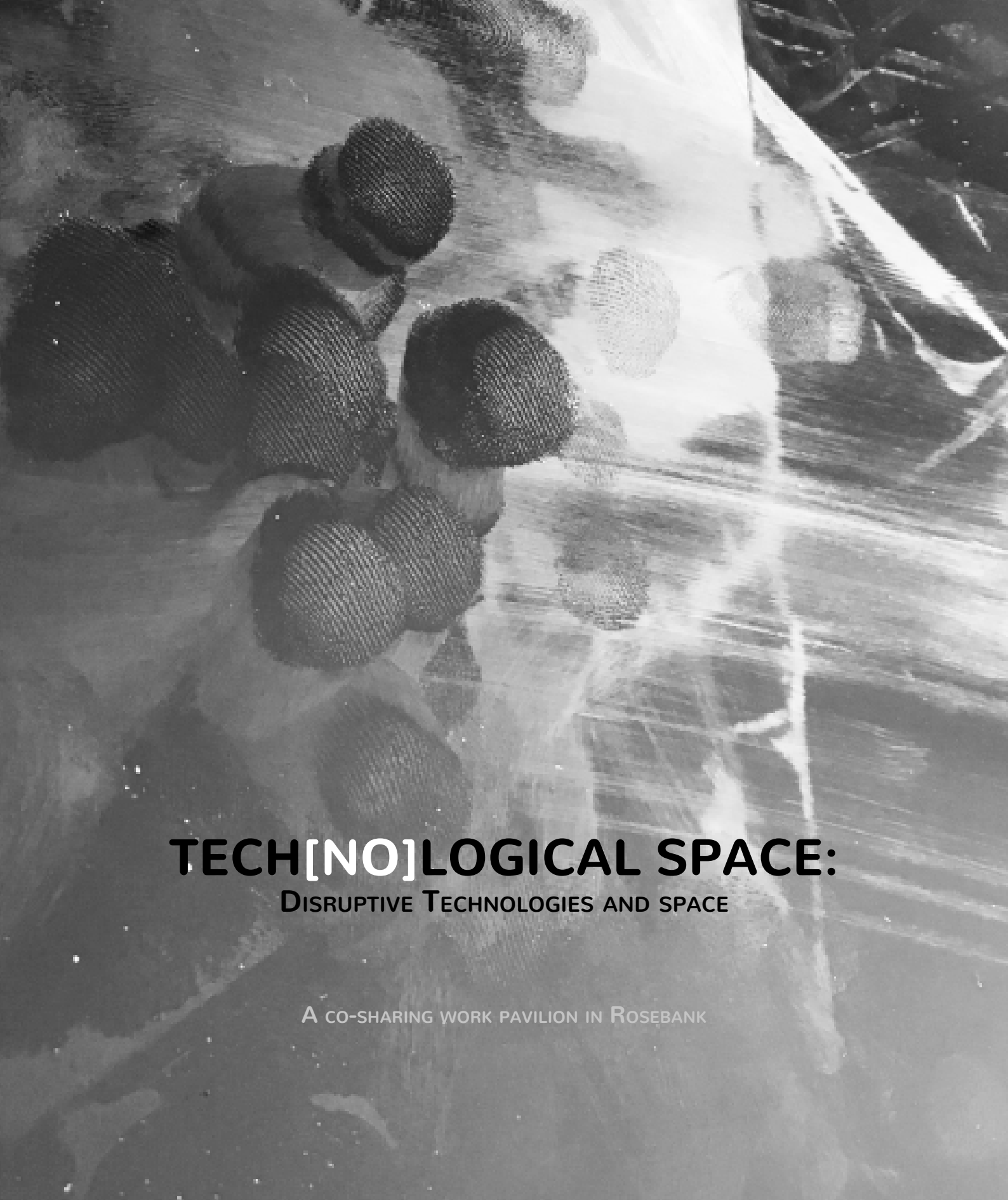




TECH[NO]LOGICAL SPACE:

DISRUPTIVE TECHNOLOGIES AND SPACE

A CO-SHARING WORK PAVILION IN ROSEBANK

DECLARATION

Stephanie Greenberg (601795) am a student registered for the degree of Masters of Architecture Professional in the academic year 2018.

