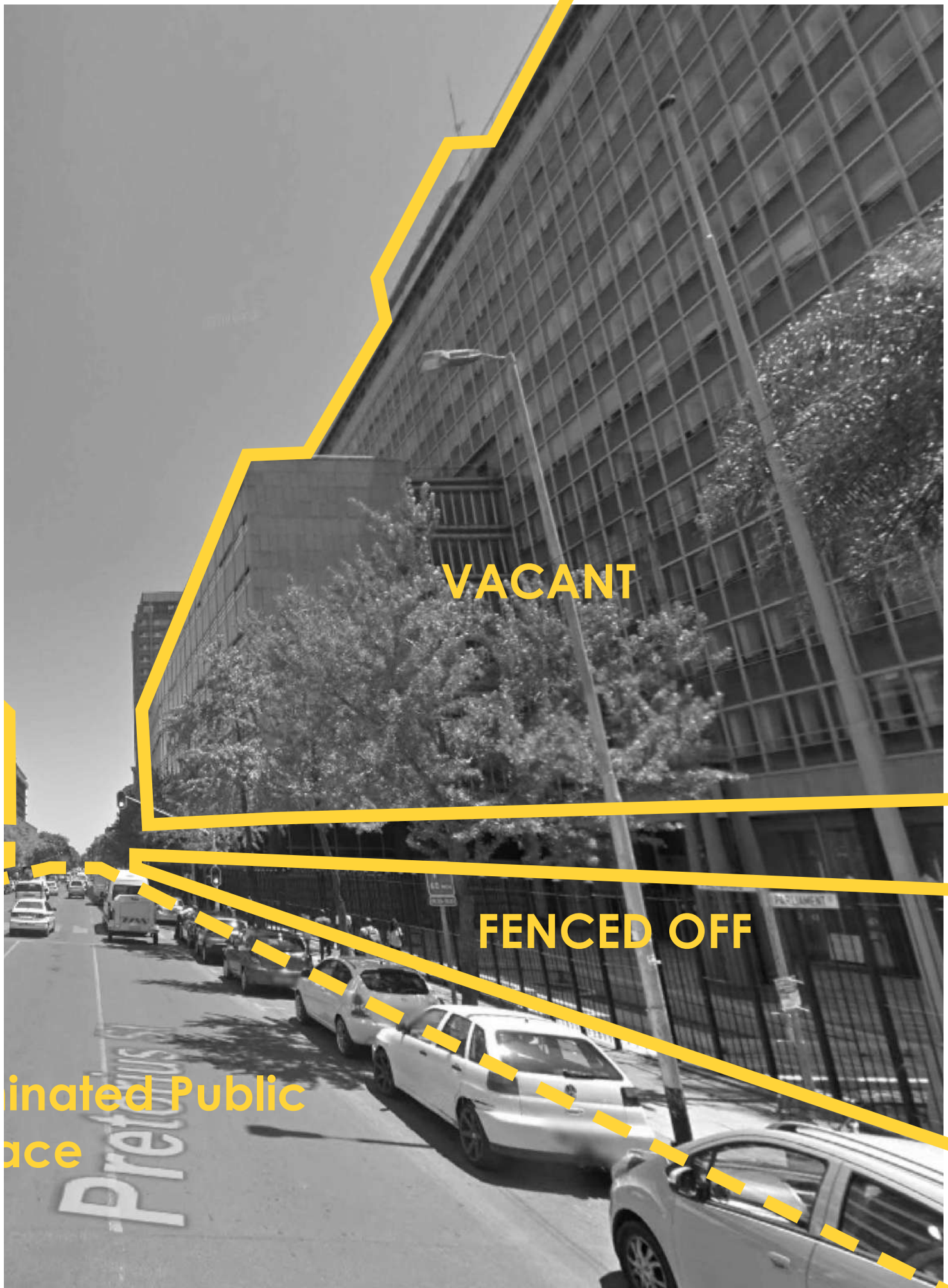


Figure 4.10 Precinct Intervention Site Analysis (Adapted from Google Street View 2020).



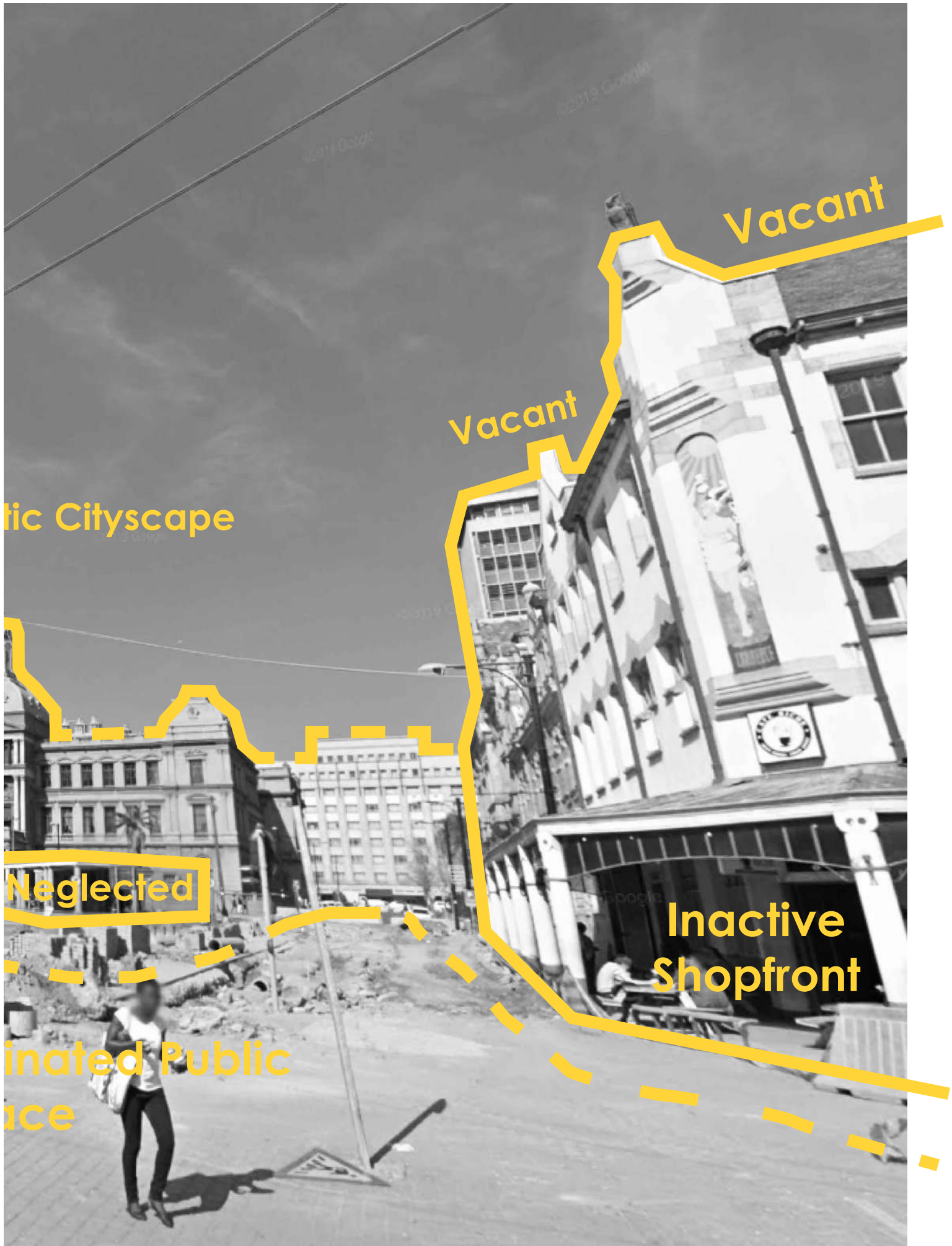


Figure 4.11 Precinct Intervention Site Analysis (Adapted from Google Street View 2020).

Under-Utilized Roof Terrace



In-Efficient Building Use

In-Active Shopfront



Inactive Public Space

Under-Utilized Roof Terrace

Vacant

Fenced-off

Public Space

Figure 4.12 Precinct Intervention Site Analysis (Adapted from Google Street View 2020).

4.4 Urban Strategy

To set out an urban strategy the following process was followed:

- a. A Meso theory analysis of various urban theorists,
- b. Urban precedent analysis to set out and formalise the selected theories into architectural principles,
- c. followed by an urban strategy, envisioning a future Church Square.

Ten principles for designing urban environments are proposed. The proposed principles, a summarization of strategies from Responsive Environments by L. Bentley, Cities for People by J. Gehl, and Creating Vibrant Urban Places to Live by D. Dewar.

01 Richness refers to the legibility and sense of the space of the city at eye level.

02 Intensity of program along with a 100m distance (Narrow units but many doors).

03 Creating opportunity for Personalisation of edge conditions and spaces as people value places more when they feel they can make it their own.

04 The Walkable city, where public space

is pedestrian centred within a 1 km range.

05 Diversity in Sharing functions takes the pressure off individual dwellings and creates locational diversity and social sustainability.

06 Variation and Integration create a multifunctional space that attracts more users and creates a local synergy by mixing and overlapping activities.

07 Robustness through creating spaces that are flexible for various purposes (creating urban qualities).

08 Continuity of the urban fabric, residential fabric above and defined by enclosed streets and public squares towards a legible urban layout.

09 The Human Scale along the urban edge to create a closer relationship between building and user.

10 Public-Private Threshold that distinguishes spaces for the inhabitant and the passer-by, however still connected visually.

**Cities for People
-Gehl, J.**

A ground floor policy-
The city developed at eye level.

Narrow units but many doors-
Increasing the amount of program
along a 100m distance

The edge as exchange and staying
zones

A walking and cycling city

Shared space for social sustainability

A multifunctional city

The fixed, flexible and fleeting

Small Spaces in large ones

A human scale

The public and private threshold

**Responsive Environments
-Bentley, L.**

Richness-
The sensory experiences of the space.

Personalisation-
People value places more when they
feel they can make it their own

Variety-
A multifunctional space attracts more
users

Robustness-
Is the space flexible for various pur-
poses

Permeability-
Access to site should be maximised

Legibility-
People need to understand the layout

Visual Appropriateness-
The interpretations of space

**Creating Vibrant Urban Places
to Live
- Dewar,D.**

Clarity-
The legibility of the space and defining
the interface between the public and
private.

Intensity-
Diversify for convenience.

Plan Partially-
Allow for personalization.

Pedestrians, not cars.

Public environments are key-
Sharing functions takes pressure off
individual dwellings and create loca-
tional diversity.

Integration-
Create local synergy by mixing and
overlapping activities.

Create urban qualities, not simply
shelter.

Balance-
Between settlement and nature, easy
access to nature and activities.

Continuity-
Of urban fabric, housing fabric, define
enclosed streets and public spaces.

Cities for People
Gehl J.

Responsive Environments
Bentley L.



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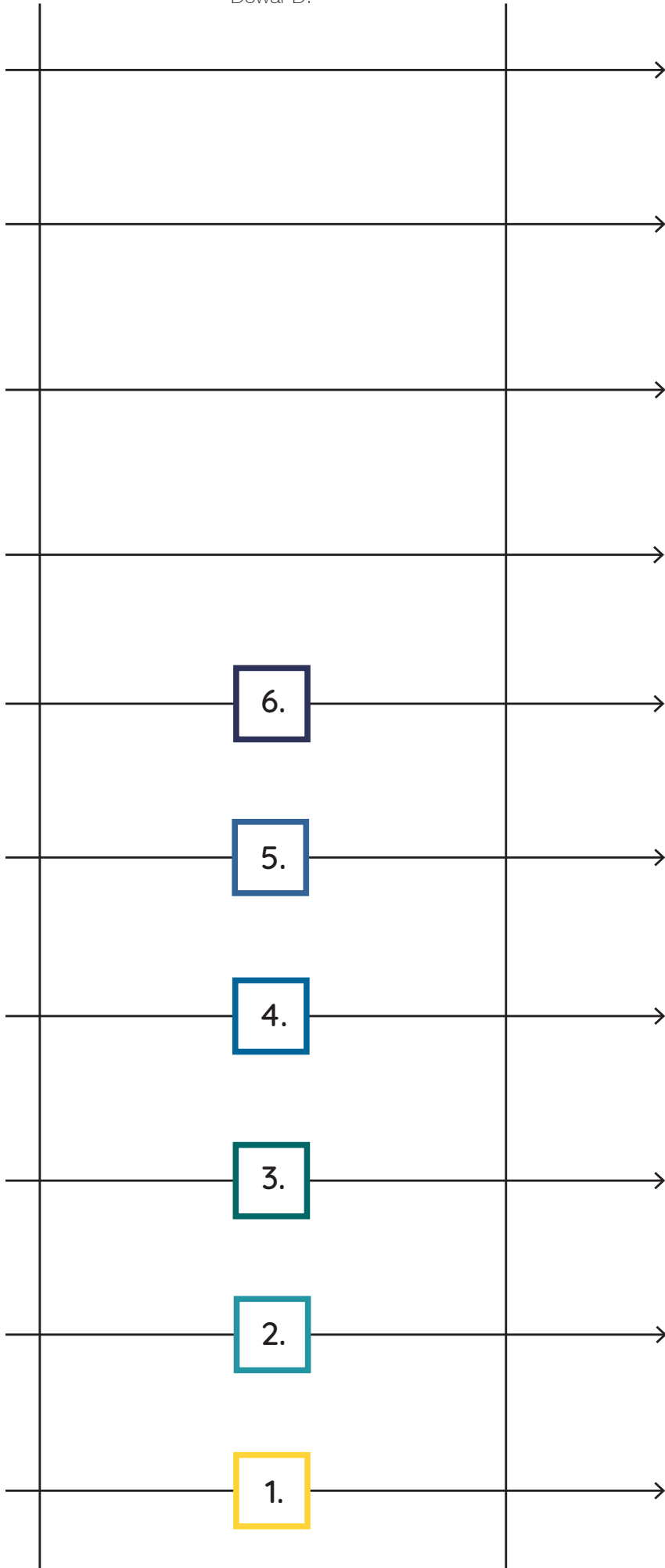
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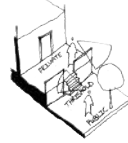
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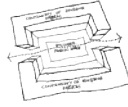
Creating Vibrant Urban Places to Live
Dewar D.

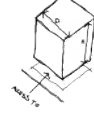
Urban Design Principles:

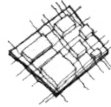



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Public-Private Threshold
- 

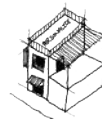
The Human Scale
- 

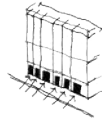
Continuity
- 

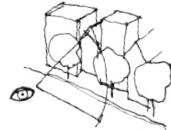
Robustness
- 

Variation and Integration
- 

Diversity in Sharing
- 

The 15 min City
- 

Personalize
- 

Intensify
- 

Richness

Figure 4.13 Urban Principles (Author 2020)

4.5 Urban Precedent

Market Street is a 4.8 km arterial route on the east-west axis running through the heart of San Francisco, linking the ocean to the hills. The street serves as a major transit corridor for its public transport, cycling, and pedestrians. The street not only serves as the most popular transit corridor but also forms an essential public space, connecting districts along its length.

Due to its position Market Street transformed in the 1960s and 70s, increasing its capacity from a slow transit corridor of pedestrians, cyclists, and trams to include private vehicles, and buses along with the tram service as public transport. The increased capacity led to faster access to different parts of the city, however, it also led to congestion, degraded public spaces, and a mono-functional streetscape dominated by vehicles. The popular street lost its founding qualities as a grand boulevard and needed a rethink in urban design and programming whilst still meeting the demands as a transit corridor. Gehl Architects joined a San Francisco team to study and establish a new future for the street and its public spaces.

The initiative studied how people moved through space and revealed Market Street as a 'mobility corridor'. The survey recorded daily counts of 75 000 transit users above ground, 500 000 pedestrians, up to 200 buses, and 650 cyclists an hour during peak hours, and the majority of people not moving were waiting in transit. In response to the findings, design proposals for different streetscapes were developed,



Figure 4.14 Market Street (Gehl 2019).

tested, and recorded over two years. The positives from the research were then translated and developed into a new coherent strategy, which was approved in 2019 and since been implemented.

The Market Street Strategy focused on addressing the existing street conditions, namely its vehicle dominance and lack of public space. 3.5 km of Market Street was made a car-free zone, a Street Life Zone was introduced where sidewalks were widened, improved, and allocated as spaces for social activities, lanes were dedicated to public transit and cycling separated from the pedestrian zones by newly introduced pedestrian loading zones and green lanes. The new street design and interventions encouraged people to interact and use the spaces to meet, transforming the corridor into a place for people.



Figure 4.15 Market Street as Arterial Route through the City (Gehl 2019).



Figure 4.16 Market Street in the 1920's (Gehl 2019).



Figure 4.17 Market Street Currently (Gehl 2019).

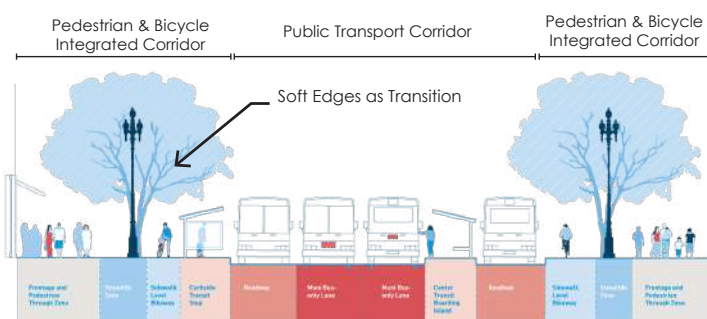


Figure 4.18 Street Section (Gehl 2019).

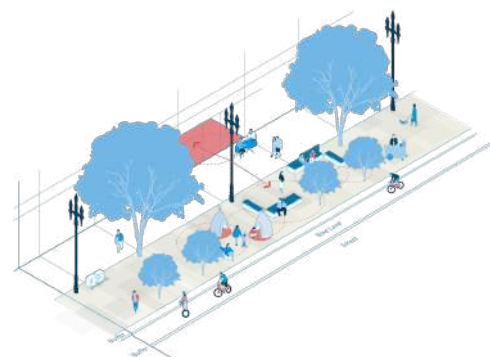


Figure 4.19 Reclaimed Pedestrian Space (Gehl 2019).

4.6 Urban Vision

4.6.1 Urban Framework



Figure 4.20 Precinct Site Analysis (Adapted from Tshwane GIS 2020).

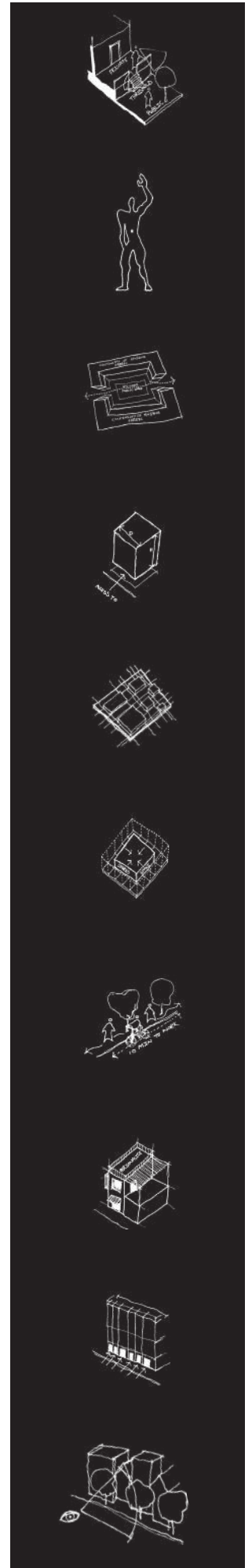


Figure 4.21 Urban Design Principles (Author 2020)





Figure 4.22 Urban Vision (Author 2020)



2.





Figure 4.23. Urban Vision (Author 2020)



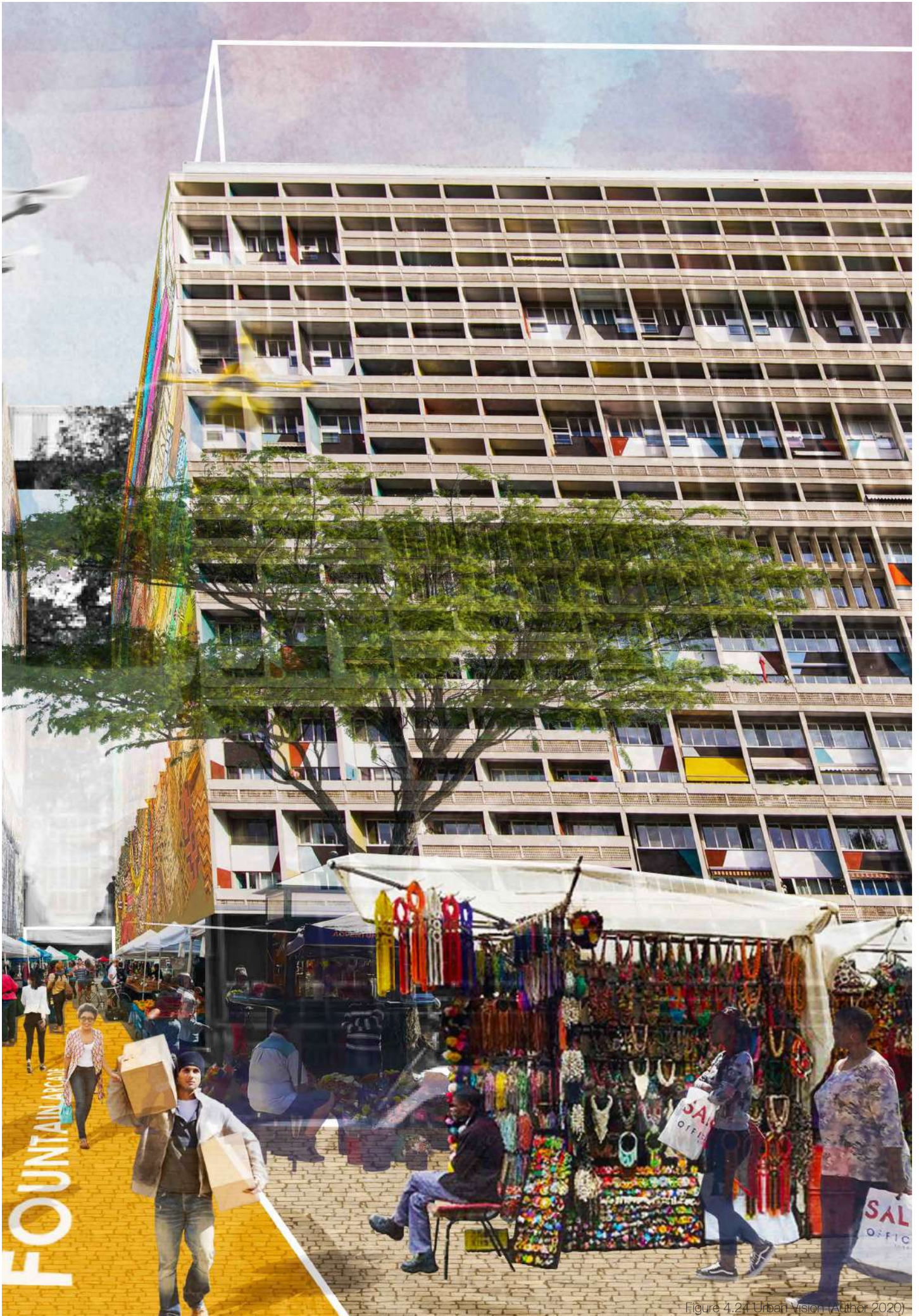


Figure 4.24 Urban Vision (Author 2020)

chapter

05

STATEMENT OF SIGNIFICANCE



Figure 5.1 The Site in its Context (Adapted from Google Earth and Edited by Author 2020)

5.1 Assessing the Significance of Place

Previous chapters outlined the heritage value of Church square and its surroundings. An investigation into the following buildings set out in chapter 5 is conducted to derive to architectural informants from historical narrative in building methods, materials used and design aesthetics.

Heritage within architectural terms refers to the conservation and preservation of buildings, structures, and urban fabrics that are considered historically significant in various ways. According to McCarthy (2012: 625) architectural heritage is a wide category which can include building facades, finishes, proportions, and spatial arrangements, the former floor plan of a demolished building, or the reconstruction of demolished buildings, the relocation and the adaptive re-use of a heritage building. The various methods all reflecting the values of heritage for different communities.

However, for all the tangible there are also intangible heritage values within the urban fabric, which need to be considered and protected (McCarthy 2012: 625,629). The tangible provides a physical representation of those things from 'the past' that speaks to a sense of place and self in a community (Smith 2006:30). The intangible is defined as the lived experiences of built heritage expressed in performances of language, dance, oral histories, and other forms, all within elements of emotion, memory, and cultural knowledge and experiences not expressed in the built form (Smith 2006:56).

According to Smith (2006:57), as the intangible becomes more defined in heritage values, critical interest in memory has increased substantially within the social sciences and various groups have

started questioning the importance of culture placed on specific heritage sites, mainly how is it culturally important if it only refers to another's culture.

Heritage management strategies in South Africa are considered in terms of the National Heritage Resource Act (NHRA 1999) and the Australian Burra Charter. The Burra Charter was adopted by the NHRA for its applicable conservation principles in regeneration and alteration, which is not covered by the NHRA (SAIA 2015). According to the Burra Charter (ICOMOS Australia 2013), adaptation may involve additions to the place, the introduction of new services, or new use, or changes to safeguard the place without affecting the cultural significance of the place.

National Heritage Resources Act

In regards to national heritage legislation and regulations in South Africa, the SAIA (2015) states the South African Heritage Resources Agency (SAHRA) as a statutory organization whose objective is to coordinate the identification and management of the national estate, established in terms of the National Heritage Resources Act (No 25 of 1999) as the national body responsible for the protection of South Africa's cultural heritage resources (NHRA 1999).

Burra Charter

The Burra Charter was adopted by the NHRA (1999) and guides the conservation and management of places of cultural significance, where the subject of Australian heritage is adapted towards South African heritage. The Burra Charter (2013) advocates a cautious approach to change: make the place useable, change as little as possible, and ensure the cultural significance is retained. The charters conservation principles can be

categorized into

- Preservation: maintaining a place in its existing state.
- Restoration: returning a place to its true former state without introducing new material.
- Reconstruction: returning a place to its former state, however distinguishing the former with the introduction of new material.
- Adaptation: changing a place to suit the existing use or proposed use.

5.2 Heritage Assessments

Assessments and analysis of the precinct conducted in the previous chapters revealed the many buildings and blocks considered important heritage sites within the city.

These sites forming part of the many layers of social networks along the historic north-south axis of the city. The heritage assessment will focus on the buildings of the relevant urban block, however assessed within the vast identified urban network of the city.



Figure 5.2 Identified heritage sites within the city (Adapted from Tshwane GIS 2020).

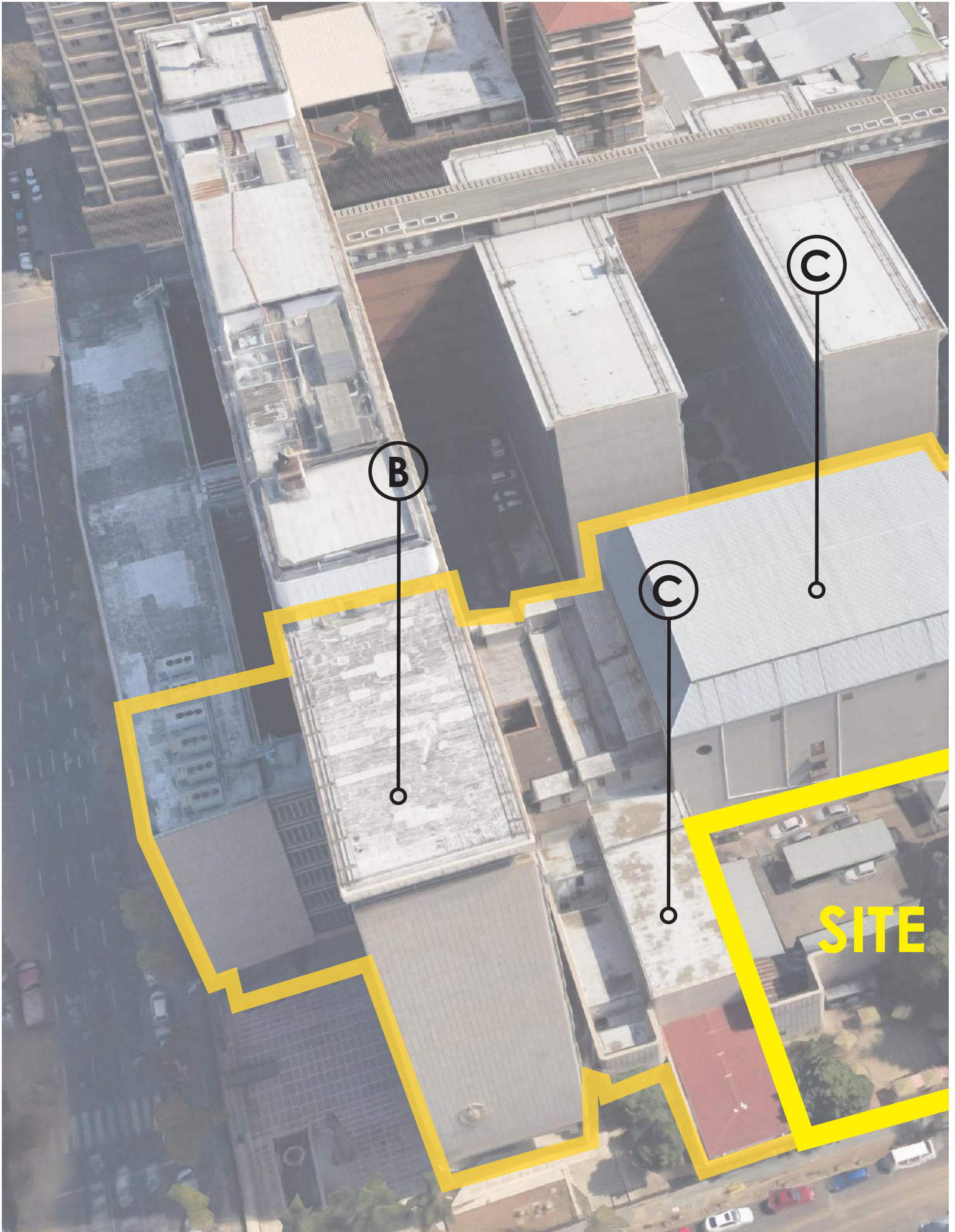


Figure 5.3 Heritage sites and Pretoria's historical North-South axis shown in conjunction (Adapted from Tshwane GIS 2020).





Figure 5.4 The site's neighbouring heritage buildings, selected for the heritage assessments (Adapted from Tshwane GIS 2020).



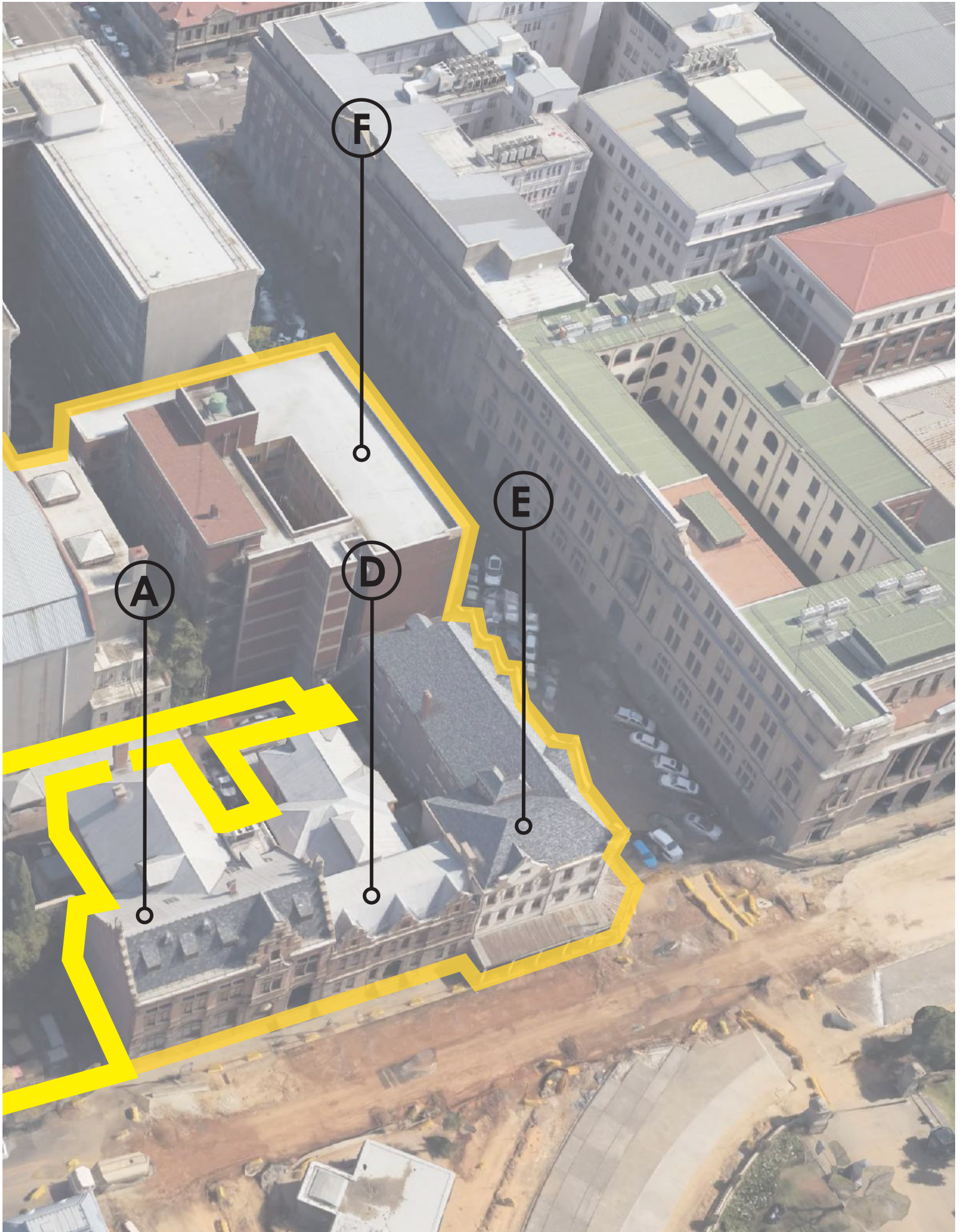


Figure 5.5 Site Block Heritage Sites (Adapted from Google Maps by Author 2020)

5.3 Individual Heritage Assessments

5.3.1 Heritage Values

A Old Netherlands Bank

Built: 1897.

Architect: Wilhelm Johannes de Zwaan.

Architectural Style: Neo Dutch Renaissance Revival.

Previous Uses: Bank, Offices.

Current Use: Tourism information centre and government offices.

Profile:

Church Square is known to have formed as a religious and political congregation, however, it has also been a place of commerce since its early years. The Old Netherlands Bank was one of the first to reflect the commerce of the area and one of the first Neo Dutch Renaissance Revival styled architecture in the country. The building features stepped gables and protrusions of red brick in line with Dutch Renaissance Revival, but with Art Nouveau ornamentation in the cast iron finishes on the exterior and interiors. The bank quickly grew in popularity and by the 1950s moved to a larger building opposite the square. The function of the old bank building shifted over the years from a bank to government offices and today the City of Tshwane tourist offices occupy the premises. According to Swart (2019) both the building and location fit the new function, although the building isn't yet used to its full potential, given the few numbers of tourists visiting the square.



Figure 5.6 Old Netherlands Bank Front Facade (Author 2020).

B Old Law Chambers

Built: 1893.

Architect: Marshall Philip.

Architectural Style: Flemish/German Renaissance Revival.

Previous Uses: Law chambers, offices, and residential.

Current Use: Vacant.

Profile:

The former Law Chambers is the oldest building on the west façade of Church Square and was the first and only building realized by its architect, in Pretoria. The two-storey building was inspired by Flemish/ German Neo-Renaissance Revival, with Art Nouveau ornamentation, the first and only of its kind in Pretoria. The building is characterized by gables of stone plinths, corrugated zinc roofing, and walls of stone and brick with ornate plaster and stonework. Openings to the street edge are defined by rectangular timber-framed windows and arched windows on the first floor with prominent lintels of incremental stone and brick. The street edge is formalized by ornate mild steel front gates, imported from England and Kirkness brick walls, a product of Pretoria. Through the years, the building still sits comfortably between the Old Netherlands Bank building and Café Riche, contextualized in its unique design, material use, and 127-year presence on Church Square.



Figure 5.7 Old Law Chambers Front Facade (Author 2020).

C Transvaal Provincial Administration (TPA) Building

Built: 1962.

Architects: Meiring and Naude.

Architectural Style: Brazilian Modernism (Regionalist).

Past Use: Government administration offices.

Current Use: Vacant.

Profile:

The TPA building is located on the block of Bosman, Pretorius, and Parliament Street. The building was inaugurated in 1963 as a government-funded Modernist building intended to portray a progressive apartheid government through its immense scale and technological complexity. The building was the tallest in Pretoria and served as an introduction to high-rise construction in the city. The building has mostly stood vacant since the mid-1990s and declared officially vacant in 2015.

The former government building illustrates principles of the Modern Movement adapted to the South African context. The urban complex is comprised of four large office wings placed along an east-west axis, separated by courtyards. Regionalist principles were integrated with that of the Modernist to better suit Pretoria's climate, achieved through finely crafted architectural details and screens that incorporate natural light, ventilation, and visual connections to the outside. The 13 storey concrete-framed building is bound by a strict modular grid, meticulously divided by partitioning on the interior



Figure 5.8 TPA Building South Facade (Author 2020).

and façade detailing on the exterior, creating the coherent and harmonious design of the TPA. The building served as the national headquarters, housing all provincial departments within a single complex, the largest government and office building of its time. Today the building stands empty, apart from the few security personnel guarding the treasures within, in the form of a collection of artworks by some of the greatest South African artists lying dormant and without an audience. After years of dormancy, the building is still in remarkable condition and stands as a heritage asset with enormous potential for future use.

D Café Riche

Built: 1904.

Architect: Francois Soff.

Architectural Style: Art Nouveau.

Past Use: bistro, bar, news agency, offices, residential.

Current Use: Vacant.

Profile:

Café Riche is situated on the corner of Parliament and Church street.

The building was initially named the Investment building, but due to the café's popularity, the original name was forgotten. The building is aesthetically significant as it's a representation of the Art Nouveau model, displaying many of the characteristics such as an a-symmetrical façade, ornamentation, and reference to organic beauty rather than art.

Ornamentation included a stone owl perched on the corner plinth, the stone relief of Mercury above the Café's entrance, and stone relief of fauna and flora as the pinnacles of the gables, all designed and sculpted by Anton van Wouw, whom also sculpted the Paul Kruger monument of Church Square. The timber window frames and the main door of the Café were salvaged from the last church that stood in the Square and imported stained glass and cast iron formed the veranda. Today, more than a hundred years old, the building stands vacant but is considered a National Monument intertwined in the history and growth of the square and Pretoria.



Figure 5.9 Cafe' Riche Front Facade (Author 2020).

E Capitol Theatre

Built: 1931

Architect: Percy Rogers Cooke.

Architectural Style: Italian Renaissance & Art Deco.

Past Use: Theatre.

Current Use: Vacant/ Parking Lot.

Profile:

Located adjacent to the Old Netherlands Bank on the south-western edge of Church Square, the Capitol was built where the former President Theatre used to stand. The Capitol was part of a new master plan for block. The auditorium recessed deep into the block and the entrance foyers reaching towards Parliament street, with a multi-storey hotel forming the street edge. However, the hotel was never built as was intended, leaving the auditorium as an unfinished and exposed box structure, in contrast to the highly finished interior (Swart 2019:150).

The Capitol Theatre was developed by African Theatres Limited during the interwar era when entertainment was a profitable social need. The interior was of Italian Renaissance Style with a nondescript exterior within the Art Deco Era. The 2500 seat theatre entertained its audience in the cinema, drama, and orchestral music. According to Swart (2019:150). The building was detailed to the highest standards of ventilation, acoustics, and lighting, conditions that were controlled to simulate the day and night skies within the volume.

The theatre was originally intended as a



Figure 5.10 Capitol Theatre Front Facade (Author 2020).

complete escape from the realities of the city, however, the otherworldly volume now serves as nothing more than the mundane: government parking. Various groups in architecture and arts have developed new proposals for the use and renovation of the Capitol. Some portions of the foyer have been restored and various art collectives have used the space for exhibitions and performances, however, currently, there are no extensive proposals in place. The Capitol stands dormant with potential, gradually deteriorating (Swart 2019:150).

F Poynton's Building

Built: 1950.

Architect: William Gordon McIntosh.

Architectural Style: Modernism of the International style with some regionalist influences. (5 storeys + shading).

Past Use: Office, Retail, Commerce.

Current Use: Informally used for Recyclable sorting and storing, Retail and Commerce.

Profile:

The Poynton's Building is located at 179 WF Nkomo Street. The structure was built in 1950 as one of Pretoria's earliest modernist architecture examples. The building was commissioned by J.C. Poynton to expand his agricultural equipment company. The seven-storey building was designed to house employee offices on the upper six storeys and a commercial ground floor that opens to the street edge covered by a cantilevered concrete canopy. The building is composed of the Domino concrete structure with double and single brick walls as infill. The building was orientated with the length on the east-west axis to make use of the contextual and environmental benefits. The structure is punctured by a light well, which runs from the first floor to the roof terrace to provide the deeper spaces with light.



Figure 5.11 Poynton's Building Front Facade (Author 2020).

5.5 Adaptive Re-Use Strategy

Rapid population growth, climate change, and limited resources have affected the way cities are being developed, making the need for regenerative strategies in the existing architectural fabric more pertinent. Architects need to make critical decisions within cities, considering areas of neglect, vacancy, and decay as opportunities for adaptive reuse of the existing or activating the in-between. Consideration should be given to historical contexts in reserving the cultural significance through appropriate regenerative strategies. Bollack (2013) classifies five architectural strategies for responding to the existing fabric, in her book titled 'Old buildings New Forms'. The strategies are insertions, parasite, wraps, juxtapositions, and weavings.

01 **Insertion** refers to the new, placed within the existing (Bollack 2013:23). The insertion using the existing (place of memories) as shelter while still retaining its own identity, creating a co-dependence between the old and the new.

02 **Parasite** interventions are described by Bollack (2013:65) as the new latching onto the existing, reliant on the original structure as support and its existing systems. The parasitic providing new function and additional space, and always reliant on the original built fabric. The new distinguished from the existing in its form, material, and colour (Bollack 2013:65).

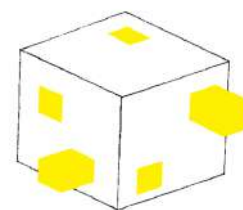
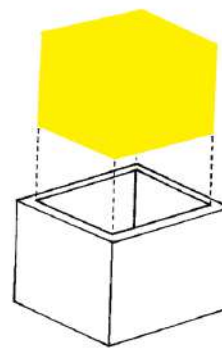
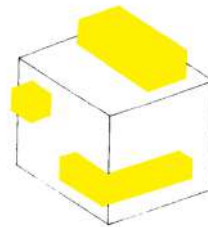
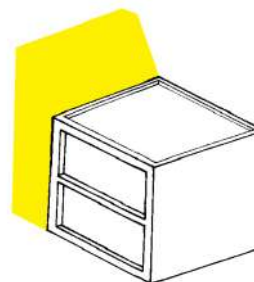


Figure 5.12 Adaptive Reuse Principles

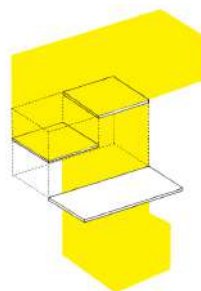
03 **Wraps** is described as a new mantle that wraps to the existing (Bollack 2013: 113). The new intervention provides the existing with shelter and protection, however, the new might render the existing obsolete as it removes the original intention of the building. The new, however, can create new spaces that incorporate the existing through the 'in-between' (2013: 113).



04 Bollack (2013:141) describes **juxtaposing** an addition against the existing fabric is to refrain from engaging with the old. There is no blurring of boundaries or transfer in architectural language or elements, no direct dialogue, or articulated relation to the original. The new and existing sharing the same programmatic function, however completely distinguishable in structure, materiality, and colour forming its own identity (Bollack 2013:141).



05 **Weaving** the new into the existing built fabric, Bollack (2013:179) describes an inseparable relationship between the new and the existing. A knitted fabric produced from the modified, altered, and actively reused through ensuing an interconnectedness.



The architect and owner reclaim the hidden value of the old building and represent it as a living contemporary object, using it in the present and ensuring its long-term preservation (Bollack 2013:23).

Figure 5.13 Adaptive Reuse Principles

CONNECTING TO THE EXISTING

Heritage Design Principles:

In 1996 Fagan listed the ten principles of the built heritage in a lecture. Barker (2014) states the principles as a realization of years of experience in conservation practice, focused on the making of a new form through responses to program and context. The principles still reinforcing the vernacular of the context as the source of design inspiration (Barker 2014). Fagan formalized his “lessons of the vernacular” as conservative and interpretive principles for responding to the vernacular and meeting the needs of the modern man and new technologies.

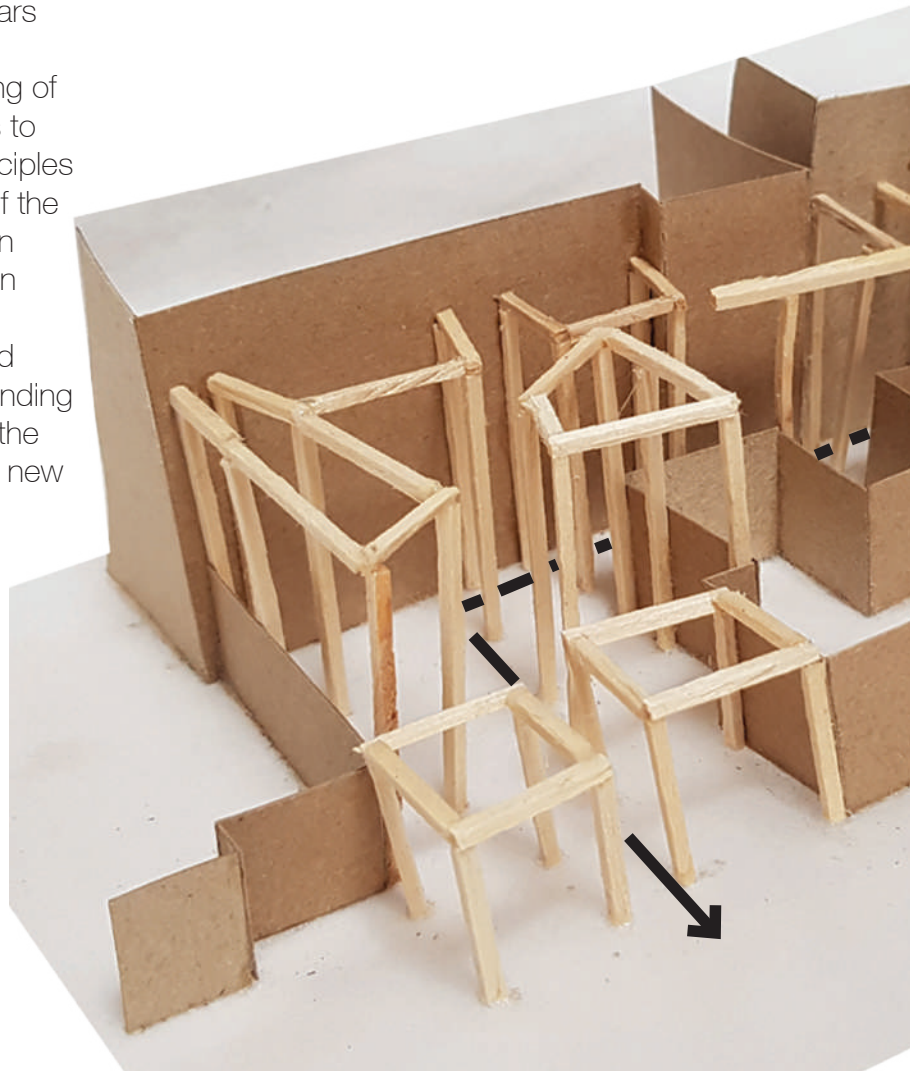
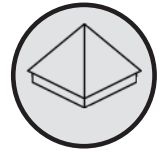


Figure 5.14 Site model showing the relationship of the old to the new (Author 2020)

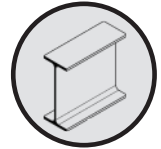


Technical & Structural Design Principles:

01 Simplicity



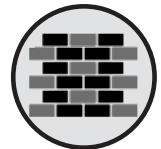
02 Structural integrity and honesty



03 Plasticity or Modelling



04 Appropriate and consistent detailing



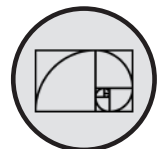
05 Unity in diversity



06 Colour



07 Proportion



08 Human scale



09 relation to the environment



10 progression of experiences

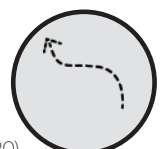


Figure 5.15 Technical Principles (Author 2020)

chapter

06

PROGRAM

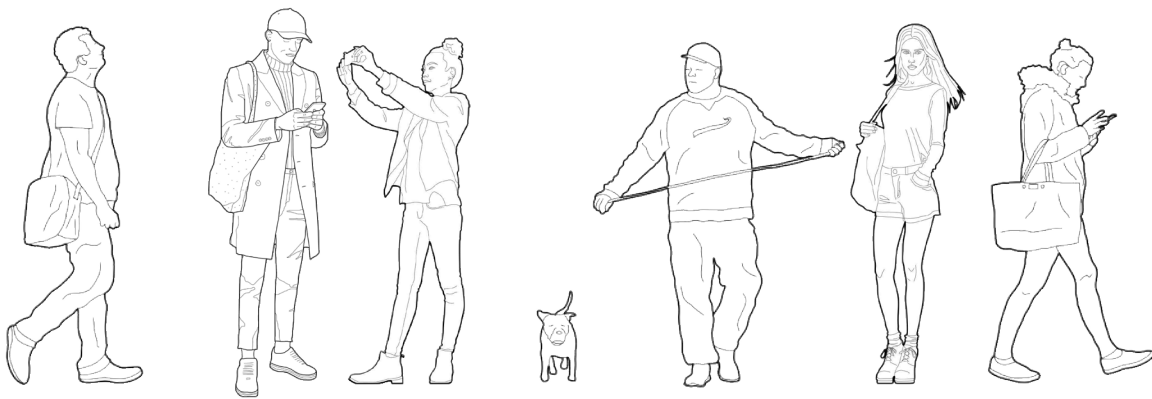


Figure 6.1 Users (Author 2020)

6.1 Programmatic Informants

The Tshwane 2055 Vision, as previously mentioned, envisions the city as liveable, resilient, and inclusive, where residents can enjoy access to social and economic opportunities equally (CoT 2013). According to the framework the liveable environment will be established through principles, namely: compact urban form, encouragement of diversity in residents, promotion of public, bicycle, and pedestrian transport, better suited public and spatial infrastructure achieved through restructured urban design strategies.

Various site visits made apparent the limited amount of users on the western blocks of the precinct in comparison to the eastern blocks. However, many daily commuters still use the precinct as the main pedestrian thoroughfare on the east-west and north-south axis. The buildings surrounding Church Square, serve predominantly as government administrative buildings, some retail and commerce activity on the ground floor, but a great number of unused-derelict buildings and public spaces within the precinct.

The mono-programmatic and decaying nature does little to attract inhabitants to the area. According to Jenks et al. (2000:15), the precinct would need more than the addition of a program to revive the urban environment and be able to provide for both inhabitants and daily commuters. To propose a program in isolation would enforce the existing unfeasible mono-programmatic model (Jenks et al. 2000:15) evident in the post-Apartheid city. Instead, the identified requirements for collaborative retail, commercial and residential programs are needed to merge to form a multi-functional and continuous liveable environment within the city.

Although the majority of the urban block currently stands vacant, still some activity persists, namely: small grocery stores, restaurants, consultation offices, exam facilities, craftsman's workshops, and market space. The Poynton's building is occupied, though informally, and serves as a collection, sorting, and cleaning space for 'street surfers' (a term for individuals who collect and sell recyclable materials using trolleys as their form of transport).

In addition to site observations, the combination of national census and election data provided an image of who inhabits the inner city of Pretoria. According to the South African Population Census (2011), an inner-city population of 33 617 show the majority of residents as between the ages of 20-29 (37%) and ages 30-39 the second highest (19%), thus giving a median age of 25. A wide variety of population groups, language, and citizenship form an incredibly culturally diverse residential area within the inner city. Of this group, 44% have completed Grade 12 (Matric) and 19% have graduated from college or university. The area shows an employment rate of 47%, of which 78% are employed in the formal sector.

The 33 617 population group makeup 12 088 households, of which 45% live in apartments, 34% houses, 4% room or flatlet, and 0.7% in informal dwellings.

The average annual household income is R57 300 where the highest rate is R75 000-150 000 annually.

RE-IMAGINING THE CITY MODEL

The program proposes a shift from daily commuting...

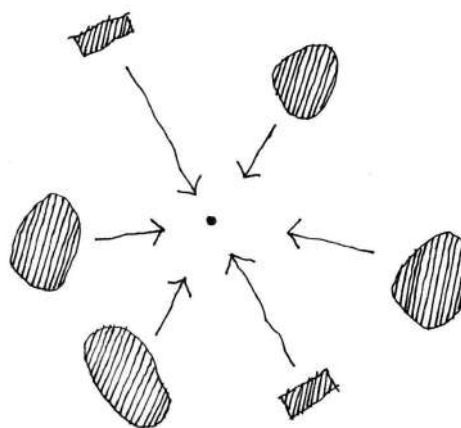


Figure 6.2 Residents working in the city, but living on the fringe (Author 2020).

...to inhabiting the city.