I hereby declare the following:

I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.

I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.

I have followed the required conventions in referencing the thoughts and ideas of others.

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Signature: SN Greenberg Date: 01/10/2018

This document is submitted in partial fulfilment for the degree: Master of Architecture (Professional) at the University of the Witwatersrand, Johannesburg, South Africa, 2018.

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LIST OF TERMS

Augmented Age - The period in which the information, derived from the Digital Age, is applied directly into technology, resulting in self-learning machines and systems.

Artificial Intelligence - The broad term used to denote the theory and development of computer systems able to perform tasks usually requiring human intelligence. The processes mainly include learning, reasoning, and self-correction. The term is general, referring to all three types of Artificial Intelligence: Artificial General Intelligence, Artificial Narrow Intelligence, and Artificial Super Intelligence.

Artificial General Intelligence - A machine or system that possesses generalized human cognitive abilities and general experiential understanding of its environments - A self-learning machine. Also known as strong Artificial Intelligence.

Artificial Narrow Intelligence - A system programmed to perform a single task and works within a limited context. Also referred to as weak Artificial Intelligence.

Augmented Reality - Technology that overlays a computer-generated image on an observer's view of the physical world - creating a digital perception of space.

Autonomous Vehicle - A car that uses a combination of sensors, cameras, radar, and artificial intelligence to travel between destinations without a human operator.

Biophilic - A hypothetical human tendency to interact or be closely associated with nature.

Cognition - The mental process of collecting and organizing data through thought, experience, and the senses.

Computer-aided Design - The design process defined by a computational input. A method that uses a computer system to assist in the generation, modification, analysis, or optimization of a design

Co-sharing - The collective use and distribution of resources as part of a community network.

Digital Age - Also referred to as the information age, denotes the era in which information was circulated, stored and retrieved at an accelerated rate - often through the use of computer technology.

Disruption - The alteration or disturbance of normative practices and perceptions

* The term descriptions indicated in bold have been generated for the purpose of identifying particular spatial, theoretical and programmatic elements of this discourse

Disruptive Technology - A product that displaces existing technology and alters old practices, for future needs.

Dynamism - A spatial strategy that utilizes space to create opportunities for social interaction

Enabling/ Enablement - A term used in this project to denote the complete acceptance and societal adaptation of changes imposed by technology.

Generative Design - An iterative design process, that uses algorithms and data input to explore permutations of a solution, quickly generating design alternatives.

Gigging - A way of working that is based on the independent worker. Work is often short-term, or temporary jobs and business through online intermediaries.

Nature - A method used to restore the diminished relationships and adverse changes caused by technology.

Singularity - A simple delineation of this term is the point in time in which ordinary human intelligence is enhanced or overtaken by artificial intelligence.

Superimposition - A spatial strategy that uses the layering of new and existing systems.

Time-space Compression - A theory articulated by David Harvey used to refer to any phenomenon that alters the qualities of and the relationship between space and time. Often a result of technological innovations that condense or elide spatial and temporal distances.

Technological Innovations - A new invention or the progression of a product derived from research developments, technical advancements and knowledge.

Trace - A spatial strategy that uses the existing landscape as an informant.

Virtual - Refers to the abstract entity of space or environment translated through the application of digital technology.

WeWork - An American based company that provides a global network of shared workspaces, for the independent workers, start-ups, small businesses, and large enterprises.

* The term descriptions indicated in bold have been generated for the purpose of identifying particular spatial, theoretical and programmatic elements of this discourse

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INTRO

TECH[NO]LOGICAL SPACE: DISRUPTIVE TECHNOLOGIES AND SPACE

ABSTRACT

Technology has been an underpinning determinant that has perpetuated society's cycle of disruption, disrupting the typical logic surrounding the use and perception of space. The reduction of physical spatial barriers, caused by the full enablement of digital culture and technology, has diminished both physical and social interactions. This has resulted in local fragmentation and a global connection. It has also caused acceleration in the temporal dimension, resulting in a 'sped-up' lifestyle. These forms of acceleration and propagation of the virtual realm have not only compressed the time in which we perceive reality but have also disrupted society's normative understanding of space. This new propagation of space, along with the advancement of disruptive technology, has propelled architecture into a new realm of experimentalism; thereby, advocating for the enablement and translation of the disruption caused by both digital and augmented culture into architecture.