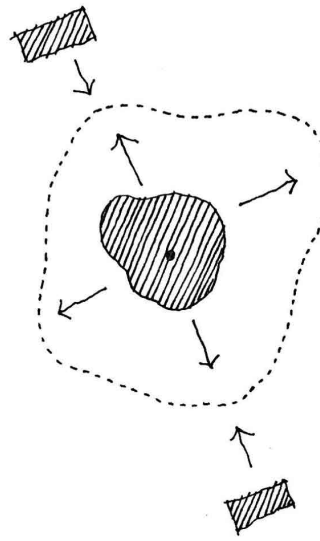


Figure 6.3 Residents both working and living in the city (Author 2020).

6.2 Identifying the Users

The inner city is projected as an urban environment where **young adults** live only for as long as they can afford not to. Instead of building a life in the city as they build their careers they move to suburbs towards the fringes and perform daily commutes in and out of the city.

The data collected is presented through a narrative of the inhabitants of the city, representing the identified **young adults and entrepreneurs** building their careers, whether as a **shop owner, craftsman, artist, informal trader, or a digital nomad looking for a workspace.**

The project, therefore, aims to formalize a liveable environment of multi-programmatic spaces, calling for an architecture that can no longer serve as only object, but compact adaptable habitat. One that does not become obsolete in time, but responds to, grows, and transforms with the growing city. It does not follow the principles of new and standing alone but merges with the existing. It becomes a collection of components, filling in the spaces between. Repurposing and reinventing the existing towards spatial, social, and environmental sustainability relevant to the present but also the future needs.



Figure 6.4 Artists making use of the market space on site (Author 2020)



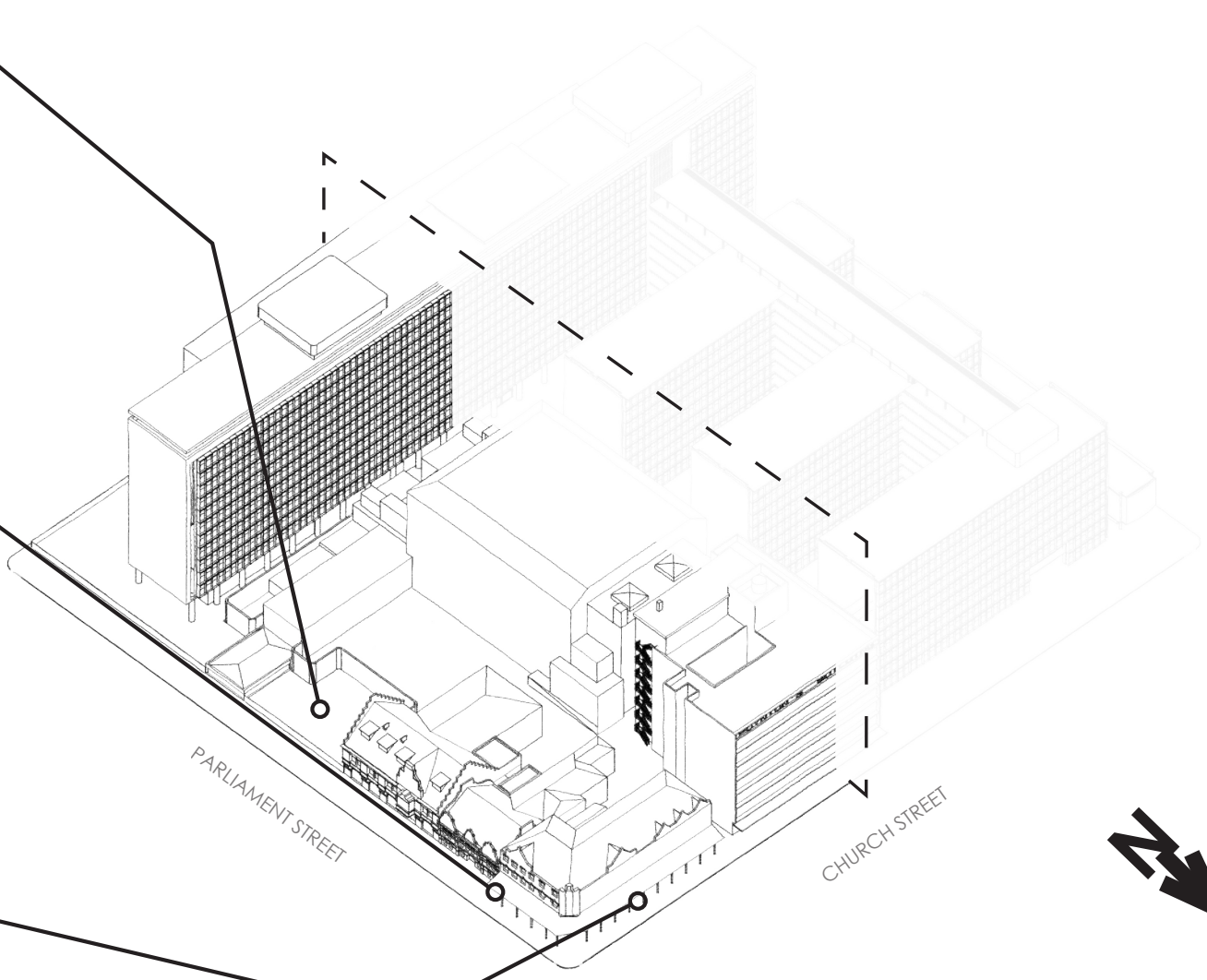
Figure 6.5 A leather craftsman sewing (Author 2020)



Figure 6.6 A flower seller on Church Square (Author 2020)



Figure 6.7 Informal traders on the covered pavement of Poynton's (Author 2020)



PARLIAMENT STREET

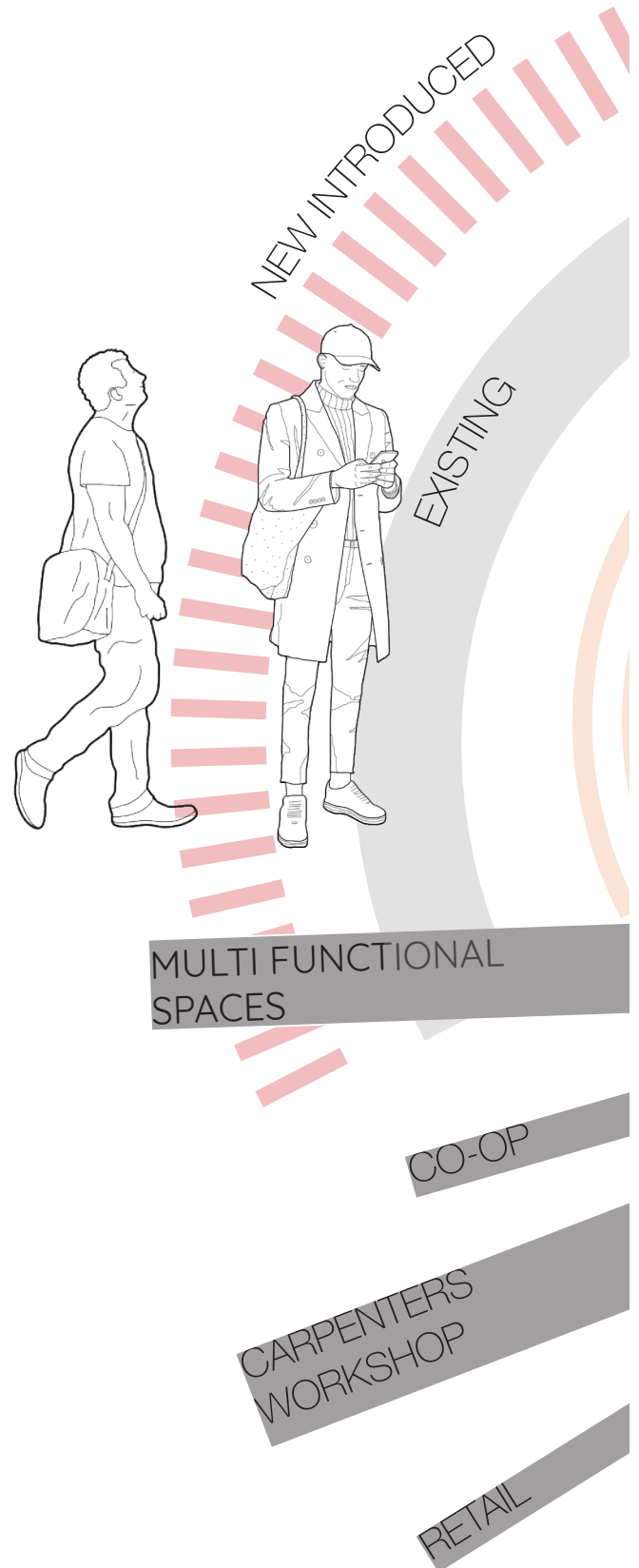
CHURCH STREET



Figure 6.8 User Locations (Author 2020)

6.3 Programmatic Requirements

The project, therefore, aims to formalize a liveable environment of multi-programmatic spaces, calling for an architecture that can no longer serve as only object, but compact adaptable habitat. One that does not become obsolete in time, but responds to, grows, and transforms with the growing city. It does not follow the principles of new and standing alone but merges with the existing. It becomes a collection of components, filling in the spaces between. Re-purposing and reinventing the existing towards spatial, social, and environmental sustainability relevant to the present but also the future needs.



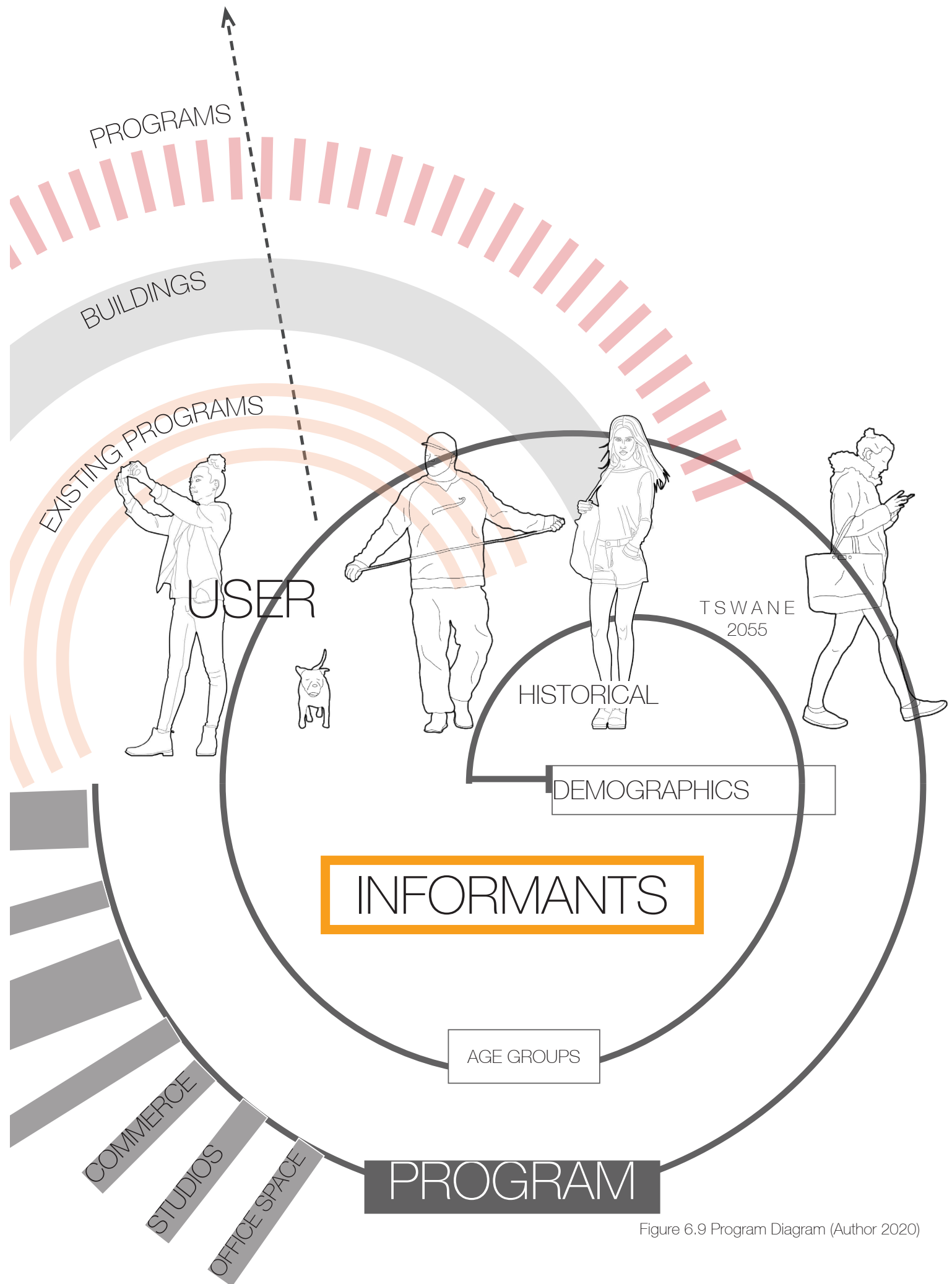


Figure 6.9 Program Diagram (Author 2020)

6.4 Programmatic Precedents

Project: One on Mutual.
Program: Mixed-used Residential.
Architect: GASS Architecture Studios.
Location: Pretoria, South Africa.
Year: 2017

The 142-unit residential project is situated in the centre of Pretoria. Located on Madiba Street near Church Square, the site was vacant and mostly undeveloped. The location provided the ideal opportunity for introducing a mixed-use development of retail, offices, and apartment units. The project forms part of a larger urban scheme to densify the urban environment around Church Square.

The ground floor consists of retail space that opens to both streets and a newly formed pedestrian arcade, formalized by the building edge. The retail ground floor and residential units above are separated by three parking levels, accommodating 210 cars, including a basement parking level. The residential units include a combination of bachelor, one-bedroom, and two-bedroom apartments accessed from the main foyer on Mutual Street. The units are arranged around a central courtyard on the fourth floor that opens to the east and serves as the green and recreational space.

The new development has resulted in the renovation of the 'Ons Eerste Volksbank' and formalized its northern edge, on a site which was simply an unbuilt property on the edge of Church Square. The existing heritage-listed building is located on the southern edge of the site and formalizes the arcade as a courtyard space. The building formed part of the project and was restored as an adaptive reuse project, introducing a restaurant and retail space on the ground floor and office space on the first floor that both opens to the newly formed courtyard and pedestrian arcade.



Fig. 6.10



Fig. 6.11

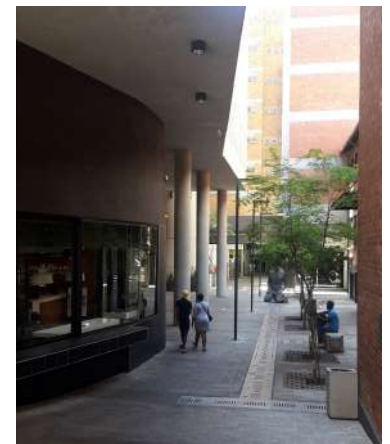


Fig. 6.12



Fig. 6.13

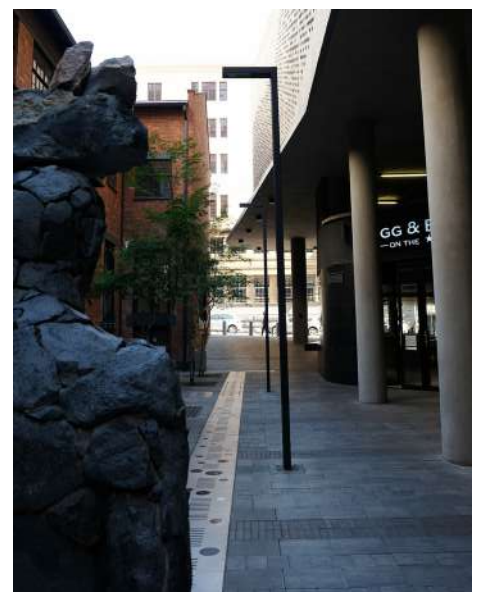


Fig. 6.14

Figure 6.10 One on Mutual building (GASS Architecture Studios 2018).

Figure 6.11 Depicting Mutual St (Author 2020).

Figure 6.12 Entrance to arcade from Mutual St (Author 2020).

Figure 6.13 View within arcade (Author 2020).

Figure 6.14 View within arcade (Author 2020).

Project: Coop Housing at River Spreefeld.
 Program: Cooperative Living.
 Architects: Carpaneto Architekten,
 Fatkoehl Architekten and BARarchitekten.
 Location: Berlin, Germany.
 Year: 2013

Three buildings form the urban space. Instead of inward blocks, they open to both neighbours and a river channel. Private and communal terraces are the defining feature of the development, compensating for the loss of public space. The design consists of predominantly simple support and construction systems that allow for a rich variety in spatial configurations. The allowance of various configurations creating 64 apartments where no two are alike, although all still following the same principles. In addition to conventional units, six cluster apartments provide communal spaces for up to 21 people.

The development has diversity in population, culture, income, and age groups. Therefore, apartments are designed to be barrier-free; offering communal use of laundry rooms, fitness rooms, guestrooms, rooftop terraces, and recreational spaces all forming the spaces between.

The ground floor is largely open to the public and includes a carpentry workshop, catering kitchen, studios, daycare centre, and a co-working space. In-between these functions are open venues, unassigned and unfinished for community, social and cultural projects. A defining feature in maintaining the project's goal for an open character at the juncture of the liveable and urban environment.



Fig. 6.15



Fig. 6.16

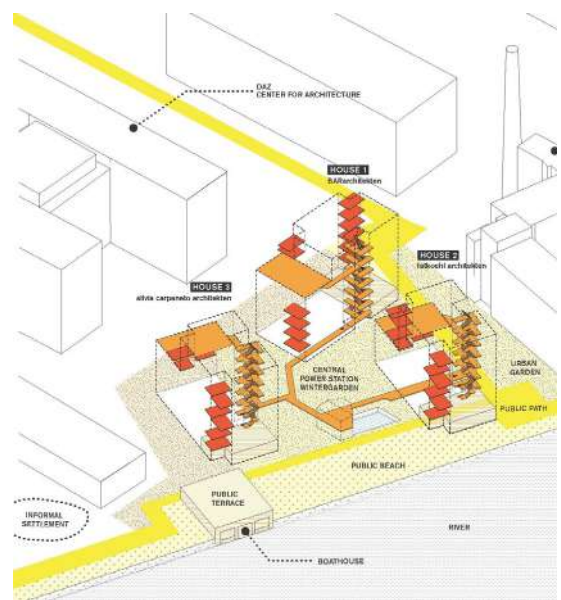


Fig. 6.17



Fig. 6.18



Fig. 6.19

- Figure 6.15 Coop Housing Development (Archdaily 2013).
- Figure 6.16 Permeable Balconies (Archdaily 2013).
- Figure 6.17 Private and Communal Spaces (Archdaily 2013).
- Figure 6.18 Adaptive Interior (Archdaily 2013).
- Figure 6.19 Transparent Workshop on the Ground Floor (Archdaily 2013).

Project: Formosa 1140.
 Program: Residential Project.
 Architect: LOHA Architects.
 Location: West Hollywood, Los Angeles,
 United States.
 Year: 2008.

An eleven-unit housing project emphasizing the central importance of shared open space for residents and the community. Instead of creating an internal courtyard space, the common space is shifted to the exterior and pushes the building to the side. The units are organized linearly allowing for views to the newly formed park and cross ventilation for every unit.



Fig. 6.20

External circulation is used as a threshold between the public and private realms and is articulated through layers of perforated metal and small openings. The threshold is further emphasized through carefully considered outer skin panels and inner skin fenestration, creating a choreographed façade, through a unique expression of form and materials. Apart from providing privacy, the exterior skin also keeps the west-facing units cooler as a screen and shading device.



Fig. 6.21

According to the architects, the project forms part of a larger urban concept that will offer public space back to the community and creating micro parks across Los Angeles's urban grid.



Fig. 6.23

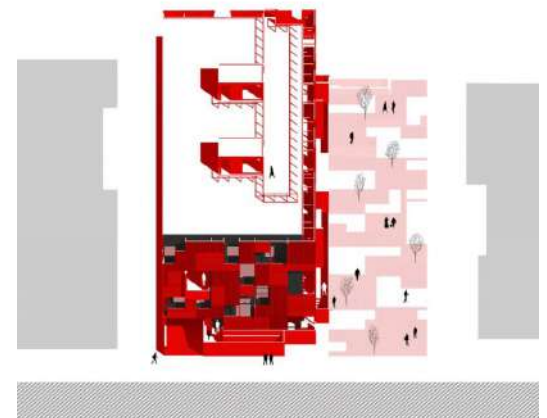


Fig. 6.22

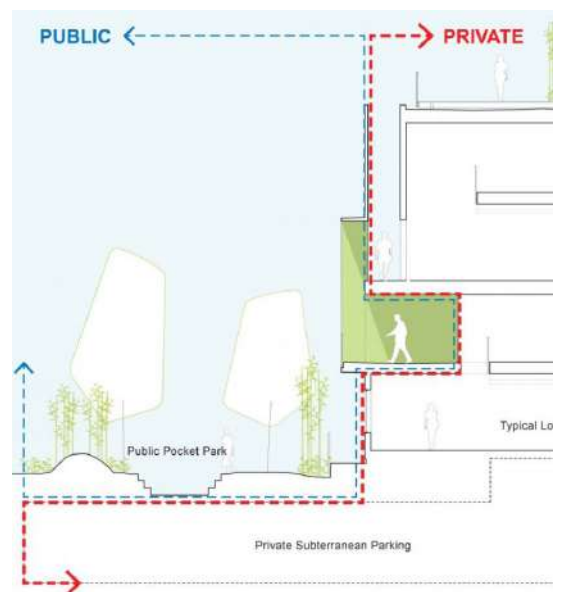


Fig. 6.24

Figure 6.20 Front Facade View (LOHA 2008).

Figure 6.21 Walkway looking to courtyards (LOHA 2008).

Figure 6.22 Axonometric View (LOHA 2008).

Figure 6.23 Walkways shaded by Perforated Screens (LOHA 2008).

Figure 6.24 Walkways as Threshold (LOHA 2008).

Project: The Six.
 Program: Residential Project.
 Architects: Brooks + Scarpa Architects.
 Location: Los Angeles, United States.
 Year: 2016.

The project is a 52-unit residential project focused on the support and rehabilitation of disabled veterans located in one of the densest populated areas of the city. The project deemphasizes private space in favour of personal and group social spaces. According to the architects, the spatial organization is intended to transform the way people live - away from a secluded and isolating layout towards a community-orientated, interactive space (Brooks + Scarpa 2016).

The ground level contains offices, support spaces, bike storage, and parking while the second level has a large public courtyard formalized by four levels of housing units with screened balconies as the threshold between the public and private realm. The courtyard has large openings with green spaces that visually connect the space to the street on the lower level, thus visually connecting the tenant to the urban environment but still retaining a secured space.



Fig. 6.25

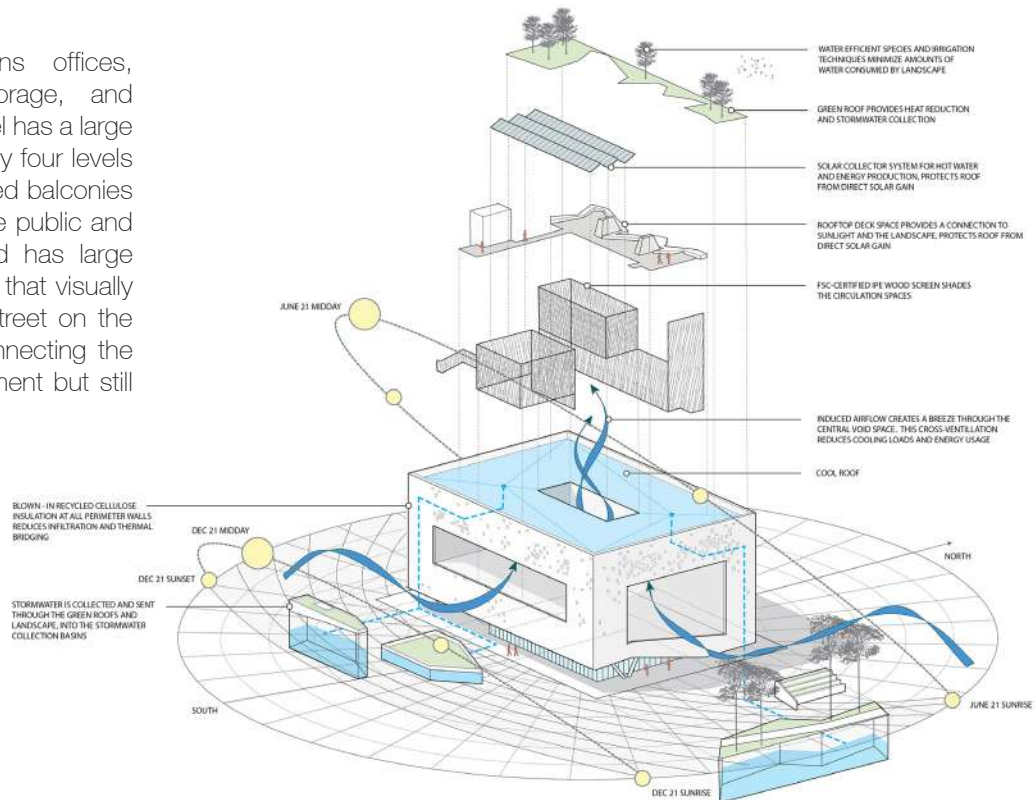


Fig. 6.26

Figure 6.25 Front Facade View (Brooks & Scarpa 2016).

Figure 6.26 Exploded Axonometric View (Brooks & Scarpa 2016).

chapter

07

CONCEPT AND DESIGN
DEVELOPMENT

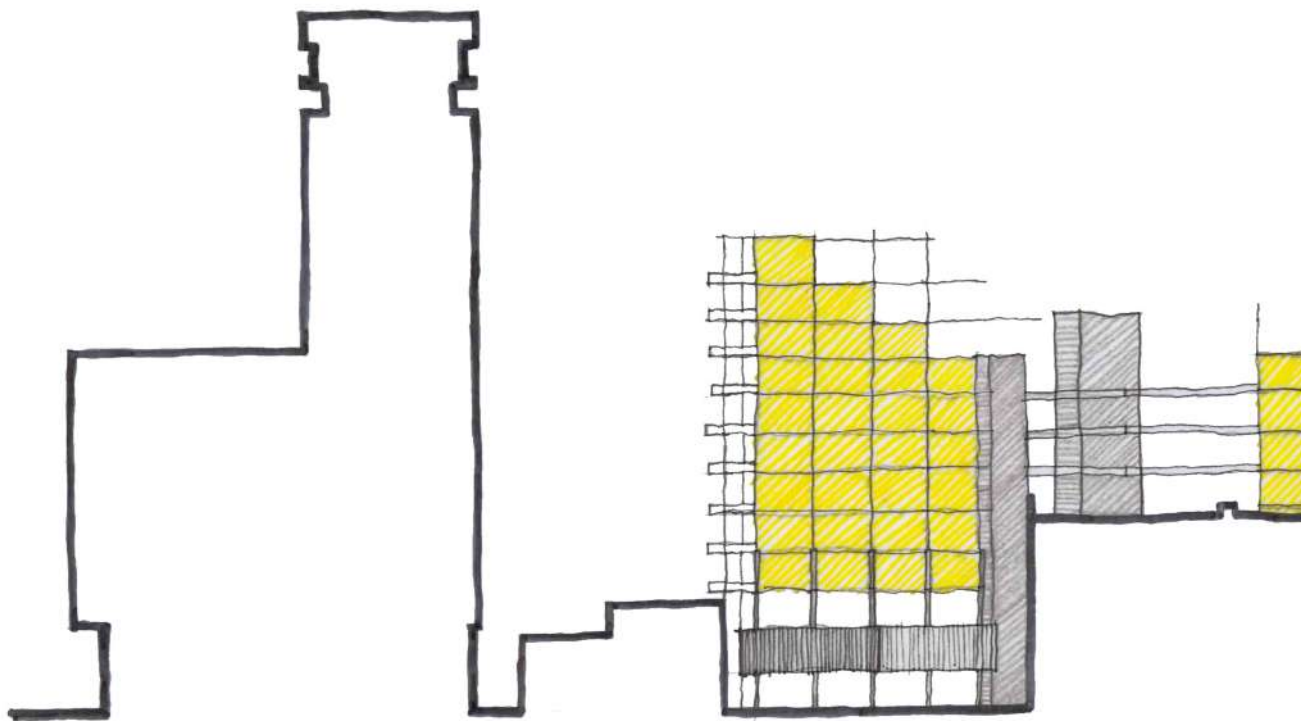
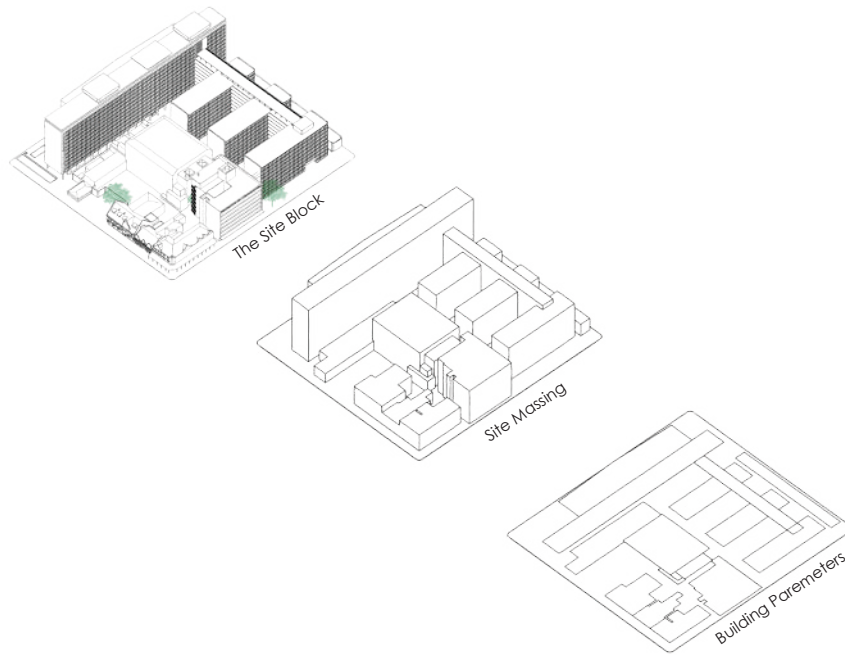


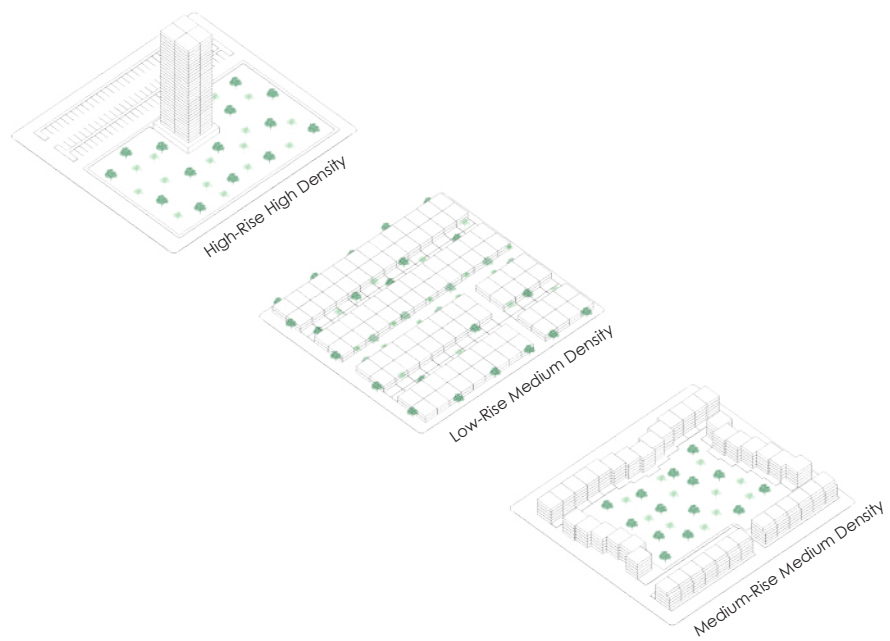
Figure 7.1 Compact Habitat Adapt Sketch (Author 2020)

7.1 Conceptual Exploration of the Urban Block

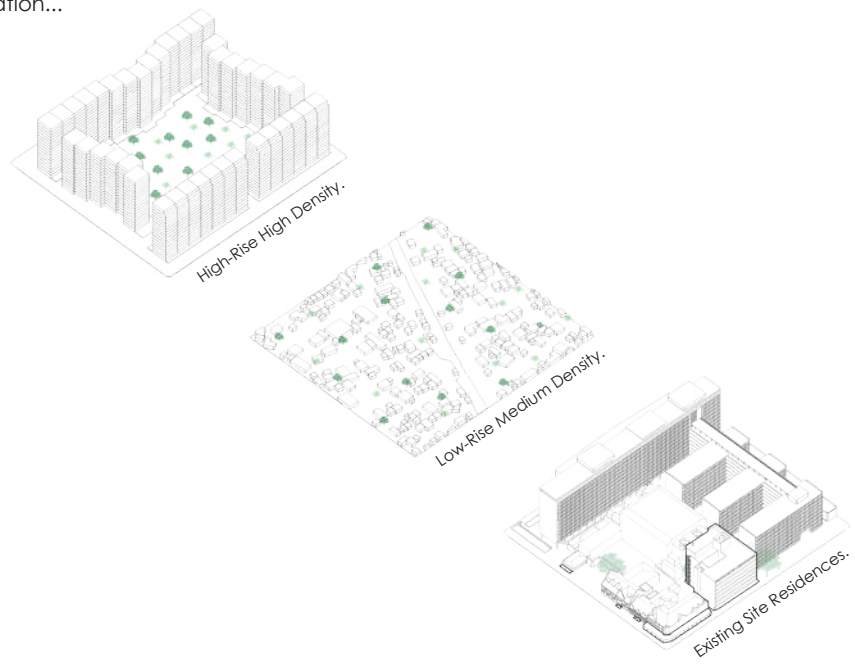
Urban Block Breakdown



Site Block Represented in Five Forms of Density...



...Compared to Current Residential Occupation...



...and Explored in its Abstract Form.

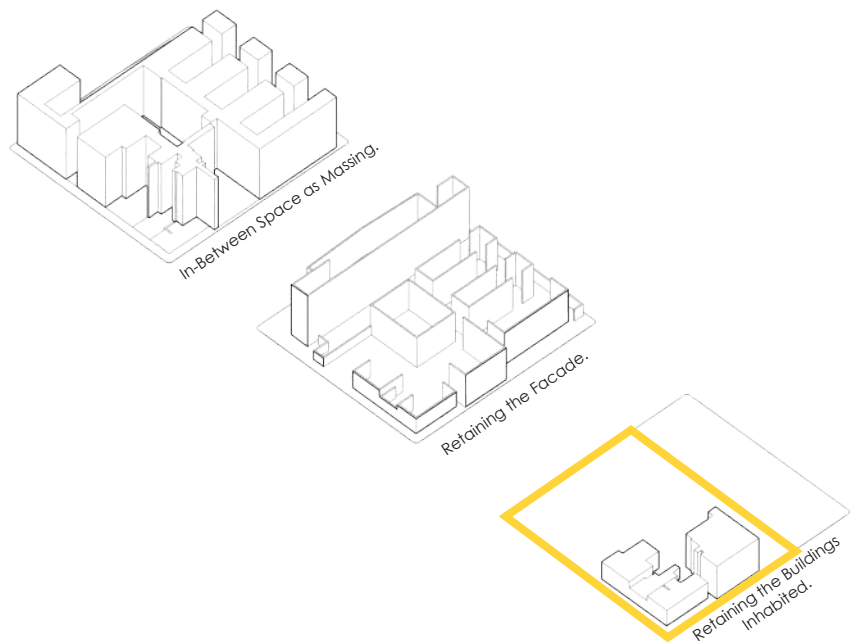
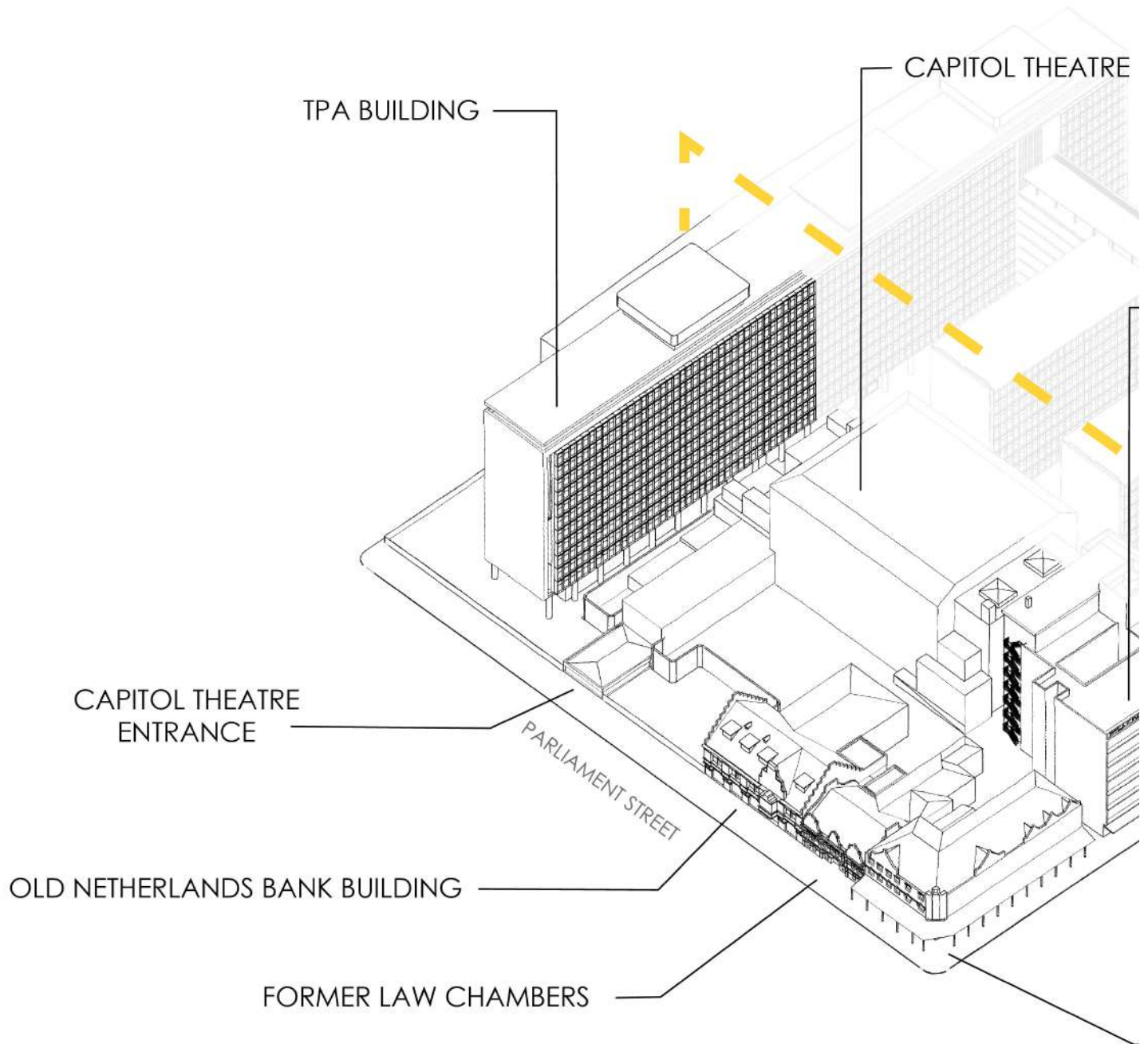


Figure 7.2 Urban Block Diagrammatic Study (Author 2020)

7.2 Defining Hyper-Density



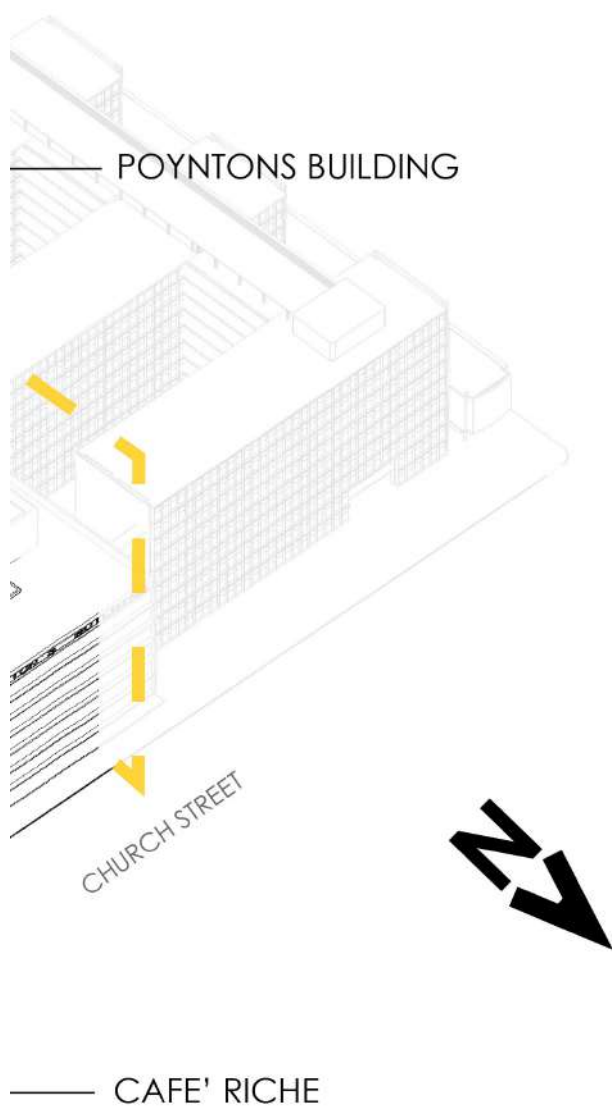


Figure 7.3 Urban Block Diagrammatic Study (Author 2020)

Defining Hyper-Density

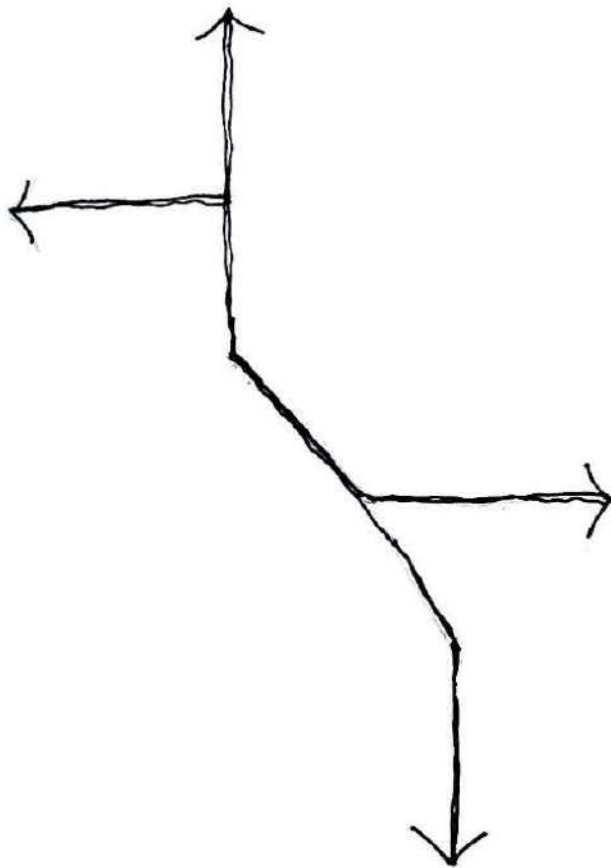
The most interesting spaces in a city are often overlooked; these include the in-between areas, side streets, alleyways, and courtyards hidden within the city's urban blocks. These spaces are not considered for development or repurpose, instead, they are typically used for parking, services, and dumping of refuse. When instead the spaces could be considered for their potential as public space and threshold between the liveable and urban environment. These in-between spaces are majority fenced-off and inaccessible to public use for the sake of security. As a result, the spaces are isolated and separated. The existing architecture of the site block offers a variety in already built space, where the coverage of the site is at a high density, but with a high density of in-between spaces of inefficient areas and use.

For the purposes of this dissertation hyper-density will therefore be defined as the repurpose and development of the in-between as public space and threshold between the liveable and urban environment.

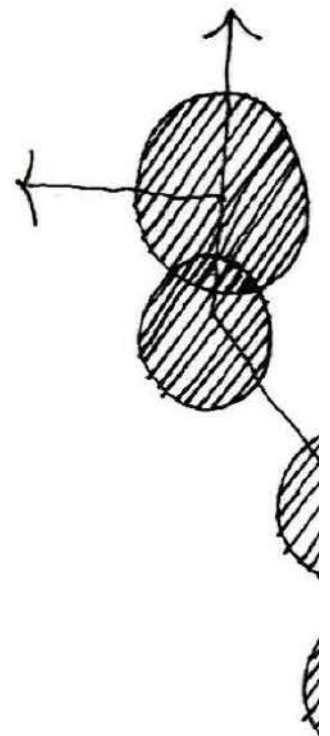
External circulation is used as a threshold between the public and private realms and is articulated through layers of materials. The dissertation aims to diversify in population, culture, income and age groups. With the intention in creating spaces that are only defined by the thresholds between.

DESIGN CONCEPT:

7.3 Design Concept

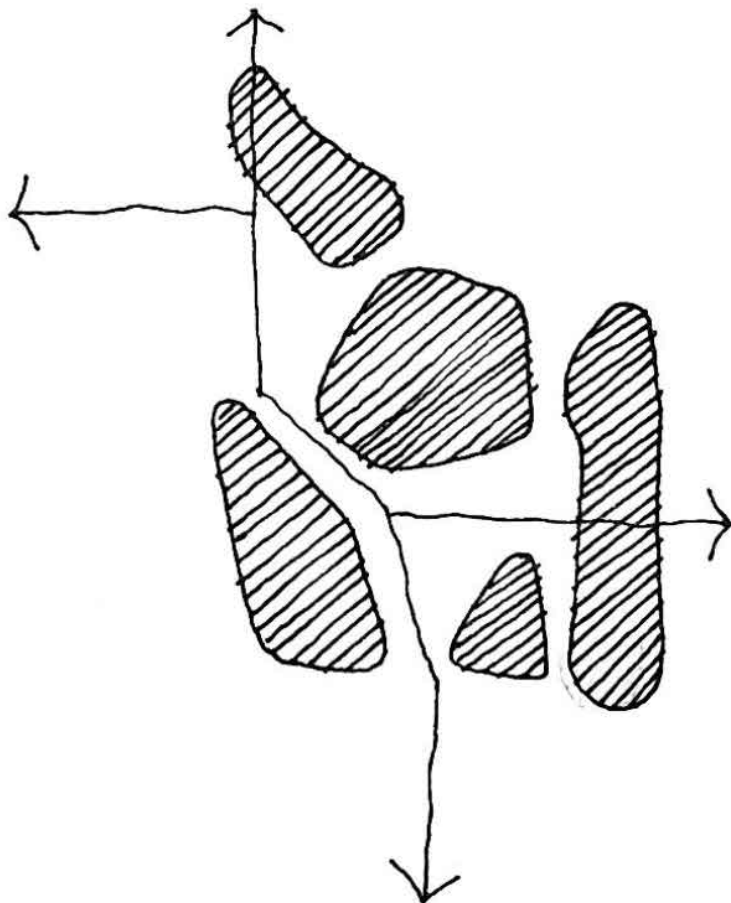
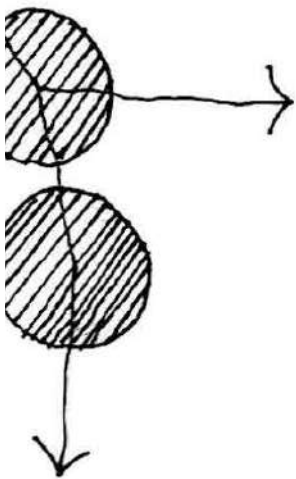


Movement Corridor



Nodes Formed Along Corridor

Figure 7.4 Design Concept Diagram Sketches (Author 2020)



Spatial Product of Movement
and Program Merging

7.4 The Existing Spatial Conditions

The most interesting spaces in a city are often overlooked; these include the in-between areas, side streets, alleyways, and courtyards hidden within the city's urban blocks. These spaces are not considered for development or repurpose, instead, they are typically used for parking, services, and dumping of refuse. When instead the spaces could be considered for their potential as public space and threshold between the liveable and urban environment. These in-between spaces are majority fenced-off and inaccessible to public use for the sake of security. As a result, the spaces are isolated and separated.

The adaptive reuse principles identified are considered, in terms of their characteristics, within the site-specific spatial conditions and existing heritage-listed architecture. The site offers the challenge of an undeveloped erf, the spaces between and connecting to the existing. 'The undeveloped' is formalized on the boundaries by the Old Netherlands Bank building on the northern boundary and the Capitol Theatre entrance on the southern boundary, therefore the intended intervention would have to satisfy architecture of two different eras and scale. the strategy of juxtaposition would therefore satisfy a response to both neighbouring buildings and introduce a new era of architecture serving as an intervention of connection in an urban block isolated by various eras and ages of architecture. The 'spaces between' serve as the newly formed arcade route on the north-south axis with several buildings, all of the different architectural eras, forming the boundaries. The strategy would therefore weave between the existing, expressing the individual qualities of the buildings as a newly formed collective architectural response. 'Connecting to

the existing' would consider a strategy where new latches onto the old, however, the majority of the heritage-listed buildings are unable to support any additional structures or be able to support a physical connection between old and new as the new structure could unsettle the old. Therefore, 'the connection' would be redefined, where it will stand as a self-supporting structure.