Situated in and focusing on Rosebank, this thesis will explore architecture's role as a mediator for disruptive technologies. The building will respond to the spatial transformation and societal disconnection created by 'disruptive' technologies through the utilisation of nature and the transformation of speculated 'left-over-space'.

Thus, through the demolition and design intervention of an existing parking structure, it will propose a co-sharing work pavilion. The design intends to facilitate the socialisation and collaboration of the mobile workforce with the natural environment. Through the emphasis of the natural world, the social world and the human body, the building will explore new spatial perceptions. These perceptions will no longer be centred around the physical aspect of space, but instead on human experience.

Society's complete immersion of technology into everyday practice, has made its implications unavoidable. Therefore, it is continuously changing the way society interacts with each other, nature and the built environments. The pervasive nature of technology encourages architects to start designing in anticipation of the future. As a platform for the disruption caused by technological innovation, the design and discourse act as respondents and enablers of technology. They also use nature as a method to disturb the disruption caused by technological innovation - through its ability to restore diminished relationships between society, nature and technology. This, therefore, speculates on an alternative environment and future for architecture in the workforce and, to a greater extent, society.

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PROBLEM STATEMENT

Digital culture presents society with a new perception of space through the virtual realm and the physical world – denoting the direct relationship between technology and space. Therefore, as today's technology differs significantly from the technological world derived from the past, the same can be speculated about space. Thus, with technology's complete diffusion into our everyday lives and into the architectural practice, this new spatial organisation needs to be comprehended to anticipate and understand the disruption imposed by technological innovation. This will result in architecture that reflects both the needs of society and technology; thus, bringing about the issue of understanding how, at present, society is using space.

AIMS AND OBJECTIVES

The aims and objectives for this research are to understand the implications of technology on architecture and to a greater extent society, with the intent of deriving an architectural solution. Through speculative design, it will reflect on the changes and adaptations derived from disruptive technologies, denoting their impact on the way people live, work and interact. It aims to discover and understand the new demands placed not only on society but also on architecture and design. By accepting technology as a perpetual variable, the purpose of this project will be to determine and explore strategies derived from aspects of smart structures and experience design to develop a building that can spatially and architecturally reflect the new requirements of a technological society.

METHODOLOGY

Design is based on the observation and understanding of the world around us and by practising it, we endeavour to articulate our needs, desires and expectations. The problem arises when we want to expand the horizon of our observation to identify emergent themes. With speculative design re-thinking the dialogue between new technological realities and new social relations, it becomes a useful strategy for researching the 'space' that lies beyond the 'current' and the 'now'. This, in turn, makes it a prevalent approach for the underpinning of this thesis.

The speculative process can be split into three steps. The first is critical design research. This is where information is collected. The next stage is the exploration and evaluation of ideas and concepts to derive at the final stage where a final form can be presented. The research is divided into two sections to represent this process, as discussed hereafter.

The first section of this document pertains to research and contains three chapters, namely Disruptive Technology, Experience Design, and Smart Structures. These chapters used methods of content analysis, field analysis, interviewing and observational study. In these chapters, literature reviews were used to analyse the impact of technology on the built environments and the new approach to spatial use. The first part of the document necessitated the researcher to engage with the public, both through interviews and spatial observations. Interviews were conducted between two individuals who specialised in developing solutions for technological changes - one dedicated to mobility while the other specialised in office development. The interviews were performed on a one-to-one basis, where both audio recordings and notes were taken. To protect the anonymity of the participants, their names are not revealed. They are identified in this research as Interviewee A and Interviewee B. The second part of engaging with the public resulted in the observation

of public spaces; public spaces that have responded to the technological changes and needs derived by the mobile worker. Therefore, the researcher visited several coffee shops and libraries, where sketches and photographs were used to spatially analyse the way in which society engaged with these spaces. The photos were edited to ensure facial recognition would not be possible, and the names of the places are referred to by a letter, i.e., Coffee Shop A. This provides an extra level of privacy for both the company and the users. The rest of the information collected for the first section comprised of literature reviews from books and online sources, podcasts as well as videos used to access Ted Talks.