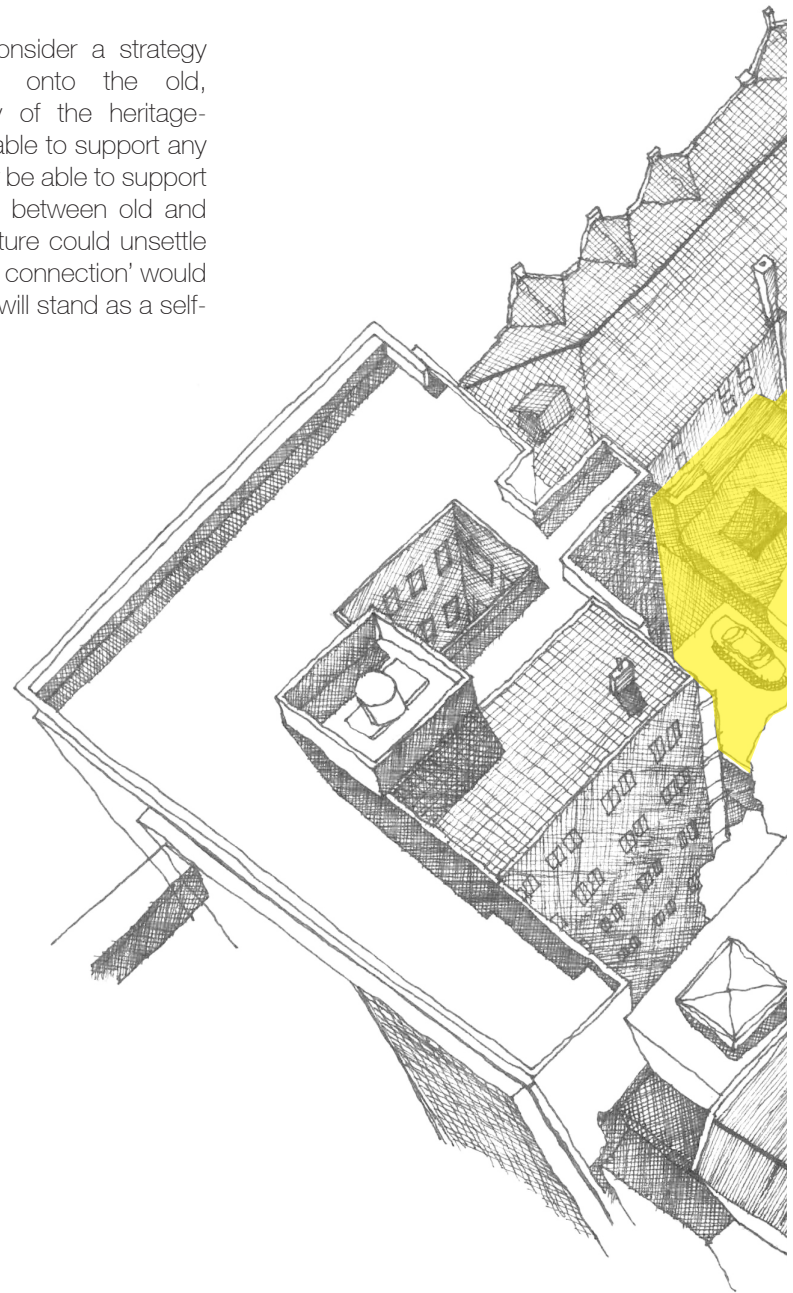
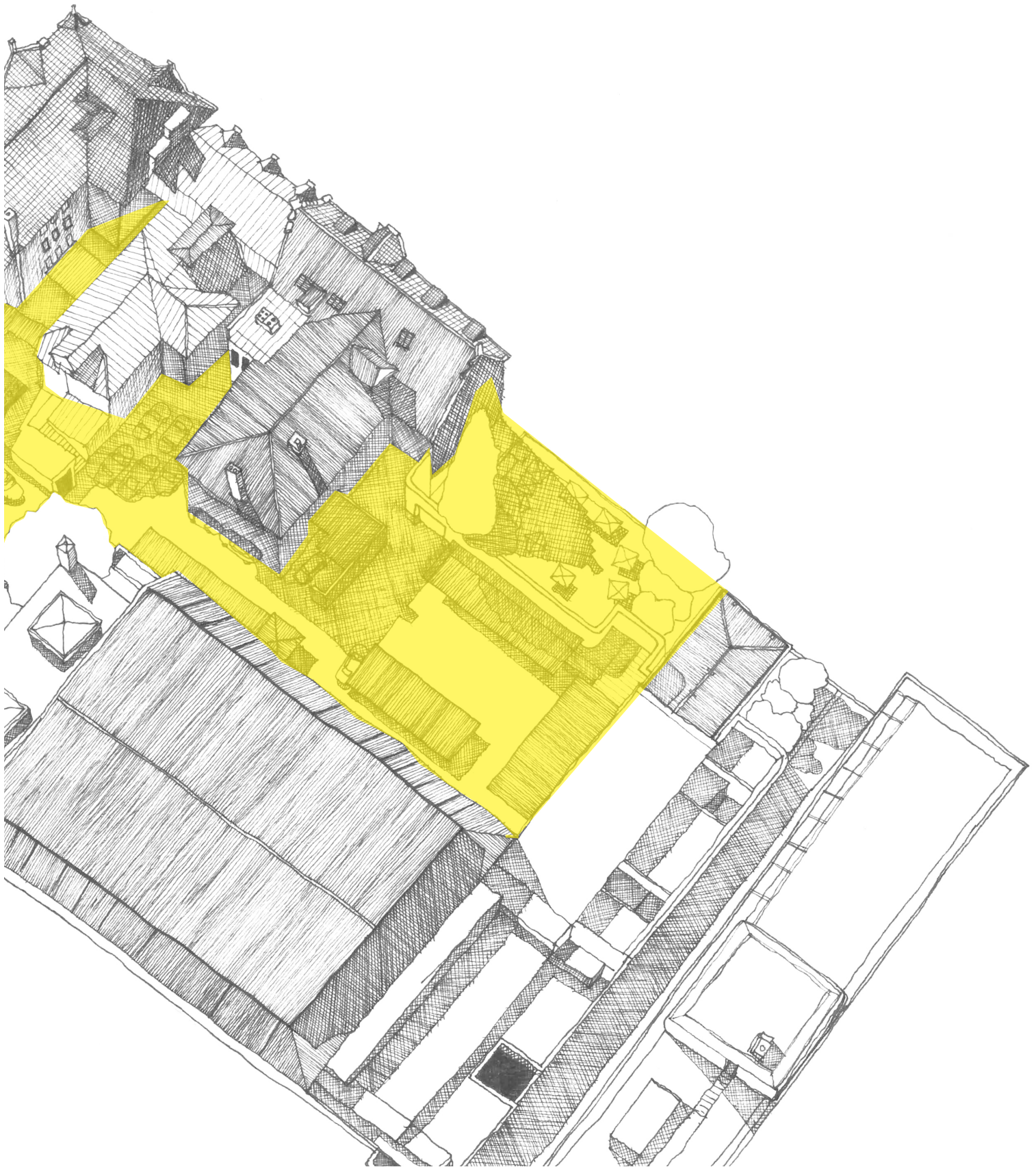
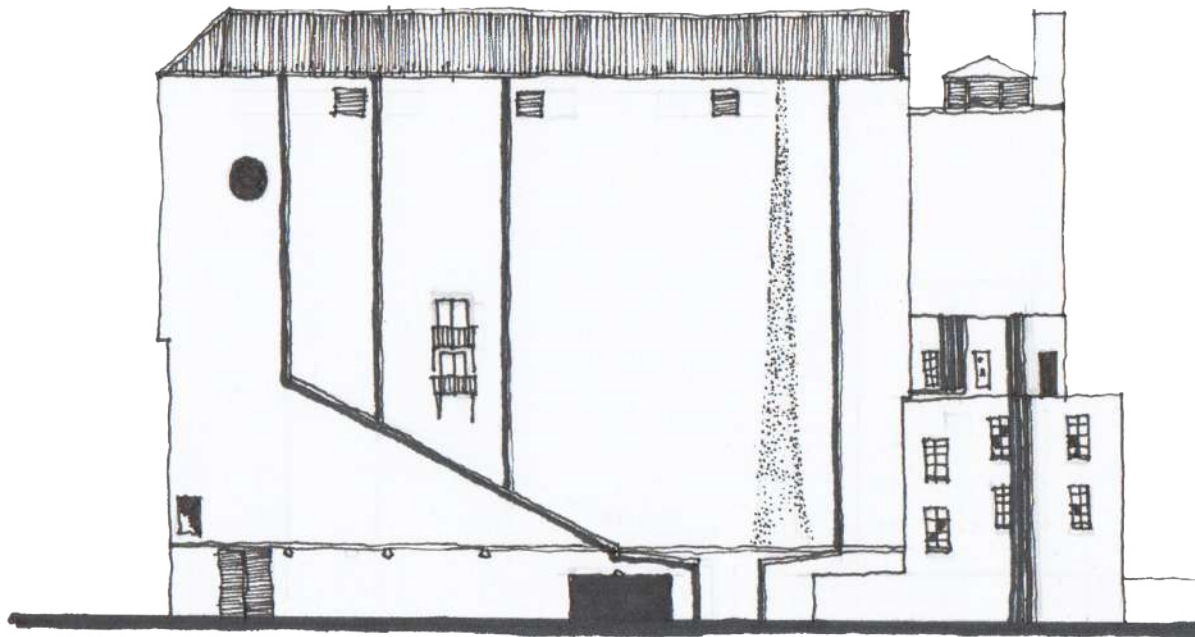


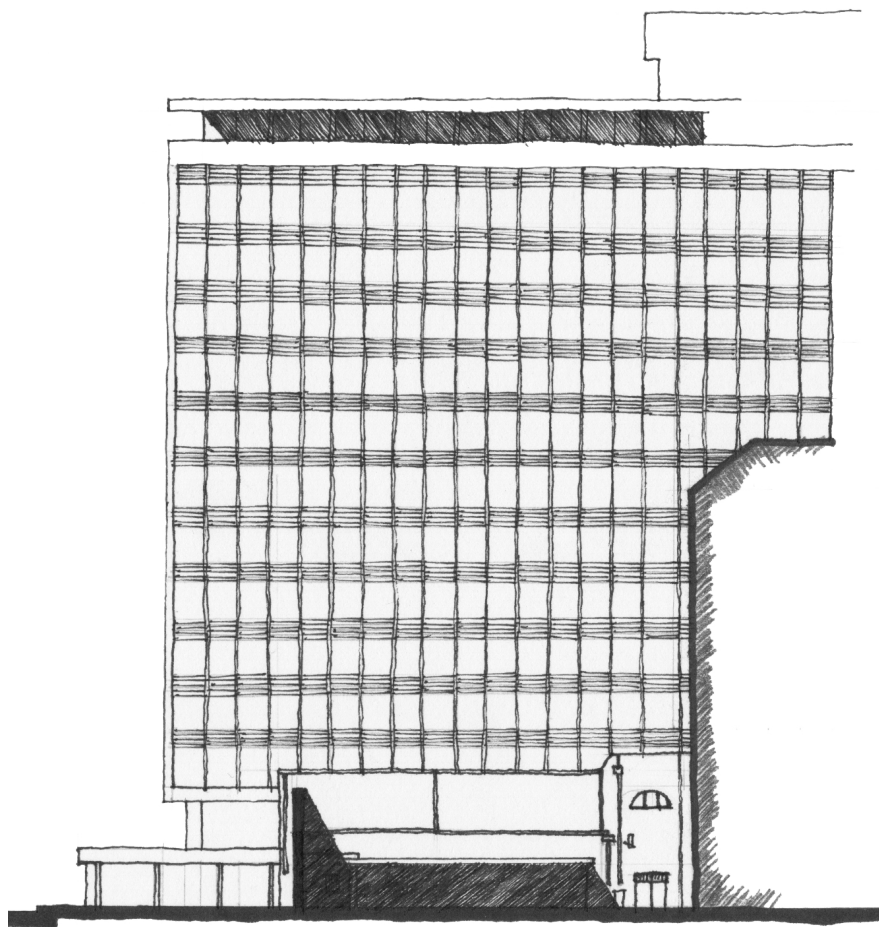
Figure 7.5 In-between space sketch (Author 2020)





Capitol Theatre

Figure 7.6 Capitol Theatre West Facade (Author 2020)



Transvaal Provincial Administration Building

Figure 7.7 TPA Building North Facade (Author 2020)

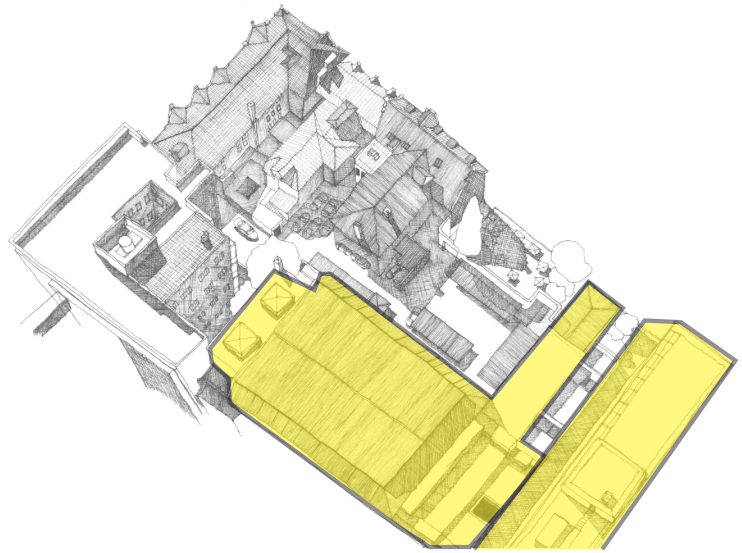


Figure 7.8 Study Area in Perspective (Author 2020)

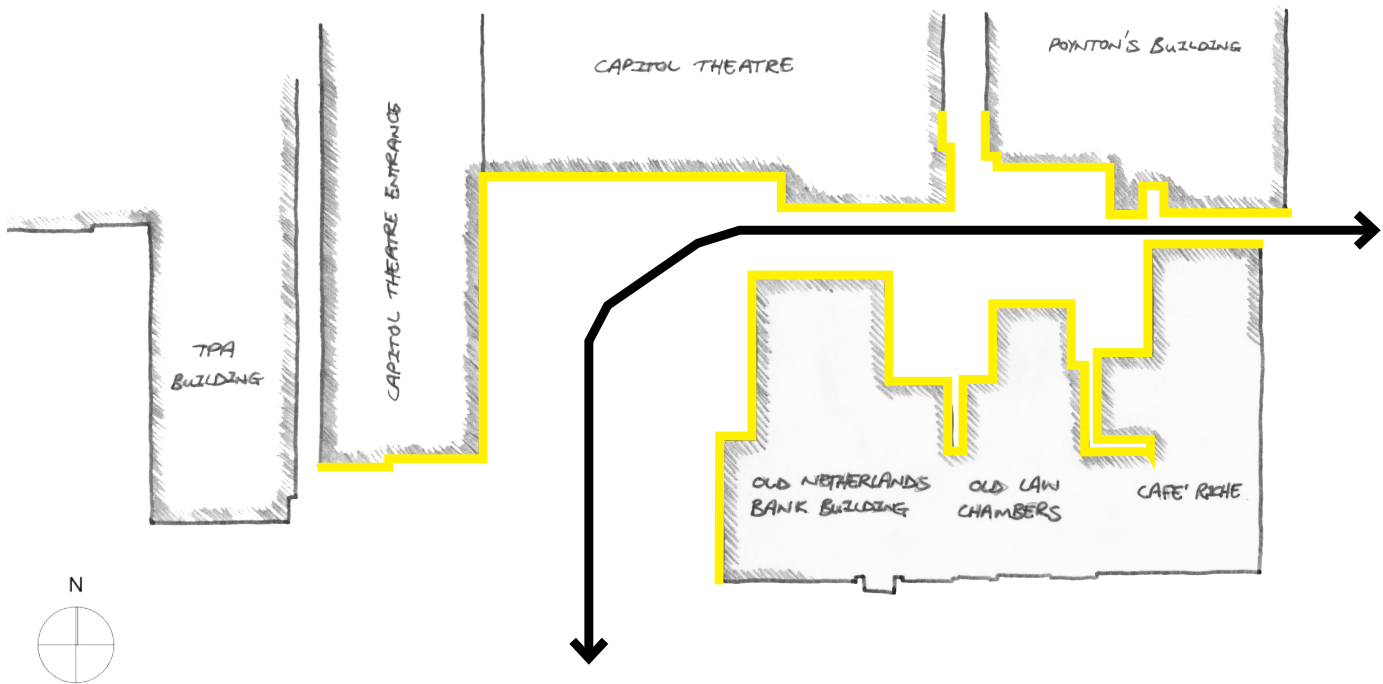
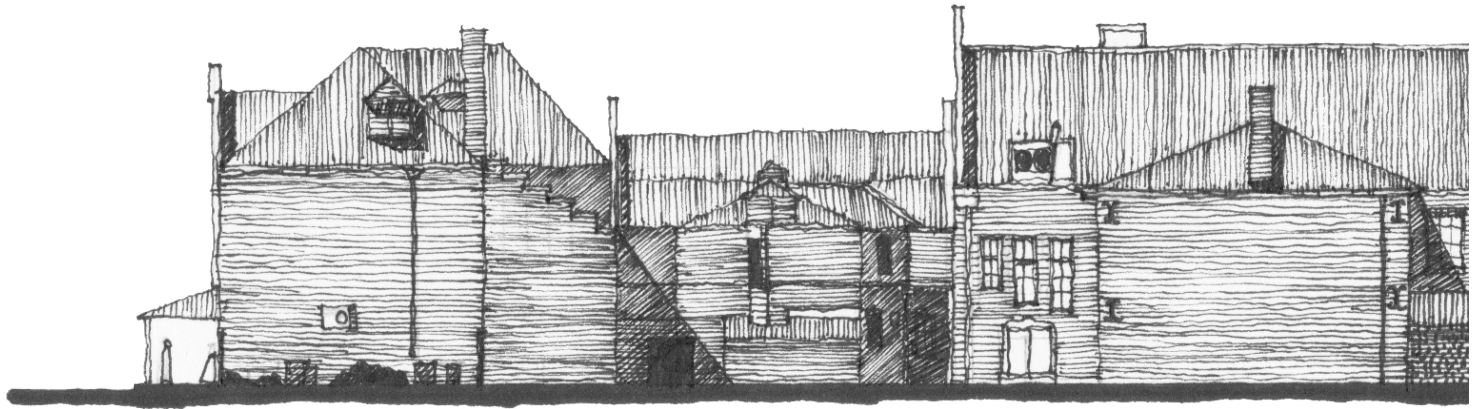


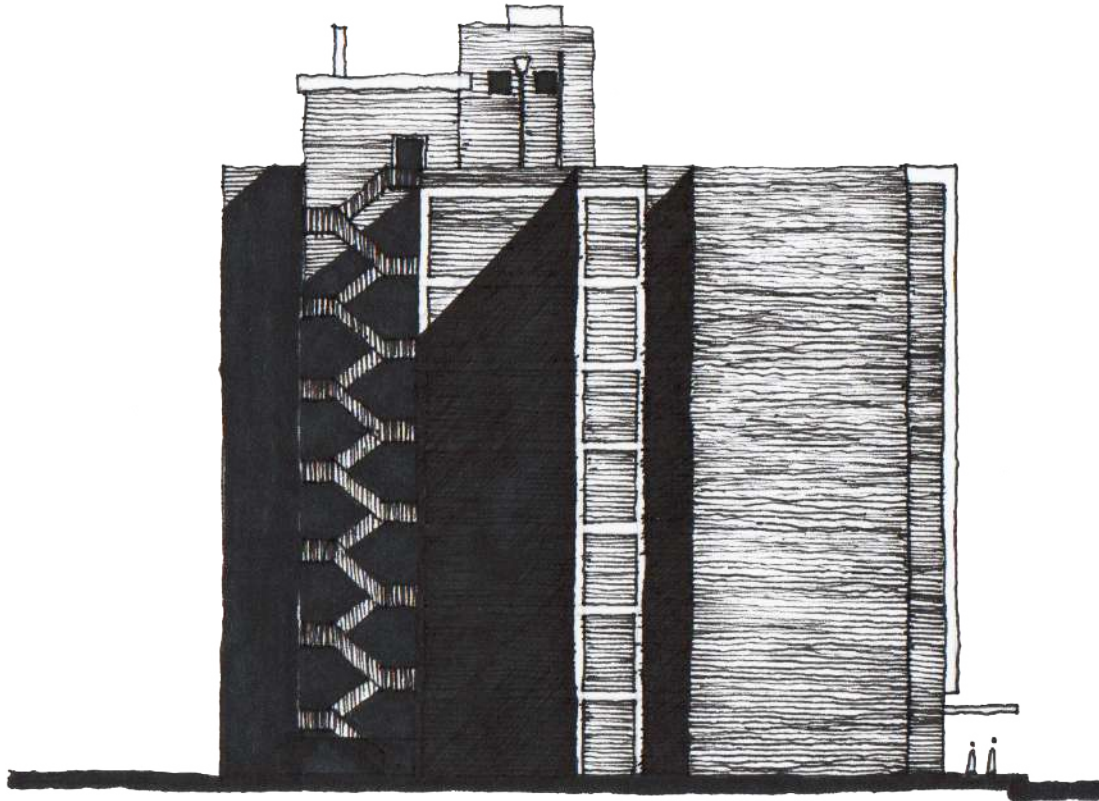
Figure 7.9 Study Area in Plan (Author 2020).



Cafe' Riche

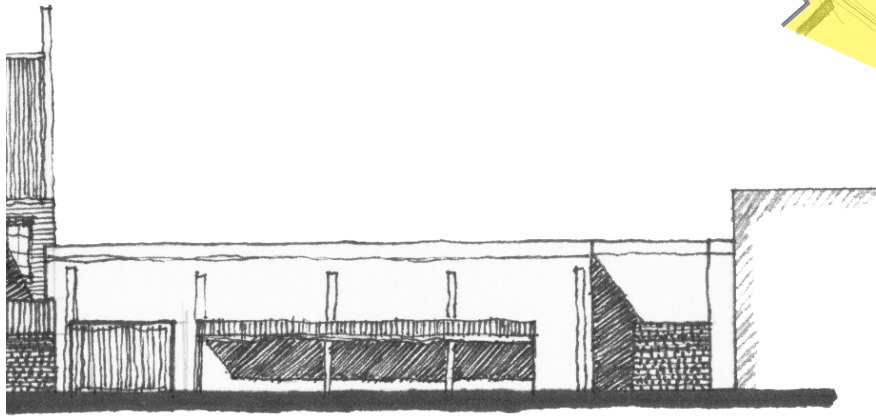
Old Law
Chambers

Old Netherlands Bank Building



Poynton's Building

Figure 7.11 Poynton's East Facade (Author 2020)



Outdoor Parking

Figure 7.10 West Facade of Existing Site (Author 2020)



Figure 7.12 Study Area in Perspective (Author 2020)

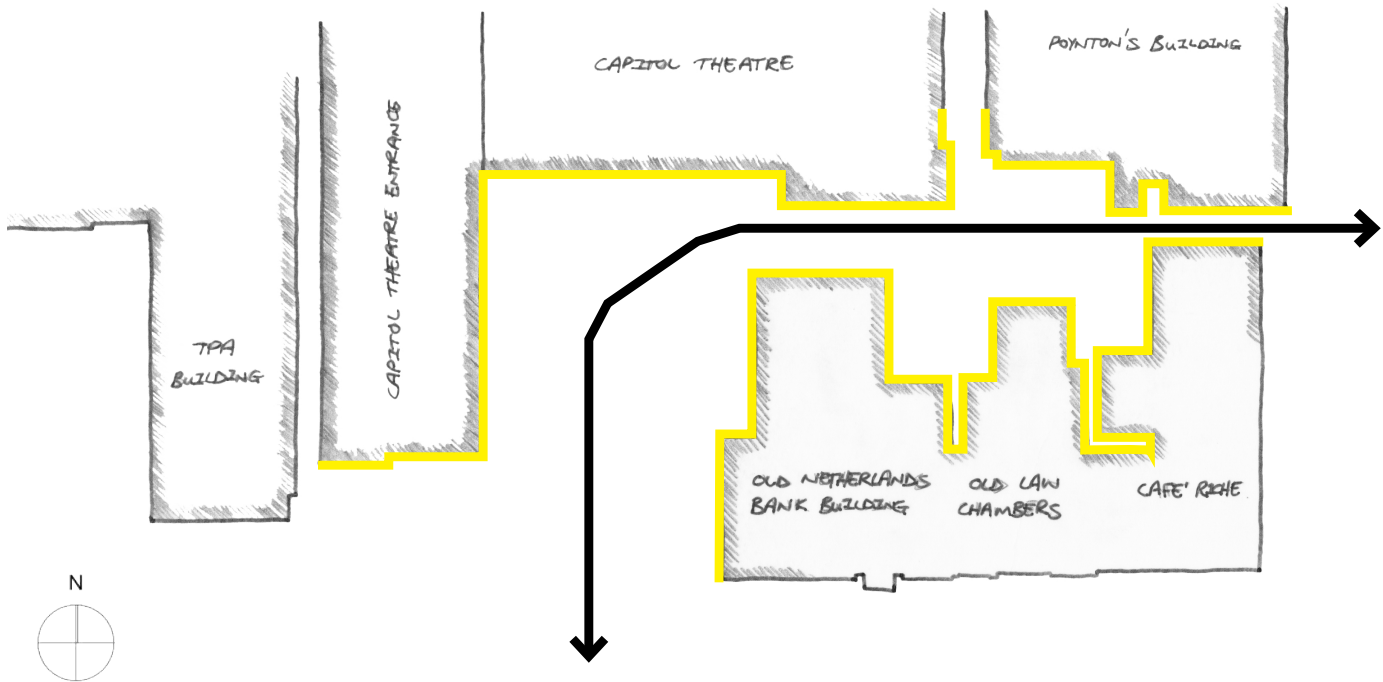


Figure 7.13 Study Area in Plan (Author 2020).

7.5 The New Spatial Identity – Architecture as Infill

The conceptual strategies of juxtaposing, weaving, and connecting-to is redefined as an architectural intervention. The design is conceived on-site as an infrastructural grid, including service ducts and vertical circulation of steel, concrete, and masonry as the rigid, permanent, and heavy structure. Attached to the permanent structure, the impermanent and lightweight, a structure that can adapt, grow, and change in program and function over time. The units are conceived as infill within the steel and concrete grid structure, sharing boundaries where possible. Services are placed strategically with the intent of sharing between units as opposed to the conventional method of supplying services individually. The units offer a base from which adaptation and expansion can occur, however always within the parameters of the structural

grid. Circulation to the units is limited to every second floor, as interior circulation allows for further vertical circulation within the units. Thus, allowing for additional social and green spaces, natural lighting, and ventilation between units.

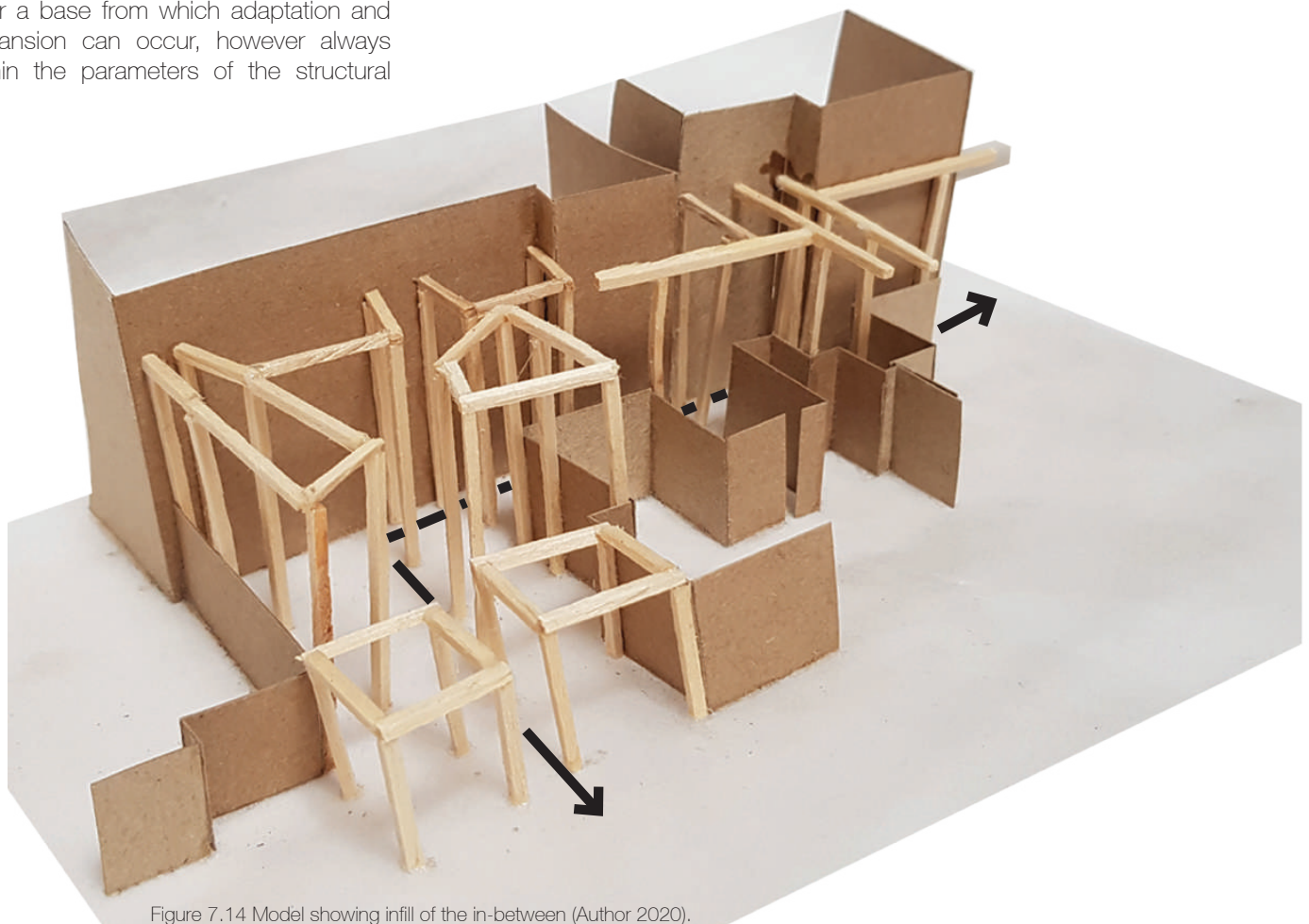


Figure 7.14 Model showing infill of the in-between (Author 2020).

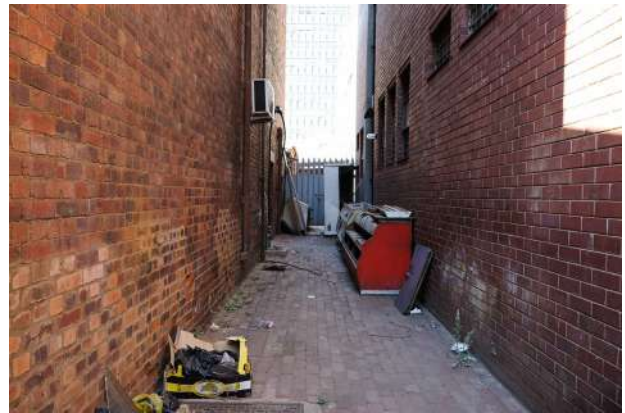
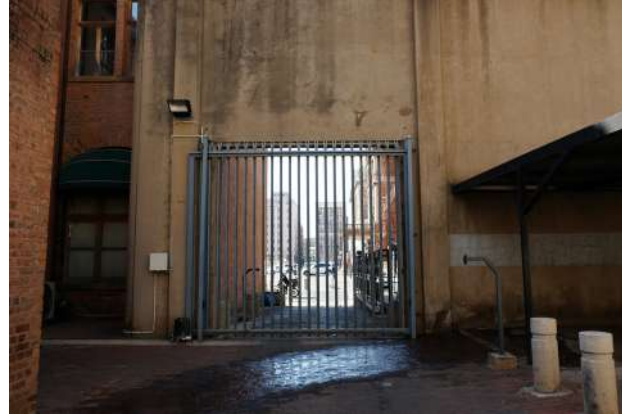


Figure 7.15 Showing the current conditions on site (Author 2020).

7.6 Site Analysis

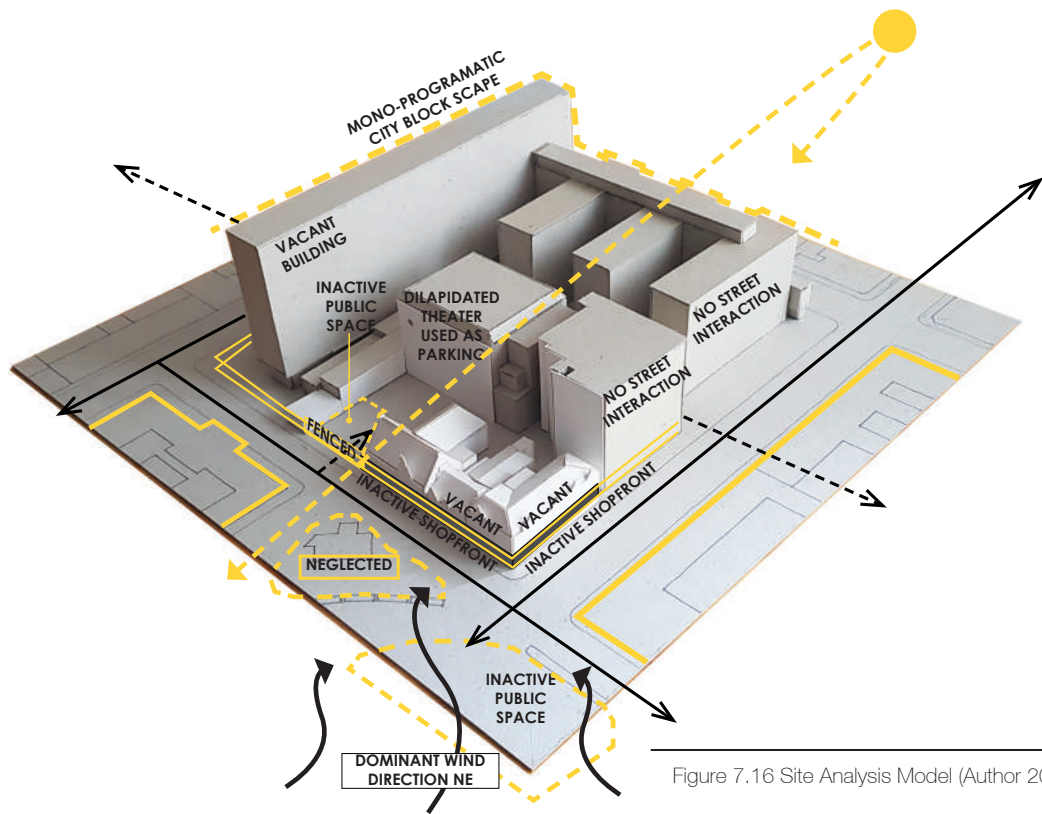


Figure 7.16 Site Analysis Model (Author 2020)

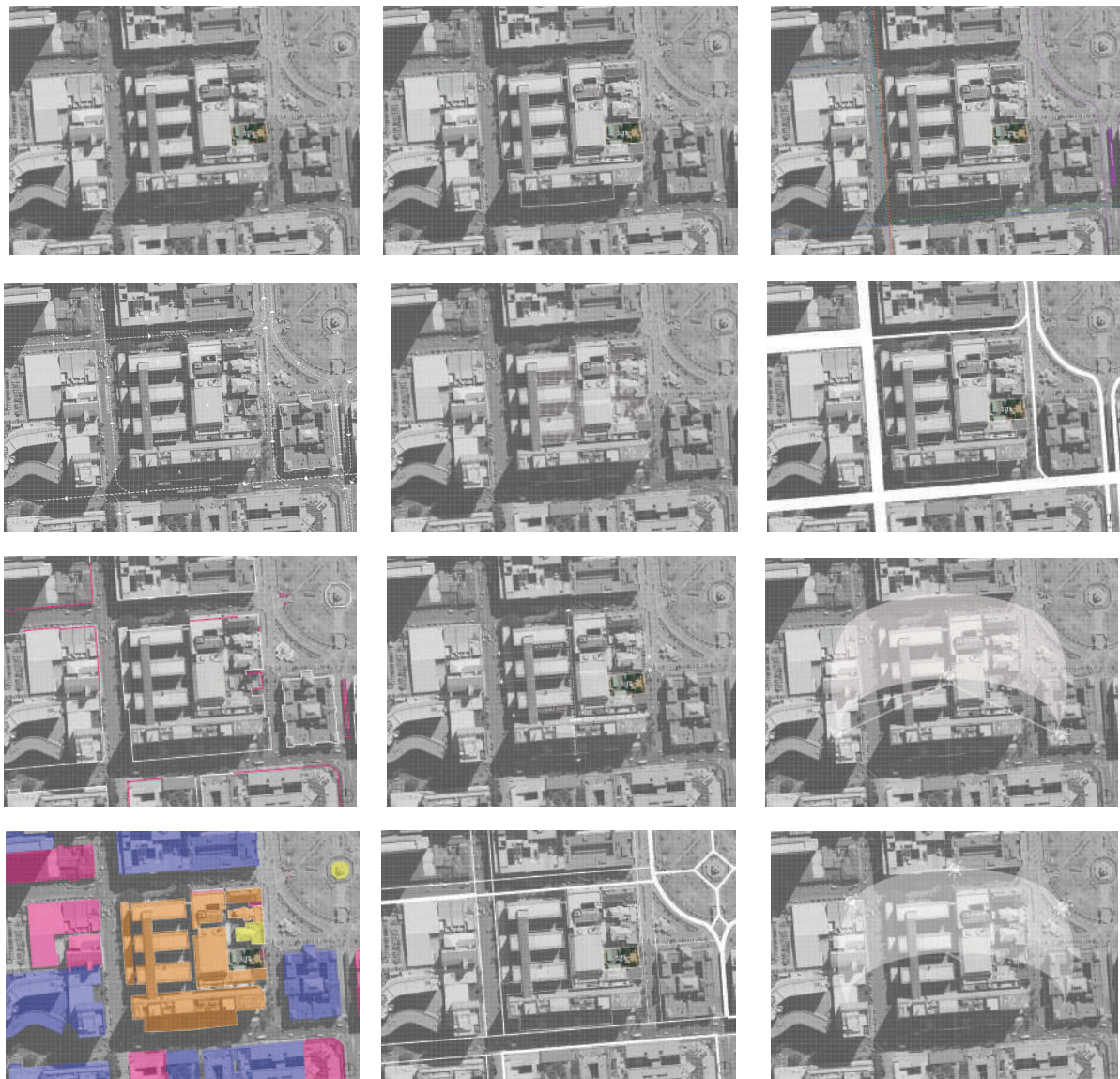


Figure 7.17 Site Analysis (Adapted from Google Maps by Author 2020)

7.7 Design Precedent

Project: 271 Spring Street
Program: Public space, office, commerce.
Architects: John Wardle.
Location: Melbourne, Victoria.
Year: 2014

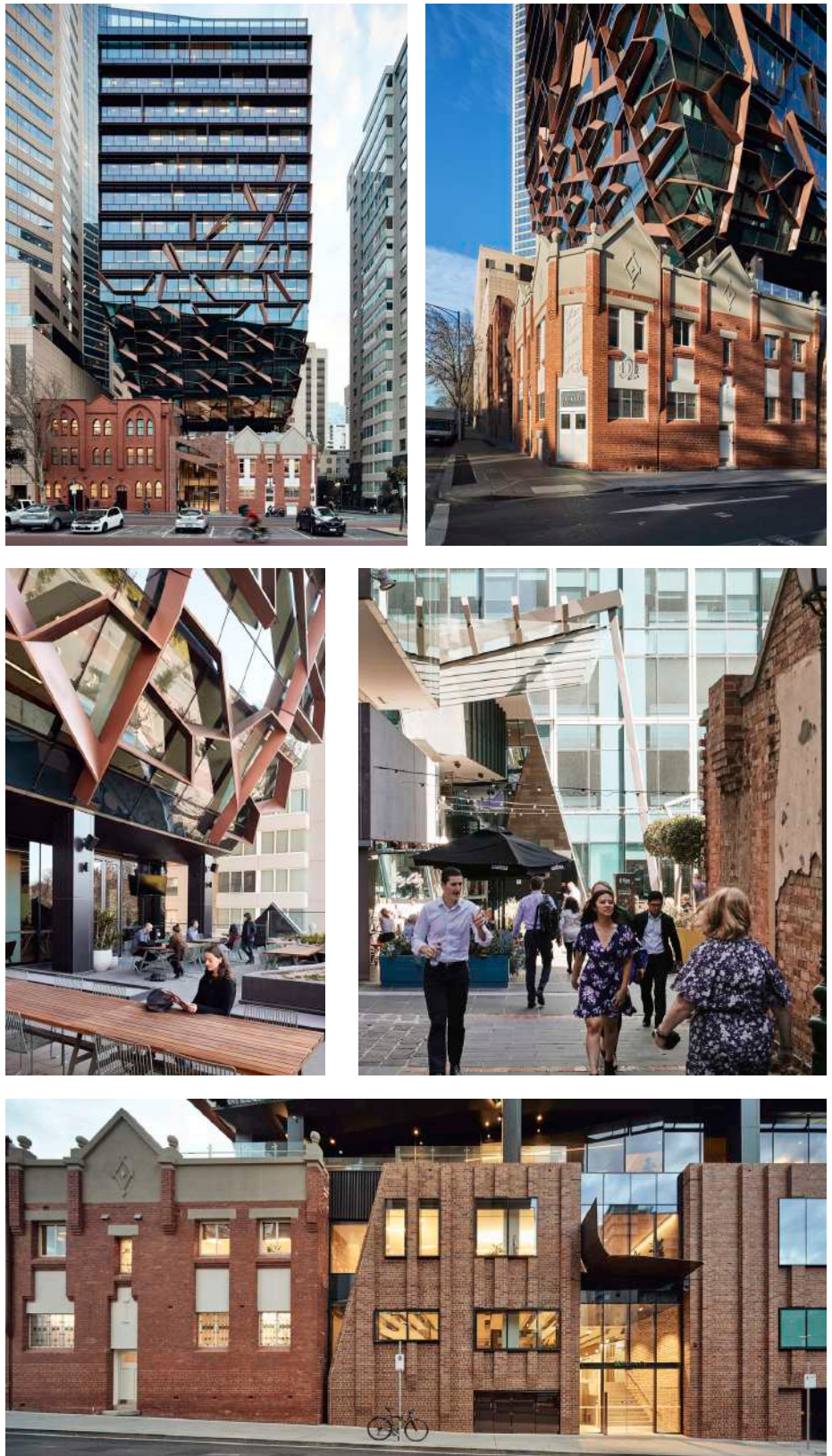
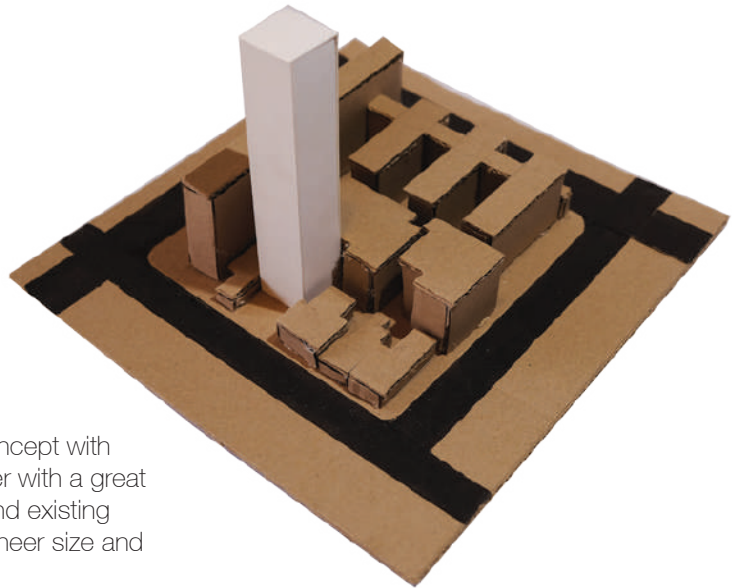
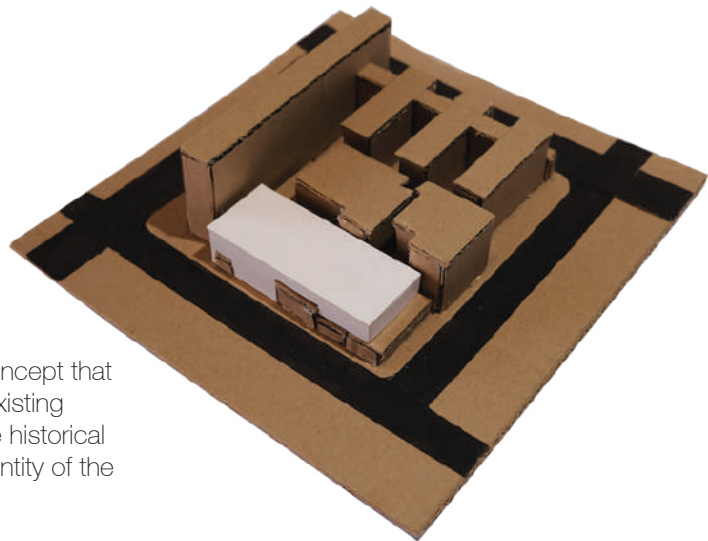


Figure 7.18 Design Precedent (John Wardle Architects 2014)

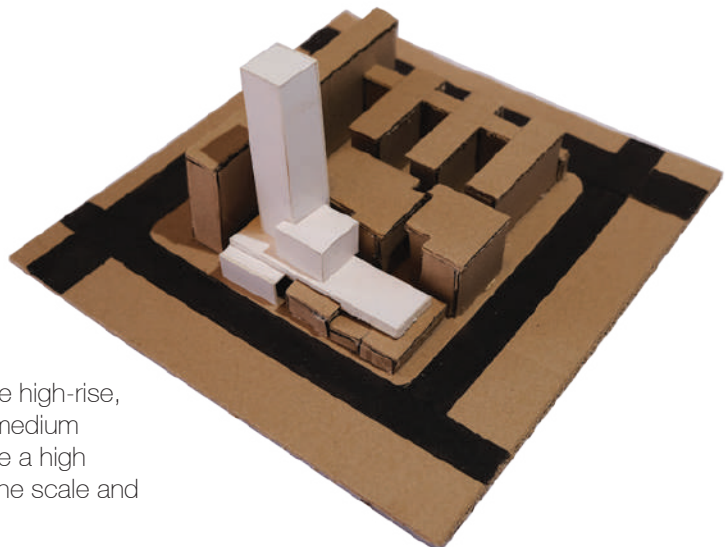
7.8 Design Explorations



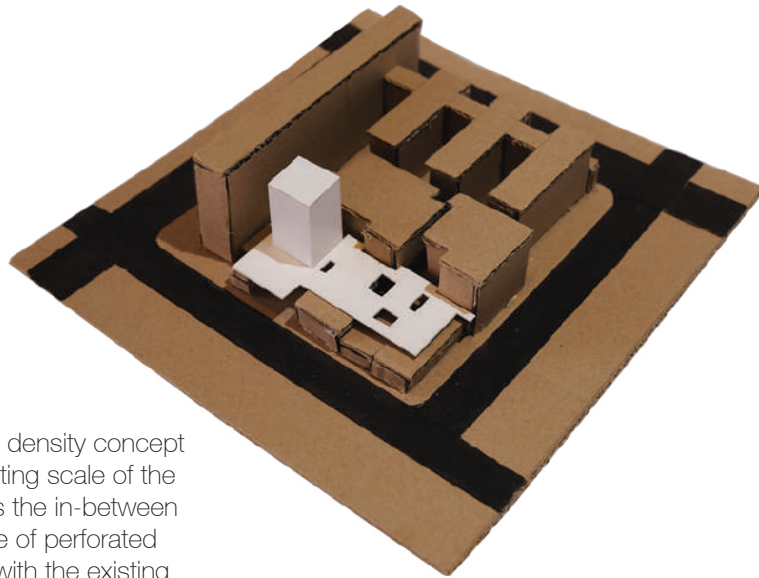
High-rise high density concept with minimal footprint, however with a great impact on the precinct and existing architecture in terms of sheer size and scale.



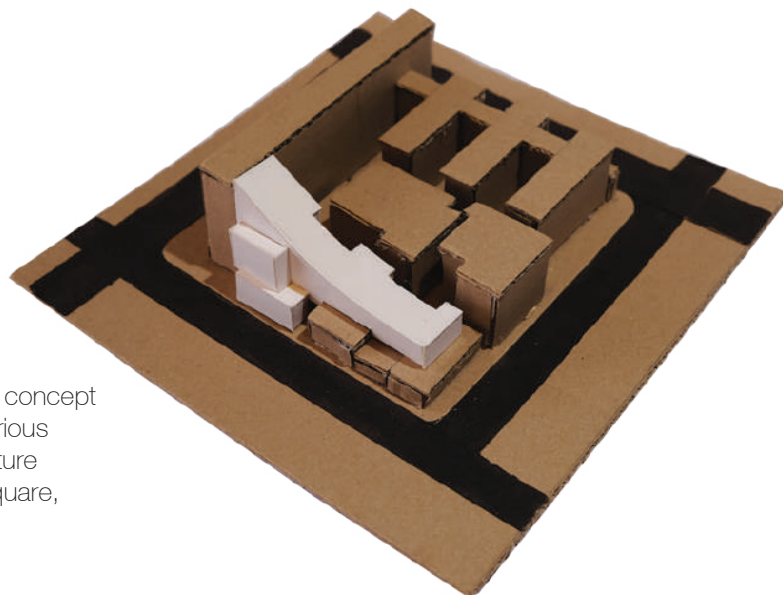
Low-rise, medium density concept that redefines the interior of the existing architecture, but retaining the historical facades, scale and visual identity of the precinct.



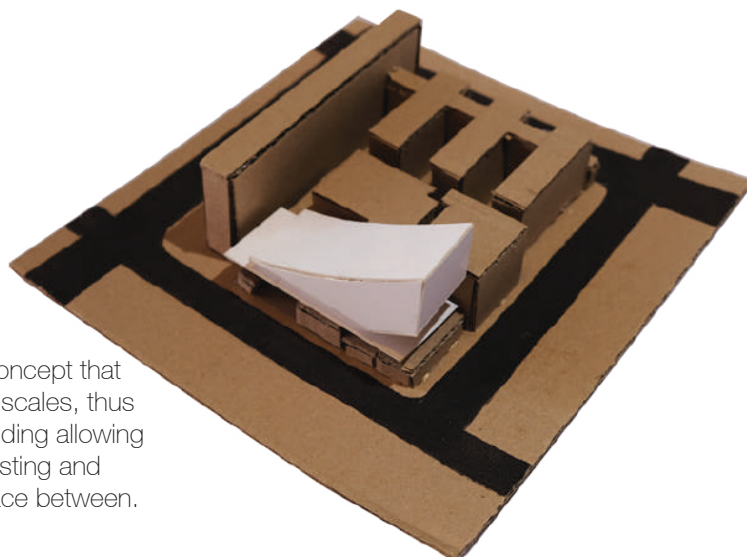
The combination of both the high-rise, high density and low-rise, medium density concepts to achieve a high density while still retaining the scale and identity of the precinct.



Medium-rise, medium density concept that relates to the existing scale of the precinct and redefines the in-between space through the use of perforated platforms that merge with the existing architecture.



Medium-rise, medium density concept that attempts to merge the various scales of the existing architecture to benefit from views to the square, sunlight gain and ventilation.



Medium-rise, medium density concept that mirrors the existing architectural scales, thus terracing away from the TPA building allowing sunlight to both the new and existing and keeping privacy through the space between.

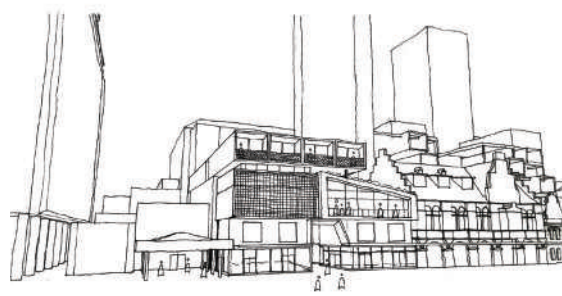
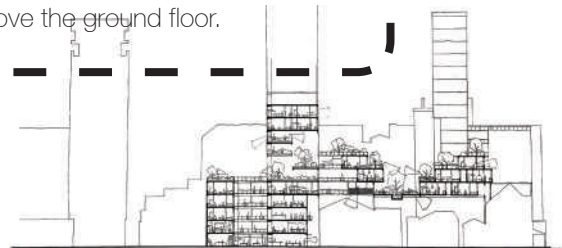
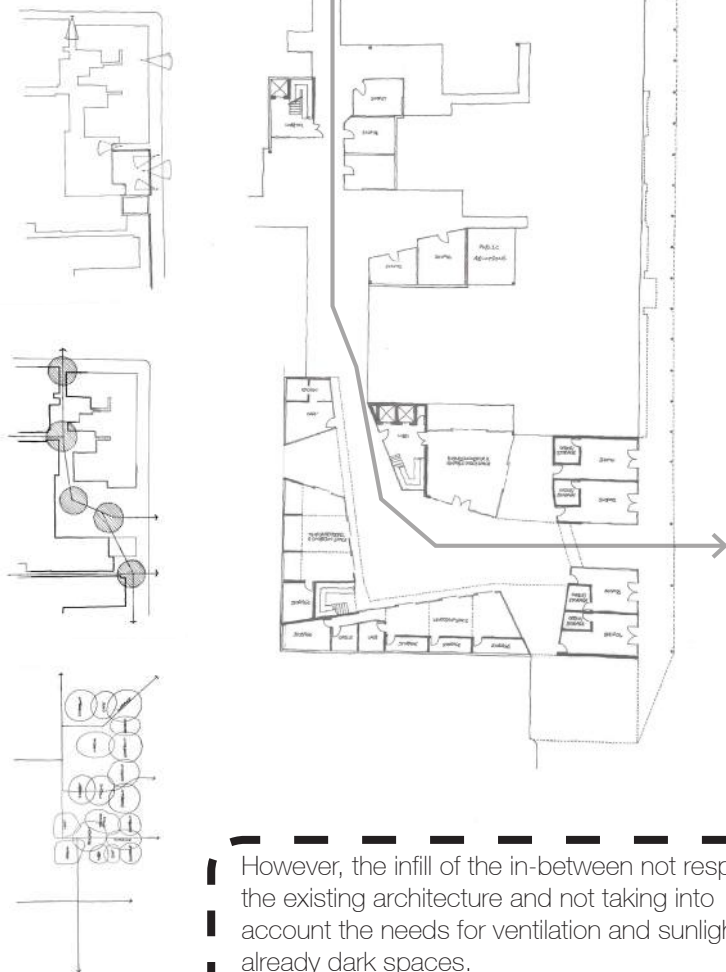
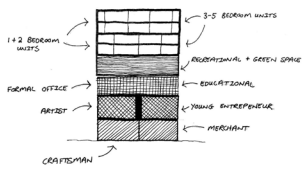
Figure 7.19 Photos of Design Exploration Models (Author 2020).

7.9 Iterations

7.6.1 Iteration 01

Serves as an initial attempt at:

- creating nodal points along the redefined pedestrian arcade and hyper-densifying the site in built area above the ground floor.



However, the infill of the in-between not respecting the existing architecture and not taking into account the needs for ventilation and sunlight to already dark spaces.