The second section focuses on design by using different strategies, through site analysis, precedent analysis and design exploration. The site analysis was conducted via two approaches. The first was physically going to the specific site and documenting it through photos and sketches. The second was using the urban framework and literature to gain a greater understanding of the existing context. This also involved collecting documents of the existing parking garage, which was redrawn and adapted for later use. Another method that was utilised in this project was the generative design. A generative design process was used for two reasons: the first was to use a program called Inspire that analysed the existing structure. It generated options for massing optimisation (grid-strategy). The second form of generative design was an energy simulation using Ecotect. The program creates a simulation of the existing site to allow for an understanding of design choices to reflect a more sustainable design approach. All of these methods used sketches, diagrams and models as a continuous method to arrive at a final form.

FRAMEWORK

Themes:

- Disruptive Technology
- Experience Design
- Smart Structures.

Disruptive technology

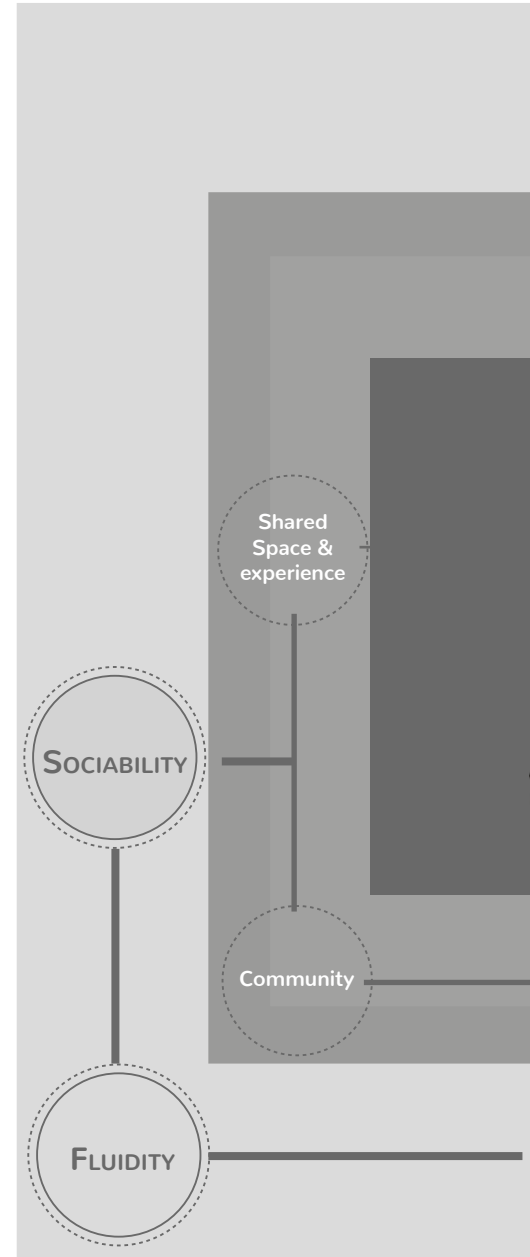
This theme focuses on technology's current and future implications on the world and to a greater extent design. The research used technologies from both the Digital Age and the Augmented Age. Technology from the Digital Age was outlined by the mobile Internet and Cloud, while the Augmented Age focused on the automation of work and advanced robotics and Autonomous Vehicles.