7.6.2 Iteration 02

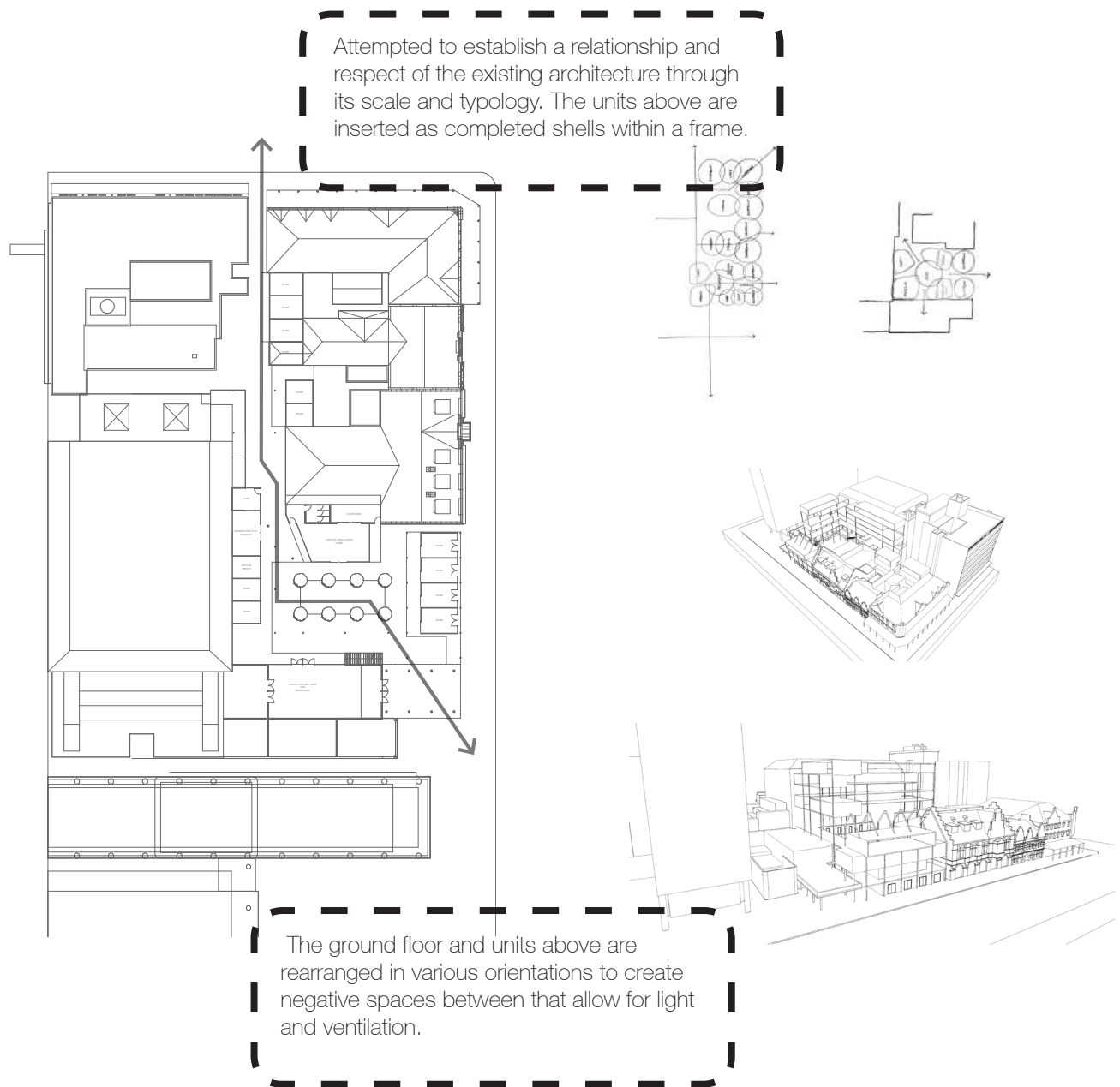
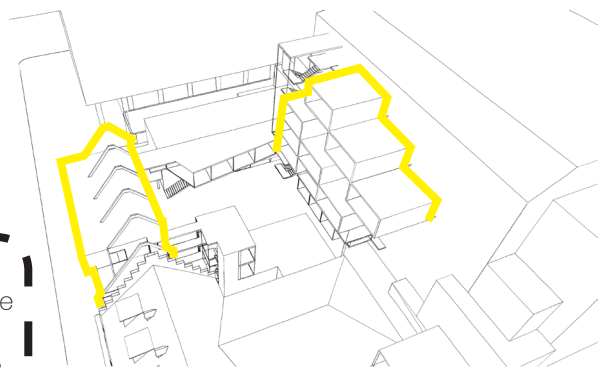
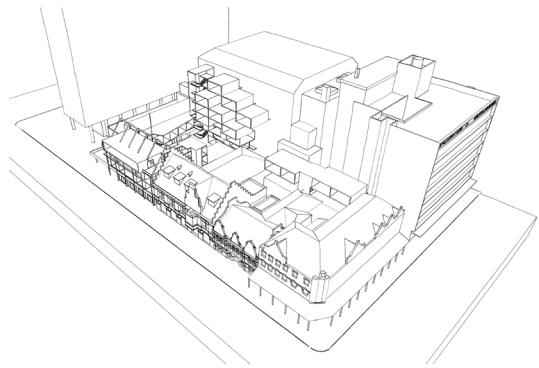
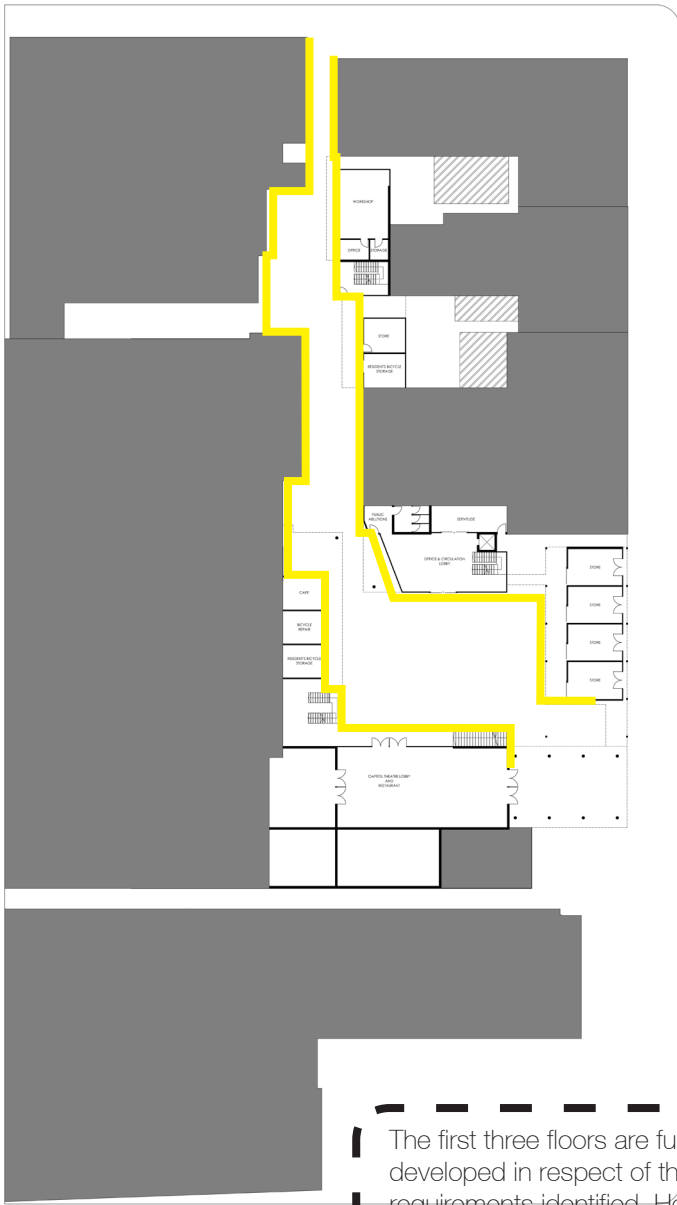


Figure 7.20 Iterative Process of Design Development (Author 2020).

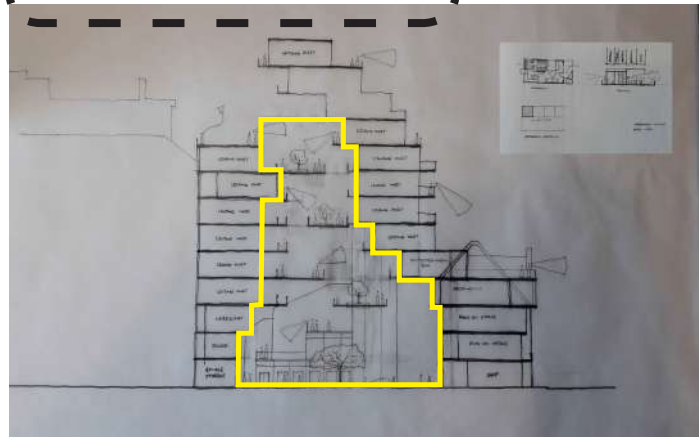
7.6.3 Iteration 03



The first three floors are further developed in respect of the heritage requirements identified. However, the heritage response reducing the density required for the project.

7.6.4 Iteration 04

The density is further increased within the scale and typology of the heritage requirements. The concept of courtyards is explored throughout all floors of the project, to serve as light and ventilation wells.



The concept of a shell within a structure is adjusted to only the shell as structure. Therefore, new questions arose in terms of cantilever requirements and the need for duct and column placements. The idea of combining the structure, ducts and light wells are explored.

Figure 7.21 Iterative Process of Design Development (Author 2020).

7.6.6 Iteration 06

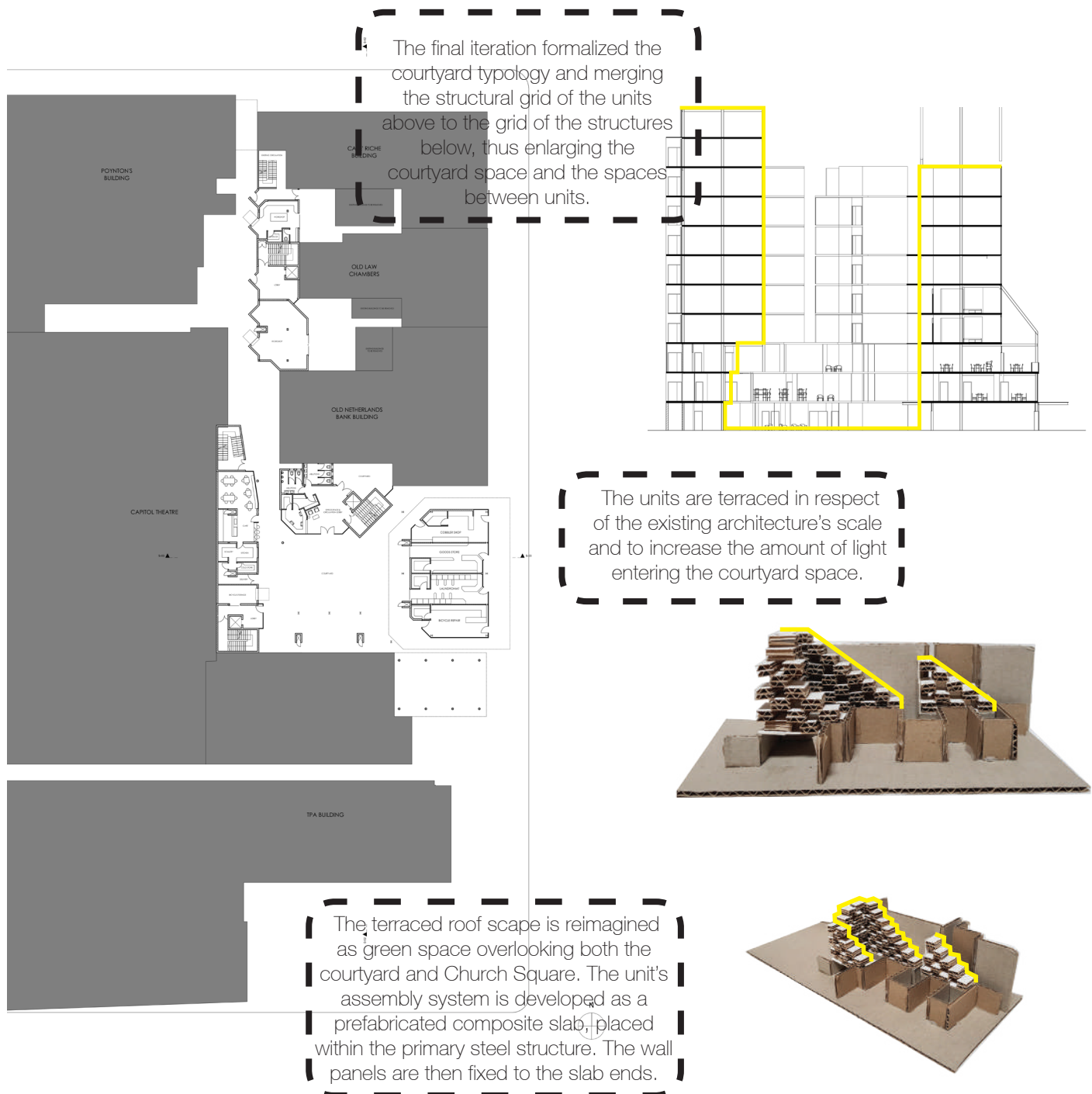


Figure 7.22 Iterative Process of Design Development (Author 2020).

chapter

08

TECHNICAL INVESTIGATION

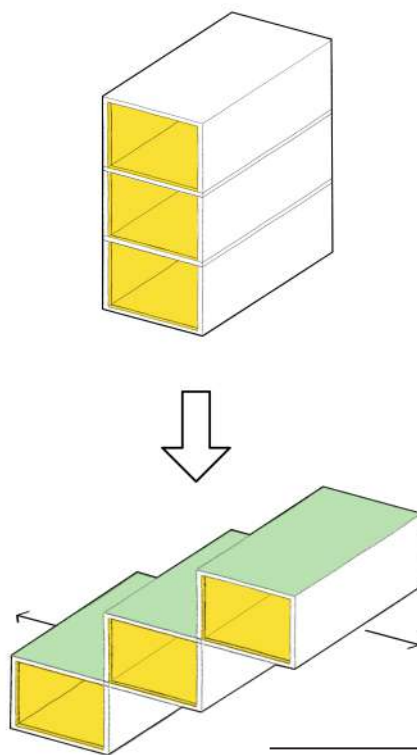


Figure 8.0 Technical Intention
(Author 2020)

8.1 Technical Strategy

As our cities densify and the needs for resources increase, it becomes more crucial to reconsider the existing built fabric. This calls for an increase in the attention of conservation practices of heritage artifacts to ensure the physical but also 'cultural significance' or 'spirit of the place' is not negatively impacted (McCarthy 2012). Analyzing the historical context and the approach to formulating strategies is guided by the ten conservation principles entitled "Learning from the Vernacular" developed by Gabriel (Gawie) Fagan.

The South African graduated as an architect from the University of Pretoria in December of 1951, missing the purely orthodox Modern Movement and receiving an education that focused on the practical aspects of Modernist architecture, in a regionalist sense, but still relevant in the ways of creating functional and technologically appropriate architecture (Barker 2015: 74). Fagan's education was more focused on regional architecture that involved responses to the climatic conditions and the use of materials found within the context.

Through years of practice, Fagan's search for an authentic South African regionalist architecture was inspired in most part by the Mediterranean vernacular and the vernaculars of Cape-Dutch architecture (Barker 2015: 74). As Fagan matured in his architectural experience of the Cape Vernacular, common characteristics in his work arose as types of efficiency: the use of space, minimization of structure and material; and responding to climate (Barker 2015: 79). Fagan balances the practical with a spiritual essence of place in the experiential qualities of the

building (Barker 2015: 79) contrasting old techniques of making with new technologies.

In 1996 Fagan listed the ten principles of the built heritage in a lecture. Barker (2014) states the principles as a realization of years of experience in conservation practice, focused on the making of a new form through responses to program and context. The principles still reinforcing the vernacular of the context as the source of design inspiration (Barker 2014). Fagan formalized his "lessons of the vernacular" as conservative and interpretive principles for responding to the vernacular and meeting the needs of the modern man and new technologies.

01 Simplicity of Cape vernacular traditions as a common-sense building approach. Problems associated with climatic conditions and functional organization had to be solved practically and builders used what they had at hand, adopting an inventive approach (Barker 2014:6) and economy of means, doing the most with the least.

02 Structural integrity and honesty referring to the structural elements that are minimized through the use of short spans, all materials are expressed in their original state, and junctions are clearly articulated in simple ways (Barker 2014:7).

03 Plasticity or Modelling referring to the soft moulding of plaster, a technique used in Cape Dutch architecture. The plastic quality of the softly plastered lime-washed walls defined by the effect of light on the surface (Barker 2014:8).

04 Appropriate and consistent detailing, but not standardized. Previous work is adjusted and made to suit the new condition. According to Barker (2014:12),

Fagan uses a detail appropriate in its application, context, and consistency in its execution, maintaining consistency of idea and intention from concept to detail (Barker 2014:12).

05 Unity in diversity of new interventions of a similar language but displaying its own 'place' and interpretations to avoid a repetitive identity (Barker 2014:12).

06 Colour used to express different functions and elements of the architecture in a simple but respectful way (Barker 2014:13).

07 Proportion (Relation to the whole) in Cape Dutch buildings consisted of two systems: the concentric scheme or a system of squares and double squares. Fagan used the Hambidge system of dynamic symmetry, where the balance between the technique and the imagination is kept (Barker 2014:14).

08 Human scale refers to simply that. Fagan uses scale to establish a relationship between the building and its inhabitant (Barker 2014:16) The connection also established to the context through form manipulation, defining space, experiential circulation, and detailing proportioned to the inhabitant.

09 Fagan explains relation to the environment, the sensitivity showed by early builders to landscape, as they were living so close to the natural world. According to Barker (2014:16), Fagan continued this tradition through building placement in accordance with the climatic conditions of the context, the views, and natural light.

10 Fagan expresses the progression of experiences as the importance of the experience along each route within circulation Barker (2014:18).

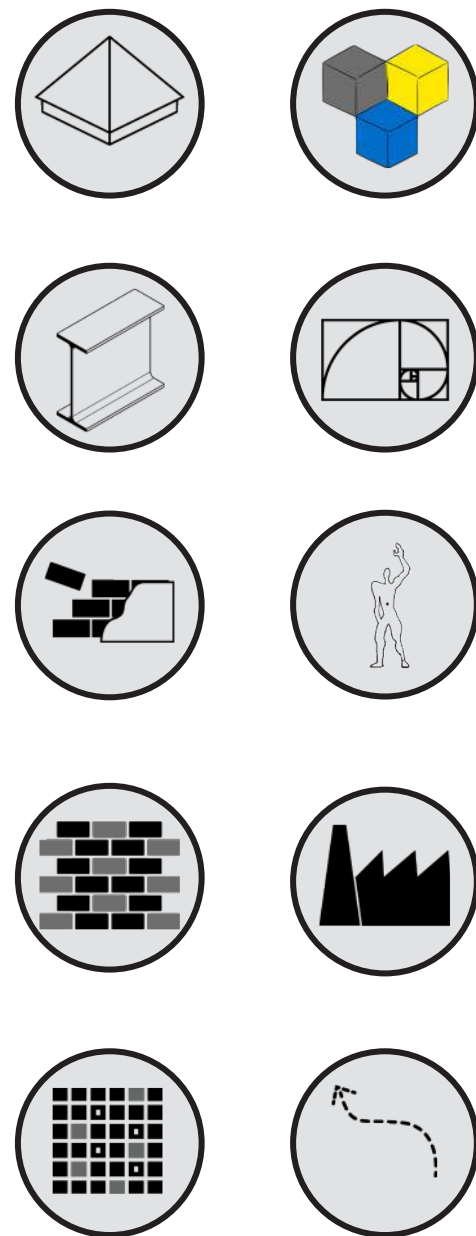


Figure 8.1 Technical Principles (Author 2020)

8.2 Technical Expression

The architectural tectonics are expressed through steel frame construction with infill, where the infill material and configuration thereof relates to the existing heritage with contemporary methods of assembly. The steel structure allows for different configurations of floor levels within the frame structure. Through pushing and pulling of portals on various levels a diversity in spaces and facades are created, therefore creating opportunity for multiple spatial experiences on the same floor levels.

Lightweight Construction

Heavyweight Construction

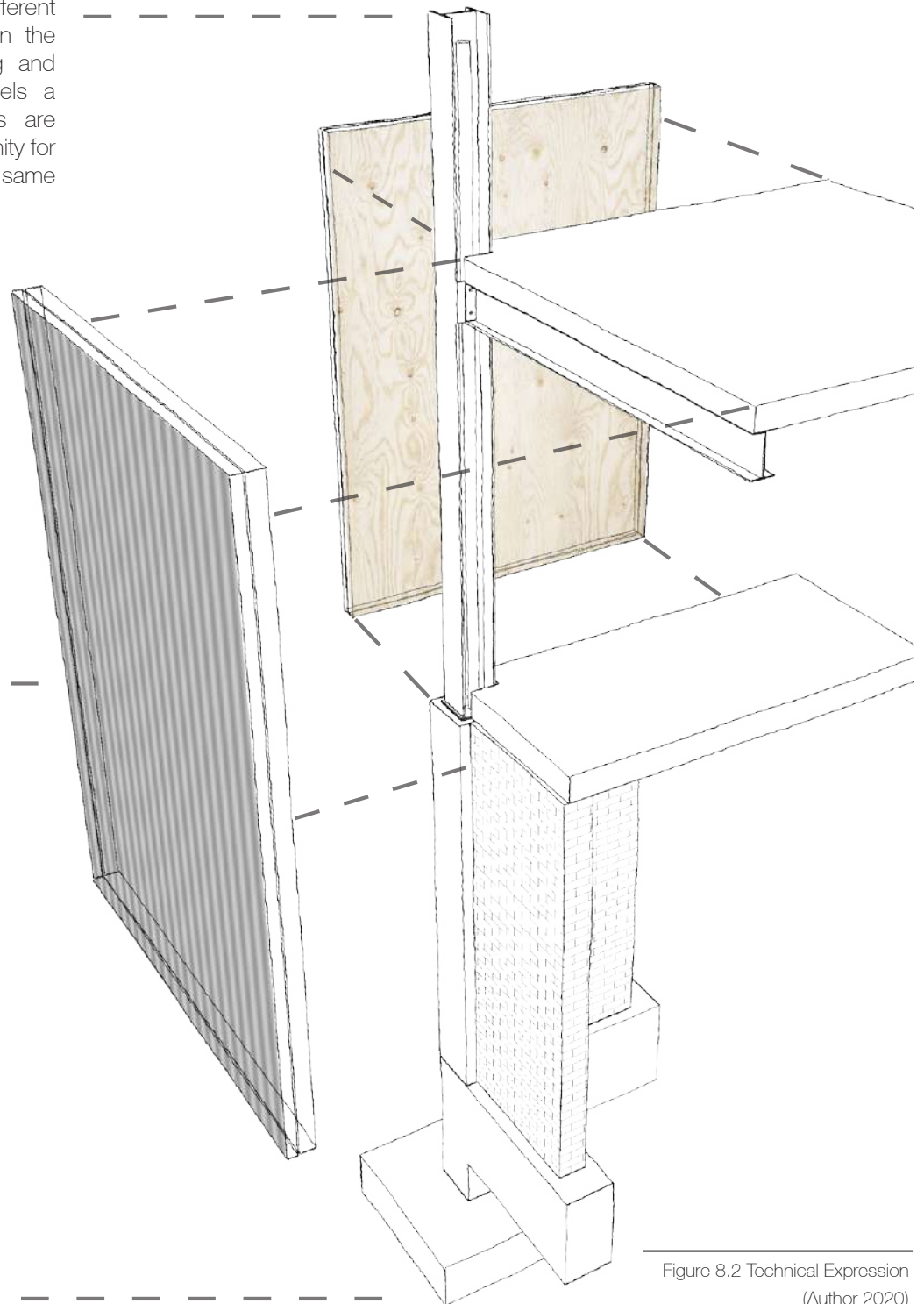
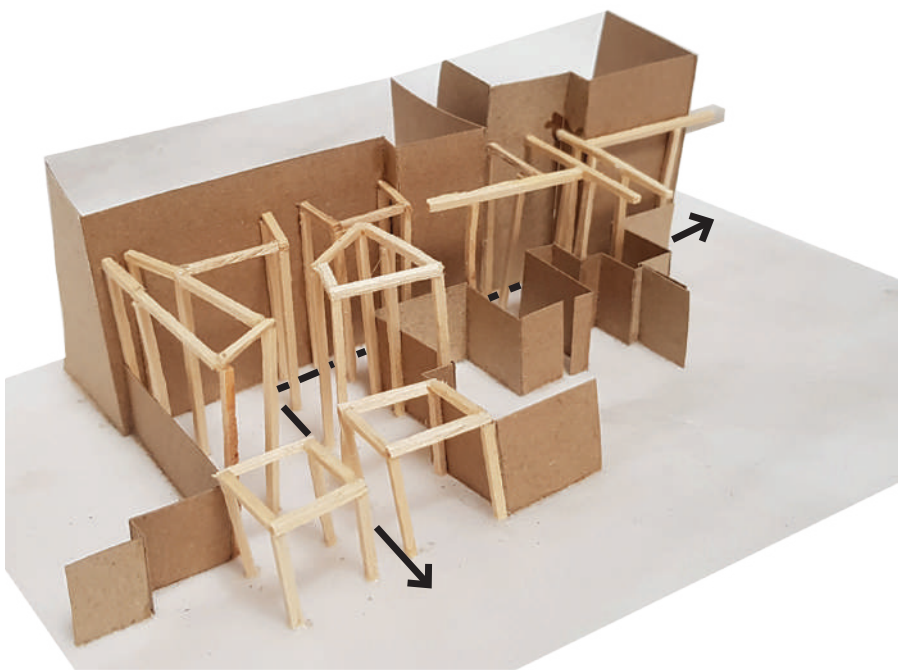
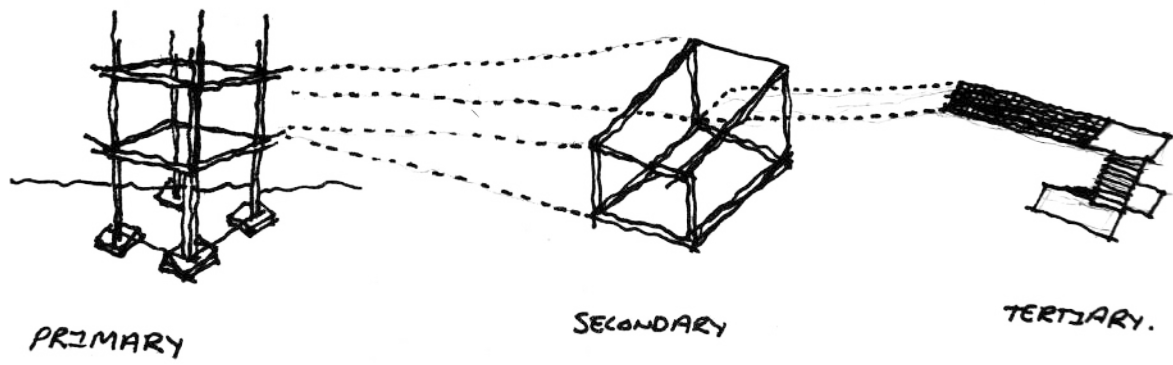


Figure 8.2 Technical Expression
(Author 2020)

8.3 Technical Development: Connecting To The Existing



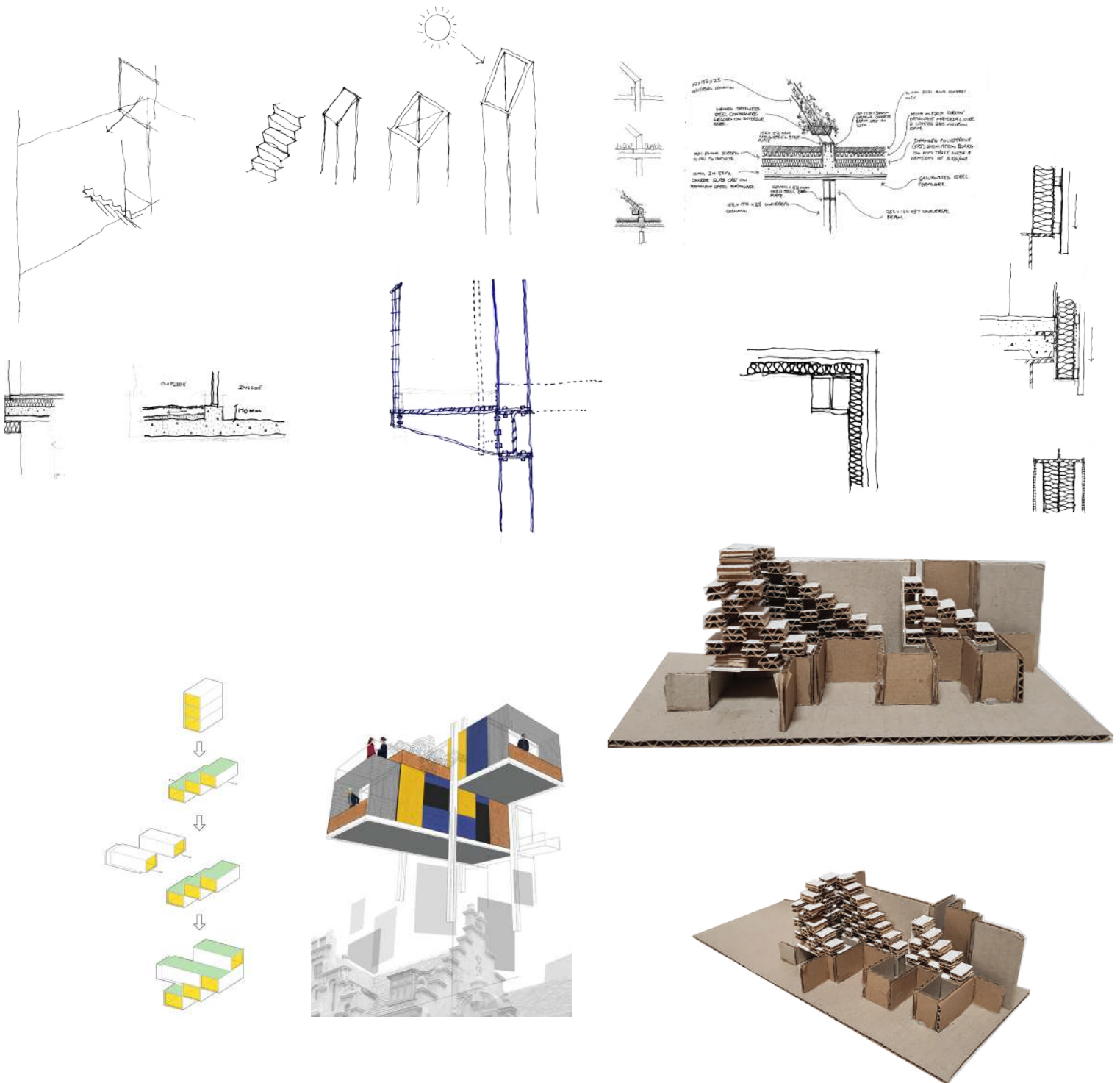
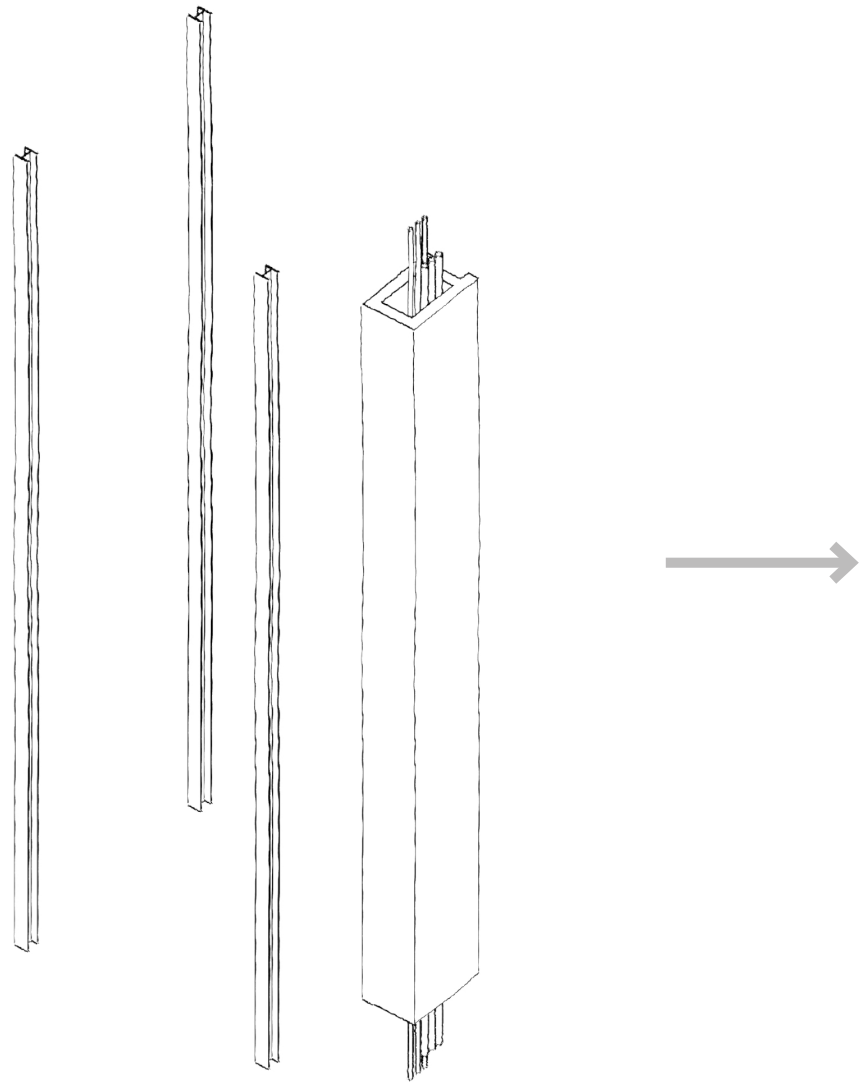


Figure 8.3 Technical Development (Author 2020)

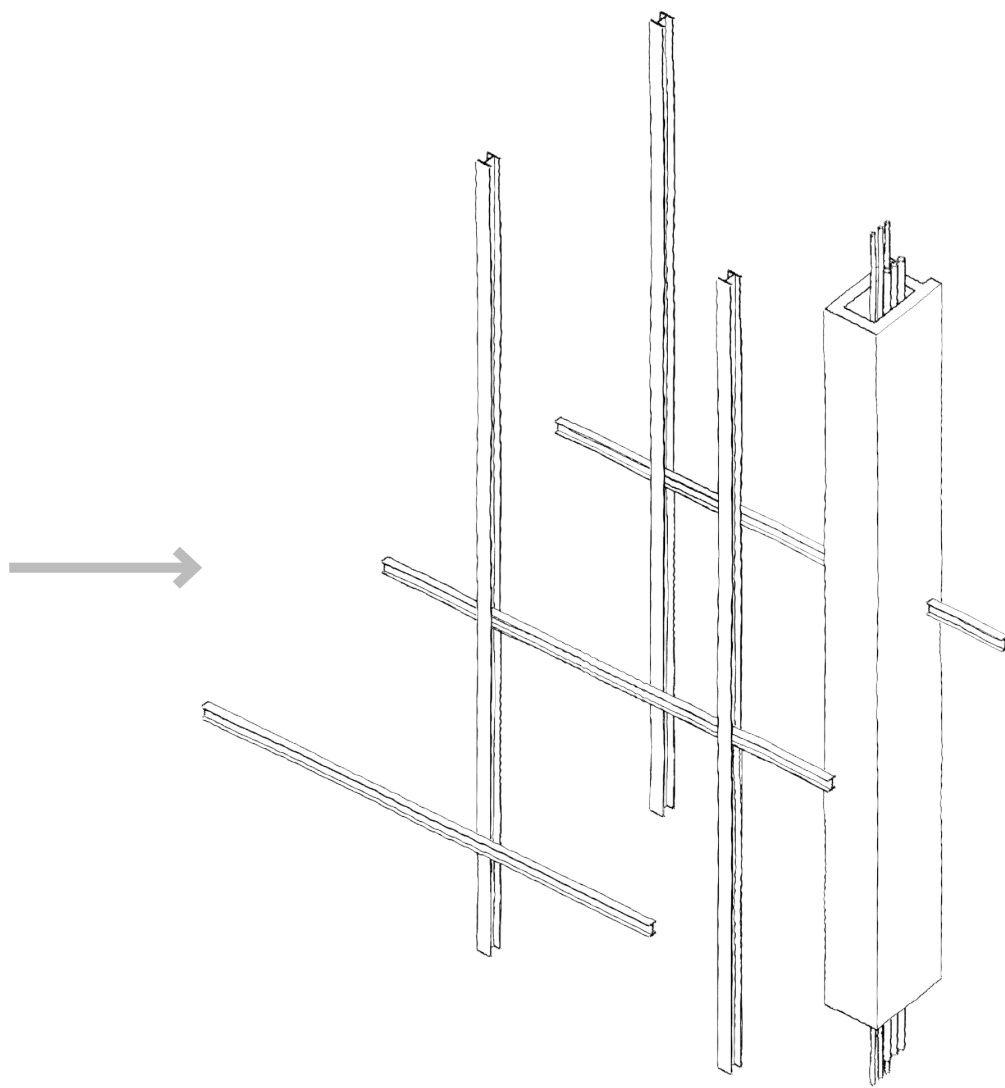
8.4 Structural System

The structural system can be understood as three interconnected elements- the frame, infill and services. the foundation supporting the structure consist of pylon footings providing support to the steel frame structure resting from above. The steel work is connected and limited by a grid format, with connections on each floor level.



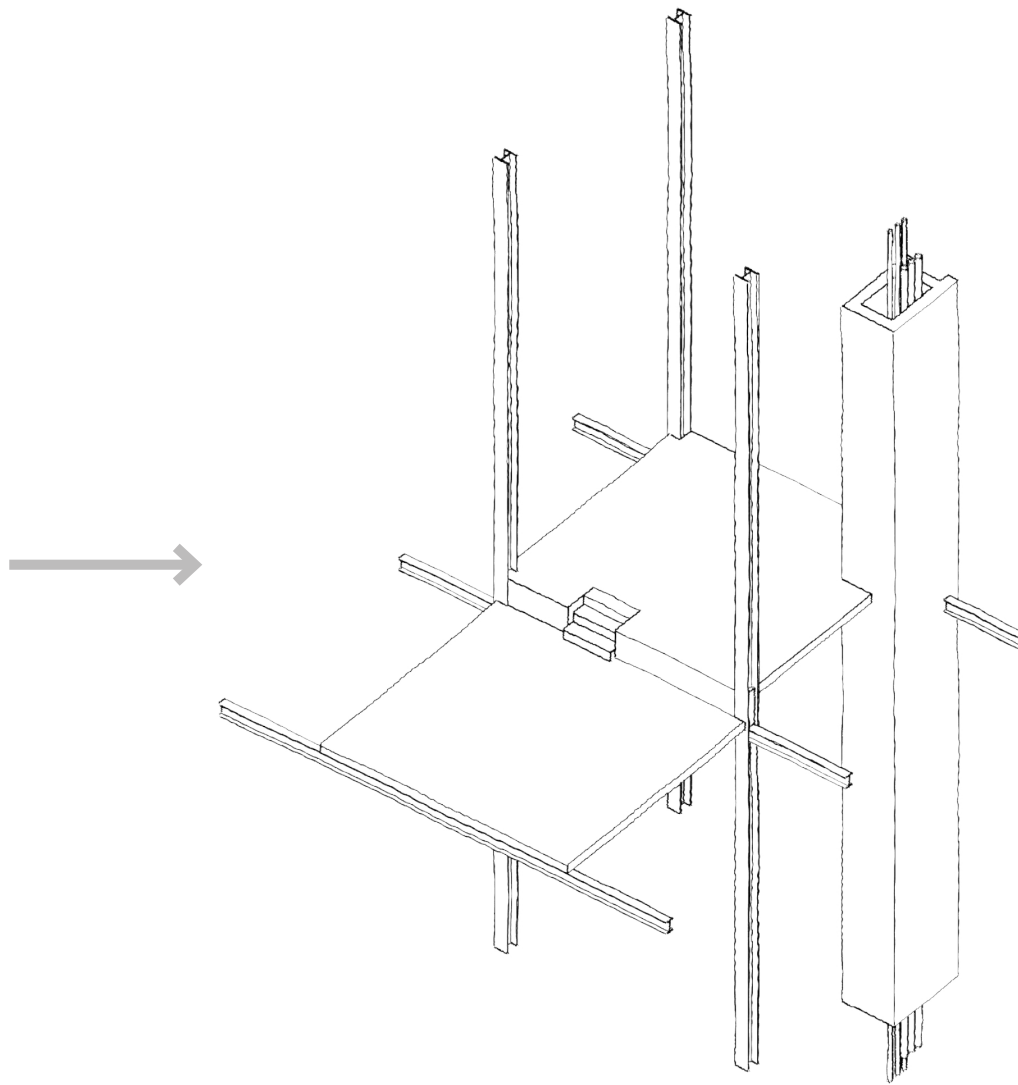
8.4.1 Primary Structure

Figure 8.4 The Primary Structural System (Author 2020)

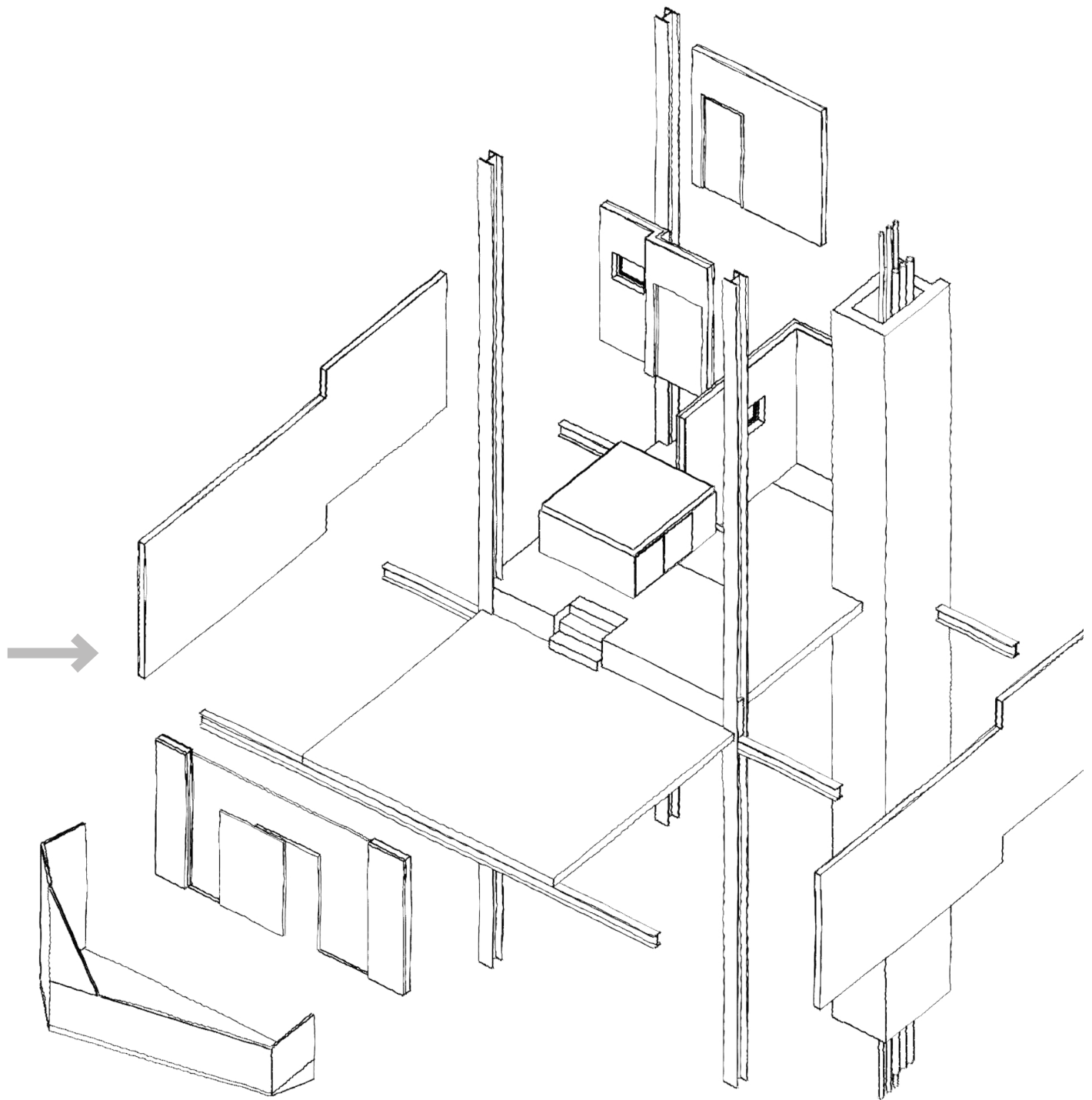


8.4.2 Secondary Structure

Figure 8.5 The Secondary Structural System (Author 2020)

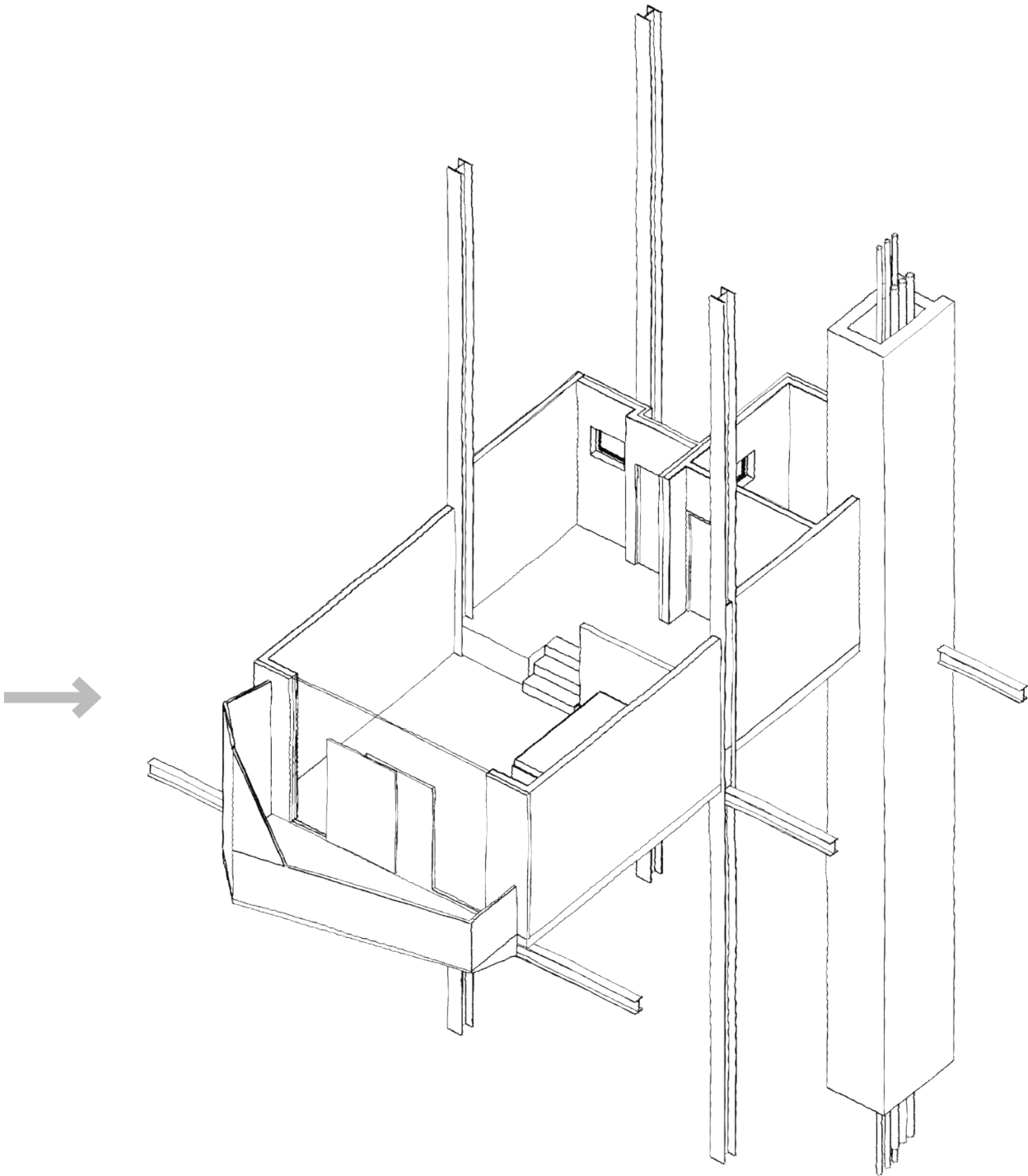


8.4.3 Prefabricated Slab Insertion



8.4.4 Prefabricated Wall Panels and Balcony

Figure 8.7 Wall Panel and Balcony Insertion (Author 2020)



8.4.5 Apartment Unit Configuration

Figure 8.8 A completed apartment unit configuration (Author 2020)

8.5 Material Study:

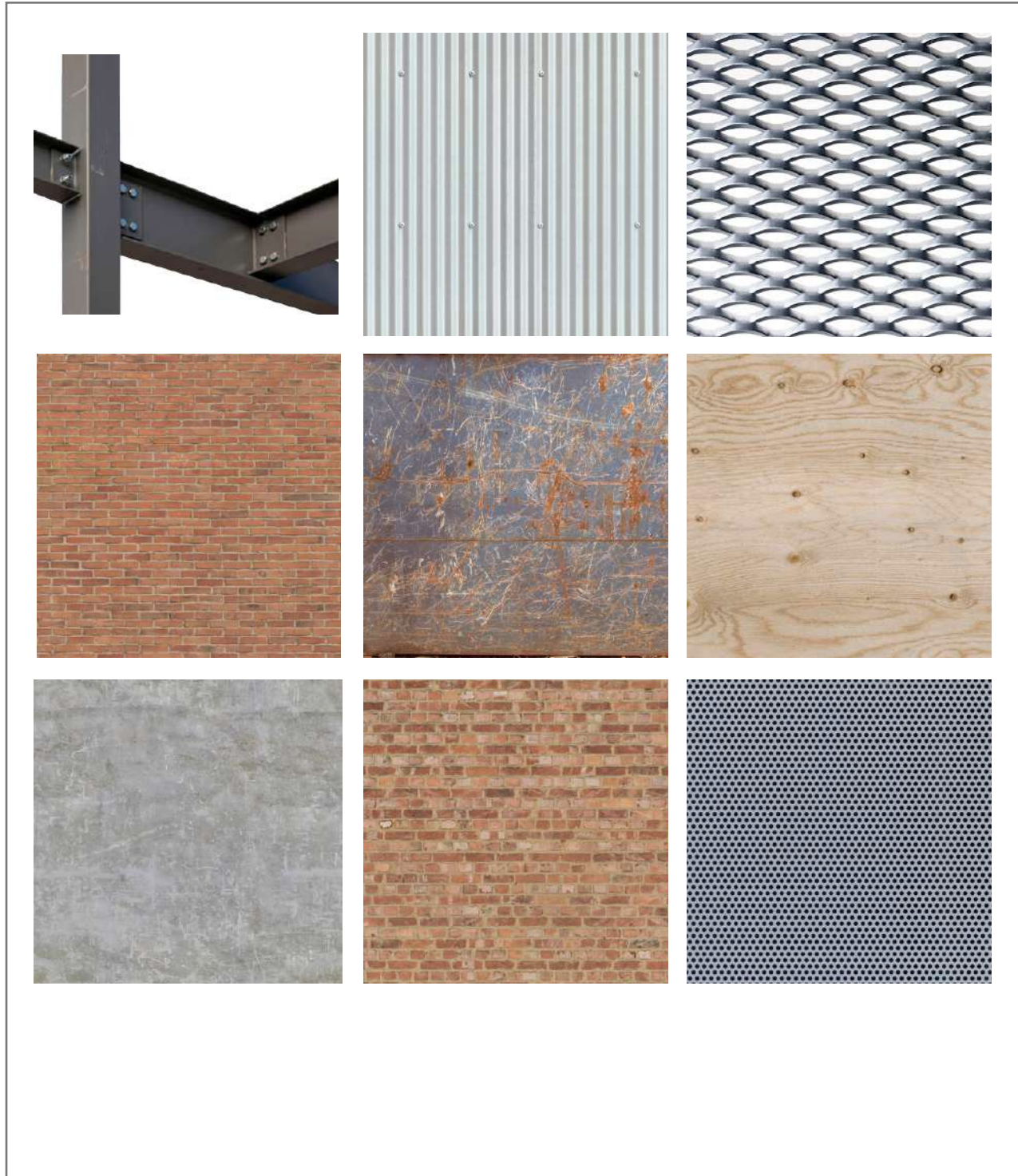


Figure 8.9 Material study (Author 2020)