Experience design

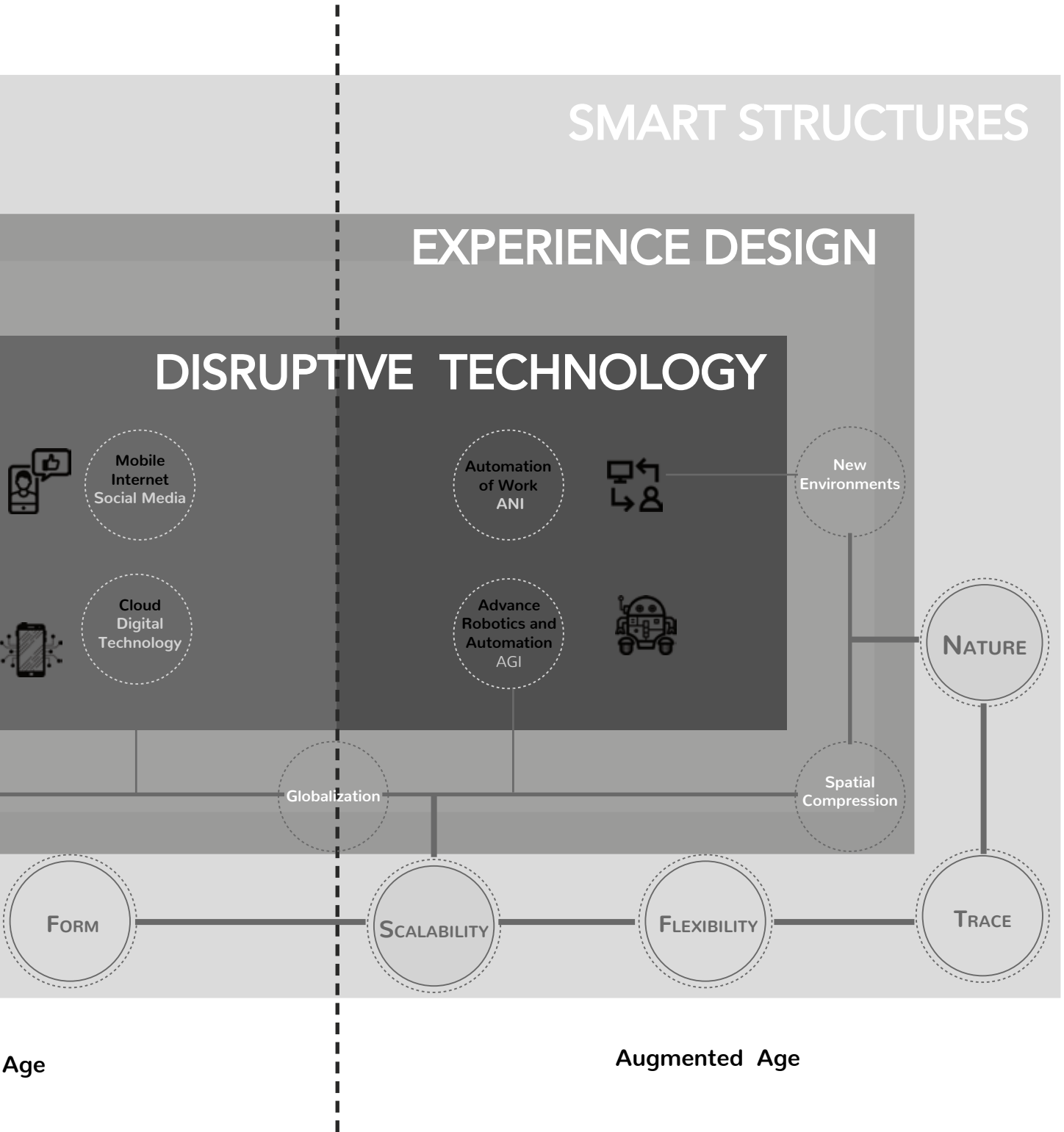
Experience design explores the current spatial and behavioural implications of disruptive technology. Concepts derived from its exploration were based on technological adaptations outlined by disruptive technology and theorised by Time-space compression. The behavioural adaptations were based on globalisation and its impact on community and experience, while the spatial implications were derived from demands for new environments and spatial compression.

Smart structures

This final theme focused on principles used to restore the negative adaptations outlined by disruptive technology. This relates to the disconnection with nature and the lack of physical social interaction. Principles were derived from spatial cognition and allow for a new experience of design. They include sociability, scalability and nature. This theme then utilises spatial strategies as a method to derive various design principles.