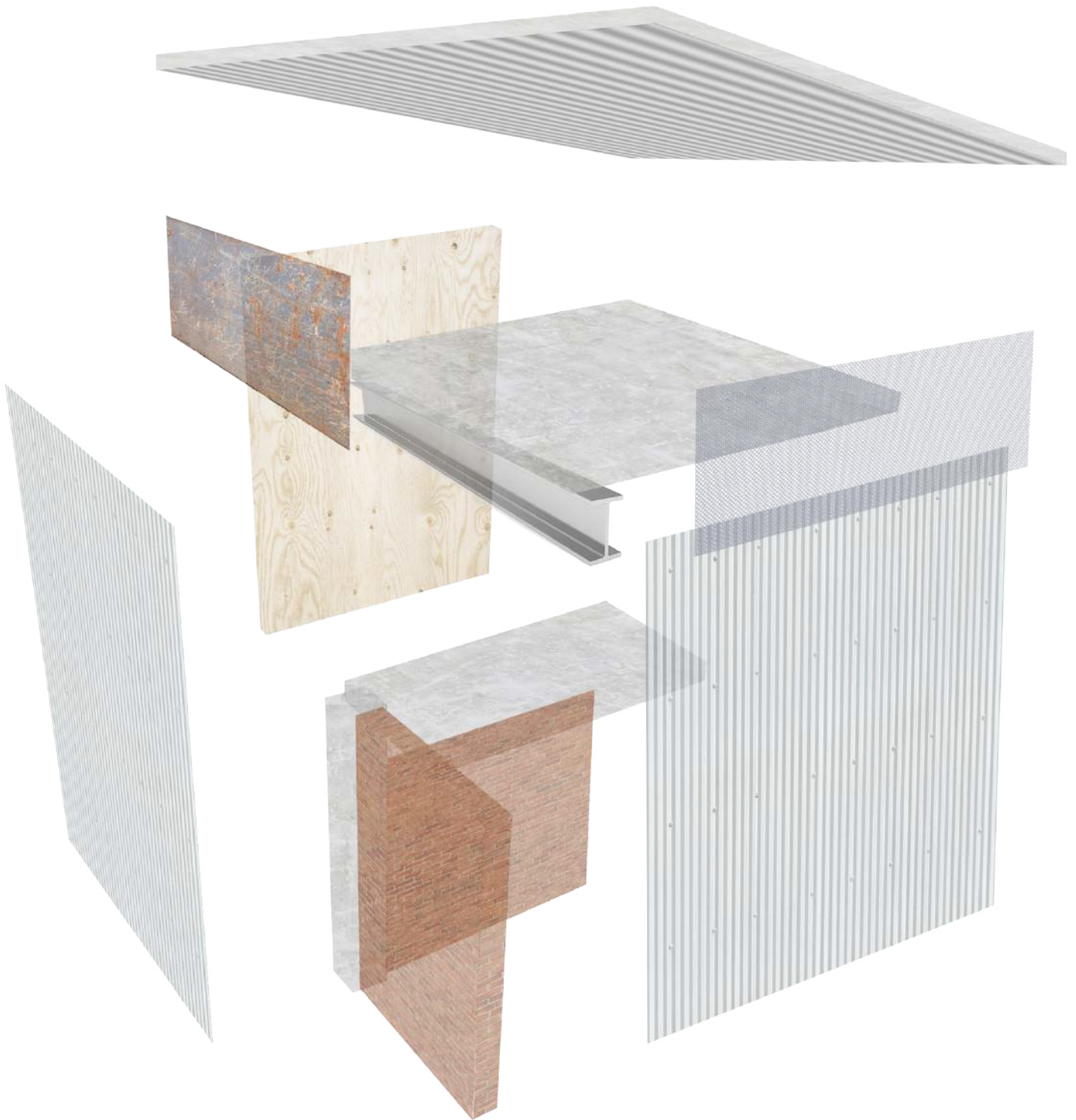
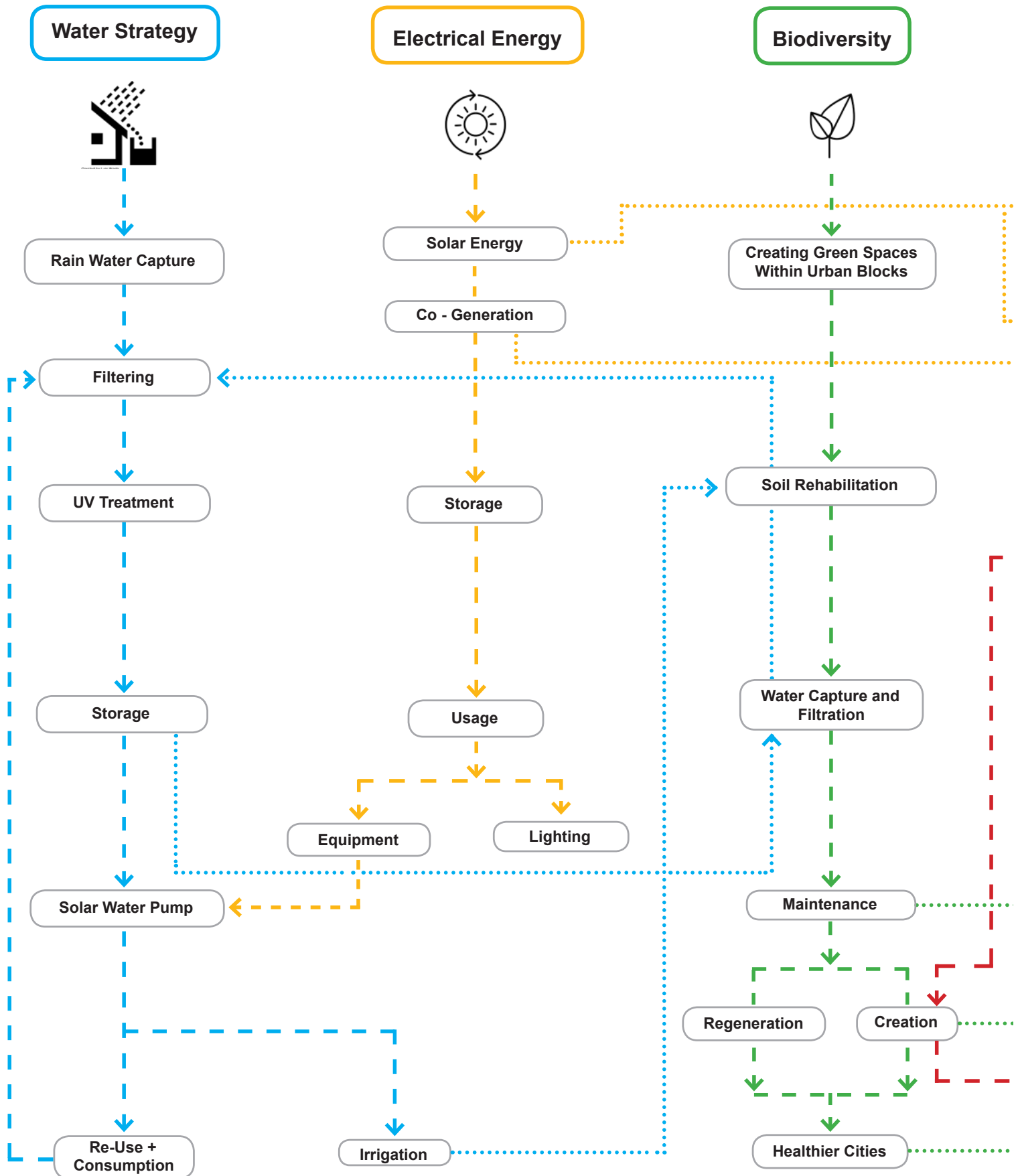


Figure 8.10 Material & structural concept (Author 2020)

8.6 Operational Systems:



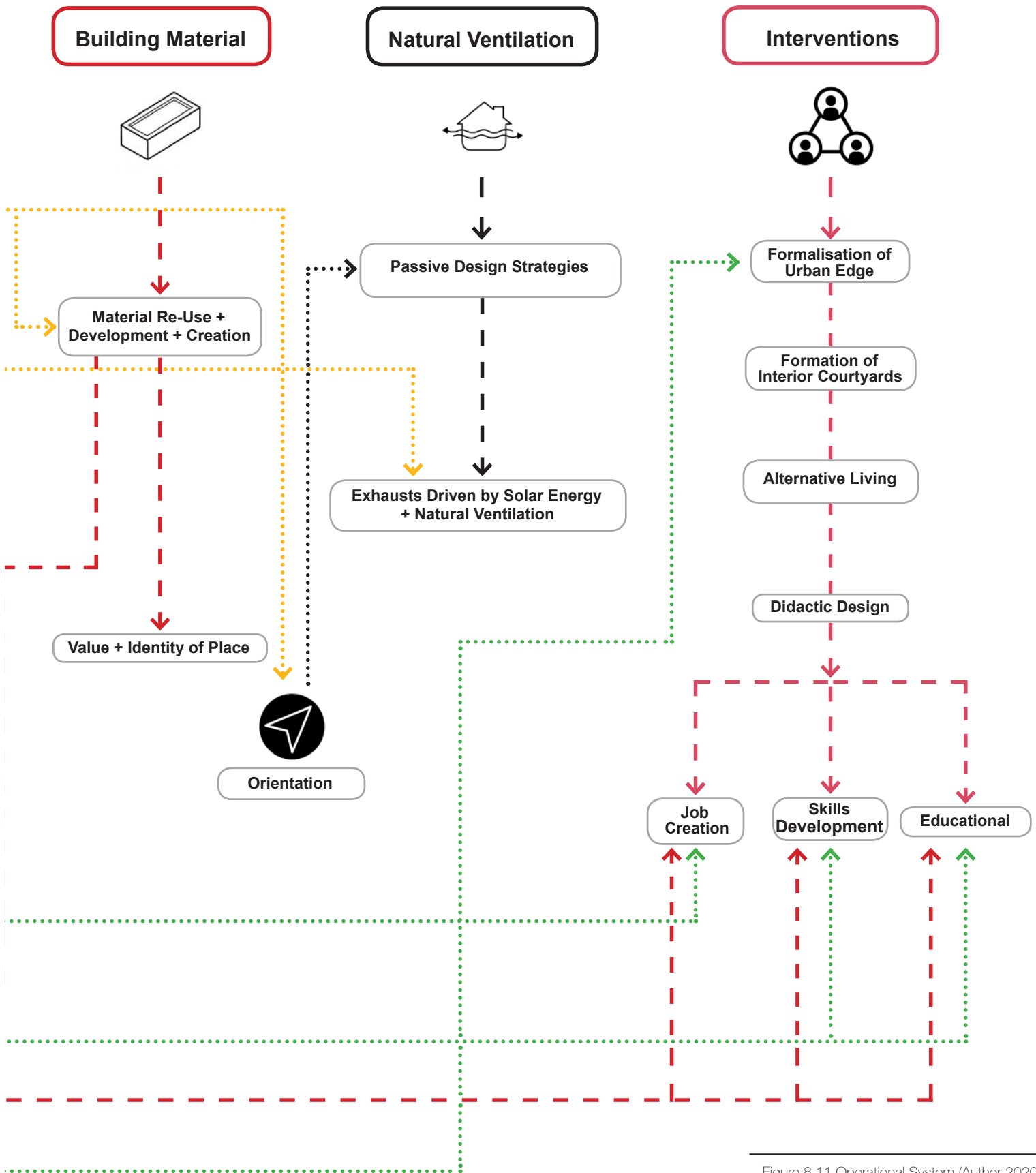


Figure 8.11 Operational System (Author 2020)

8.6.1 Systems To Program Integration

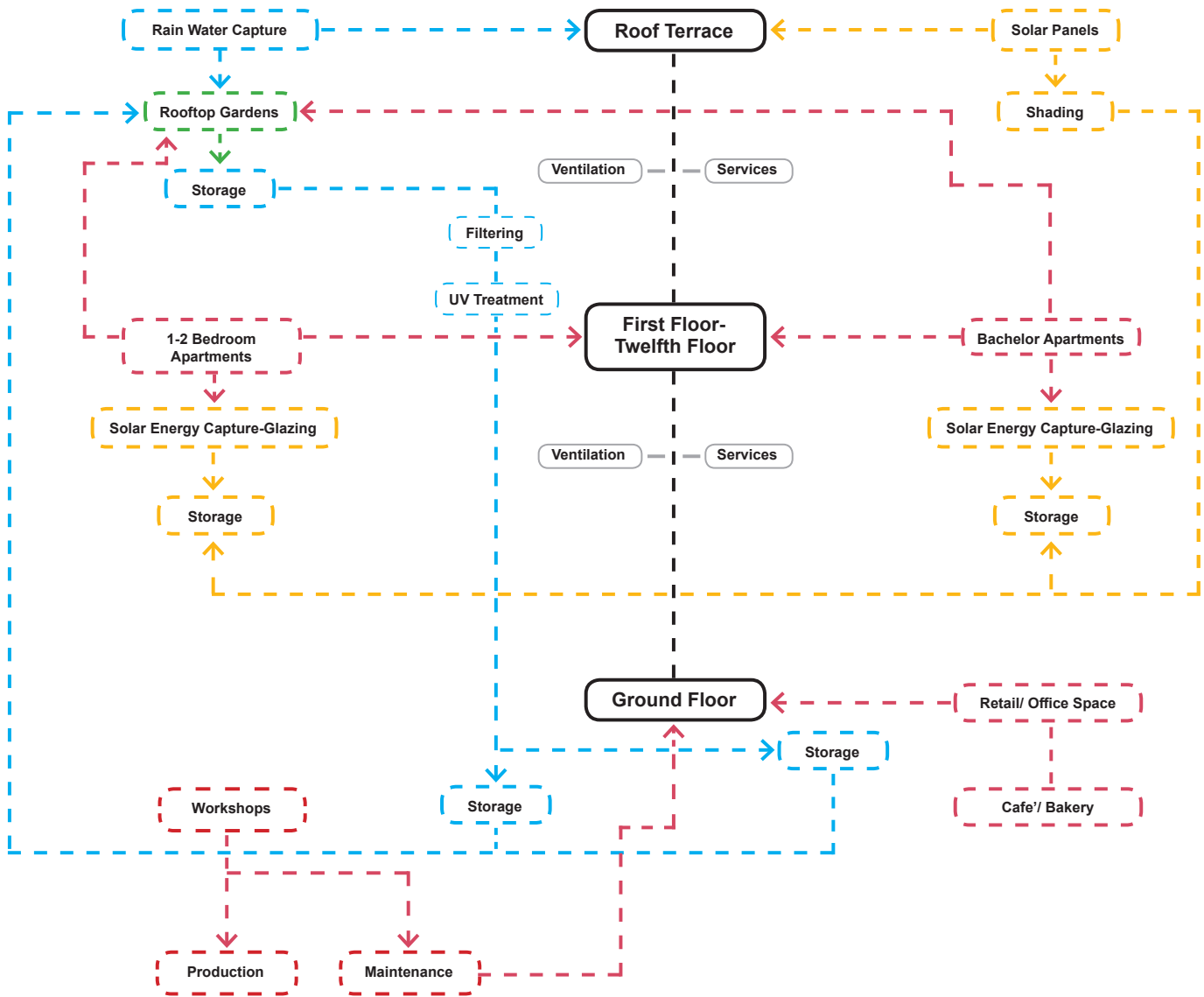


Figure 8.12 Systems to Program Integration
(Author 2020)

8.6.2 Site Weather Data

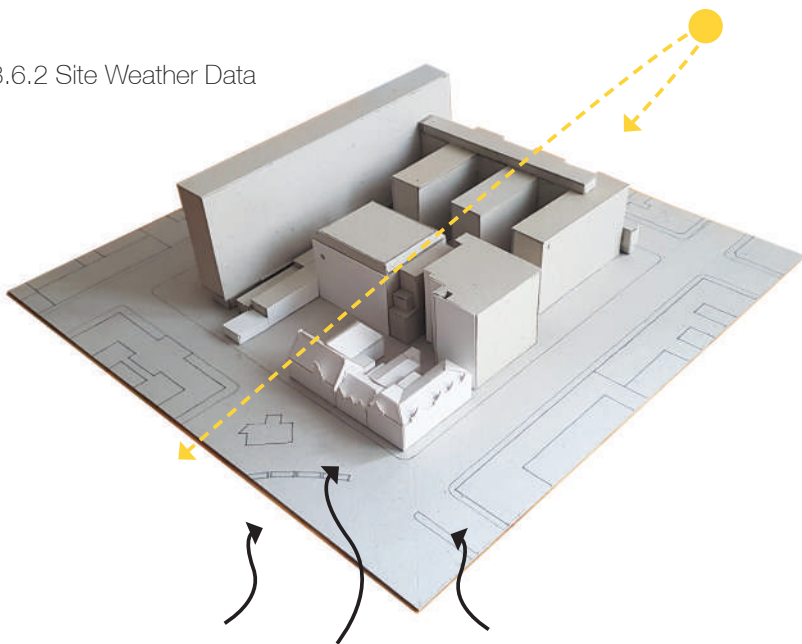


Figure 8.13 Site Model (Author 2020)

Monthly Average Rainfall

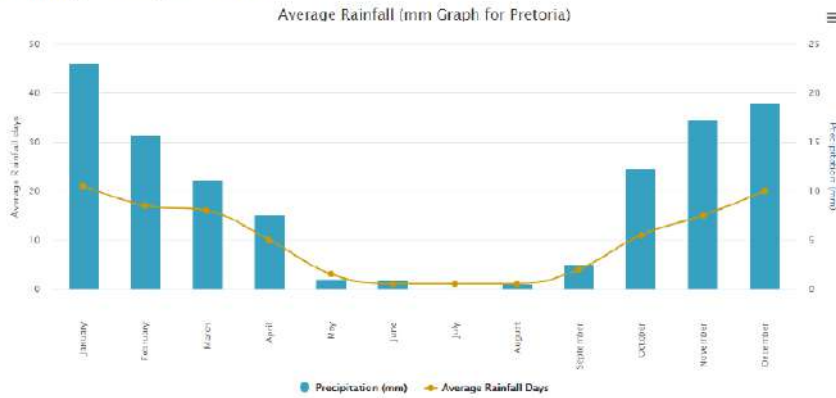


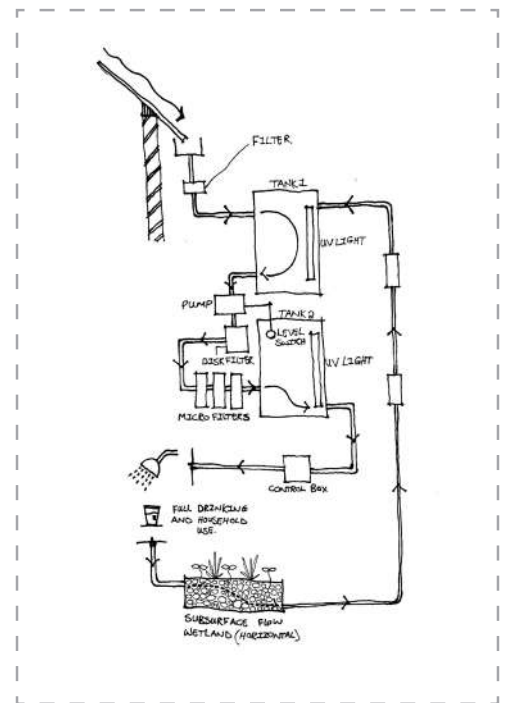
Figure 8.14 Monthly Average Rainfall (WorldWeatherOnline 2020)



Figure 8.15 Water Demand (Author 2020)

8.6.3 System Development

Rainwater Harvesting System



PV Panel Solar Energy System

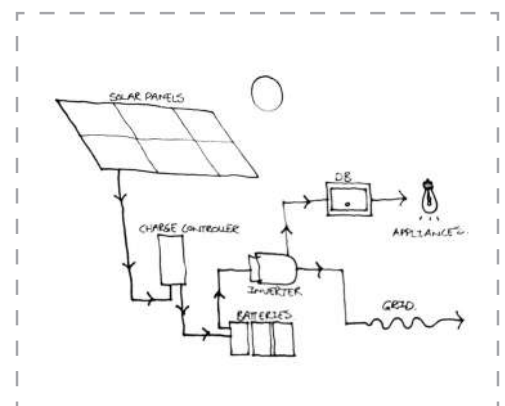
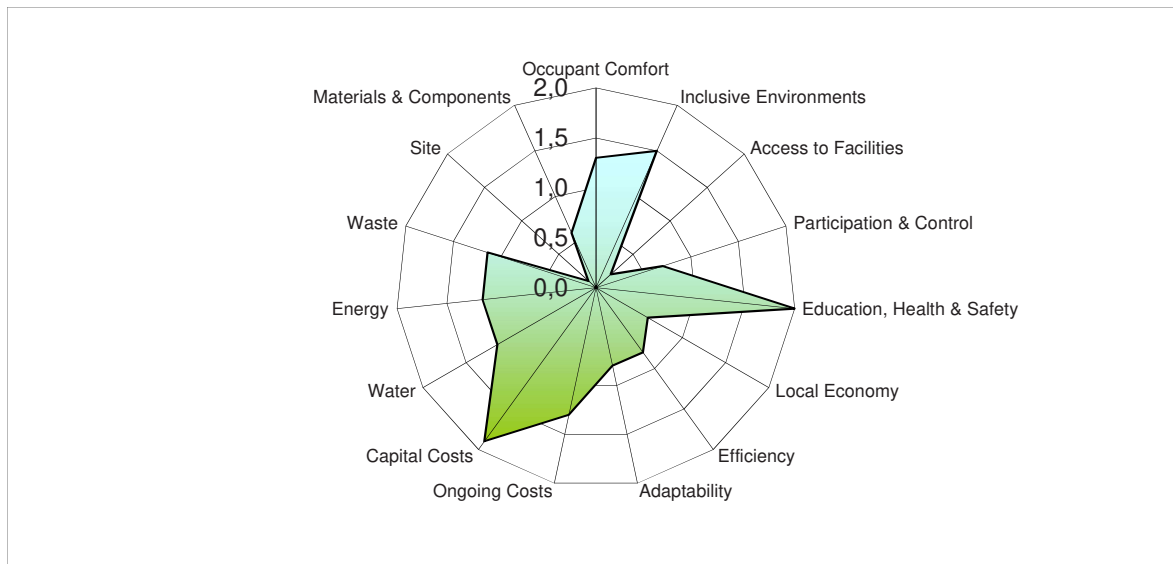


Figure 8.16 Systems Sketches (Author 2020)

8.7 SBAT Rating

Before Intervention



Social	1,1	Economic	1,1	Environmental	0,8
Overall		1,0			

After Intervention

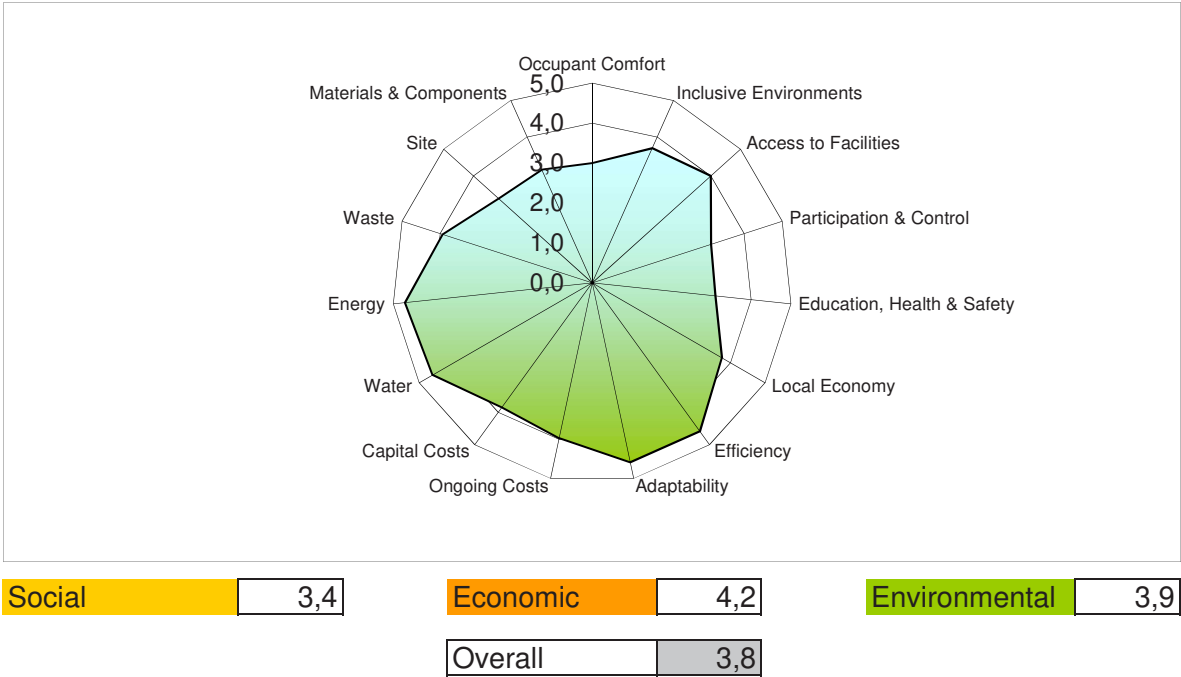


Figure 8.17 SBAT Rating (Author 2020)

chapter

09

CONCLUSION

9.1 Conclusion

The research question- how can architectural intervention implement sustainable hyper-densification into the existing fabric of the inner city of Pretoria? Is unpacked and resolved by defining the various density design principles for a South African city, urban design principles for inhabiting cities and technical principles for respecting the existing built fabric.

For the purposes of this dissertation hyper-density is defined as the repurpose and development of the in-between as public space and threshold between the livable and urban environment.

The project formalizing the in-between as multi-programmatic spaces, proposing an architecture that can no longer serve as only object, but a compact adaptable habitat. One that does not become obsolete in time, but responds to, grows, and transforms with the growing city. It does not follow the principles of new and standing alone but merges with the existing. It becomes a collection of components, filling in the spaces between. Repurposing and reinventing the existing towards a spatial, social, and environmental sustainability relevant to the present but also the future needs.

Research Question

How can architectural intervention implement sustainable hyper-densification into the existing fabric of the inner city of Pretoria?

Sub Question

How can social, spatial, and economic sustainability make possible the densification of the city?

How can the existing infrastructure of Pretoria be adaptively reused and repurposed for the 21st century?

How can spaces over time adapt to suit the changing needs of its users?

Design principles for the effective densification of a South African city:



- a strong pro-urban philosophy,



- the inclusion and connection of living, working, playing, and movement spaces,



- the design and construction of buildings considered from both a qualitative and quantitative philosophy,



- the promotion of a multi-programmatic city



- and providing for easily accessible, safe, and efficient public transport,



- and pedestrian and bicycle lanes.



- The population density of units in relation to square meters should be considered when designing for compact development, however, the principles of a sustainable urban form and an effective density should be used as the guiding design philosophy.

Figure 9.1 Density Design Principles (Author 2020)

Urban Design Principles:

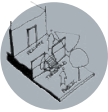



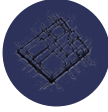




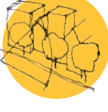
-  Public-Private Threshold
-  The Human Scale
-  Continuity
-  Robustness
-  Variation and Integration
-  Diversity in Sharing
-  The 15 min City
-  Personalize
-  Intensify
-  Richness

Figure 9.2 Urban Principles (Author 2020)

Technical & Structural Design Principles:


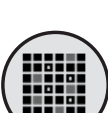
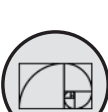


- 01 Simplicity 
- 02 Structural integrity and honesty 
- 03 Plasticity or Modelling 
- 04 Appropriate and consistent detailing 
- 05 Unity in diversity 
- 06 Colour 
- 07 Proportion 
- 08 Human scale 
- 09 relation to the environment 
- 10 progression of experiences 

Figure 9.3 Technical & Structural Principles (Author 2020)

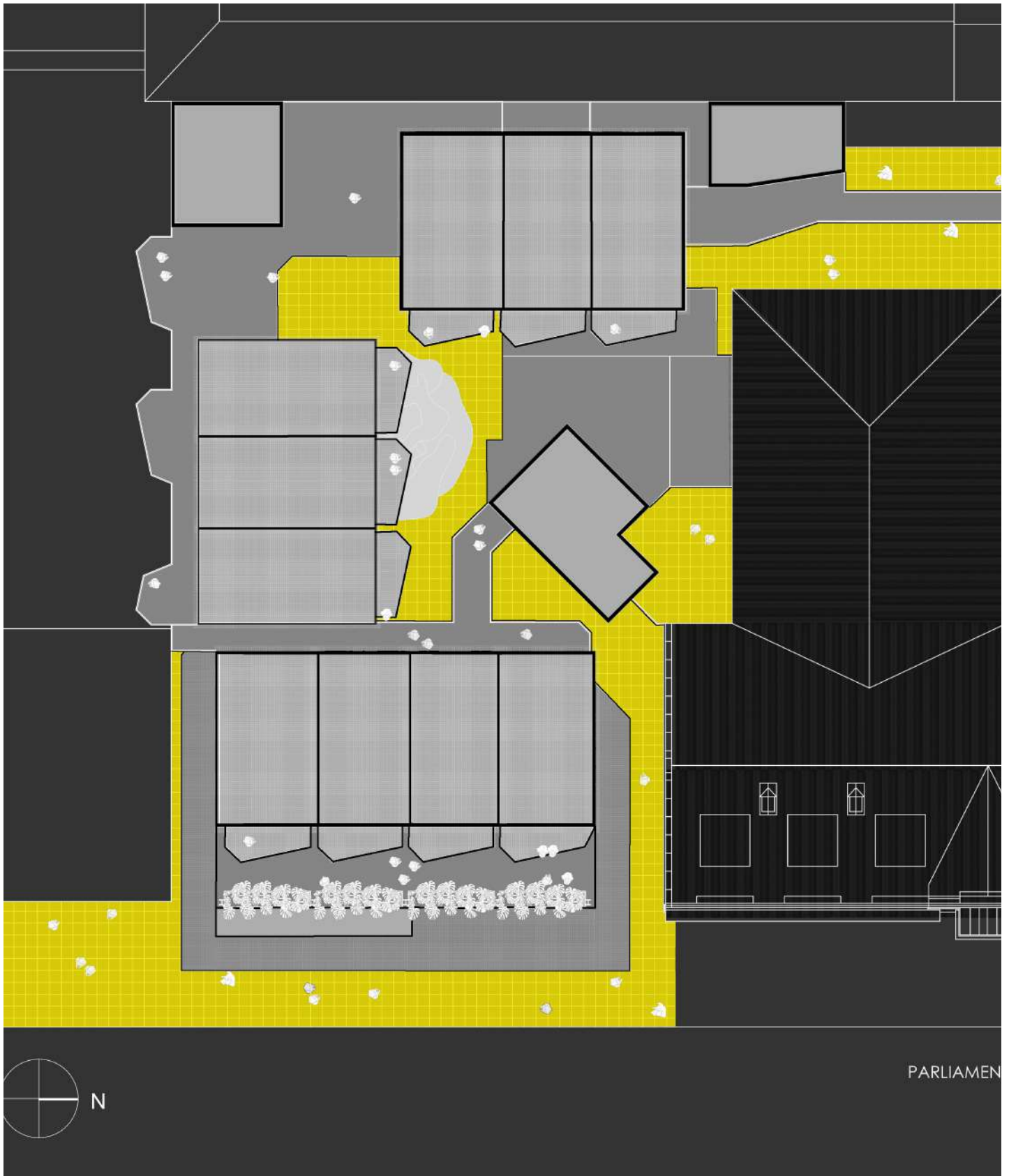
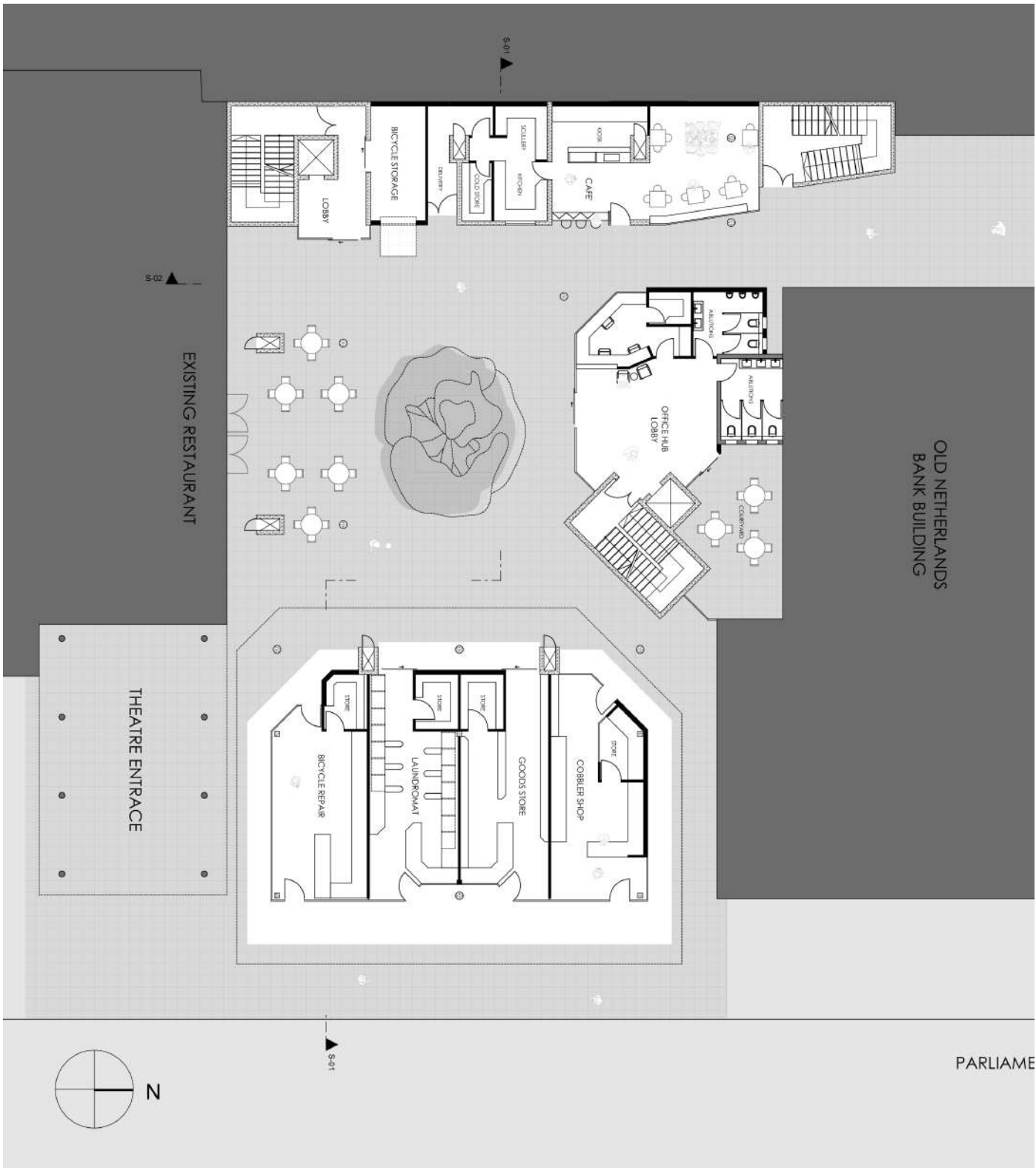




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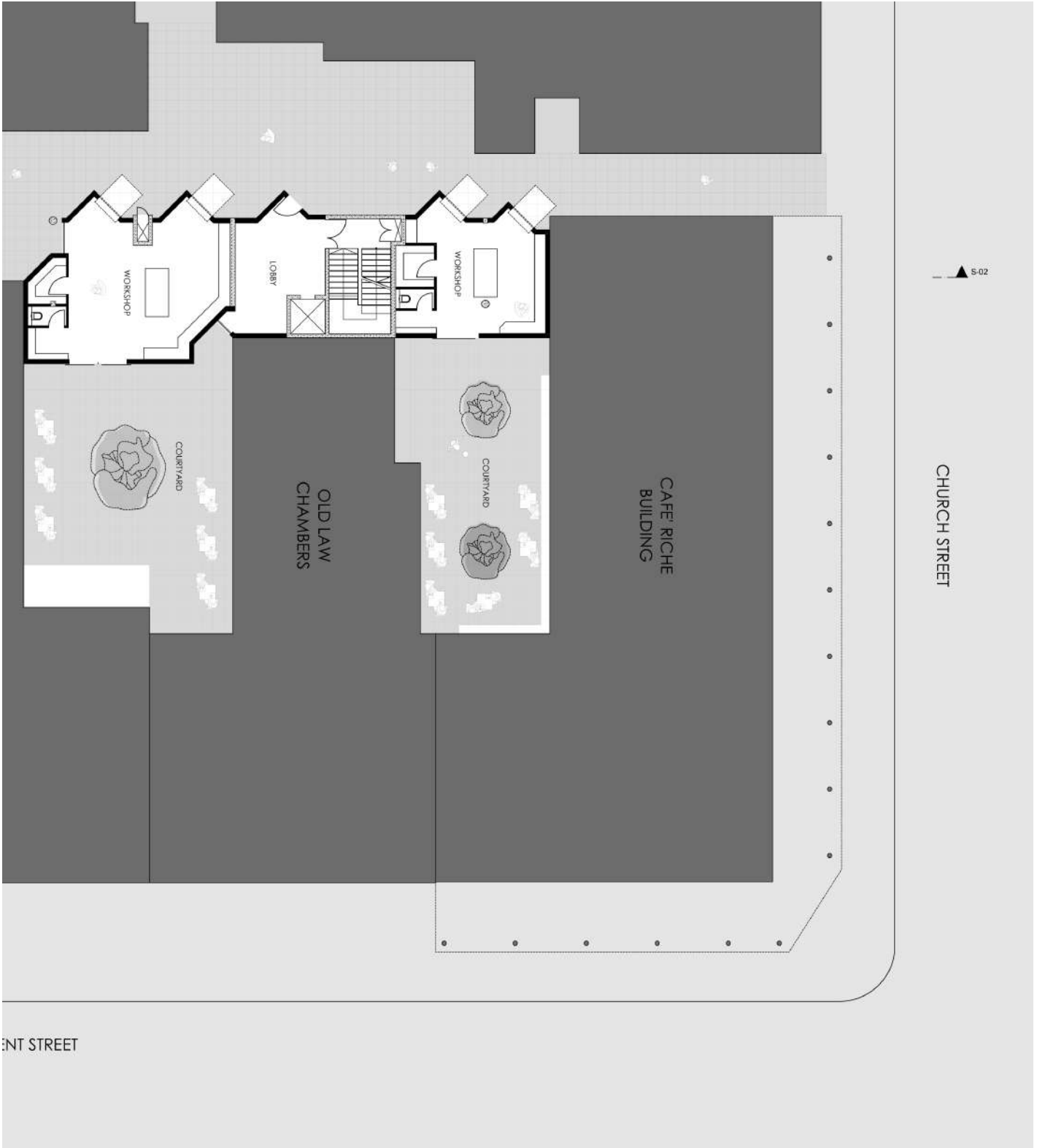


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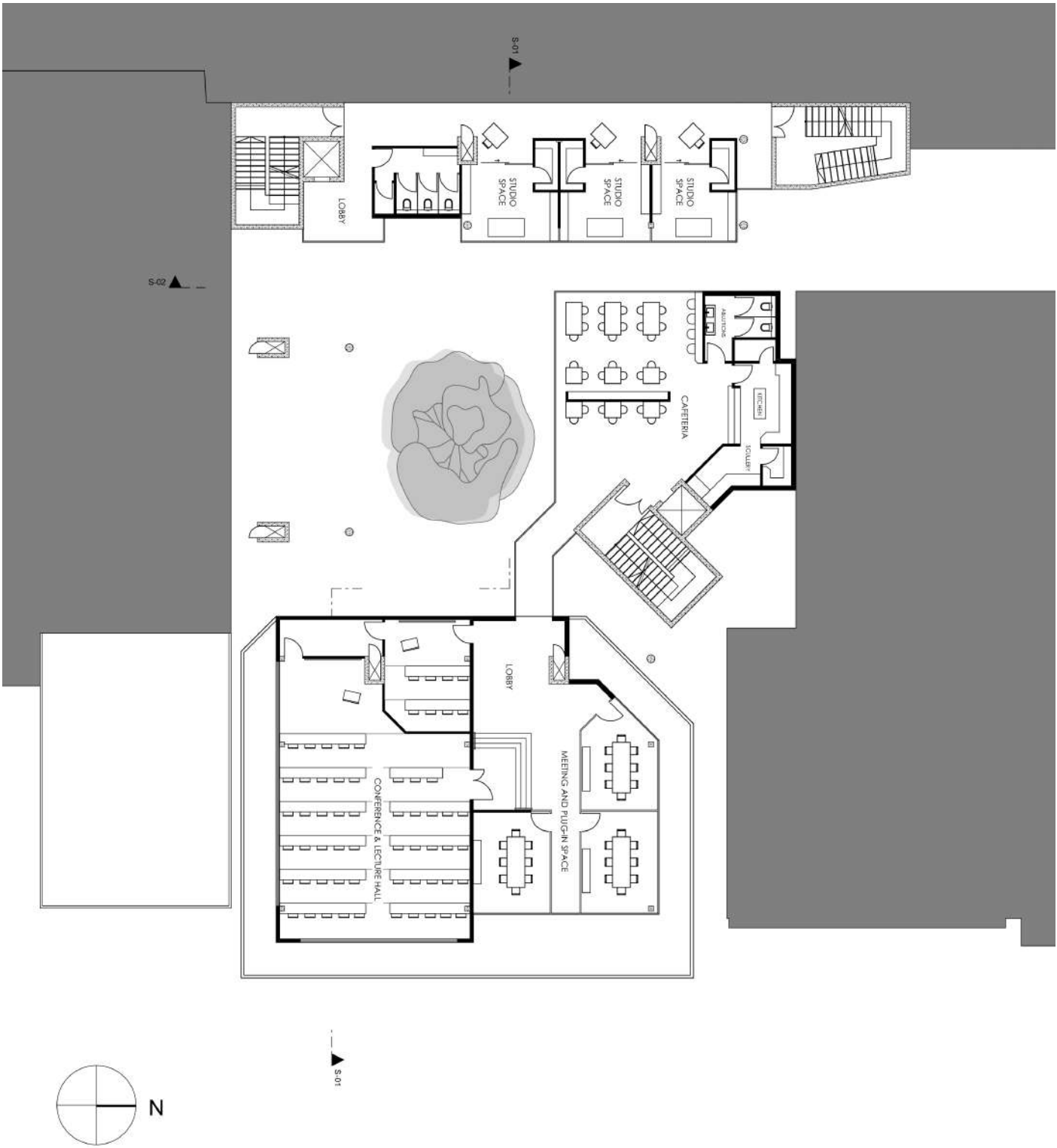
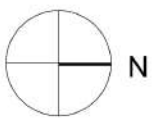




Figure 9.6 First Floor Plan (Author 2020)



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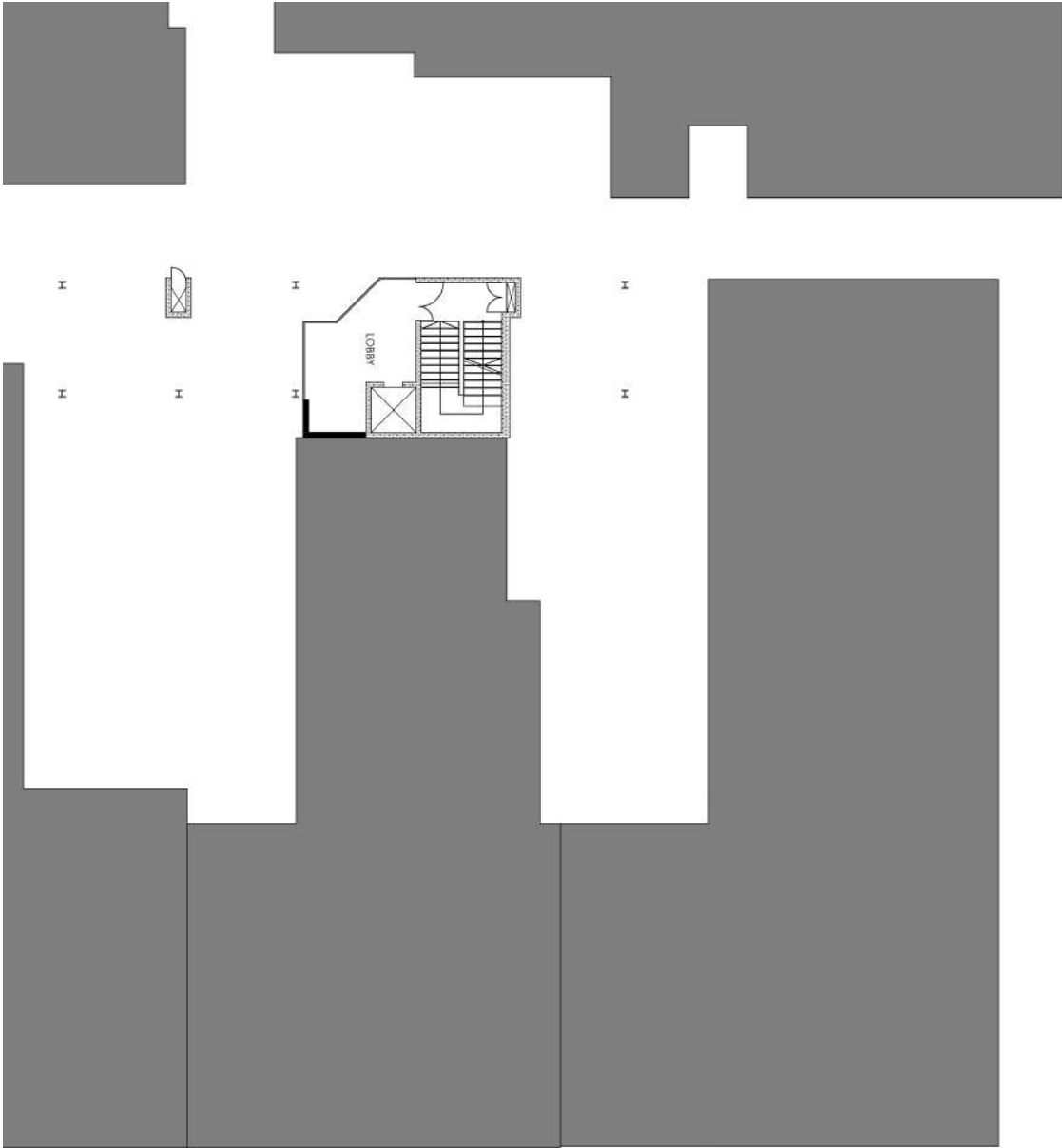
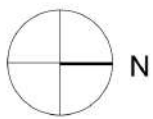
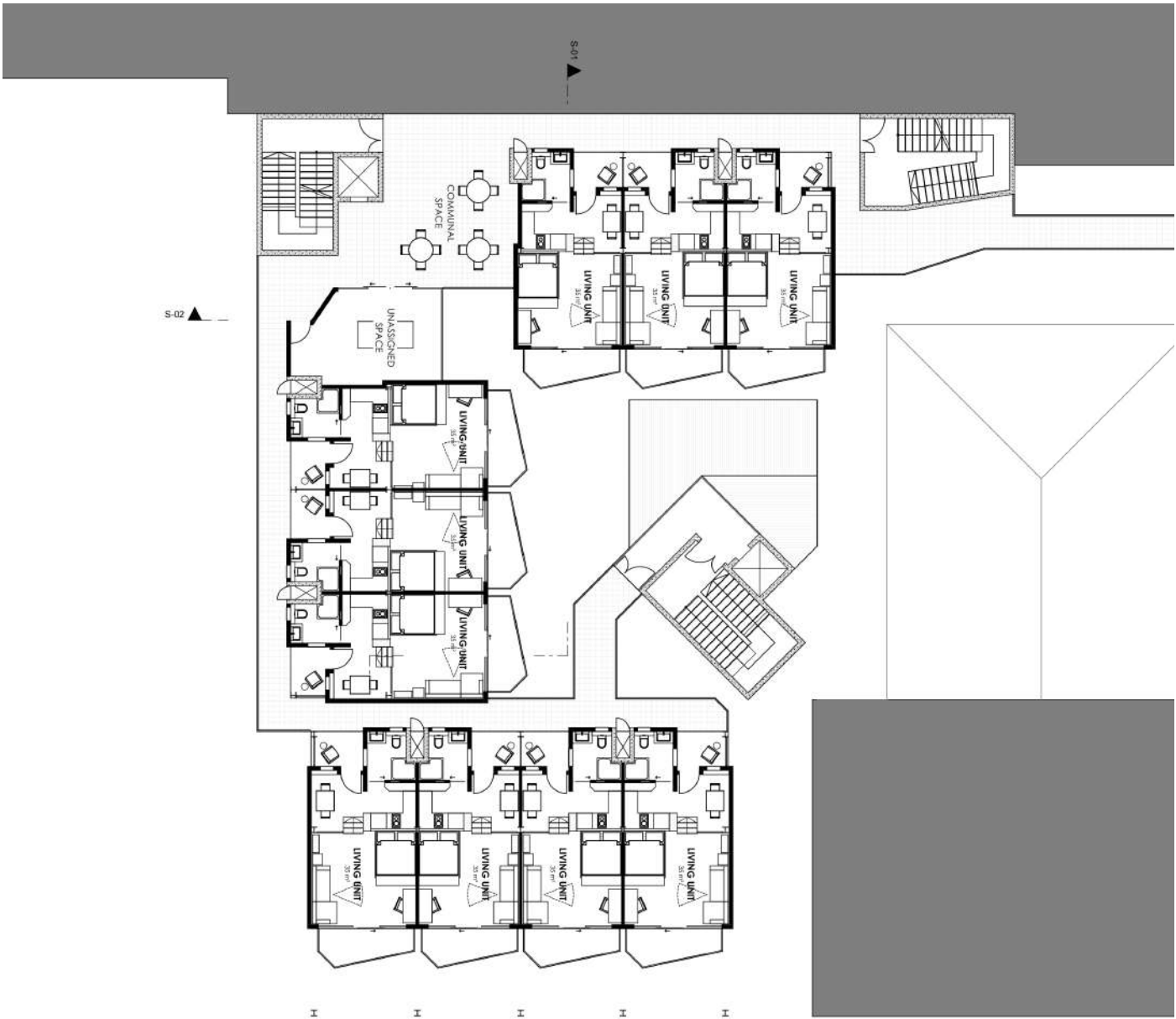
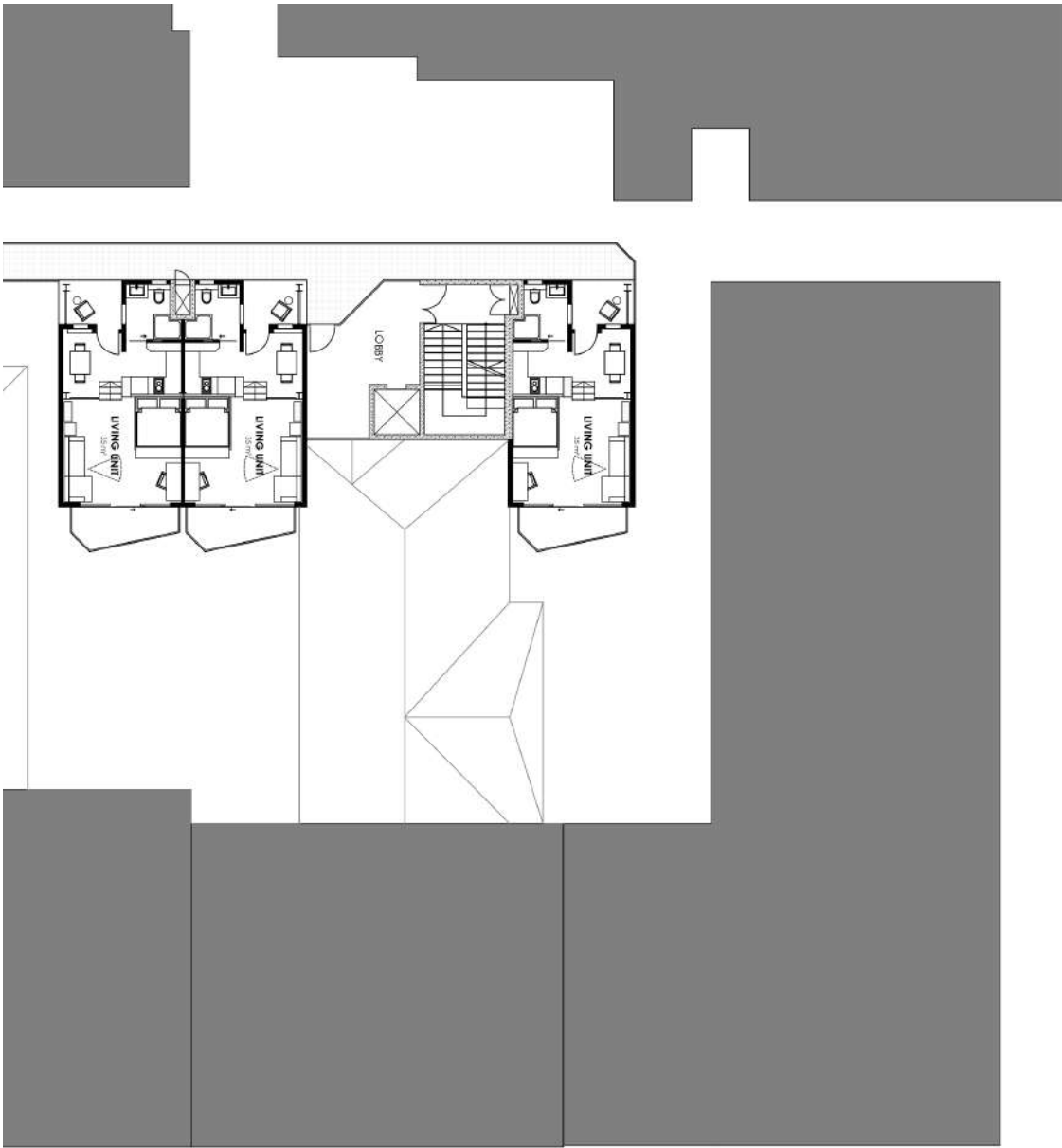


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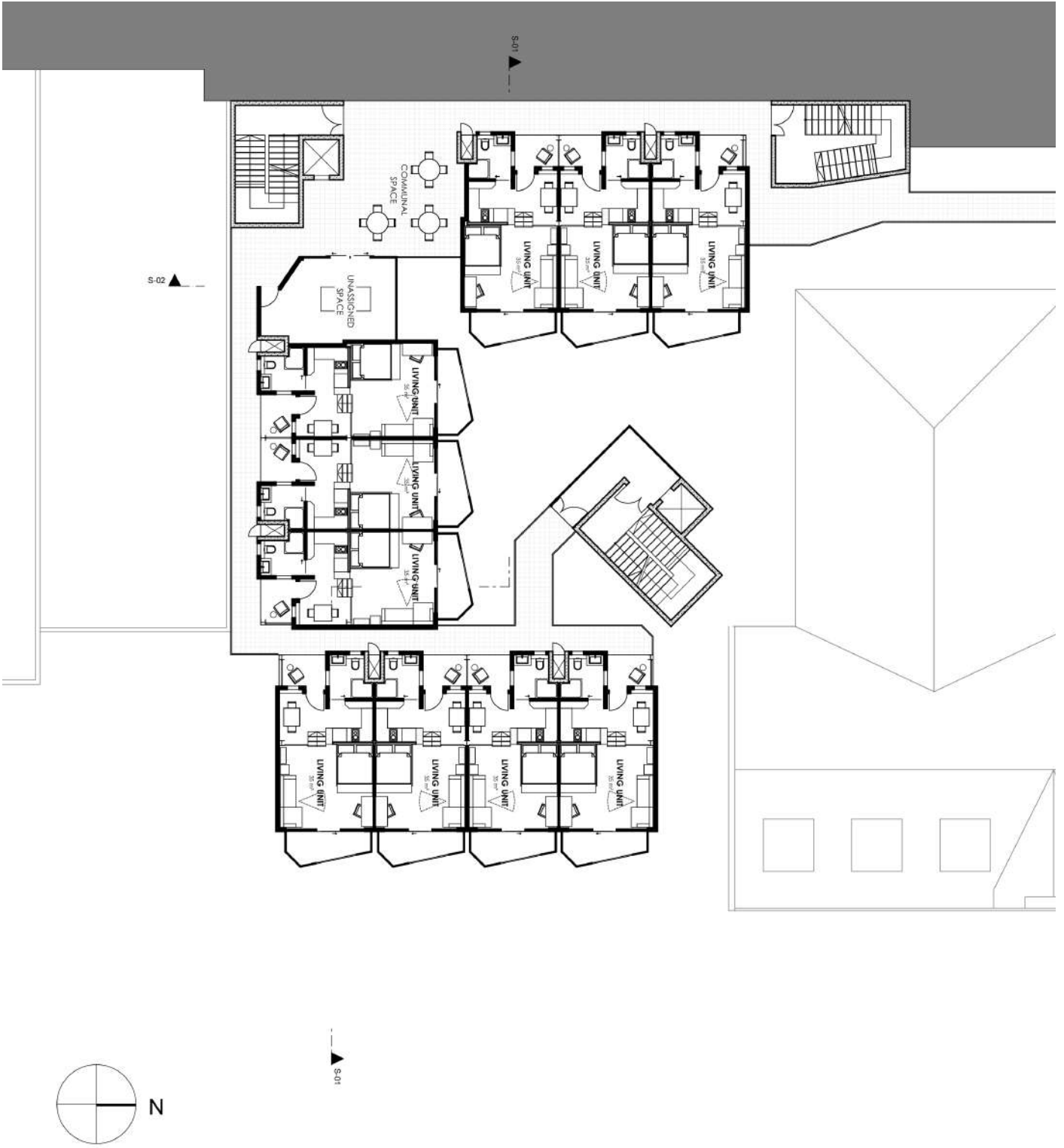


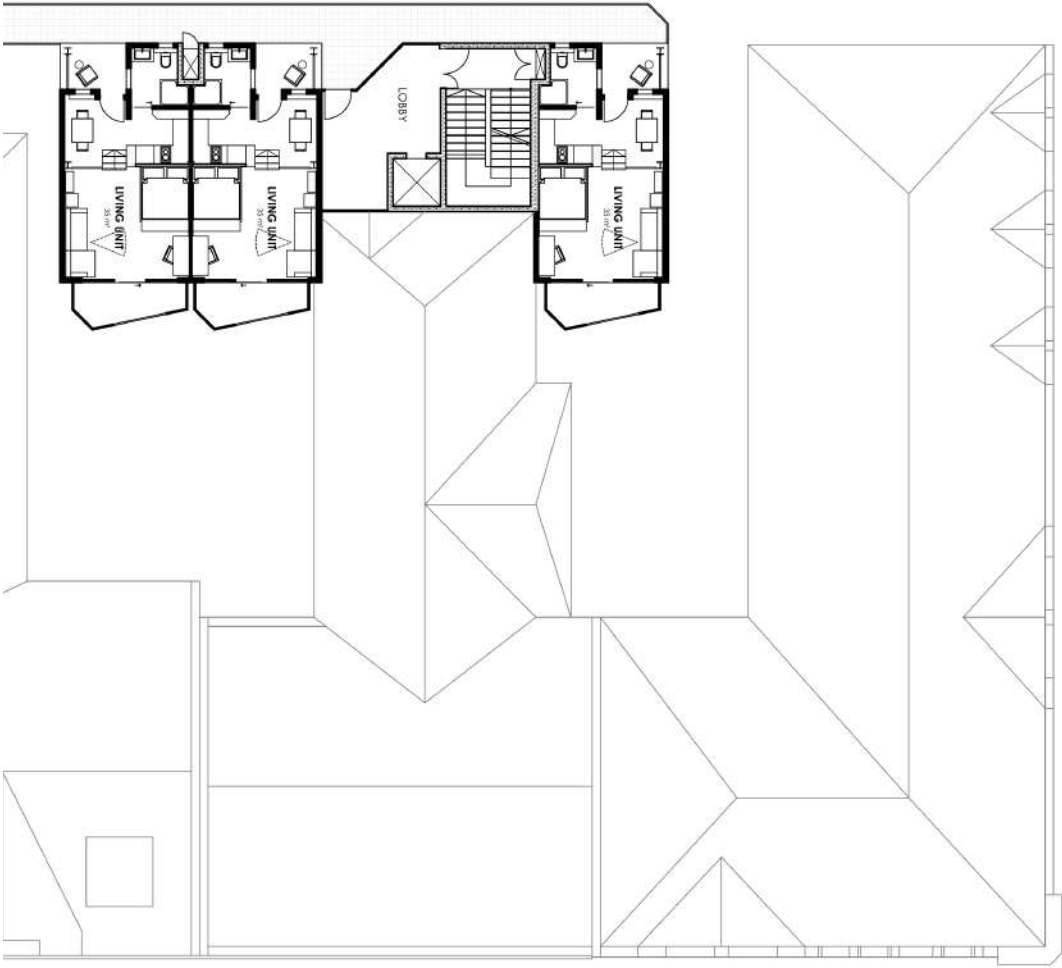
S-01



▲ S-02

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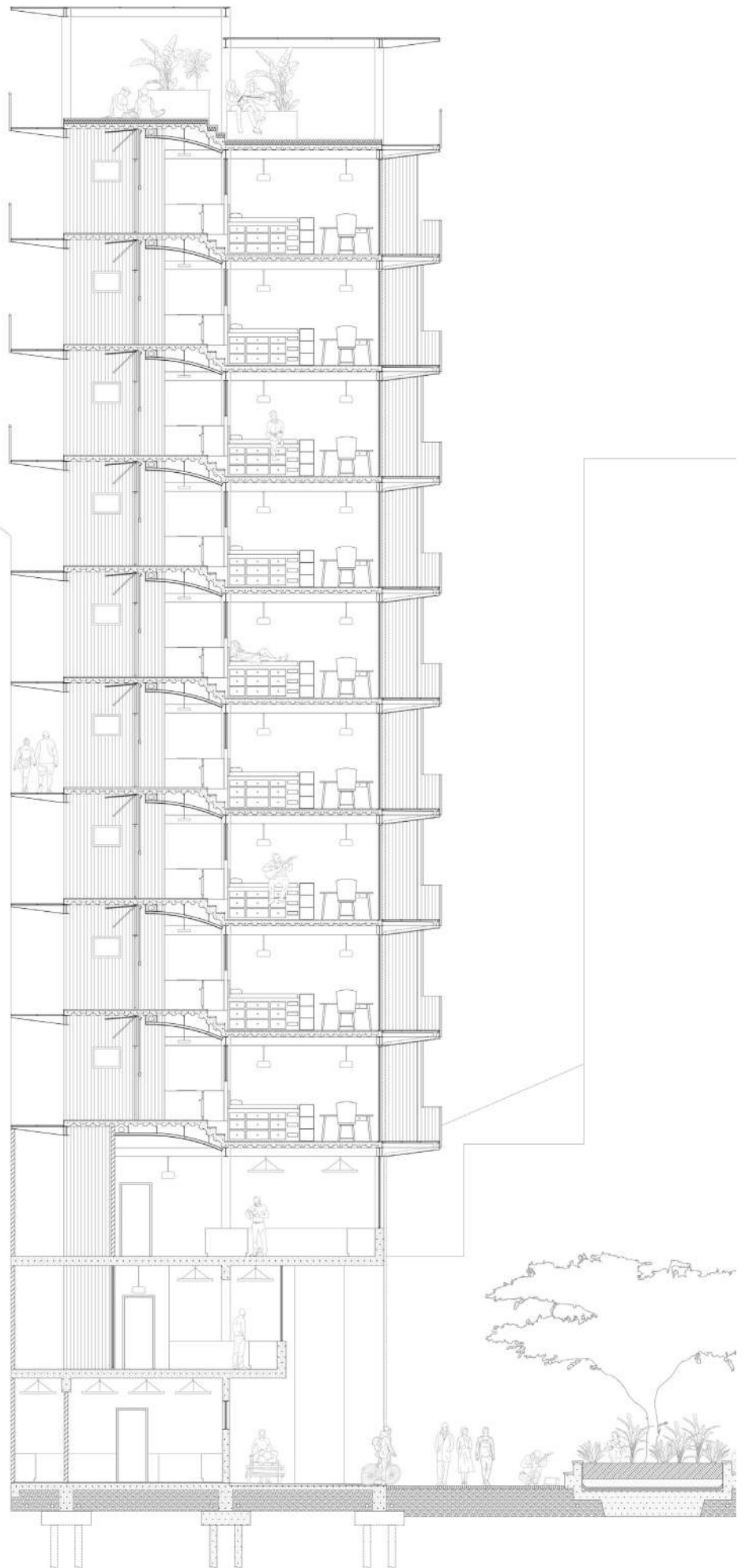




▲ S-02

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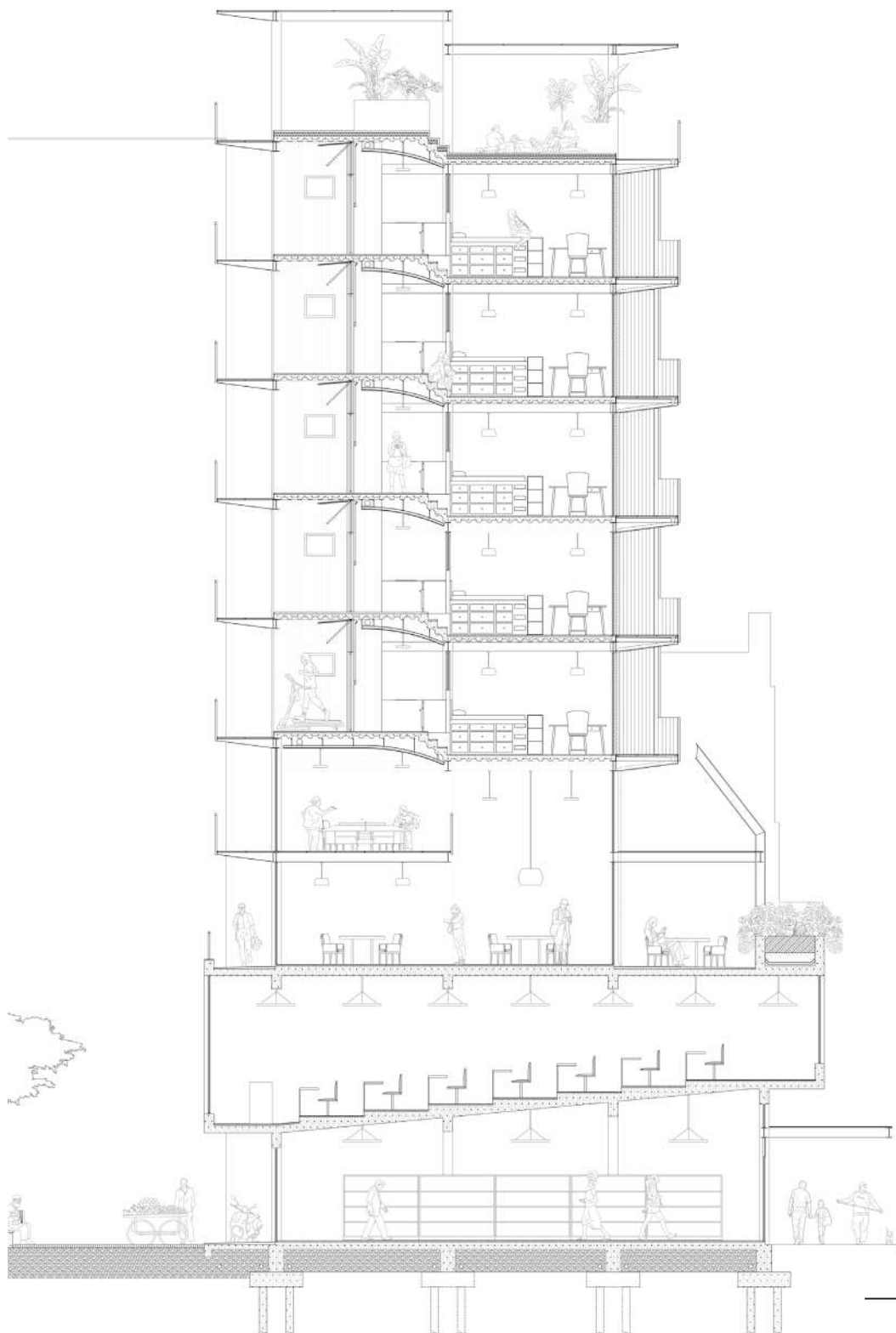
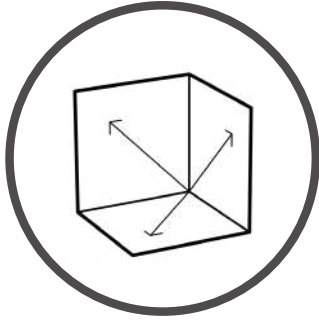


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9.4 Three design responses:



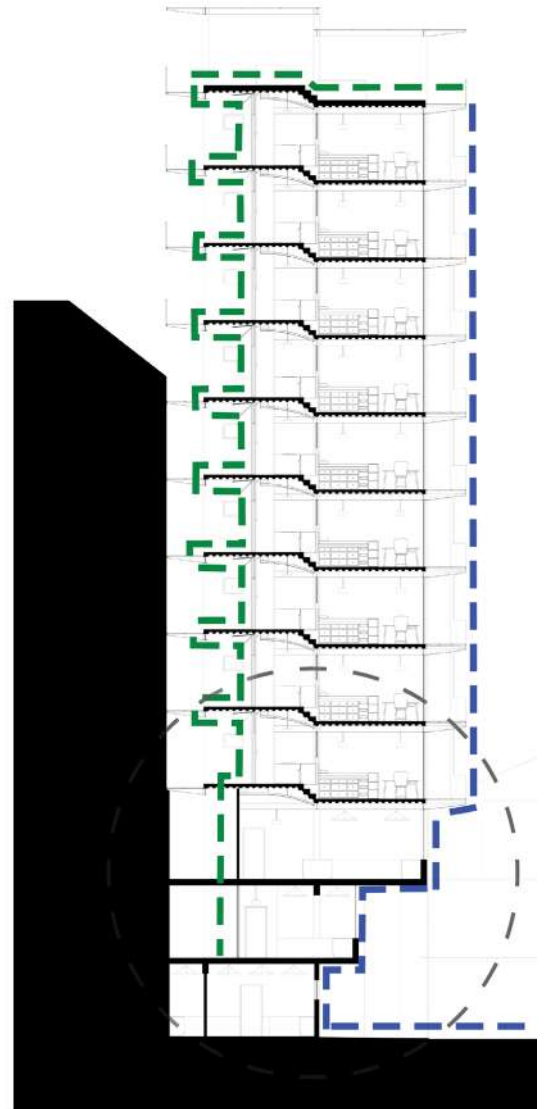
THE SPATIAL



THE ECONOMICAL



THE ENVIRONMENTAL



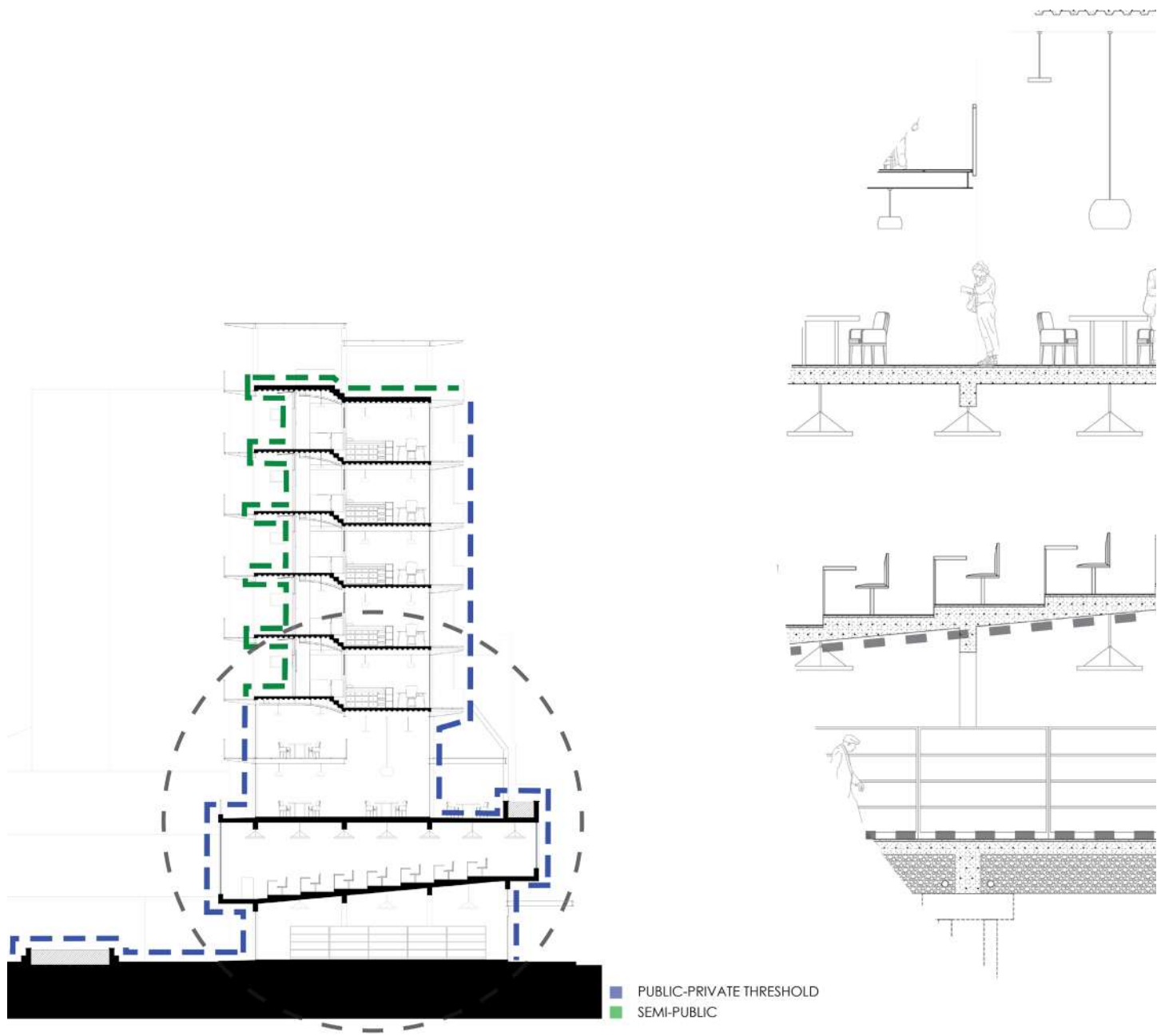
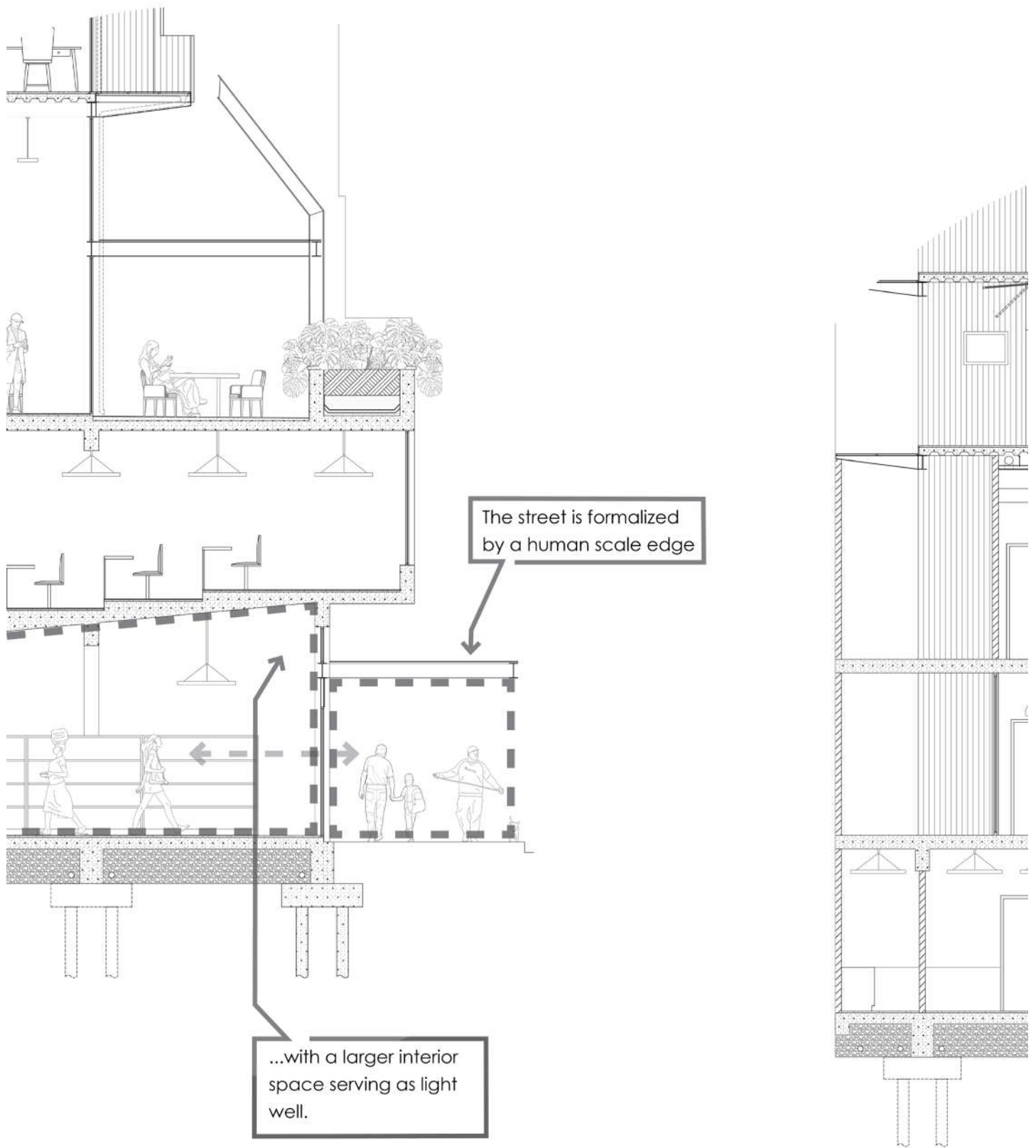


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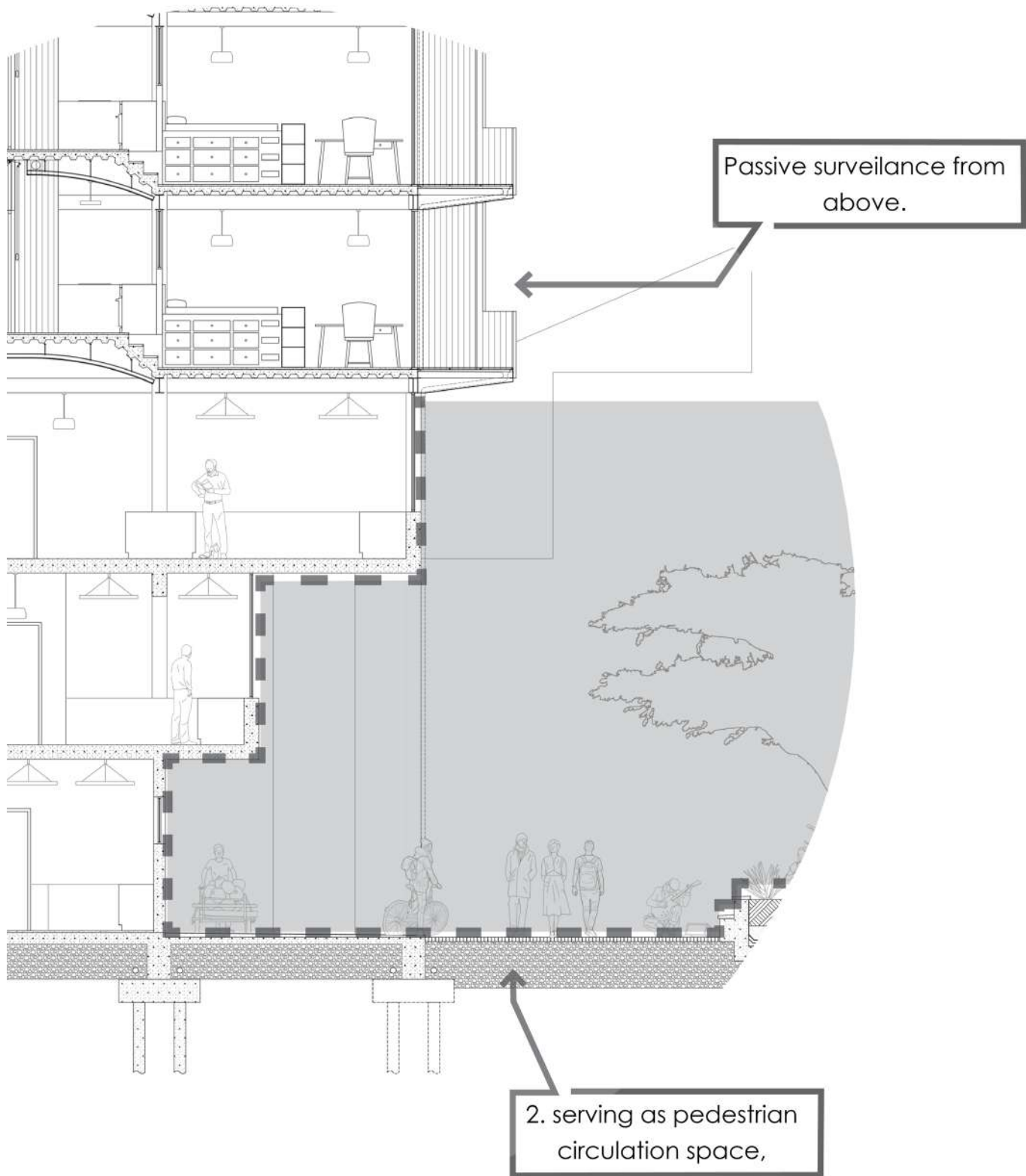
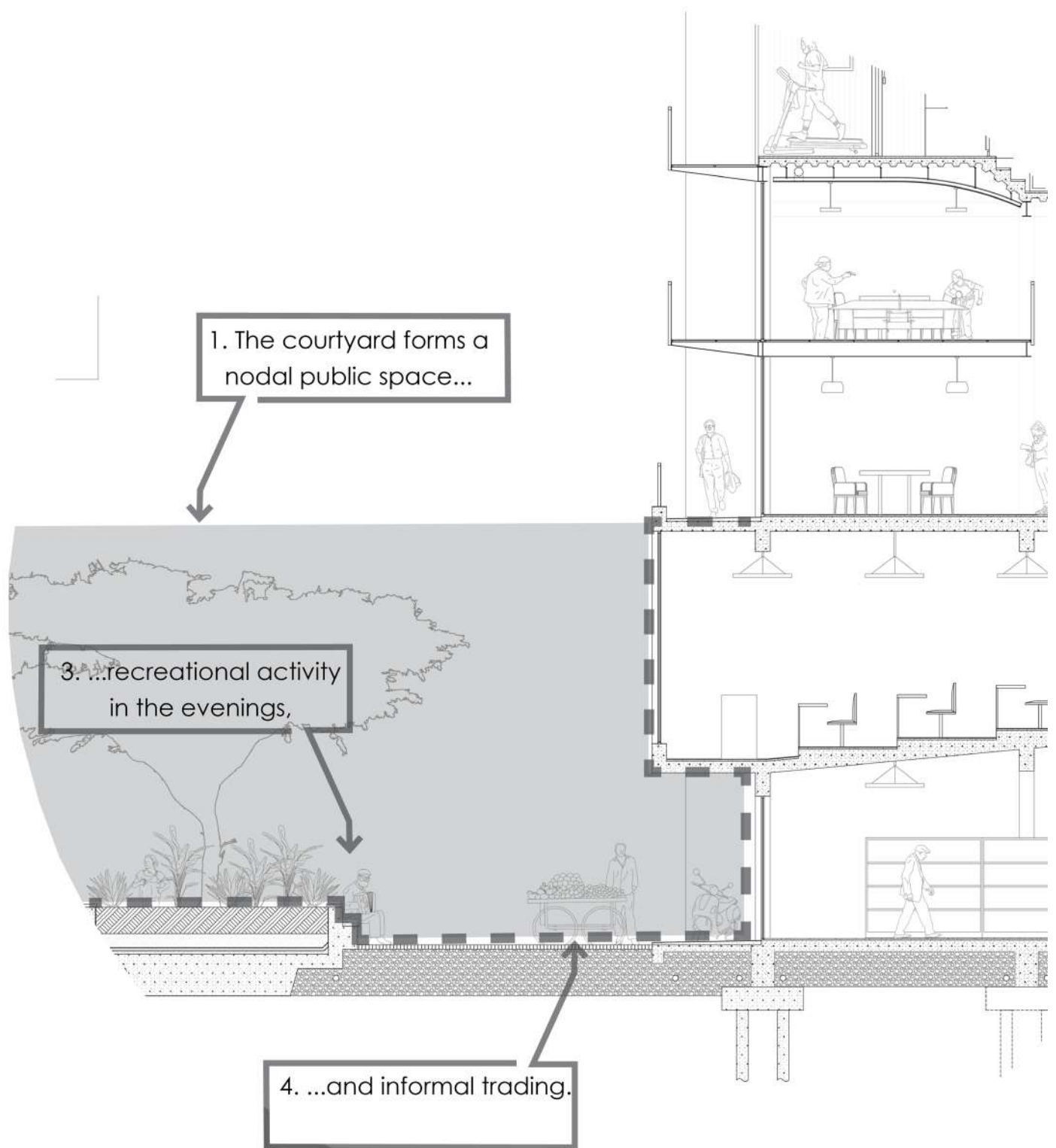


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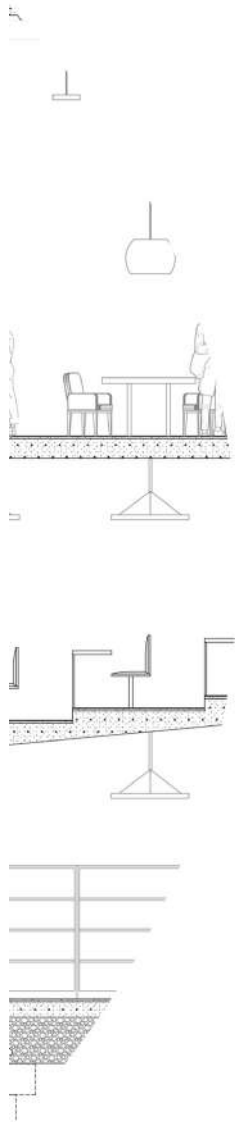
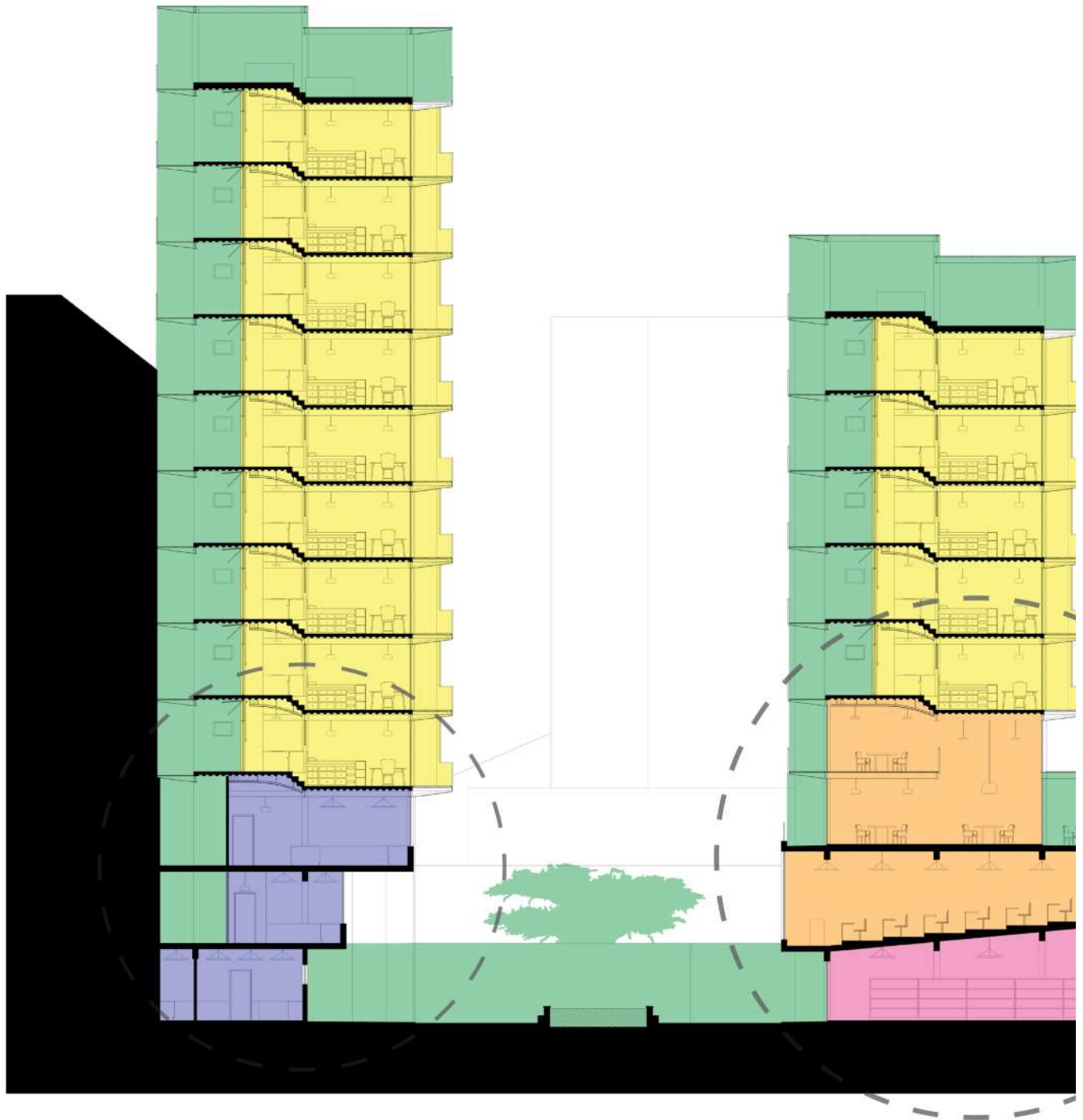


Figure 9.13 The Spatial (Author 2020)



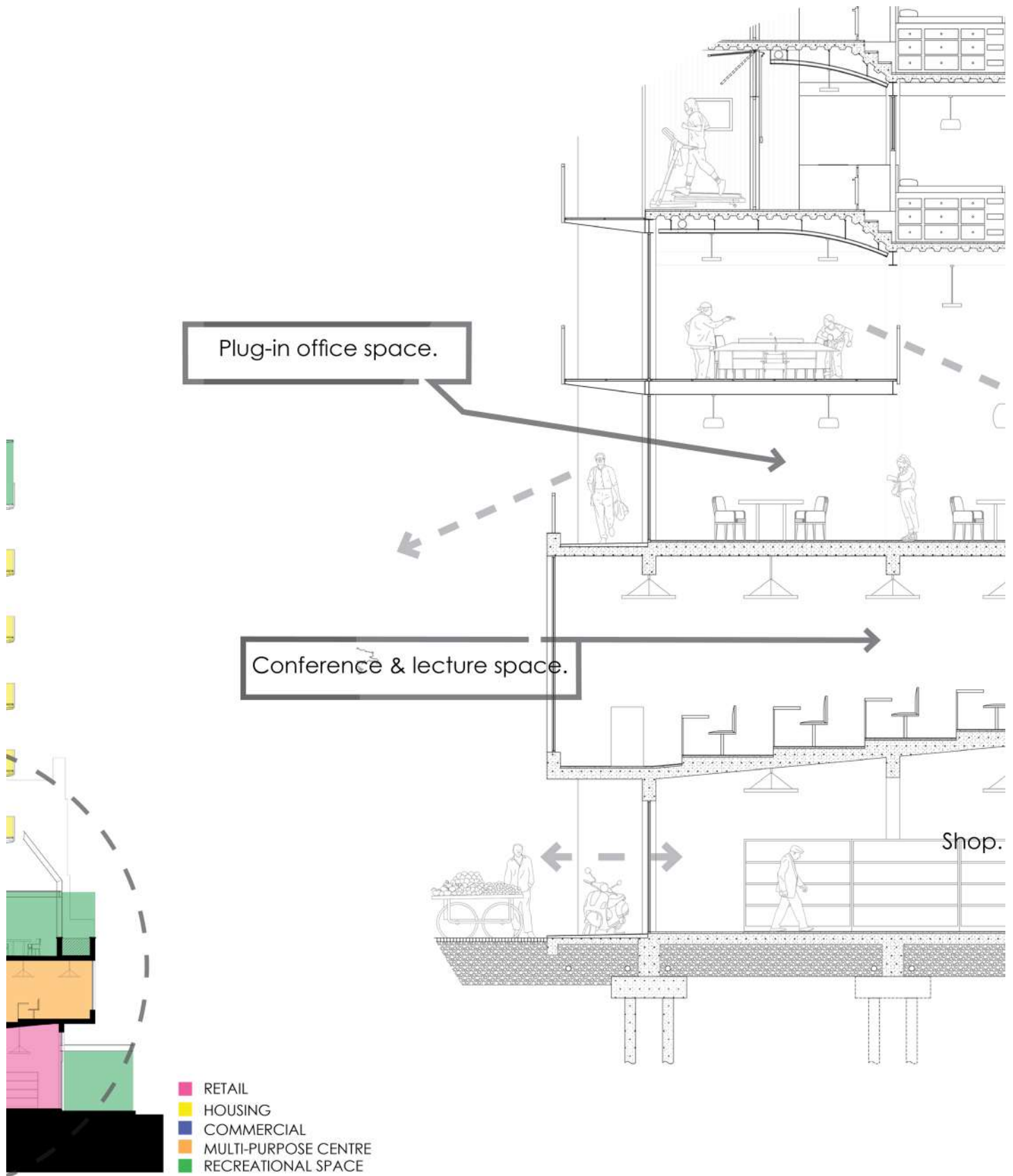
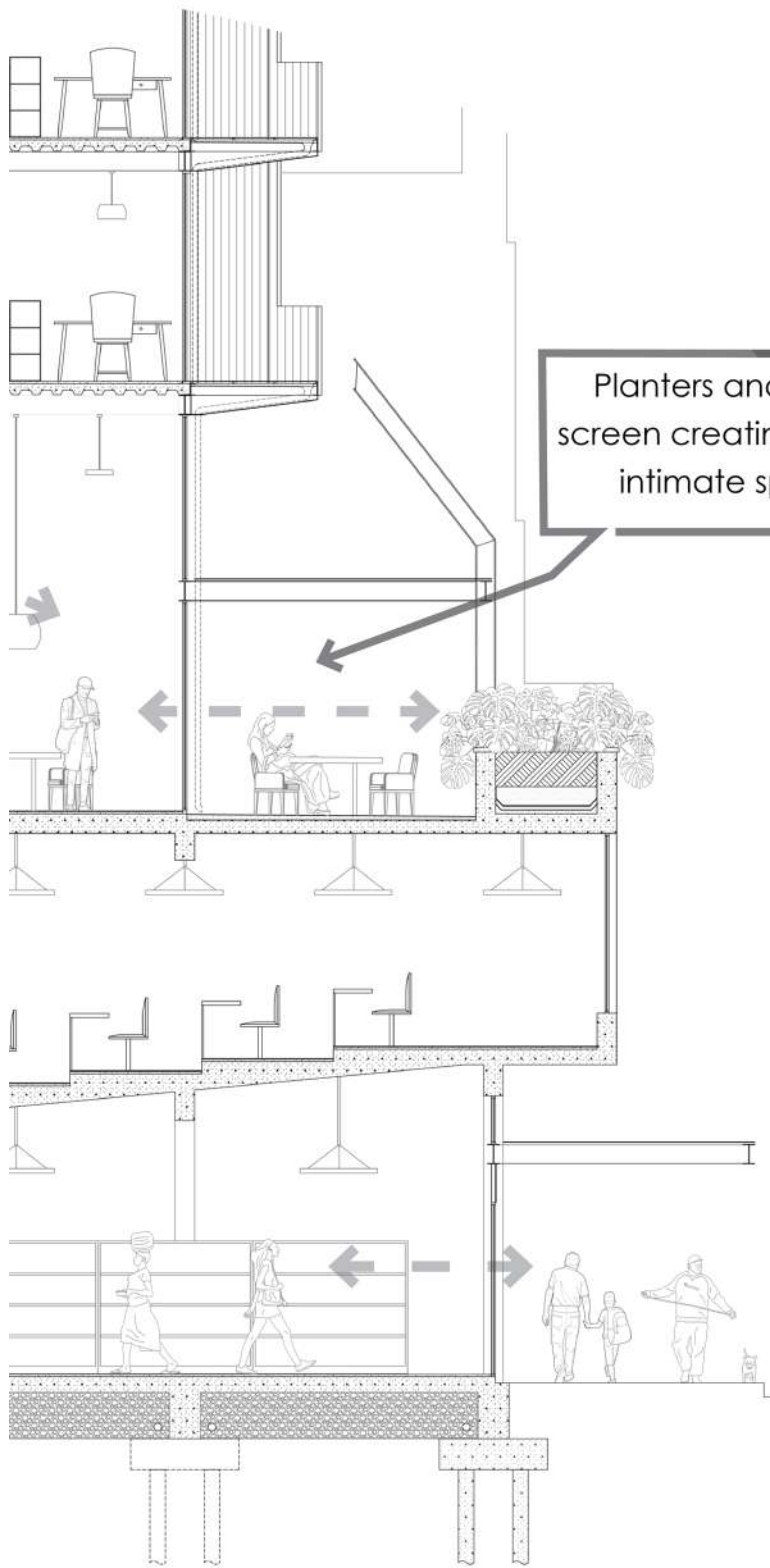
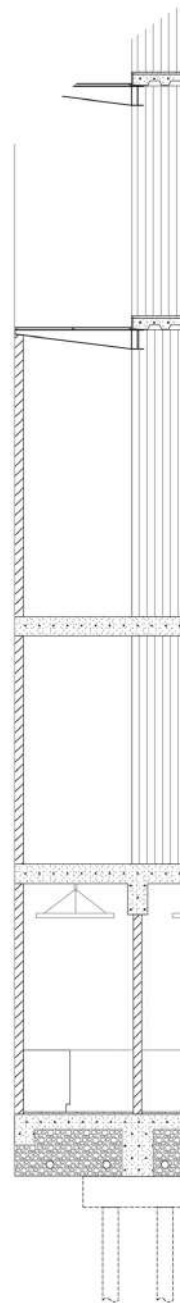


Figure 9.14 The Economic (Author 2020)



Planters and green screen creating a more intimate space.



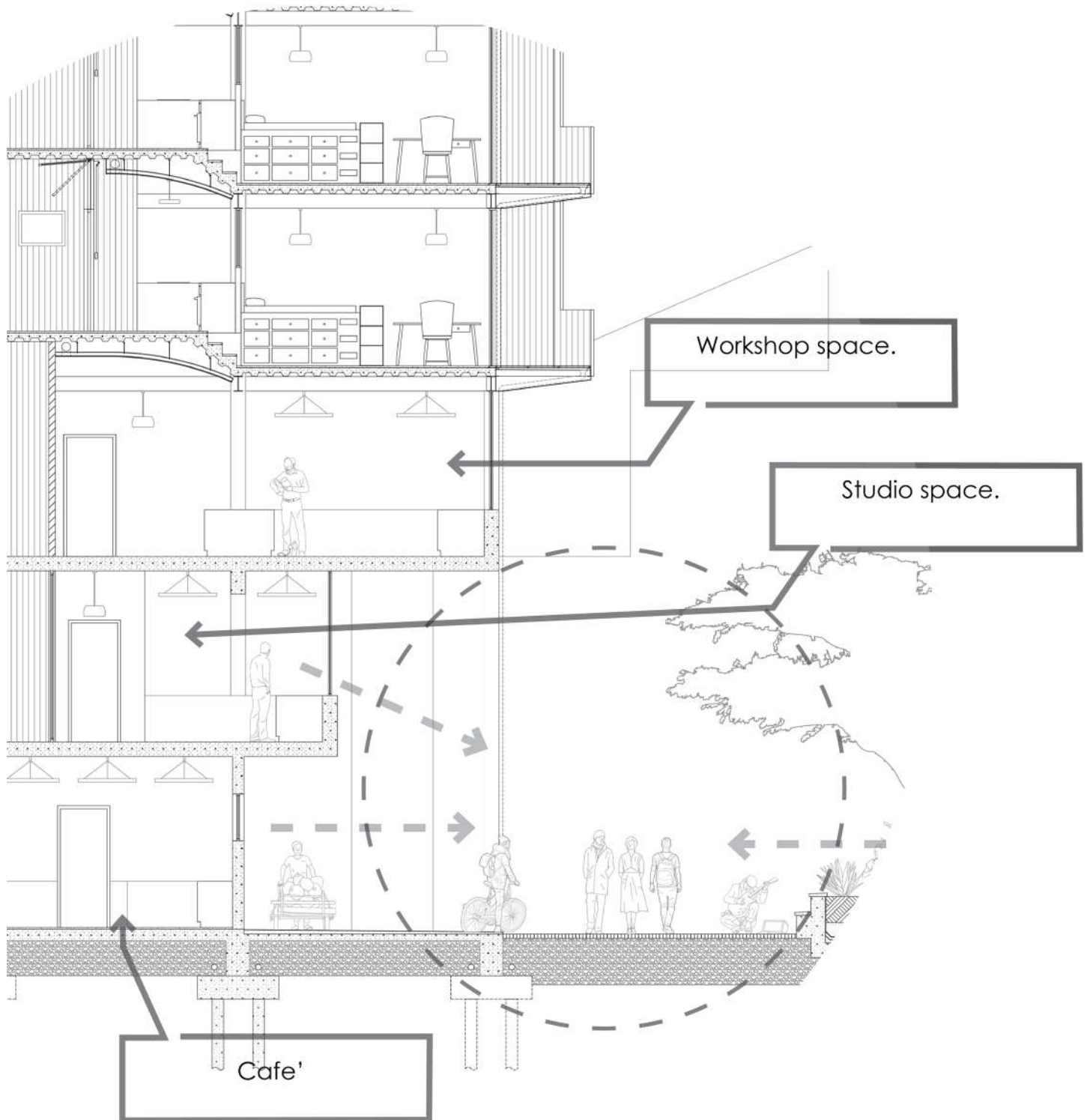
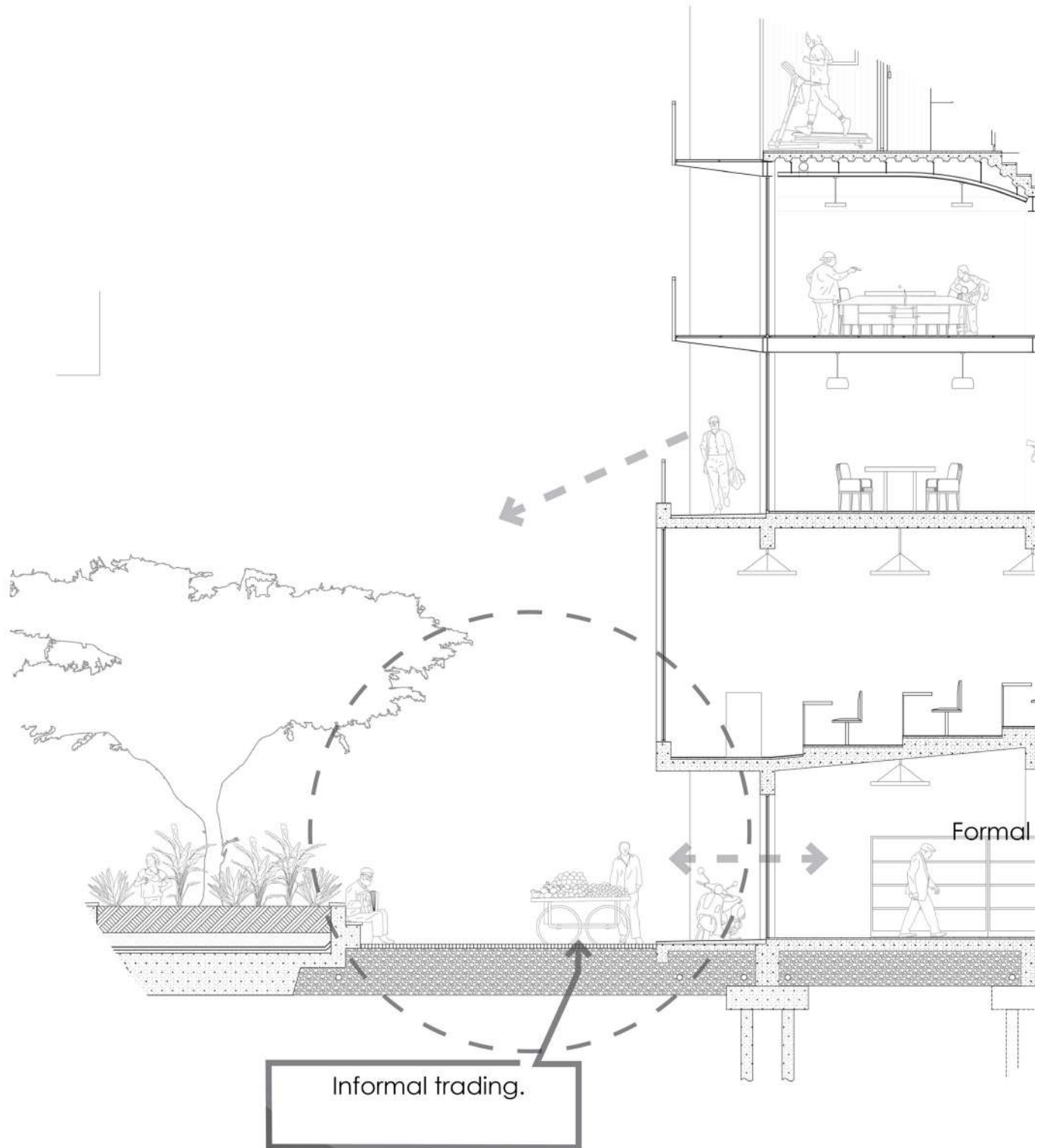


Figure 9.15 The Economic (Author 2020)



Informal trading.