Digital



01

THEORY

ESSAY STRUCTURE

Theoretical discourse is structured into three parts:

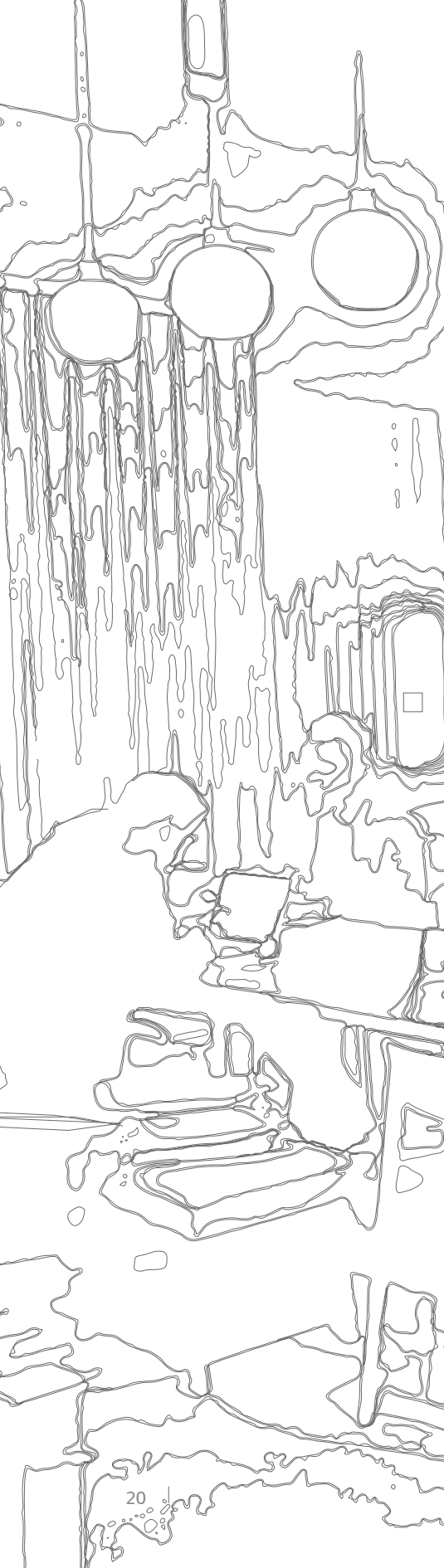
Chapter One the present context and future implications of technology on society and architecture.

Chapter Two analyses the current spatial implications and strategies implored as a response to architectural innovation

Chapter Three outlines the projective outcome of technology's impact on architecture through design applications and spatial strategies.

CHAPTER

DISRUPTIVE TECHNOLOGIES



History is a visible indicator that technology is undeniably disruptive to the way we live, work and interact. Since the coming of the Machine Age, society has been continuously impacted by the implementation of newer technologies. These innovations, throughout history, have been met with some resistance by people known as Luddites¹ and Neo-Luddites (present-day term). Despite their attempts to stop the perpetual cycle of disruption, they have failed at every turn. This failure can be attributed to technology's diffusion into everyday life and its aptitude for global interconnection, thereby accelerating technology's distribution cycle and compressing its adaptation cycle. At present, society is being shaped and challenged with disruptive technologies at a faster rate than ever experienced before. Not only has it created a shift into a new age but it has also impacted society's interaction with the built environments, nature and their cognition of space (King et al., 2016).

'Disruptive technology' is a term that was first popularised by Clayton Christensen² and is outlined as a product that replaces established technology and alters old practices, for future needs (Christensen, 2003). For example, the personal computer replaced the typewriter and changed the way people work and communicate. Therefore, disruptive technology can be defined as a new or emerging technology that has the ability to alter the social or business landscape, thereby disrupting the status quo and changing societal values by altering the way people live, work and interact (Manyika et al., 2013).

Historically, the invention of fire and the wheel can be viewed as disruptive innovations. However, most historians regard the steam engine as the first significant disruptive technology. Not only did it commence the ongoing 250-year cycle of disruption, but it also propagated the Industrial Revolution - resulting in global mass production. This disruptive technology not only changed the built environments regarding the implementation of new materials like glass and steel but also introduced Fordism into society, thereby permanently altering the business and social landscape. This is because Fordism is subsequent to mass production that resulted in the implementation of minimum wage and the eight-hour workday. It denoted a significant social change: the distinction between work and play - time to earn sufficient income and time to consume mass-produced products (Harvey, 1990). The delineation between work and play has been integrated and transitioned into everyday life.