Figure 9.16 The Economic (Author 2020)

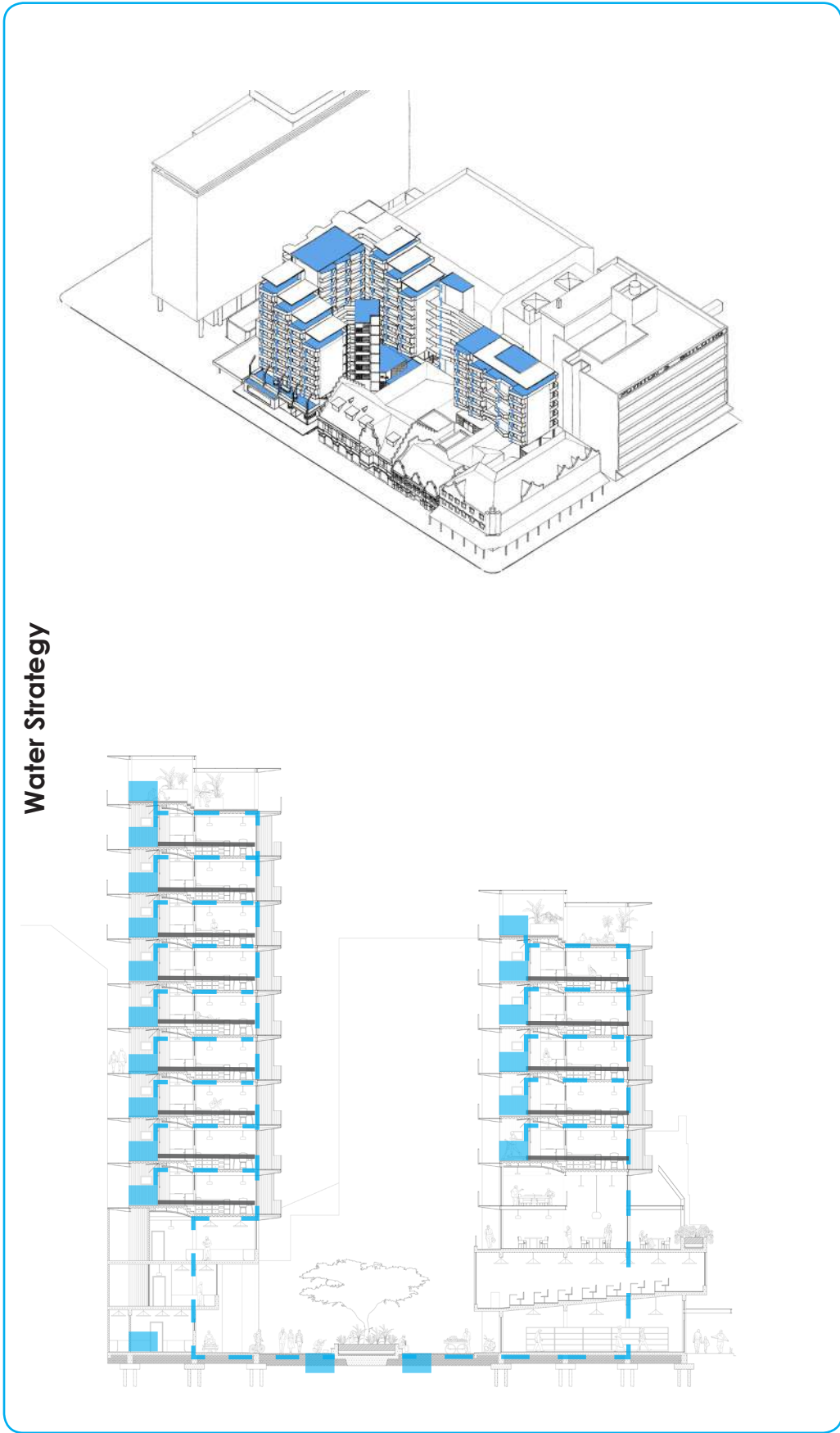
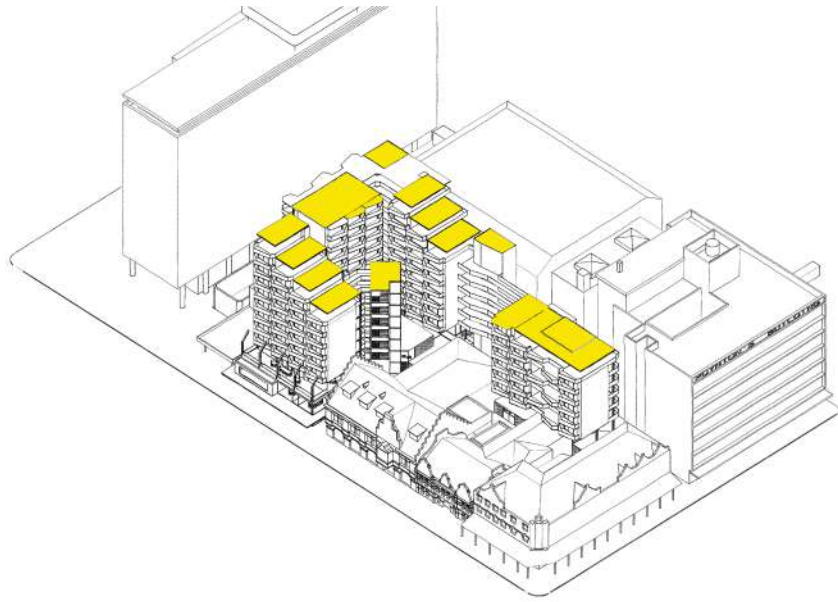
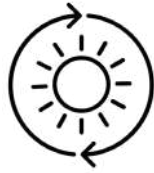


Figure 9.17 Water Strategy Diagram (Author 2020)



Solar Energy

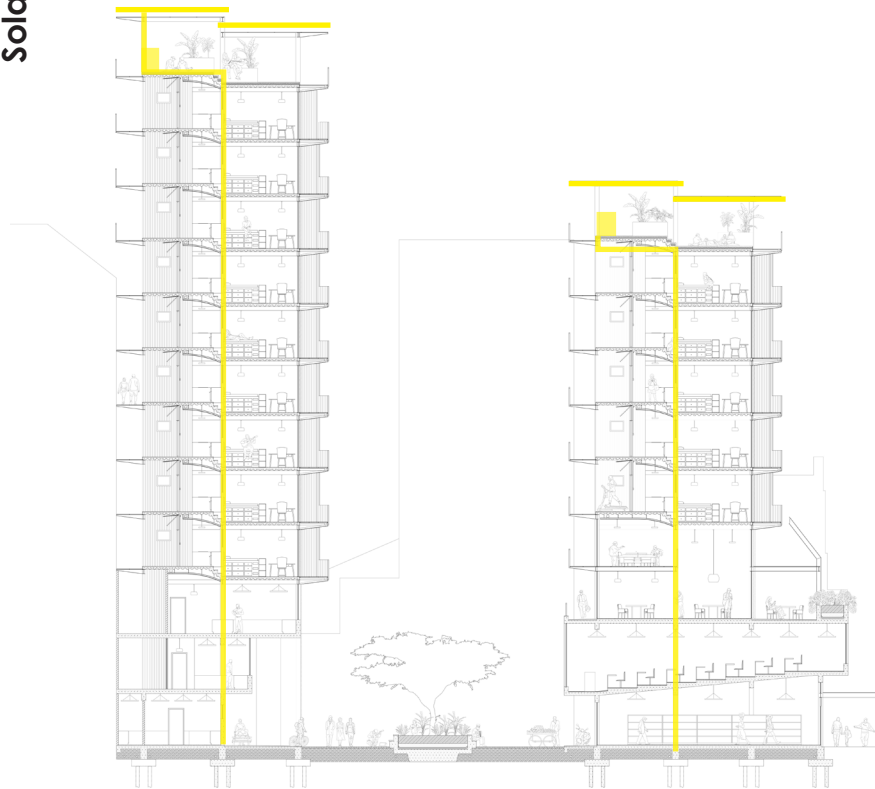


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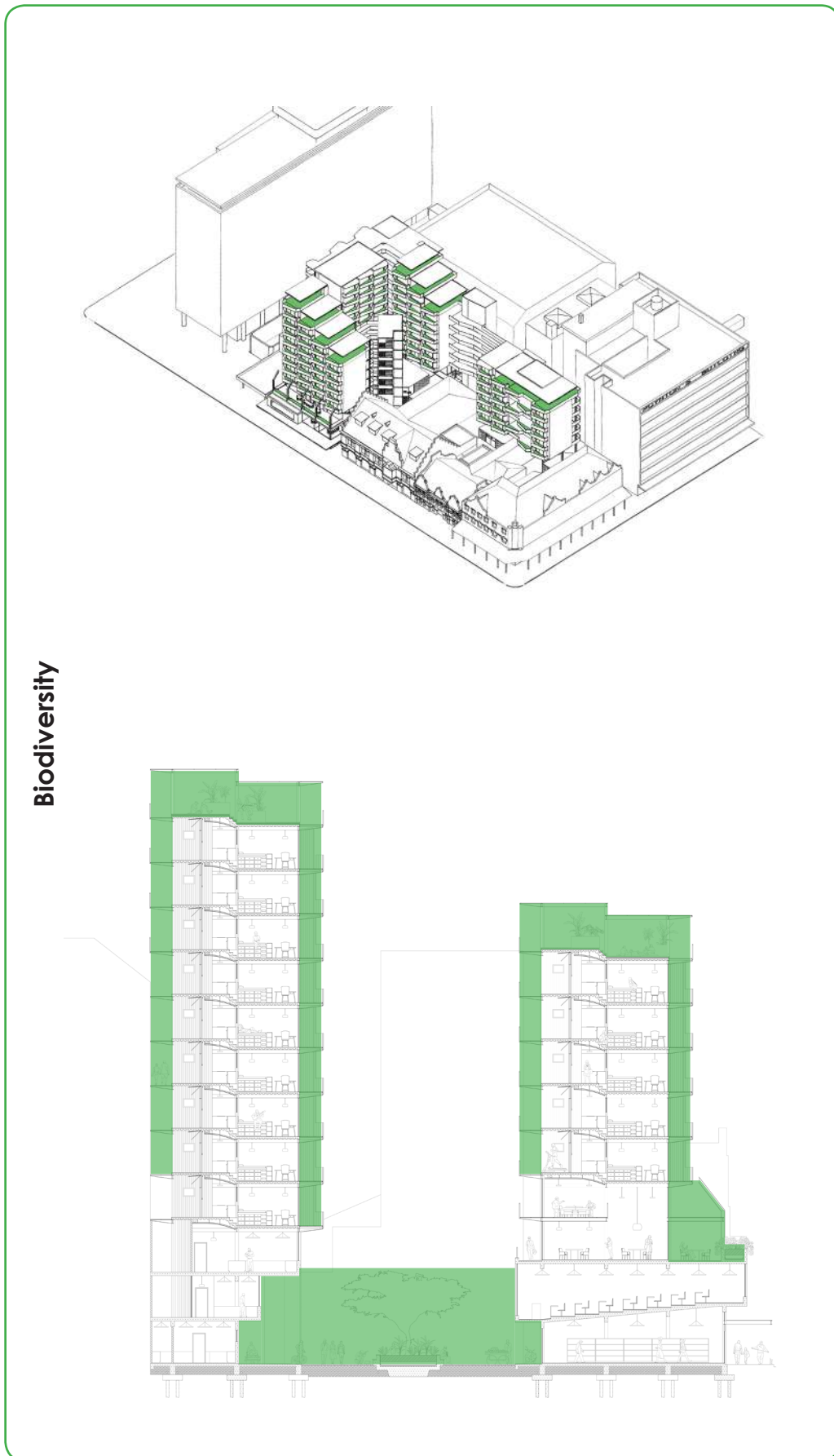
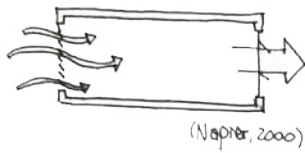


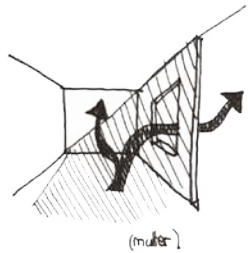
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Natural Ventilation



(Napper, 2000)

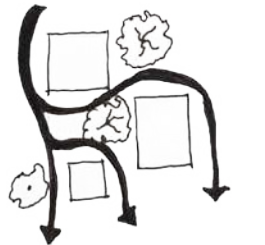


(Muller)

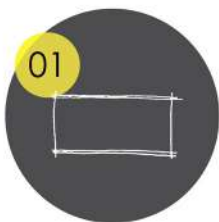
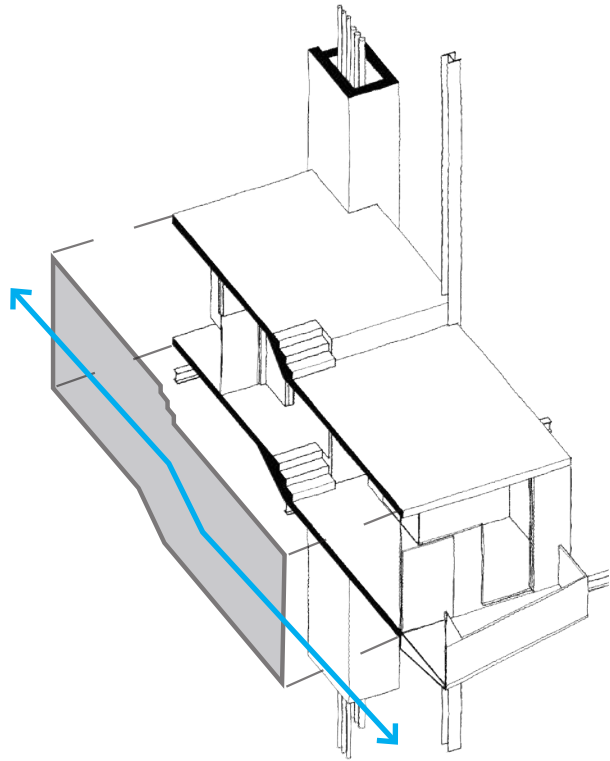


deflecting breeze flows past building

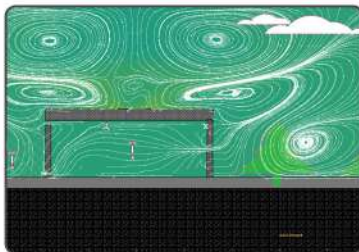
(Muller)



Breaking up the structure allows breeze to be forced through.



TEST 01



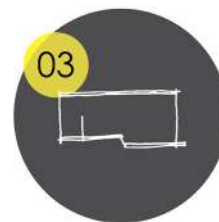
-Cross ventilation
-No temperature difference



TEST 02



-cross ventilation
-elevated floor level
-indoor/outdoor temperature difference



TEST 03



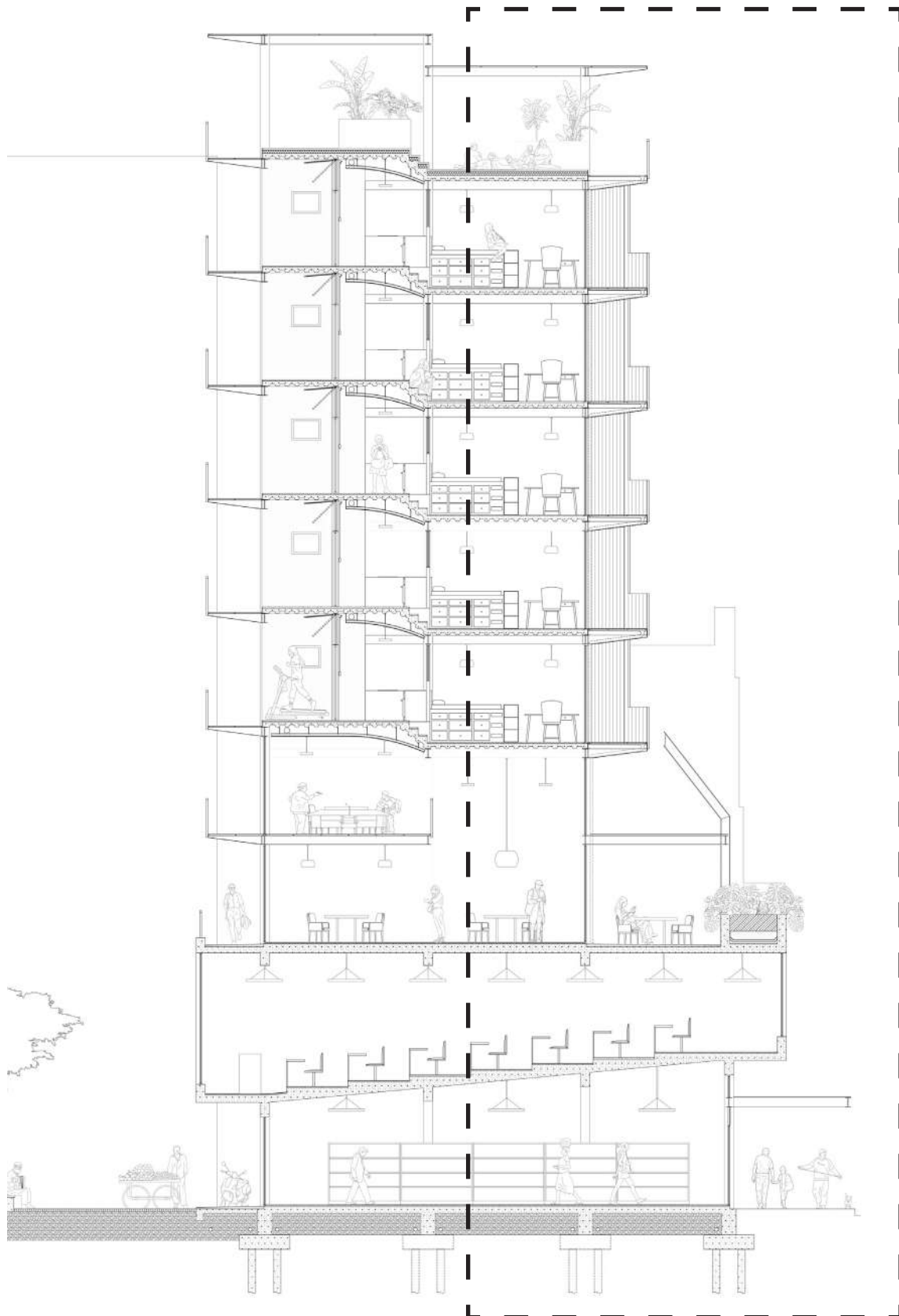
-cross ventilation
-elevated floor level
-indoor/outdoor temperature difference
-duct

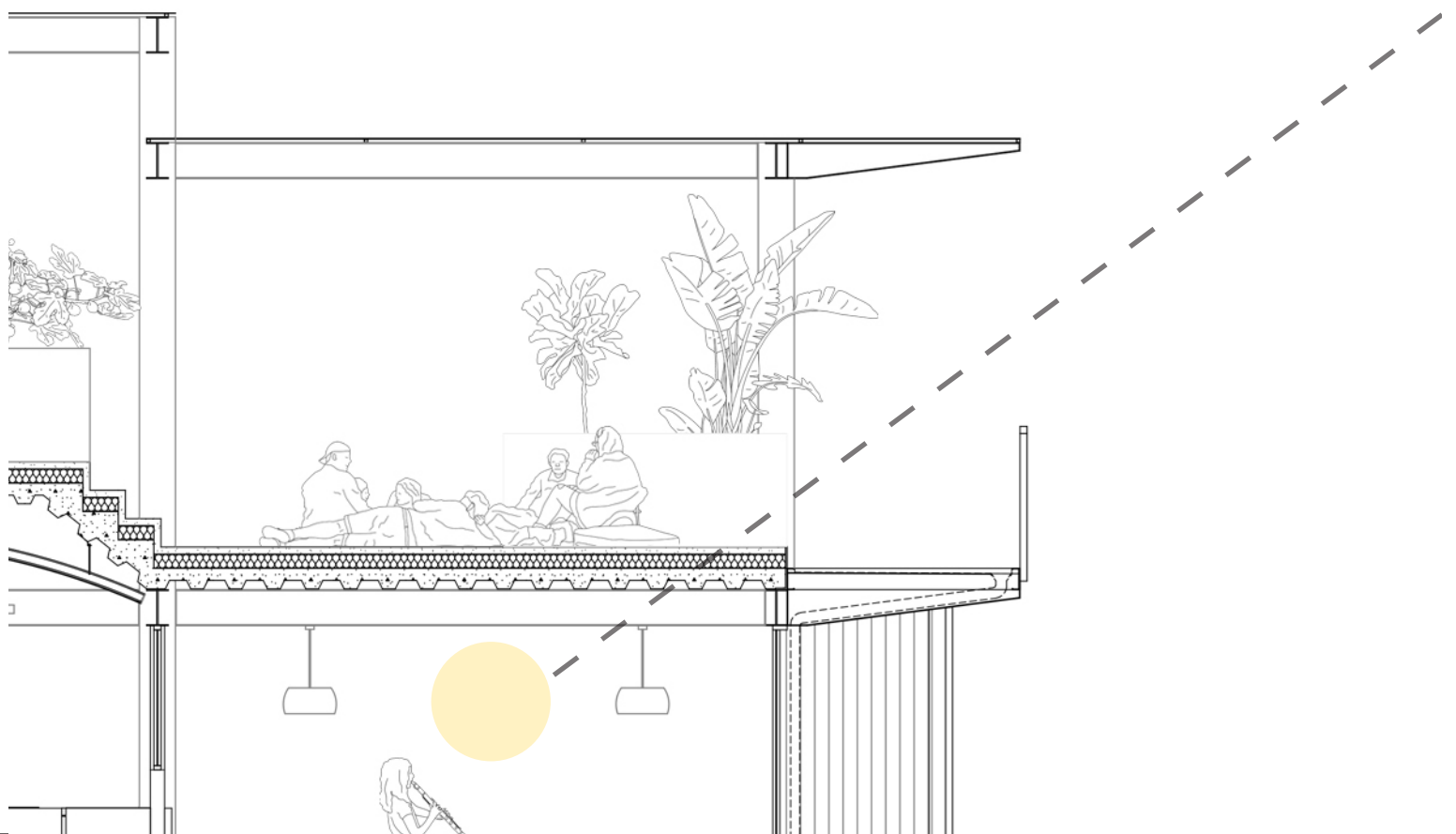
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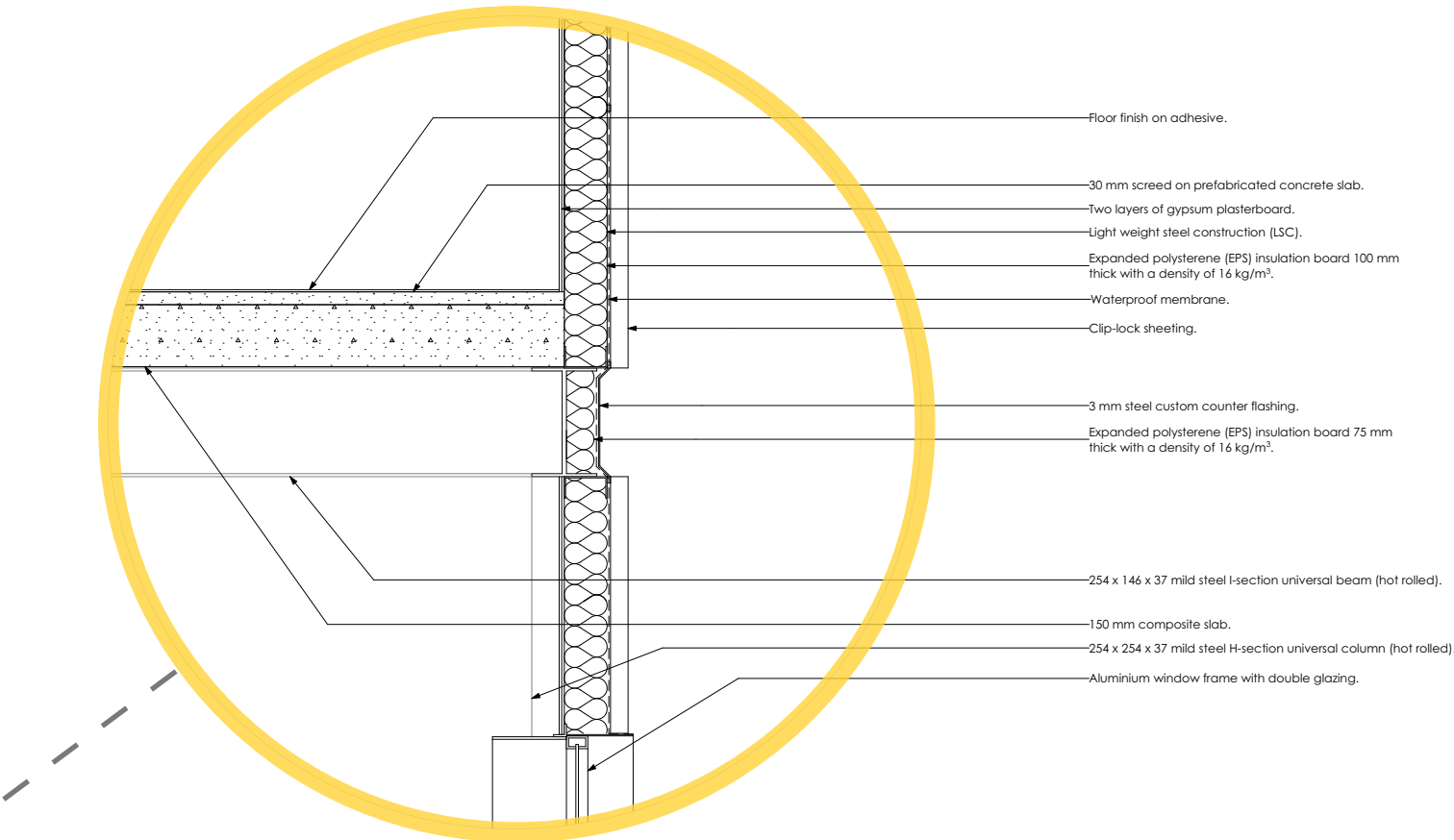


Figure 9.21 Detail Allocation (Author 2020)



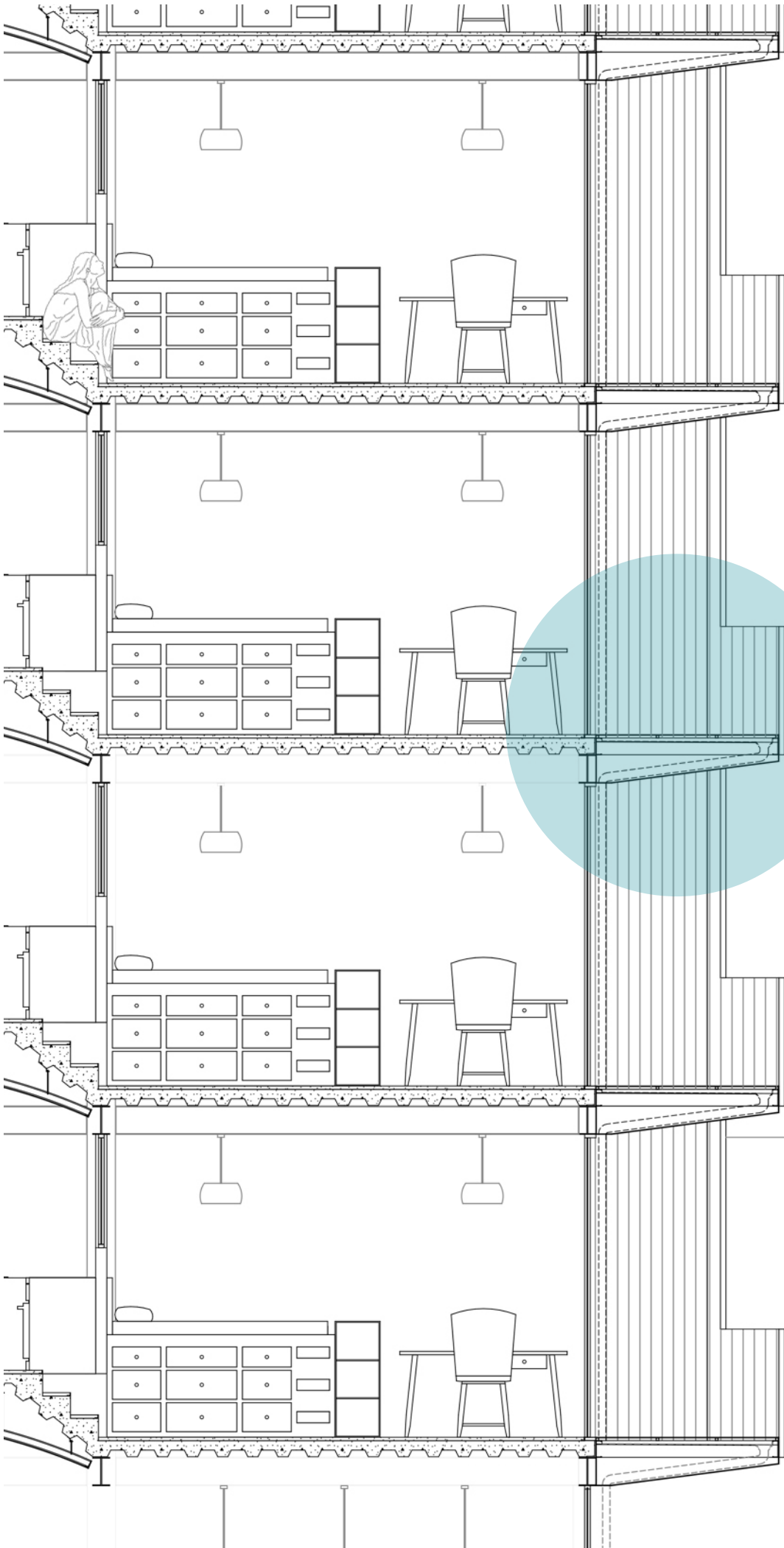


Detail-01



- Floor finish on adhesive.
- 30 mm screed on prefabricated concrete slab.
- Two layers of gypsum plasterboard.
- Light weight steel construction (LSC).
- Expanded polysterene (EPS) insulation board 100 mm thick with a density of 16 kg/m³.
- Waterproof membrane.
- Clip-lock sheeting.
- 3 mm steel custom counter flashing.
- Expanded polysterene (EPS) insulation board 75 mm thick with a density of 16 kg/m³.
- 254 x 146 x 37 mild steel I-section universal beam (hot rolled).
- 150 mm composite slab.
- 254 x 254 x 37 mild steel H-section universal column (hot rolled).
- Aluminium window frame with double glazing.

Figure 9.22 Detail 01 (Author 2020)



Detail-02

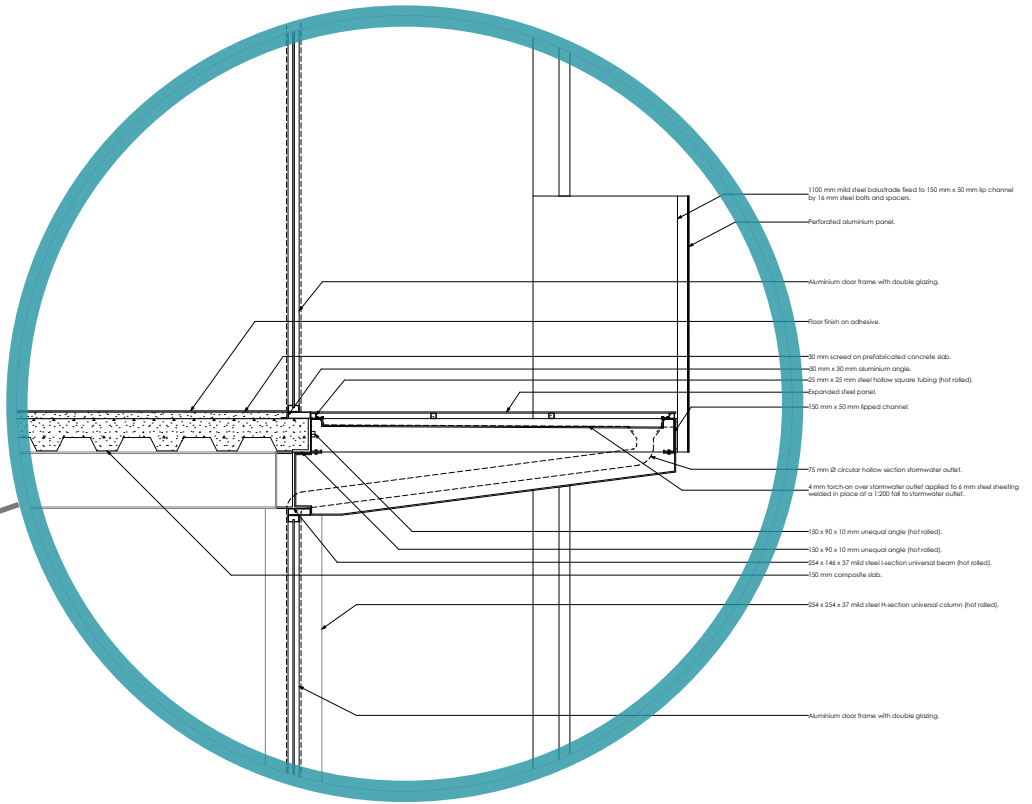
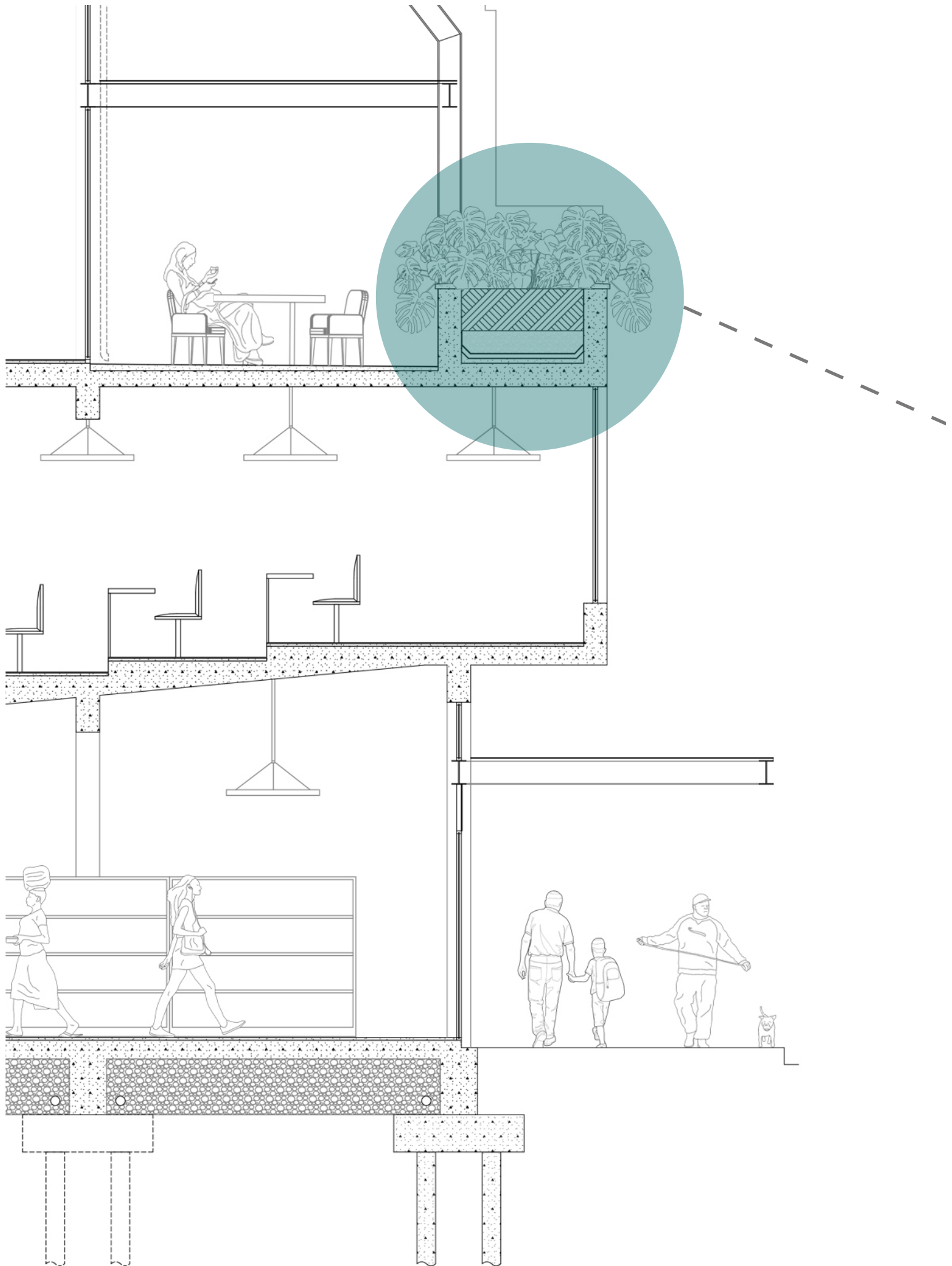


Figure 9.23 Detail 02 (Author 2020)



Detail-03

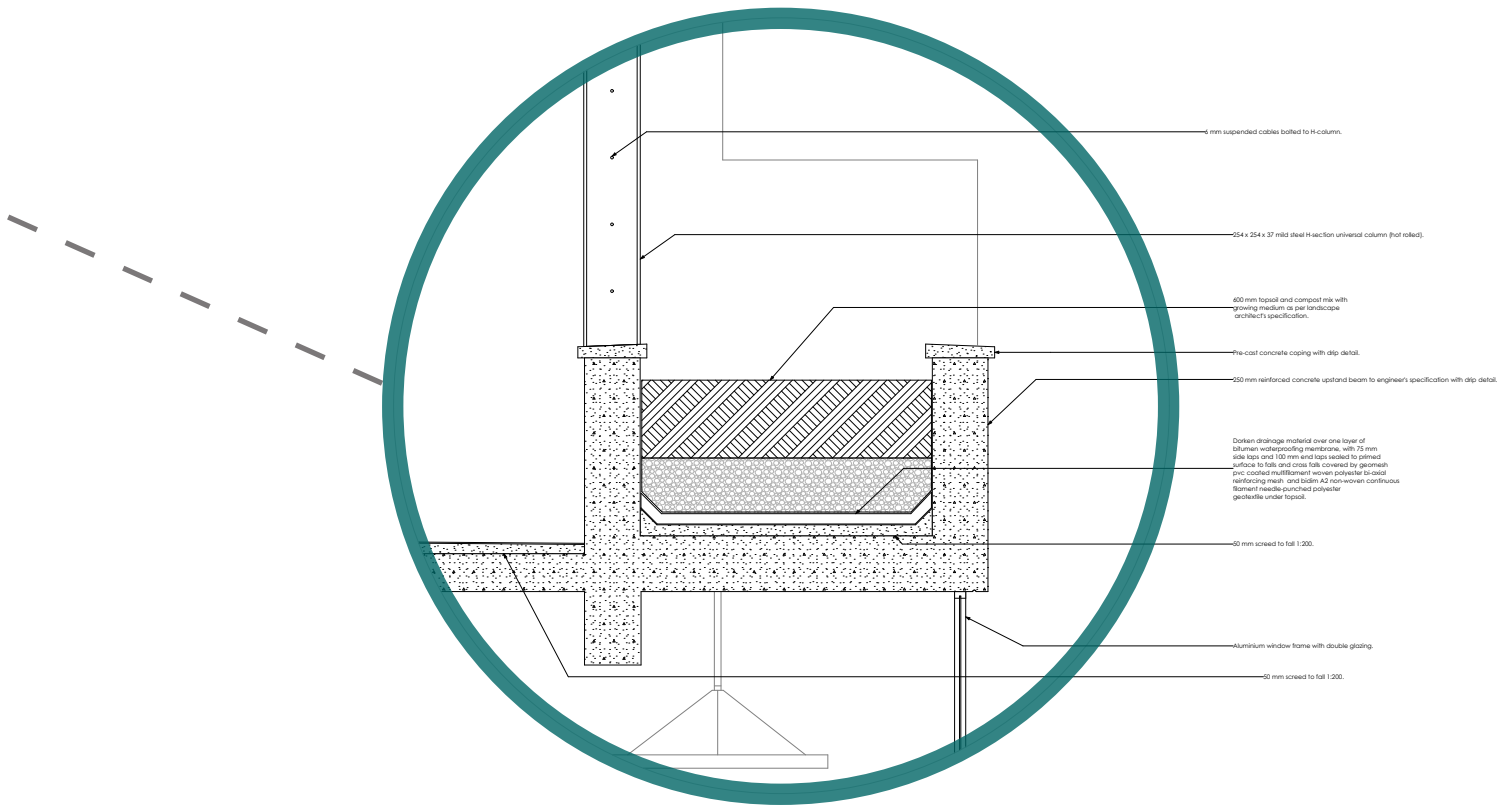


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9.6 Perspectives





Figure 9.25 Final Perspective of Building in its Context
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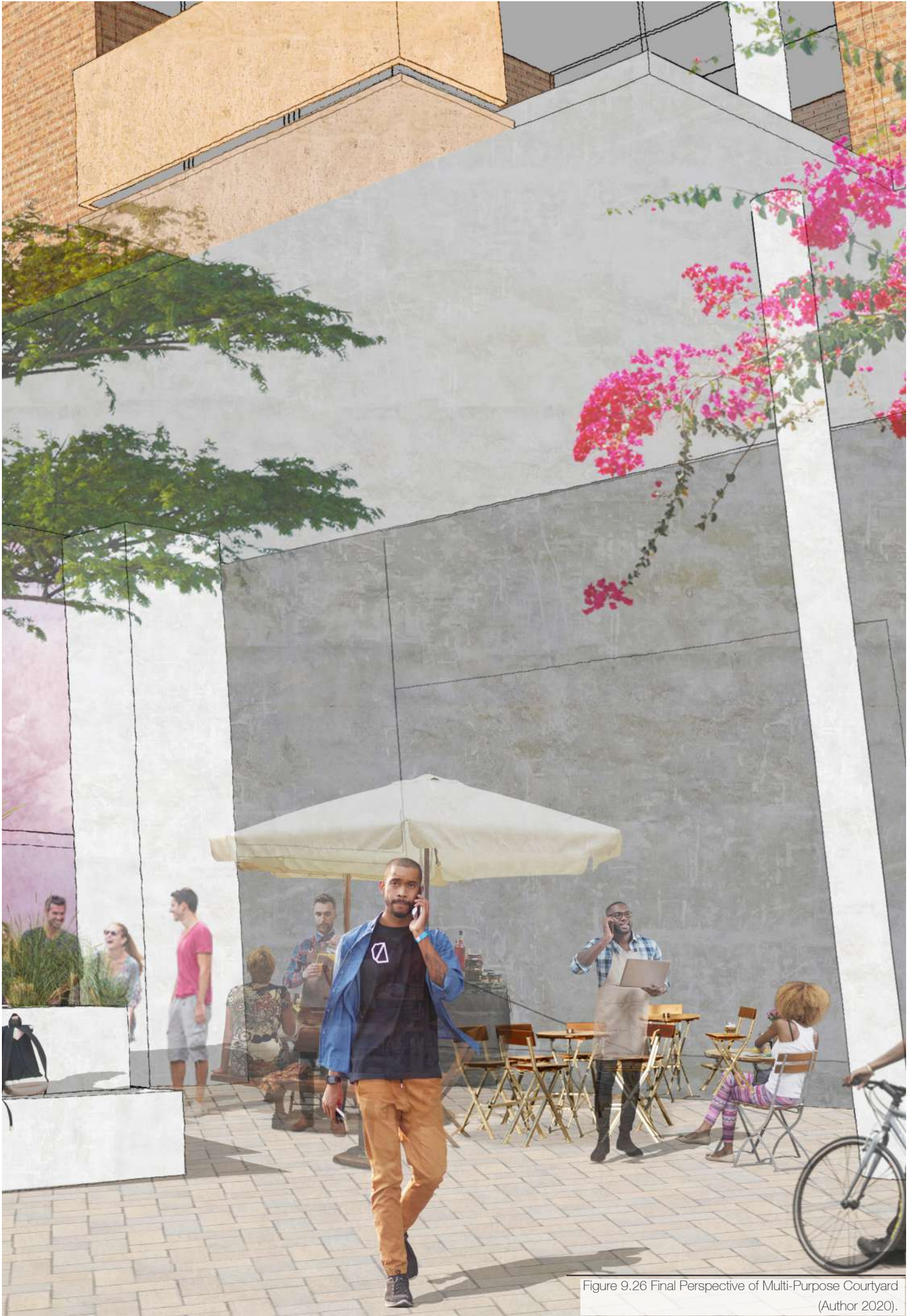


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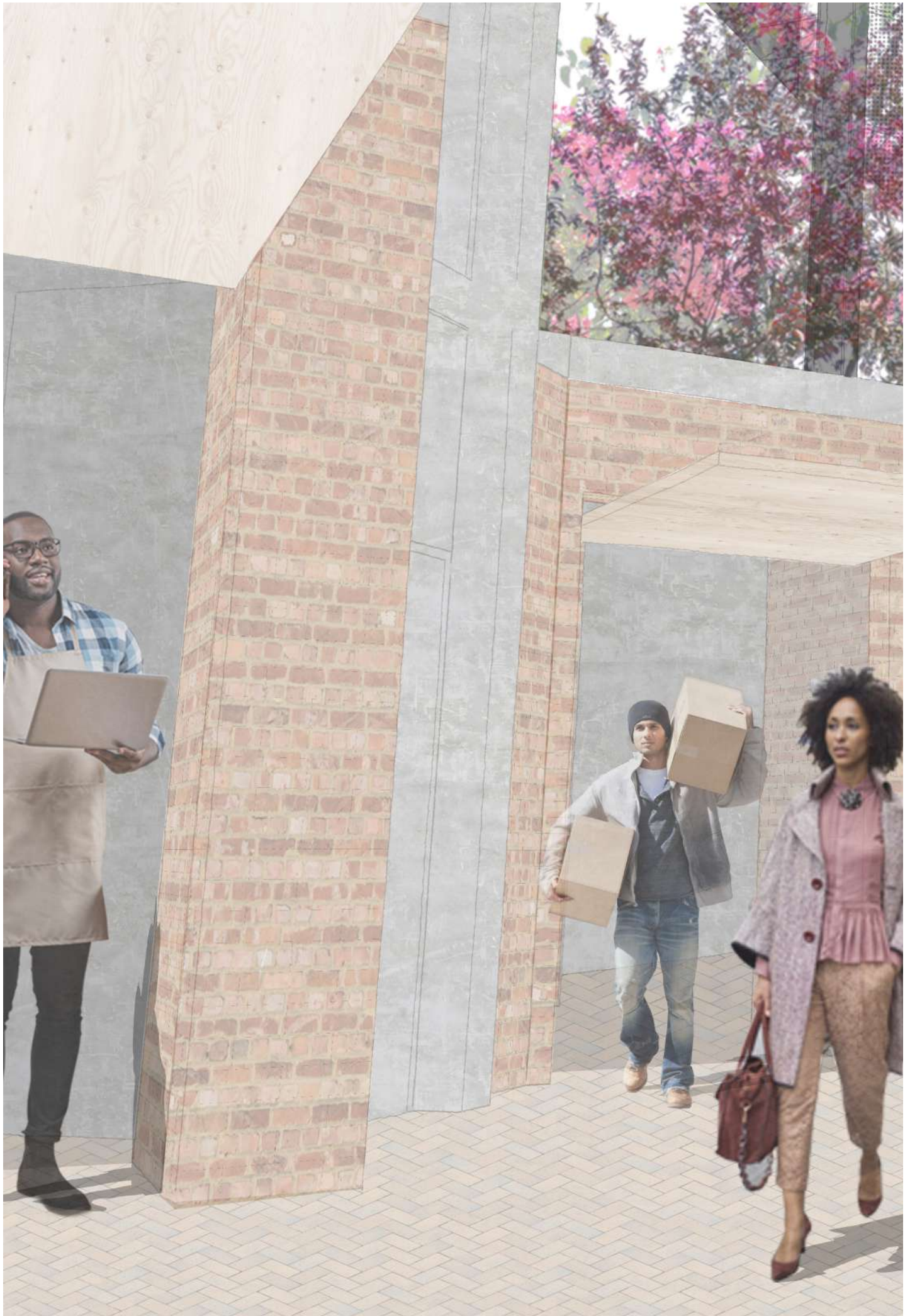




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References

- Barker, A. (2014) Gabriël (Gawie) Fagan: the genesis and development of a new Cape vernacular. *VASSA Journal*, ISSN 1562-5257, number 29, 2014: 1-20.
- Barker, A. (2015) "A Mediated Modern Movement: Le Corbusier, South Africa and Gabriel Fagan," *South African Journal of Art History*, 30(4), pp. 69–89.
- Bentley, I. (1985) *Responsive environments: a manual for designers*. London: Architectural Press.
- Bollack Françoise Astorg (2013) *Old buildings, new forms: new directions in architectural transformations*. New York: Monacelli Press.
- Boyko, C. T. and Cooper, R. (2011) Clarifying and Re-Conceptualising Density. *Progress in Planning*, 76(1), pp. 1–61.
- Census 2011: Statistics South Africa (2011) South African Population Census 2011. Indicators derived from the full population Census <<https://wazimap.co.za/profiles/ward-79900058-city-of-tshwane-ward-58-79900058/>>
- Chan, Y.-K. (1999) "Density, Crowding, and Factors Intervening in Their Relationship: Evidence from a Hyper-Dense Metropolis," 48(1), pp. 103–124.
- City of Tshwane. (2013) *Tshwane vision 2055 Remaking South Africa's Capital City*. Pretoria. City of Tshwane.
- Corten, J.-P., Meurs, P. and Meurs, P. (eds) (2014) *Heritage as an asset for inner-city development : an urban manager's guide book : planning the past, building the future*. Rotterdam: Nai010.
- Cox, W. (2012) *The Evolving Urban Form: Ho Chi Minh City (Saigon)* | *Newgeography.com*. <https://www.newgeography.com/content/002738-the-evolving-urban-form-ho-chi-minh-city-saigon> 16 August 2020.
- Christine McCarthy (2012) Re-thinking threats to architectural heritage. *International Journal of Heritage Studies*, 18:6, 624-636, DOI: 10.1080/13527258.2011.608373
- Dewar, D. and Uytendogaardt, R. S. (1995) *Creating vibrant urban places to live: a primer*. Cape Town: publisher not identified.
- Falco, E., Zambrano-Verratti Jesús and Kleinhans, R. J. (2019) "Web-Based Participatory Mapping in Informal Settlements: The Slums of Caracas, Venezuela," *Habitat International*, 94.
- Fourchard, L. (2011) Lagos, Koolhaas and Partisan Politics in Nigeria: Lagos, Koolhaas and Partisan Politics in Nigeria, *International Journal of Urban and Regional Research*, 35(1), pp. 40–56. doi: 10.1111/j.1468-2427.2010.00938.x.
- Gehl, J. (2010) *Cities for people*. Washington, DC: Island Press.
- Gehl Architects. Gehl — Making Cities for People. <https://gehlpeople.com/> 15 September 2020.
- Harper, C. (2019) "Density: Objective Measure or Critical Tool of the Neoliberal Agenda?" 2019(24), pp. 31–54.
- Habraken, N. J. and Teicher, J. (1998) *The Structure of the Ordinary: Form and Control in the Built Environment*. Cambridge, Mass.: MIT Press.
- Holm, D. (1998) *Architecture of the Transvaal, in Kerkplaats and Capitalists*. Pretoria: UNISA, 1998, pp. 55–77.
- Jenks, M. and Burgess, R. (eds) (2000) *Compact Cities: Sustainable Urban Forms for Developing Countries*. London: E. & F.N. Spon.
- Koolhaas, R. et al. (2000) *Mutations: rem koolhaas, harvard project on the city, stefano boeri, multiplicity, sanford kwinter, nadia tazi, hans ulrich obrist*. Barcelona: ACTAR.
- Lam, B. 2018. *Boxed in: Life Inside the 'Coffin Cubicles' of Hong Kong—in pictures*. *The Guardian*. <https://www>.

theguardian.com/cities/gallery/2017/jun/07/boxed-life-inside-hong-kong-coffin-cubicles-cage-homes-in-pictures accessed 18th July 2020.

LSE Cities. (2012). Residential density, Hong Kong
<https://www.lse.ac.uk/cities/urban-age> accessed 18th July 2020.

Mukeku, J. (2018) Urban Slum Morphology and Socio-Economic Analogies: A Case Study of Kibera Slum, Nairobi, Kenya, *Urbanisation*, 3(1), pp. 17–32. doi: 10.1177/2455747118790581.

Municipal Elections 2016: Electoral Commission of South Africa (IEC), Municipal election results <<https://wazimap.co.za/profiles/ward-79900058-city-of-tshwane-ward-58-79900058/>>

Nguyen, T. B. et al. (2016) "Saigon-Ho Chi Minh City," *Cities*, 50, pp. 16–27. doi: 10.1016/j.cities.2015.08.007.

Nowek, A. (2012). Hyperdense: High-Density Residential Architecture in Hong Kong. *TheProtoCity.com*. <http://theprotocity.com/hyperdense-high-density-residential-architecture-in-hong-kong/> 16 August 2020.

Roberts, D. 2019. Barcelona, Spain, urban planning: a city's vision to dig out from cars - Vox. <https://www.vox.com/energy-and-environment/2019/4/8/18273893/barcelona-spain-urban-planning-cars> [Accessed: 12 March 2020].

Roberts, D. 2019. Barcelona's remarkable history of rebirth and transformation. Vox. <https://www.vox.com/energy-and-environment/2019/4/8/18266760/barcelona-spain-urban-planning-history> [Accessed: 12 March 2020].

Sinclair, D.B.R. & Tsang, D. (2019). The Slums of Hong Kong: Towards a Dignified Living for the Working Poor in Sham Shui Po District. https://www.academia.edu/40032088/The_Slums_of_Hong_Kong_Towards_a_Dignified_Living_for_the_Working_Poor_in_Sham_Shui_Po_District 16 August 2020.

Swart, J. and Proust, A. (2019) *Hidden Pretoria*. Cape Town, South Africa: Struik Lifestyle.

Taylor, K., St. Clair, A. and Mitchell, N. (2015) *Conserving cultural landscapes: challenges and new directions*. New York: Routledge (Routledge studies in heritage, 7).

Tian, T. (2013) Informal vertical communities: Torre David in Caracas, Venezuela. *Landscape Architecture Frontiers*, vol. 1, no. 2, p. 96+. Gale Academic OneFile, <https://go.gale.com/ps/anonymou?id=GALE%7CA459894925&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=20955405&p=AONE&sw=w> Accessed 16 Aug. 2020

Turok, I. (2016) "Housing and the Urban Premium," *Habitat International: Part 3*, 54, pp. 234–240. doi: 10.1016/j.habitatint.2015.11.019.

Turok, I. and Parnell, S. (2009) "Reshaping Cities, Rebuilding Nations: The Role of National Urban Policies," *Urban Forum*, 20(2), pp. 157–174.

World Population Review. (2020) "World Population Review" Accessed: 03/23/2020 <https://worldpopulationreview.com/>



APPENDICES



Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en
Inligtingtegnologie / Lefapha la Boetšenere,
Tikologo ya Kago le Theknolotši ya Tshedimošo

Reference number: EBIT/53/2020

Ms C Karusseit
Department: Architecture
University of Pretoria
Pretoria
0083

Dear Ms C Karusseit

FACULTY COMMITTEE FOR RESEARCH ETHICS AND INTEGRITY

Your recent application to the EBIT Research Ethics Committee refers.

Conditional approval is granted.

This means that the research project entitled "Masters Professional Dissertation in Architecture, Landscape and Interior Architecture" is approved under the strict conditions indicated below. If these conditions are not met, approval is withdrawn automatically.

Conditions for approval

Approved based on the summaries provided.

Applications from each student (including application forms and all necessary supporting documents such as questionnaire/interview questions, permission letters, informed consent form, etc) will need to be checked internally by the course coordinator/ supervisor. A checklist will need to be signed off after the checking.

All of the above will need to be archived in the department and at the end of the course a flash disc / CD clearly marked with the course code and the the protocol number of this application will be required to be provided to EBIT REC administrator.

No data to be collected without first obtaining permission letters. The permission letter from the organisation(s) must be signed by an authorized person and the name of the organisation(s) cannot be disclosed without consent.

This approval does not imply that the researcher, student or lecturer is relieved of any accountability in terms of the Code of Ethics for Scholarly Activities of the University of Pretoria, or the Policy and Procedures for Responsible Research of the University of Pretoria. These documents are available on the website of the EBIT Ethics Committee.

If action is taken beyond the approved application, approval is withdrawn automatically.

According to the regulations, any relevant problem arising from the study or research methodology as well as any amendments or changes, must be brought to the attention of the EBIT Research Ethics Office.

The Committee must be notified on completion of the project.

The Committee wishes you every success with the research project.

Prof K.-Y. Chan

Chair: Faculty Committee for Research Ethics and Integrity
FACULTY OF ENGINEERING, BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY



Reginald Venter

C

Compact Habitat Adapt

*Responding to Densification Practices in the Historical
Centre of the Post-Apartheid City*



Fig. 01. Top; Compact Habitat Adapt (Author 2020).

Fig. 02. Opposite Right; Issues (Author 2020).

Abstract

The article questions densification in terms of its measure and application within an existing historical context. As South Africa faces a future of rapid population growth and urban sprawl, the cities are faced with densification and a decline in resource availability. The argument is set in a scenario that looks towards an architectural realm of the future in the city of Pretoria, where population size, climatic conditions and resource availability have been predicted using local and global data.

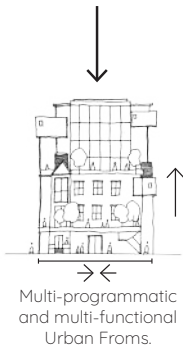
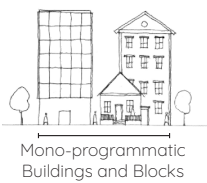
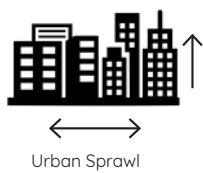
The data reveal future needs and future scales to suite those needs within the city, however working within the historical centre of the city means working within the existing historical context. The strategies are therefore required to respond to the future needs and historical fabric of the inner to provide for the new without undermining the existing tangible and intangible qualities of the city. Density is questioned as a measure and use as an architectural response in the historical centre of a post-apartheid city, where the translation of density as more than

a numerical measure to a design response. The Densification process therefore defined by its numerical and programmatic requirements and a third element, the space not built, defined by conservation strategies of the existing historical artefacts.

The existing artefacts serving as the 'breathing space' requirement for densifying, but also as drivers in the making of place. A 're-urbanism' of the inner city providing multi programmatic spaces, calls for an architecture that can no longer serve as only an object, but adaptable habitat. One that does not become obsolete in time, but responds to, grows and transforms with the growing city. It does not follow the principles of new and standing alone, but merges with the existing. It becomes a collection of components, much like a machine, filling in the spaces between. Repurposing and reinventing the existing towards a spatial, social and environmental sustainability relevant to the present and future needs.

Introduction

Density can refer to various



measures of subject quantities in a given area. When referring to a human or spatial density then there are still more variables of measure. In the spatial sense, however in simple terms it can be defined as a number of units in a given area (Boyko et al. 2011). The measures then vary in scale, from city to single unit in terms of population.

Density as an urban concept has been widely accepted as a fundamental principle for sustainable urban form (Harper 2019). Densification or compaction of cities optimise and reduce the use of resources, use less land, optimise the use of public transport, energy, and goods. Proximity between programmes are increased and therefore demand fewer resources and produce less pollutants.

Jenks et al. (2000) describes sustainable urban form 'as development that does not require resources beyond its environmental capacity, is equitable, promotes social justice, and is created through inclusive decision-making procedures'(Jenks et al. 2000). Sustainable urban form, in terms of density, can be influenced by various components including size, shape, compactness, intensity, mixed-use of land, the plan layout and type of buildings; and the use of green and open space.

Global Issue
Rapid population growth is a challenge faced globally.

According to the UN (2019) more than half of population growth will occur in Africa in the next 30 years and the current population of 67 million in the SADC countries is expected to double by 2050. South Africa, the largest and more developed of the Southern African countries, will therefore play a central role in shaping the expected rapid increase of global population from 7.7 billion to 9.7 billion by 2050 (UN 2019). South Africa is expected to gain 19-24 million more residents in the next three decades and the vast majority will settle in cities (CSIR 2018). As the administrative capital of South Africa, Pretoria will experience some of the greatest population growth and unless this growth is effectively planned for and efficiently managed, it will place enormous pressure on infrastructure and already scarce resources.

Apart from rapid population growth, Pretoria is also faced with the impact climate change has on the cities physical, biological and human managed systems.

According to the IPCC (2014) report, Summer temperatures are expected to rise, causing more severe heat waves and more intense precipitation events.

Urban Issue
Social and environmental problems as a direct result from the structure of the South African city suggest that the current urban fabric and its further

development is entirely unsustainable (Jenks 2000). In the South African context however, there are concerns in regards to the viability of compaction and sustainability, in terms of the cultural and social implications. The City of Tshwane, to some extent, encourages densification along major transport corridors and creating a more accessible city to its citizens. However, Pretoria has been shaped by both Apartheid and modernist town planning principles resulting in a city both segregated and mono-functional. The city can currently be described as decentralized, of low density, fragmented and separated.

The current infrastructure of Pretoria does provide opportunity for creating a sustainable compact city through densification of the built environment and residential populations; intensifying program and to manipulate urban size, form, structure and systems in pursuit of the environmental, social and economic sustainability derived from the concentration of urban functions (Jenks et al 2000). However, the city continues to grow laterally through urban sprawl, spreading further into rural and natural environments.

Fig. 02. Below Left; Image name or title (Author, 2017)
Fig. 03. Right; Image name or title (Author, 2017)
Fig. 04. Below Right; Image name or title (Author, 2017)

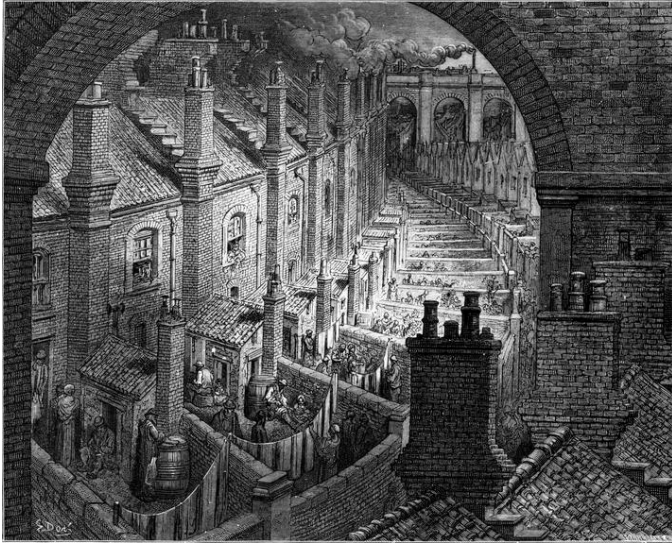


Fig. 03. Top Left; 'Over London-by Rail' engraved by Gustav Doré (1872).

Architectural Issue

The mono-programmatic nature of the city and the resultant residential typologies will be questioned in terms of its location, built density and occupational density. These typologies include inner city apartment blocks and suburban housing, township housing with informal infill and informal settlements on the periphery of cities.

The inner city, in particular Church Square, consists of a majority heritage buildings and landscape of the colonial and apartheid era. Due to its heritage status and lack in funding for preservation; obsolete function and negativity towards its past use, the majority of the buildings stand neglected and in some cases vacant.

Methodology

The first part to the research methodology is based on conducting in depth qualitative studies by means of a literature review with regards to the compaction of urban environments, urban regeneration, and social environmental and economic sustainability. The second part includes a critical analysis and investigation of the existing urban fabric and history of the study area and comparative areas to establish a project site and program using the principles identified in part one.

The selection of a site location as case study allows for an in depth

literature study of both international and local examples, which can be categorized and compared to the principles established in part one. The formulated theoretical premise, derived from the investigations, will serve as guidelines for alternative design strategies for compact living environments.

Literature Review

During the period of the industrial revolution, high density living became a common occurrence in working class housing, to the point of overcrowding. Workers lived as close to factories as possible in terrible conditions. In London population density was at 15 750 people per km², many workers sharing small spaces in sub-let houses and tenements. However, from the 1850's, it was recognised that the living conditions had effected public health immensely (Harper 2019). People moved to cities in search of work, but the increased work force also caused a shortage in housing and food availability. Thus poverty also increased.

In 1898, as a reaction to the overcrowded living conditions of the time, Ebenezer Howard published the Garden Cities of To-morrow. Howard's model set out quotas for the proper arrangement of the individual buildings and the limitation on the area of building in relation to open space (Harper 2019). The spatial planning proposition suggest a new model for towns, with restrictions on population and densification with a population

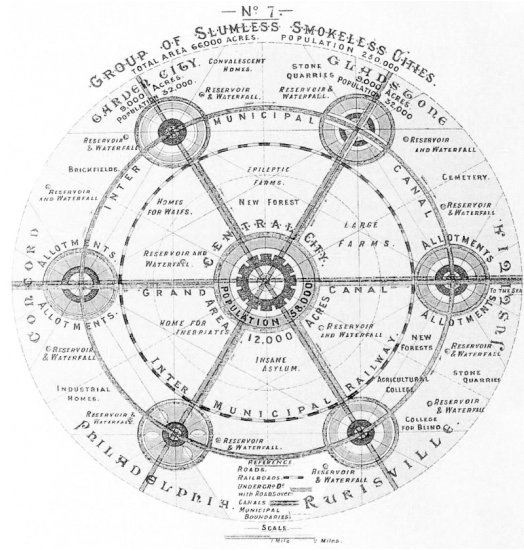


Fig. 04. Top Right; The original Garden City concept by Ebenezer Howard (1902).

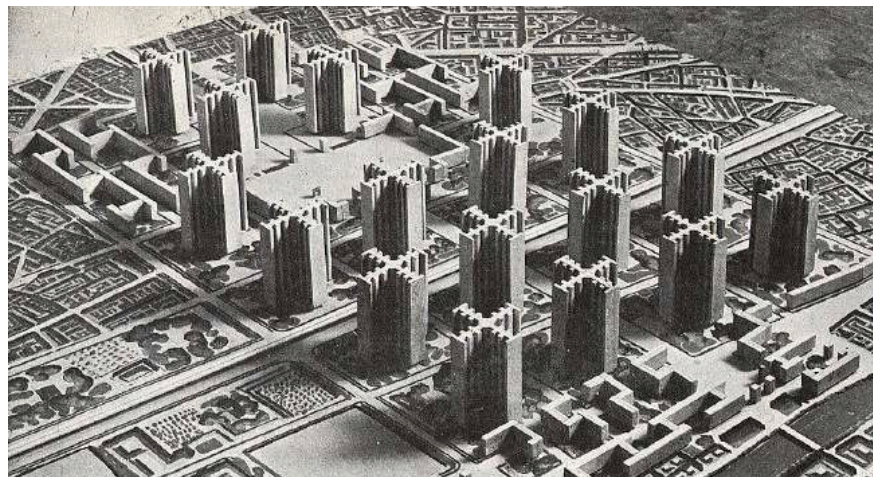
density of only a 125 residents per km². The low-density principles proposed, focused on the intent in optimising living conditions for the inhabitants. At this point in time densification had a negative connotation in terms of spatial planning principles and was related to overcrowding and a condition of the poor (Jenks et al. 2000).

The next shift in thinking of density came in the early 1920's and was led by the pioneers of modernism in central Europe. The City of Tomorrow, by Le Corbusier, was published in 1929 and included the city planning project, Plan Voisin. The famous proposal for a new Paris presented densification as a means of optimizing productivity. Plan Voisin would not only have increased the density of an already dense city, but proposed quadrupling it from a population density of 55 000 residents per km² to a staggering 300 000 residents per km². The increased densities would have been achieved through high-rise buildings, which was a fairly new concept in residential architecture at the time. The high-density, high-rise typologies freed up ground space for wider roads and more green space in closer proximity to the residences. The housing models also facilitated services to residents which would have been otherwise considered unaffordable. Unite' d'Habitation, a concentration of apartments in one building, made possible the distribution of internal plumbing and heating to all its residents, who would otherwise not have been able to afford it.

In 1935 Walter Gropius published *The New Architecture* in which he presented morphological studies testing the relationship between density, built form and sunlight (Harper 2019). The diagrammatic studies illustrated principles for achieving higher densities through taller housing blocks set further apart that also made more efficient use of the site and allowed for higher site capacities. Gropius's proposal of a model that would have fixed components in site planning, building height, distances apart, number of dwellings and sunlight created design instruments that were in favour of high or even hyper densities (Harper 2019). The negative connotations to densification was reconsidered, given the recognition of the health, sunlight and ventilation benefits offered by the new models.

However, in the 1960's South Africa, the principles of the modernist city and apartheid principles of segregation were conveniently compatible. The emphasis of separation in Plan Voisin meant that urban planners of the Apartheid regime eagerly adopted and manipulated the concept. Land uses, urban areas, and racial groups were separated leading to the mono-functionality and control of populations (Jenks 2000).

The principles of the modernist densification models also compatible to manipulation within expensive living economies. Hong Kong is one of the most densely populated cities in the world (LSE 2012) that experienced severe urban sprawl in the 1950's. The rapid population growth created widespread housing shortage and given the major spatial constraints of the city, due to topography and extremely expensive land prices, the only viable solution to the demand in housing was to develop high-rise-hyper-dense residential buildings (Chan 1999). The housing crisis led to the increase in an apartment typology referred to as coffin cubicles, which can only be referred to as extreme hyper density. The coffin homes are described as minuscule rooms lived in by Hong Kong's poorest. The rooms are defined



by beds sealed by wire mesh or wooden planks and measure a mere 1.5 m2. Standard 40 m2 apartments are subdivided into cubicles so small that residents are unable to lay down or stand up straight in their own cubicle (Lam 2018). The coffin cubicles highlight the reality of the cramped conditions that the residents live in, as they can't afford anything else.

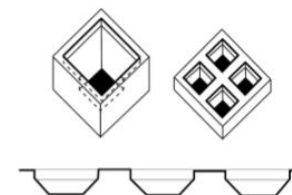
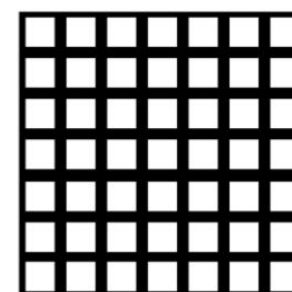
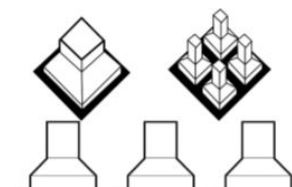
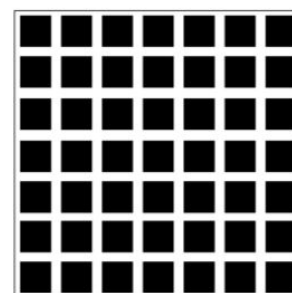


Fig. 05. Top; Le Corbusier's Plan Voisin scaled model (Le Corbusier 1925).

Fig. 06. Top Left; Photo of Unite de Habitation (Archdaily 2020).

Fig. 07. Left; Photo of Hong Kong Hyper Dense High-Rise (Wolf 2019)

Fig. 08. Top Right; Gropius's Morphological Studies (Harper 2019).



Research methods & Design

Cities are expressed and described through case studies, where the cities have been chosen for their extreme population densities and the urban-architectural responses to these densities. The city characteristics are described and summarized as urban profiles in order to establish clear comparisons between these profiles:

Barcelona, Spain

The historical city of Barcelona has a population of 1.7 million in a city area of 101.9 km². The city has an average population density of 16 000 residents per km², a 36 000 residents per km² density in the historic Eixample area, and a 50 000 residents per km² in the la Sagrada Familia neighbourhood. This makes Barcelona one of Europe's most densely populated cities (WPR 2020).

The city traces back to the 15 BC Roman Era. A small city surrounded by a wall with Roman grid perpendicular streets (Roberts 2019). According to Roberts(2019) the city was defined by two characteristics that would define its future development: First, it began and still is a city that is constrained, compressed and compact from its establishment. And secondly, it has always been a deliberate city, planned and built according to the architects. Unlike cities in the developing world, Barcelona has not sprawled. Each new growth of the

city was on purpose, planned that way. The city has developed over the centuries, transformed by various city planner visionaries. The most notable architect Ildefons Cerdà, considered one of history's great urban planners (Roberts 2019). A reaction to the overcrowded and unhygienic conditions of the city, Cerdà designed a new extension to the city, known as the Eixample – a model that offered a clean and safe lifestyle. He wanted to provide each person, with enough water, clean air, sunlight, ventilation, and space. Orientating each block to maximize daily sun exposure.

Each block, or Manzana, was to be almost of identical proportions in height, spacing and majority green spaces. Roberts (2019) states that the ground floor was allocated commerce, and the upper floors residential with upper, middle and lower income groups living in the same building or block. In this way, public space would be shared among the groups, reducing inequality and encouraging social diversity (Roberts 2019).

Cerdà envisioned each urban block to be largely self-sufficient, with its commerce, retail and public facilities. Whereas hospitals, parks, and squares would be shared within the city, encouraging equality on an urban scale.

The urban scheme was, and still is successful due to its short and regular blocks, derived from the Roman hypodamic city plan. The characteristic

Fig. 09. Top Left; Bird's Eye View of the Courtyard Typology (The Guardian 2016)

Fig. 10. Top Right; Coffin Apartment (Wolf 2019).

of the block in combination with the orthogonal streets, encouraged a diverse and vibrant street life. The regular grid is easy to navigate and comprehend, but diverse in multiple routes and regularly spaced choices. An underlying uniformity that's endlessly adaptable (Roberts 2019).

The intention was to combine the advantages of rural living: open green space, fresh food and air and close communities with the advantages of urban living: intense commerce, social and cultural activity, accessibility to a range of goods and innovation. However, today the city is faced with various problems as it becomes too crowded and is faced with the need for another transformative model, one that is design around the well-being of people and not its cars. A new urban planning visionary, Salvador Rueda, looks to providing this radical transformation of the city, yet again.

He envisions a city that's pedestrian orientated and of mixed-use, termed "superblocks,". Each resident has access to all superblocks within the city and can navigate through these pedestrian spaces without having to cross vehicle dominated streets. Roberts (2019) states that If it is fully realized (over multiple generations), it could make Barcelona the first major pedestrian orientated city (Roberts 2019).

Hong Kong, CSAR

Hong Kong is one of the most densely populated countries in the world, with a population density of 6,659 residents per km². The former independent country, now a Chinese special administrative region has a population of 7.5 million in an area of 1 110 km² (WPR 2020). As a mega-city, Hong Kong faces countless and daunting urban planning challenges. With the 1 110 km² divided by 240 islands, there is merely 42 km² of viable residential land; of which 7 % is occupied by non-marketable low density rural homes (Sinclair 2019:2). Hong Kong has developed as a hyper-dense and tall urban environment in most part due to a difficult geographical location and a unique economic and political setting (Nowek 2012). Hong Kong's hyper-dense and tall building typology, reaches peaks of over 100,000 people per km². The city planners implemented an urban model that clusters the already extremely high-density developments around public transport (LSE Cities 2012).

Ho Chi Minh City, Vietnam

Ho Chi Minh City, once known as Saigon is the largest city in Vietnam with a population of 8.6 million over a 2061,2 km² area of which 494,01 km² is urbanized. The city is dense at an average of 4097 residents per km² and 40 000 residents per km² within the inner city, however it continues to grow rapidly (WPR 2020).

Between 1954 and 1975 Vietnam was divided by a civil war during which millions of immigrants fled into HCMC to avoid the war (Nguyen, T. B. et al. 2016:16). The rapid population growth created serious overcrowding issues, resulting in many slums along its river. Following the end of the war in 1975, the Socialist government took responsibility for providing housing for those working for the state, however little spatial development took place (Nguyen, T. B. et al. 2016:17). By 1986, the central government introduced the Doi Moi policy aiming to create a more market-orientated economy, in which a new land law allowed for the grant of land to individual land owners as opposed to the socialist collective land ownership policy.

Since 1986, land policies have changed several times and is now



Fig. 11. Top Left; Narrow Saigon building typology (Author 2018).



Fig. 12. Top Right; Tower of David (U-TT 2012).

immensely complicated as the state has had limited understanding of urban management (Nguyen, T. B. et al. 2016:20). The policies have affected the city in two major ways. First, the individual land ownership rights have encouraged residents to upgrade their homes, thus increasing their home value and secondly the allowance of foreign investment has increased the inner cities development. Thus, the economy has seen improvement and available real estate within the city has quickly become rare and expensive (Nguyen, T. B. et al. 2016:21). The increase in density has changed the city to a capitalist urban model where residents are taxed based on the width of their buildings, therefore changing its morphology (Cox 2012). The new taxation system within the core of the city has resulted in a morphology of incredibly slender, but tall buildings, where there's no separation between residential and commerce (Nguyen, T. B. et al. 2016:20, Cox 2012). Instead, a very thin typology of commercial ground floors forms a consistent street edge with residences above, resulting in the incredibly dense inner city (Nguyen, T. B. et al. 2016:20).

Caracas, Venezuela

The city is not only the capital but also the largest city in Venezuela with a population of 2 million in a 777 km² area and an average population density of 28 490 residents per km² (WPR 2020). Over 1.25 million people live in informal settlements (barrios), representing 60 % of the cities total population, with no functioning urban planning framework in terms of land use and housing. The barrios represent high informality and illegality in structure and land occupation, lack in infrastructure, public space and health facilities (Falco et al. 2019:2). In 2007, a group of residents turned to an abandoned and unfinished bank building within the inner city of Caracas. The 45 storey high-rise had been standing empty and incomplete for 18 years. Due to a housing crises and the precarious conditions in the barrios, the occupation of empty buildings became common practice in the city, with an estimated 155 offices, apartments and government buildings already occupied by 'squatters' at the time (Tian 2012:5).



Gradually more families moved in, cleaning and removing rubble from each floor. As Torre David continued to grow in occupancy the complex became more extensively modified through the construction of balustrades, communal spaces and private apartments. By 2009 the tower was estimated to house 200 families and continued to grow.

Lagos, Nigeria

Lagos is the largest city in Africa and is still rapidly growing. The rapid population growth and urban sprawl experienced by Lagos is unmatched by any city in Africa, increasing from 325 218 in 1950 to its estimated 17.5 million residents, however this figure is disputed within the Nigerian government with some believing it already exceeds 21 million (WPR 2020).

Fourchard (2011) argues that Lagos' urban, planning management and conditions are as a direct result of political interference and a long history of disagreement between political parties and the elected government, since the end of colonialism (Fourchard 2011:40,41). This goes against the portrayal of the city depicted by Rem Koolhaas and the Harvard Project on the City team (Fourchard 2011: 41, Koolhaas et al. 2000). Koolhaas refers to the city as a the 'paradigm and the extreme and the pathological form of the West African city' (Fourchard

2011:41, Koolhaas et al. 2000: 652). Lagos continues to function as a city despite lacking in all the basic amenities and public services. It functions because it exists as a series of self-regulatory systems not managed or controlled by town planning regulations (Fourchard 2011:41).

Koolhaas and his team suggest that: 'rather than viewing the conditions of dysfunctionality as African ways of becoming modern, it is instead possible to argue that Lagos represents a developed, extreme paradigmatic case-study of a city at the forefront of globalised modernity' (Koolhaas et al. 2000:653). The Harvard Project on the City, according to Fourchard (2011:41), envisions an African city, that has not achieved urban development in accordance to the west, but rather an icon of West African urbanity in de-historicising the city (Koolhaas et al. 2000:652). Other academics that have taken a historical perspective of the colonial and independent periods have presented a city suffering under a worsening infrastructure crises that is less capable of dealing with the informality, the now identity of Lagos (Gandy 2006, Fourchard 2011). The informal economy often seen as a weakness in the African city, illustrated by the infrastructure crisis and general chaos, however Rem Koolhaas still considers Lagos a city that has formulated its own urban identity by escaping the modernist town planning principles of its former colonists

(Koolhaas 2002: 183).

Nairobi, Kenya

Nairobi is the capital of Kenya and its largest city, dating back to 1899. The city is consistently growing and currently covers an area of 696 km² resulting in a population density of 4850 residents per km². The city is one of the fastest growing in Africa, growing at a 4% rate annually due its high birth and immigrant rates, it's expected to continue on its upward trajectory in terms of population growth, reaching 5 million by 2025 (WPR 2020). Nairobi is also known for Kibera, the second largest informal settlement Africa, originally established in 1912 as a soldier camp (Mukeku 2018:21). Since Kenya gained independence post 1945, the settlement quickly grew with cheap makeshift structures as people migrated to the city in search of work. The settlement is within walking distance of inner city, offering access to socio-economic activities within the city. Most Kibera residents living within 5 km of the city centre, supported by government institutions, schools and medical facilities around the settlement, it has grown to an estimated 700 000 to 1 million residents, although the government claims only 140 070 residents.

Housing in the settlement is characterised by spatial inadequacy, insufficient shelter, lack in infrastructure and unhygienic conditions (Mukeku 2018:23). The average dwelling

unit comprising of one-roomed structures measuring less than 9 m², but housing families of six. The spaces between dwellings have no formal order or planning layout and the housing is densely arranged with few in-between spaces. It is estimated there are 250 housing units per hectare compared to 25 housing units per hectare in middle-class neighbourhoods (Mukeyu 2018:24). Kibera is characterised by its lack in differentiation of its building process, as the resident generally plays the part of designer, builder and dweller. According to Mukeyu (2018) this allowing for a rapid decision making to feedback context. This results in a built environment that evolves continuously, based on informal mechanisms of construction and alterations.

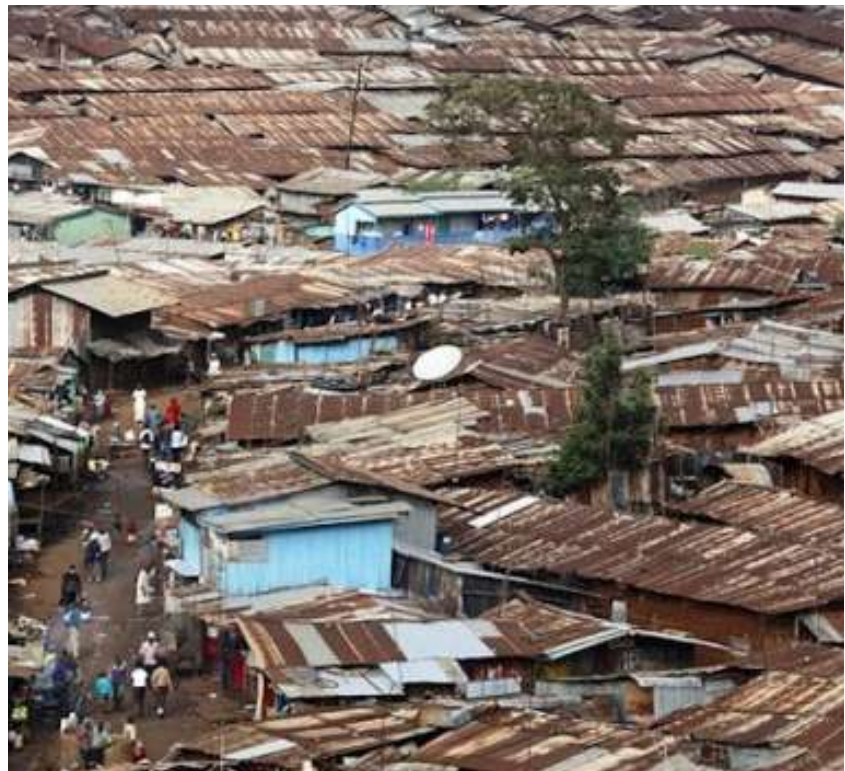


Fig. 13. Opposite Top Left; Lagos, Nigeria (Mitchell 2017).

Fig. 14. Opposite Top Right; Commerce spills into the pedestrian orientated streets (Reuters 2017).

Fig. 15. Top Right; Kibera roofscape (The Guardian 2019).

Fig 16. Bottom Right; Daily conditions within the settlement (The Guardian 2019).



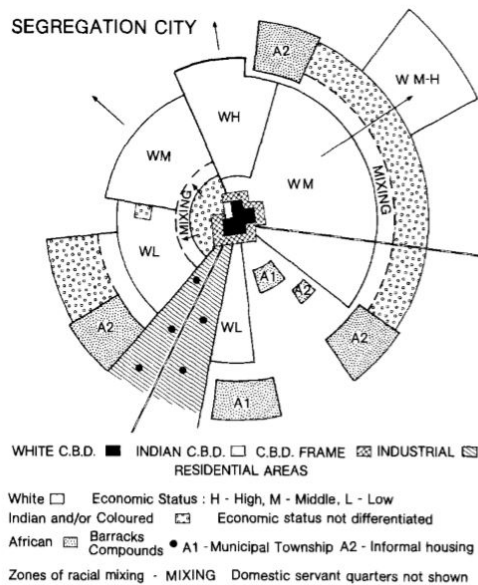


Fig. 17. Top Left; The Apartheid City Model (van der Waal Collection 2020).

Fig. 18. Top Right; Pretoria City (Adapted from Tshwane GIS 2020)

Fig. 19. Bottom Right; Density Design Principles (Author 2020).

Fig. 20. Opposite Right; Urban Principles (Author 2020)

The Case for Density in South Africa
 The structure and form of South African cities have been shaped by two ideologies, modernism and segregation.

Modernist city planning policies adapted from European and US models. The principles for these modernist or rather segregated, low dense, and mono-functional cities included:

- a strong anti-urban or pro-suburban philosophy,
- emphasis on the separation of living, working, playing and movement,
- Quantitative and programmatically determined buildings and settlements,
- the promotion of the neighbourhood unit,
- and the private vehicle as the primary and dominant mode of transport.

Design principles for the effective densification of a South African city should then include:

- a strong pro-urban philosophy,
- the inclusion and connection of living, working, playing and movement spaces,
- the design and construction of

buildings considered from both a qualitative and quantitative philosophy,

-the promotion of a multi-programmatic city and providing for easily accessible, safe and efficient public transport,

-and pedestrian and bicycle lanes.

-The population density of units in relation to square meters should be considered when designing for a compact development, however the principles of a sustainable urban form and an effective density should be used as the guiding design philosophy.

Pretoria as Case Study

The city of Pretoria is one of three capital cities and also the administrative capital of South Africa. The city itself has a population of 700 000 residents and the larger urban area, a population of 2 565 660 residents. The city occupies 687.54 km² and a population density of 1100 residents per km² (WPR 2020). The city was founded in 1855, centred around a church, which later became a public square within the city and the historic centre of the city named church square.

The Third Measure of Density
 Measuring density should extend further than the human population measure, numbers per unit or built form in a given area. A third measure is needed. Considering the qualities of sustainable urban form, the measures should also include regenerative strategies of the existing.



Therefore, the precinct is explored and studied through various theories on different scales in order to establish a framework within the respects of an existing heritage fabric but also theories delving into the existing social and political constructs of the city. The various strategies are formulated to form a regenerative response that satisfies the existing heritage constraints, the identified spatial needs in terms of a hyper density and also the social, cultural and political needs.

The theories are categorised into three parts: macro, meso and micro theories. The macro theory looks towards works of three urbanists to define general principles in the understanding and designing of good urban environments. The principles of the 2055 Vision developed by the City of Tshwane is combined to form coherent urban design principles and a guideline to how Pretoria is expected to develop as a city of various nodes. The meso theory compares the heritage and conservation acts of South Africa and internationally, namely the Burra charter. The response to the architectural heritage derives from principles developed by F. Bollack and the social constructs are understood through an Emancipatory or critical realist philosophy to derive at a more appropriate social understanding of the causes of urban decay and vacancy faced in the precinct.

The micro theory looks towards regeneration as a social and spatial response. Using conservation principles adapted from Gawie Fagan, where the principles are used as a connection between the new and the existing.

Macro Theory:
During 2008 the Department of Works and City of Tshwane approved the Tshwane Inner City Development Framework and in 2013 the Tshwane Inner City Revitalisation Strategy was Launched, which included Vision 2055. Along with the initiative an Inner City Development by law was also put in place, namely the 'ito Sect 13 of Local Govt: Municipal Systems Act, 2000 and Sect 162 of the Constitution'. The acts purpose is to ensure the regeneration of the inner city through the formalisation of a Capital City Commission which would propose development guidelines, regulations, criteria and incentives to

promote sustainable investment in the Tshwane Inner City (Cot 2013). According to CoT (2013) City of Tshwane is a polycentric City that is made up of a number of nodes, where each possess a number of opportunities. The Tshwane Vision 2055 foresees a city as liveable, resilient and inclusive, where the urbanites can all enjoy access to social and economic opportunities equally (CoT 2013).

The envisioned liveable environments will be established through principles namely: compact urban form, encouragement of diversity in residents, promotion of public, bicycle and pedestrian transport, better suited public and spatial infrastructure through restructured urban design strategies. Ten principles for designing for urban environments are proposed. The proposed principles, a summarization of strategies from Responsive Environments by L. Bentley, Cities for People by J. Gehl and Creating Vibrant Urban Places to Live by D. Dewar.

01 Richness refers to the the legibility and sense of the space of the city at eye level.

02 Intensity of program along a 100m distance (Narrow units but many doors).

03 Creating opportunity for Personalisation of edge conditions and spaces as people value places more when they feel they can make it their own.

04 The Walkable city, where public space is pedestrian centred within a 1 km range.

05 Diversity in Sharing functions takes pressure off individual dwellings and creates locational diversity and a social sustainability.

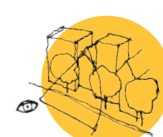
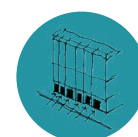
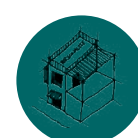
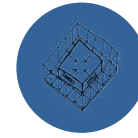
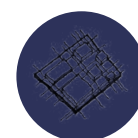
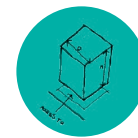
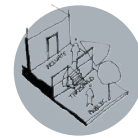
06 Variation and Integration creates multifunctional space that attracts more users and creates a local synergy by mixing and overlapping activities.

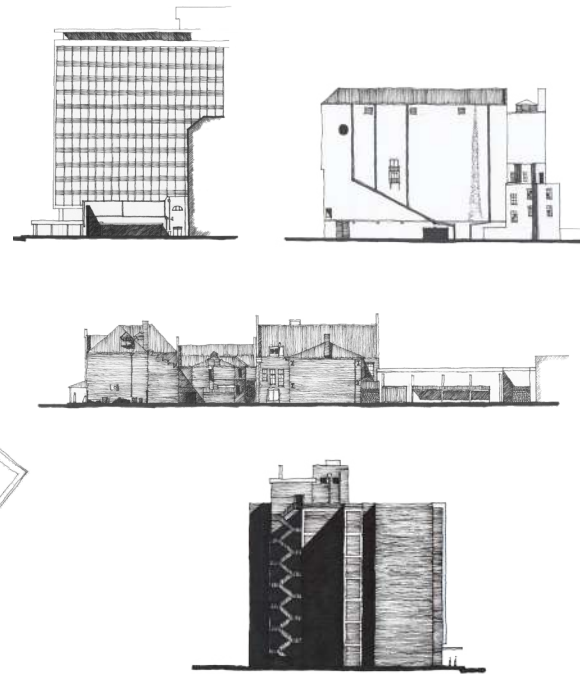
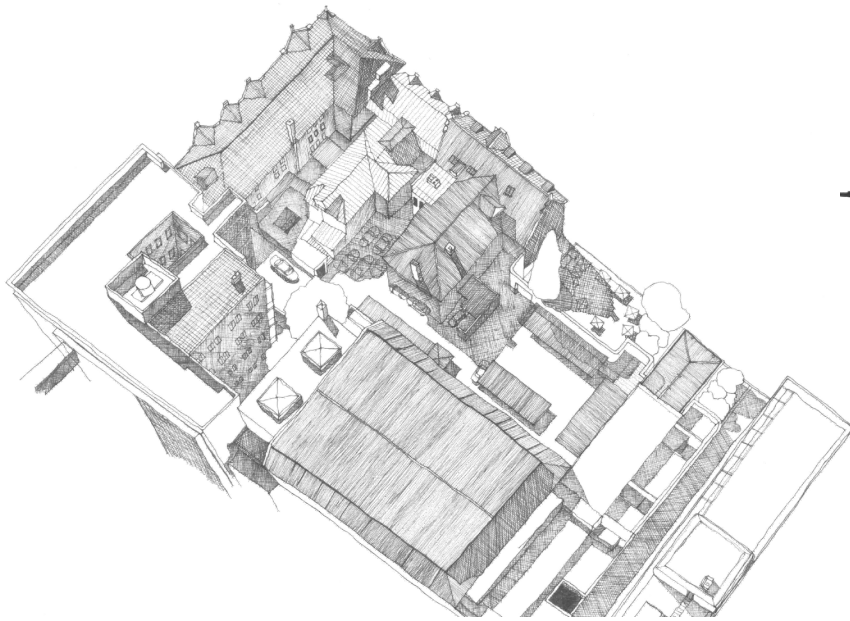
07 Robustness through creating spaces that are flexible for various purposes (creating urban qualities).

08 Continuity of the urban fabric, residential fabric above and defined by enclosed streets and public squares towards a legible urban layout.

09 The Human Scale along the urban edge to create a closer relationship between building and user.

10 Public-Private Threshold that distinguish spaces for the inhabitant and the passer-by, however still connected visually.





Meso Theory

Heritage within architectural terms refers to the conservation and preservation of buildings, structures and urban fabrics that are considered historically significant in various ways. According to McCarthy (2012: 625) architectural heritage is a wide category which can include building facades, finishes, proportions, and spatial arrangements, the former floor plan of a demolished building, or the reconstruction of demolished buildings, the relocation and the adaptive re-use of a heritage building. The various methods all reflecting values of heritage for different communities.

However, for all the tangible there are also the intangible heritage values within the urban fabric, which need to be considered and protected (McCarthy 2012: 625,629). The tangible provides a physical representation of those things from 'the past' that speak to a sense of place and self in a community (Smith 2006:30). The intangible defined as the lived experiences of built heritage expressed in performances of language, dance, oral histories and other forms, all within elements of emotion, memory and cultural knowledge and experiences not expressed in the built form (Smith 2006:56).

According to Smith (2006:57) as the intangible becomes more defined in heritage values, critical interest

in memory has increased substantially within the social sciences and various groups have started questioning the importance of culture placed on specific heritage sites, mainly how is it culturally important if it only refers to another's culture.

Heritage management strategies in South Africa are considered in terms of the National Heritage Resource Act (NHRA 1999) and the Australian Burra Charter. The Burra Charter was adopted by the NHRA for its applicable conservation principles in regeneration and alteration, which is not covered by the NHRA (SAIA 2015). According to the Burra Charter (ICOMOS Australia 2013), adaptation may involve additions to the place, the introduction of new services, or a new use, or changes to safeguard the place without affecting the cultural significance of the place. National Heritage Resources Act In regards to national heritage legislation and regulations in South Africa, the SAIA (2015) states the South African Heritage Resources Agency (SAHRA) as a statutory organisation who's objective is to co-ordinate the identification and management of the national estate, established in terms of the National Heritage Resources Act (No 25 of 1999) as the national body responsible for the protection of South Africa's cultural heritage resources (NHRA 1999).

Burra Charter

The Burra Charter was adopted by the NHRA (1999) and provides guidance for the conservation and management

of places of cultural significance, where the subject of Australian heritage is adapted towards South African heritage. The Burra Charter (2013) advocates a cautious approach to change: make the place useable, change as little as possible and ensure the cultural significance is retained. The charters conservation principles can be categorised into

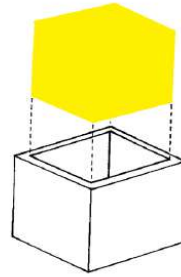
- Preservation: maintaining a place in its existing state.
- Restoration: returning a place to its true former state without introducing new material.
- Reconstruction: returning a place to its former state, however distinguishing the former with the introduction of new material.
- Adaptation: changing a place to suit the existing use or a proposed use.

Adaptive Re-use:

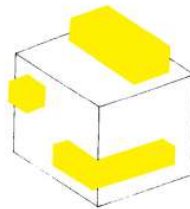
Rapid population growth, climate change and limited resources have affected the way cities are being developed, making the need for regenerative strategies in the existing architectural fabric more pertinent. Architects need to make critical decisions within cities, considering areas of neglect, vacancy and decay as opportunities for adaptive reuse of the existing or activating the in-between. Consideration should be given to historical contexts in reserving the cultural significance through appropriate regenerative strategies. Bollack (2013) classifies five architectural strategies for responding to the existing fabric, in her book titled 'Old buildings New Forms'. The strategies are insertions, parasite,

wraps, juxtapositions, and weavings.

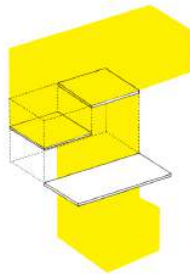
01 Insertion refers to the new placed within the existing (Bollack 2013:23). The insertion using the existing (place of memories) as shelter while still retaining its own identity, creating a co-dependence between the old and the new.



02 Parasite interventions are described by Bollack (2013:65) as the new latching onto the existing, reliant on the original structure as support and its existing systems. The parasitic providing new function and additional space, and always reliant on the original built fabric. The new distinguished from the existing in its form, material and colour (Bollack 2013:65).



03 Wraps is described as a new mantle that wraps to the existing (Bollack 2013: 113). The new intervention provides the existing with shelter and protection, however the new might render the existing obsolete as it removes the original intention of the building. The new, however, can create new spaces that incorporate the existing through the 'in-between' (2013: 113).



04 Bollack (2013:141) describes to juxtapose an addition against the existing fabric is to refrain from engaging with the old. There is no blurring of boundaries or transfer in architectural language or elements, no direct dialogue or articulated relation to the original. The new and existing sharing the same programmatic function, however completely distinguishable in structure, materiality and colour forming its own identity (Bollack 2013:141).

05 Weaving the new into the existing built fabric, Bollack (2013:179) describes an inseparable relationship between the new and the existing. A knitted fabric produced from the modified, altered, and actively reused through ensuing an interconnectedness.

The architect and owner reclaim the hidden value of the old building and re-present it as a living contemporary object, using it in the present and ensuring its long-term preservation (Bollack 2013:23).

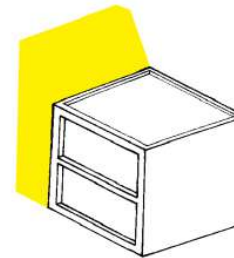
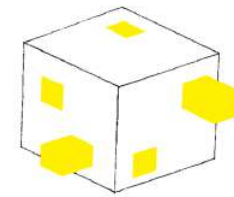


Fig. 21. Opposite Left; Adaptive Reuse Principles (Author 2020).

Fig. 22. Top Right; Existing Heritage Fabric (Author 2020).

Micro Theory

As our cities densify and the needs for resources increase, it becomes more crucial to reconsider the existing built fabric. This calls for an increase in attention of the conservation practices of heritage artefacts to ensure the physical but also 'cultural significance' or 'spirit of the place' is not negatively impacted (McCarthy 2012). Analysing the historical context and the approach to formulating strategies is guided by the ten conservation principles entitled "Learning from the Vernacular" developed by Gabriel (Gawie) Fagan.

The South African graduated as architect from the Pretoria University in December of 1951, missing the purely orthodox Modern Movement and receiving an education that focused on the practical aspects of Modernist architecture, in a regionalist sense, but still relevant in the ways of creating functional and technologically appropriate architecture (Barker 2015: 74). Fagan's education was more focused on regional architecture that involved responses to the climatic conditions and the use of materials found within the context.

Through years of practice, Fagan's search for an authentic South African regionalist architecture was inspired in most part by the Mediterranean vernacular and the vernaculars of Cape-Dutch architecture (Barker 2015: 74). As Fagan matured in his architectural experience of the Cape Vernacular, common characteristics in his work arose as types of efficiency: the use of space, minimization of structure and material; and responding to climate (Barker 2015: 79). Fagan balances the practical with a spiritual essence of place in the experiential qualities of the building (Barker 2015: 79) contrasting old techniques of making with new technologies.

In 1996 Fagan listed the ten principles of the built heritage in a lecture. Barker (2014) states the principles as a realization of years of experience in conservation practice, focused on the making of a new form through responses to program and context. The principles still reinforcing the vernacular of the context as the source of design inspiration (Barker 2014). Fagan formalised his "lessons of the vernacular" as conservative and interpretive principles for responding

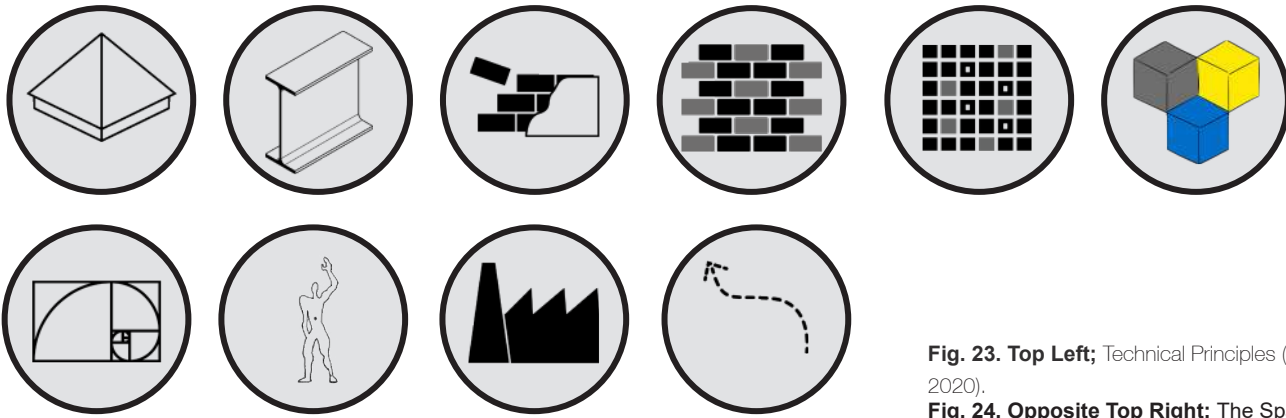


Fig. 23. Top Left; Technical Principles (Author 2020).

Fig. 24. Opposite Top Right; The Space Between (Author 2020).

Fig. 25. Opposite Bottom Right; Densification as Infill (Author 2020).

to the vernacular and meeting the needs of the modern man and new technologies.

01 Simplicity of Cape vernacular traditions as a common sense building approach. Problems associated with climatic conditions and functional organization had to be solved practically and builders used what they had at hand, adopting an inventive approach (Barker 2014:6) and economy of means, doing the most with the least.

02 Structural integrity and honesty referring to the structural elements that are minimised through the use of short spans, all materials are expressed in their original state and junctions are clearly articulated in simple ways (Barker 2014:7).

03 Plasticity or Modelling referring to the soft moulding of plaster, a technique used in Cape Dutch architecture. The plastic quality of the softly plastered lime washed walls defined by the effect of light on the surface (Barker 2014:8).

04 Appropriate and consistent detailing, but not standardised. Previous work is adjusted and made to suit the new condition. According to Barker (2014:12) Fagan uses a detail appropriate in its application, context and consistency in its execution, maintaining consistency of idea and intention from concept to detail (Barker 2014:12).

05 Unity in diversity of new interventions of a similar language but displaying its own 'place' and interpretations to avoid a repetitive

identity (Barker 2014:12).

06 Colour used to express different functions and elements of the architecture in a simple but respectful way (Barker 2014:13).

07 Proportion (Relation to the whole) in Cape Dutch buildings consisted of two systems: the concentric scheme or a system of squares and double squares. Fagan used the Hambidge system of proportions, where balance between the technique and the imagination are kept (Barker 2014:14).

08 Human scale refers to simply that. Fagan uses scale to establish a relationship between the building and its inhabitant (Barker 2014:16) The connection also established to the context through form manipulation, defining space, experiential circulation and detailing proportioned to the inhabitant.

09 Fagan explains relation to the environment, the sensitivity showed by early builders to landscape, as they were living so close to the natural world. According to Barker (2014:16) Fagan continued this tradition through building placement in accordance with the climatic conditions of the context, the views and natural light.

10 Fagan expresses the progression of experiences as the importance of the experience along each route within circulation Barker (2014:18).

Discussion and Findings

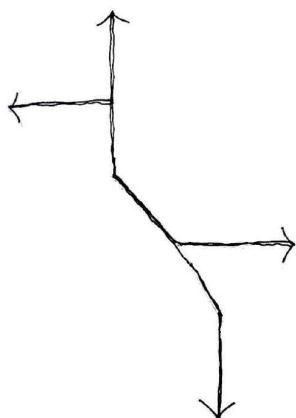
The case study reveals an intense historical context, one facing densification as a result of imminent population growth and ever limiting resources. The international examples

show cased both the results of working with the existing fabric or building over it either out of necessity, economic/ political gain or to erase a colonial past. The results of not working with the existing context, resulting in an identity that's environmentally, socially and spatially unsustainable (Jenks et al. 2000). Compaction of these cities are essential in resolving these conditions, however ambiguous compaction on its own could simply amplify these concerns or spur more. Compaction would need to include substantial restructuring and recognise the needs of the various social and cultural groups of a city. Directed residential infill, the primary form of compaction, needs to be enforced within this positive restructuring process and not applied without a consideration of the existing.

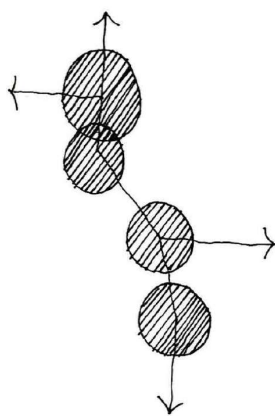
The theories in urban design and regenerative design strategies focus on not only preserving the existing architecture, but creating opportunity for reusing an already existing structure for a new purpose- a new identity. The urban, architectural and detailing theories all refer to the need for retaining and creating space that is suitable at a humanist scale. One that provides for the tangible and the intangible values, which can be described as the built form and the existing cultural values that are not evident in the architecture, but how the spaces are used. Therefore, when designing for densification the need for understanding the value of the existing (the tangible) and the intangible should be considered for preserving the past, but also preserving the already new identity (the intangible) that has grown from this existing.

Conclusion

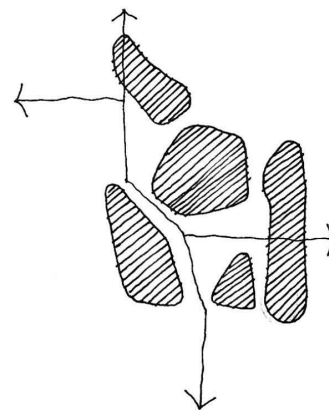
Applying the third element to the densification process allows for the preservation of the existing tangible and intangible values to avoid a monotonous built fabric and build on an existing social identity that would ensure community and ownership. The practical necessities of densification providing an intensity and diversity in culture, spaces and the formation of new spaces previously considered undesirable. These spaces, forming the in-between become the connecting factor in the disconnected city, connecting both the physical and the abstract environment. Thus the success of densification and compaction relies on strategies of infill that consider the social, spatial, sustainability and heritage of existing communities in the city.



Movement Corridor



Nodal Points Along Corridor



Infill and Compaction along the corridor and Nodal Points.

References

- Barker, A. (2014) Gabriël (Gawie) Fagan: the genesis and development of a new Cape vernacular. *VASSA Journal*, ISSN 1562-5257, number 29, 2014: 1-20.
- Barker, A. (2015) "A Mediated Modern Movement: Le Corbusier, South Africa and Gabriel Fagan," *South African Journal of Art History*, 30(4), pp. 69–89.
- Bentley, I. (1985) *Responsive environments: a manual for designers*. London: Architectural Press.
- Bollack Françoise Astorg (2013) *Old buildings, new forms: new directions in architectural transformations*. New York: Monacelli Press.
- Boyko, C. T. and Cooper, R. (2011) "Clarifying and Re-Conceptualising Density," *Progress in Planning*, 76(1), pp. 1–61.
- Chan, Y.-K. (1999) "Density, Crowding, and Factors Intervening in Their Relationship: Evidence from a Hyper-Dense Metropolis," 48(1), pp. 103–124.
- City of Tshwane. (2013) *Tshwane vision 2055 Remaking South Africa's Capital City*. Pretoria. City of Tshwane.
- Cox, W. (2012) *The Evolving Urban Form: Ho Chi Minh City (Saigon)* | *Newgeography.com*. <https://www.newgeography.com/content/002738-the-evolving-urban-form-ho-chi-minh-city-saigon> 16 August 2020.
- Christine McCarthy (2012) Re-thinking threats to architectural heritage. *International Journal of Heritage Studies*, 18:6, 624-636, DOI: 10.1080/13527258.2011.608373
- Dewar, D. and Uytendogaardt, R. S. (1995) *Creating vibrant urban places to live: a primer*. Cape Town: publisher not identified.
- Falco, E., Zambrano-Verratti Jesús and Kleinhans, R. J. (2019) "Web-Based Participatory Mapping in Informal Settlements: The Slums of Caracas, Venezuela," *Habitat International*, 94.
- Fourchard, L. (2011) Lagos, Koolhaas and Partisan Politics in Nigeria: Lagos, Koolhaas and Partisan Politics in Nigeria, *International Journal of Urban and Regional Research*, 35(1), pp. 40–56. doi: 10.1111/j.1468-2427.2010.00938.x.
- Gehl, J. (2010) *Cities for people*. Washington, DC: Island Press.
- Harper, C. (2019) "Density: Objective Measure or Critical Tool of the Neoliberal Agenda?" 2019(24), pp. 31–54.
- Habraken, N. J. and Teicher, J. (1998) *The Structure of the Ordinary: Form and Control in the Built Environment*. Cambridge, Mass.: MIT Press.
- Jenks, M. and Burgess, R. (eds) (2000) *Compact Cities: Sustainable Urban Forms for Developing Countries*. London: E. & F.N. Spon.
- Koolhaas, R. et al. (2000) *Mutations: rem koolhaas, harvard project on the city, stefano boeri, multiplicity, sanford kwinter, nadia tazi, hans ulrich obrist*. Barcelona: ACTAR.
- Lam, B. 2018. *Boxed in: Life Inside the 'Coffin Cubicles' of Hong Kong—in pictures*. *The Guardian*.
- LSE Cities. (2012). *Residential density, Hong Kong* <https://www.lse.ac.uk/cities/urban-age> accessed 18th July 2020.
- Mukeku, J. (2018) Urban Slum Morphology and Socio-Economic Analogies: A Case Study of Kibera Slum, Nairobi, Kenya, *Urbanisation*, 3(1), pp. 17–32. doi: 10.1177/2455747118790581.
- Nguyen, T. B. et al. (2016) "Saigon-Ho Chi Minh City," *Cities*, 50, pp. 16–27. doi: 10.1016/j.cities.2015.08.007.
- Nowek, A. (2012). *Hyperdense: High-Density Residential Architecture in Hong Kong*. *TheProtoCity.com*. <http://theprotocity.com/hyperdense-high-density-residential-architecture-in-hong-kong/> 16 August 2020.

Roberts, D. 2019. Barcelona, Spain, urban planning: a city's vision to dig out from cars - Vox. <https://www.vox.com/energy-and-environment/2019/4/8/18273893/barcelona-spain-urban-planning-cars> [Accessed:12 March 2020].

Roberts, D. 2019. Barcelona's remarkable history of rebirth and transformation. Vox. <https://www.vox.com/energy-and-environment/2019/4/8/18266760/barcelona-spain-urban-planning-history> [Accessed:12 March 2020].

Sinclair, D.B.R. & Tsang, D. (2019). The Slums of Hong Kong: Towards a Dignified Living for the Working Poor in Sham Shui Po District. https://www.academia.edu/40032088/The_Slums_of_Hong_Kong_Towards_a_Dignified_Living_for_the_Working_Poor_in_Sham_Shui_Po_District 16 August 2020.

Taylor, K., St. Clair, A. and Mitchell, N. (2015) *Conserving cultural landscapes: challenges and new directions*. New York: Routledge (Routledge studies in heritage, 7).

Tian, T. (2013) Informal vertical communities: Torre David in Caracas, Venezuela. *Landscape Architecture Frontiers*, vol. 1, no. 2, p. 96+. Gale Academic OneFile, <https://go.gale.com/ps/anonymous?id=GALE%7CA459894925&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=20955405&p=AONE&sw=w> Accessed 16 Aug. 2020

Turok, I. (2016) "Housing and the Urban Premium," *Habitat International: Part 3*, 54, pp. 234–240. doi: 10.1016/j.habitatint.2015.11.019.

Turok, I. and Parnell, S. (2009) "Reshaping Cities, Rebuilding Nations: The Role of National Urban Policies," *Urban Forum*, 20(2), pp. 157–174.

World Population Review. (2020) "World Population Review" Accessed: 03/23/2020 <https://worldpopulationreview.com/>



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