Although the Industrial Revolution was responsible for society's introduction to technology's ability to reshape the world, technology's disruptive implications have only recently been demonstrated; therefore, one needs to analyse the current disruptions caused by both digital and augmented technologies. To understand the behavioural and spatial shifts caused by emerging technology, this thesis will focus on four prominent disruptive technologies - identified by the McKinsey Global Institute report³, namely mobile Internet; Cloud; automation of knowledge work; advanced robotics and autonomous vehicles (Manyika et al., 2013).

¹ Luddite is a term originating from the industrial revolution used to describe someone with an adverse reaction to new technology

² Clayton Christensen is a professor at Harvard Business School. He is a renowned expert on innovation and idea regeneration.

³ The McKinsey Global Institute report identified twelve emerging technologies that have the potential to reshape the world in which we live and work. Ranked in magnitude of disruption the list includes: mobile Internet, automation of knowledge work, the Internet of things (IIOT), Cloud, advanced robotics, autonomous and near autonomous vehicles, next-generation genomics, energy storage, 3-D printing, advanced materials, advanced oil and gas exploration and recovery and renewable energy

Our language changes, our
behaviour change, but society
adapts to technology.

(King et al., 2016: 25).

SOCIAL MEDIA – SOCIAL ARCHITECTURE

Digital technologies transformed the circulation, storage, and retrieval of information into binary forms that translated onto a screen. This created a drastic change in the social cognition of space. For the first time, an abstract entity – Cyberspace – categorised by networks and fields was introduced to society. Cyberspace is a virtual space in which people transcend normal physical space, by entering into an almost limitless range of electronic environments; eliminating physical and spatial boundaries (Graham, 1995). These new environments also started to spatially **redefine traditional communities and public places**, where people would meet to exchange goods and ideas, into virtual communities – communities identified by Rheingold as the Electronic Agora⁴ (Rheingold, 1993). This not only started to shift society's interaction into the virtual realm but soon society's dialogue changed; words like 'Googling,' 'live streaming' and 'online' became part of everyday jargon. Adaptation occurred, the smartphone became a dependency to ensure a constant connection between the artificial and the real world could be established from any location (Crysler, Cairns and Heynen, 2013). This new dependency resulted in the mobile workforce while propagating a diminished relationship between individuals and nature. The transformations of society's comprehension of architecture, the built environment and to a greater extent society's behaviour can be examined through digital technologies' enablement of the mobile Internet, the smartphone and social media.

The smartphone is viewed as one of the devices that drastically changed personal communication and interaction within society. It is believed that within five years, 85% of the world will have a mobile device connected to the Internet (King et al., 2016). This dependency can easily be depicted by a millennial's constant connection to their smartphone. This behavioural shift has quickly become the norm and over time has collectively resulted in more significant changes in the way society works. Society's pattern of employment has not only shifted from the manufacturing sector to technology-driven and service-driven industries but also the ability to work remotely. This also means that there is no longer a clear distinction between the home and the work environment. The other notable societal change pre-empted by the smartphone is its ability to form

⁴ The agora is a public space derived from the ancient Greeks. It was the market place at the very centre of the ancient city, where public activities were focused

local and virtual communities, giving rise to 'Me-centred society'. Me-centred societies increase focus on personal growth, meaning that relationships are being formed through online communities and platforms like social media based on an individual's interest (Castells, 2018). Social media enables the juxtaposition of physical isolation with a virtual connection. Thus, people no longer need to leave their bedroom to interact with the outside world, attributing to 90% of people's time being spent inside environments constructed by man. This means that more than ever before, people are being shaped by their immediate surroundings (Goldhagen, 2017). With individuals spending more time indoors and connected to their screens, it has resulted in what Richard Louv defines as Nature Deficit Disorder⁵ - the alienation of the individual from nature. Consequently, contributing to the diminished use of the senses, attention difficulties, conditions of obesity and higher rates of physical and emotional illness within society (Louv, 2008). Mobile technology, with its global real-time communication, has made the world smaller and more social within the virtual realm. It has also resulted in individuals becoming more isolated and physically disconnected from not only the natural environment but also the urban landscape. It has also reduced the occurrence of face-to-face social interaction within the real world. This interconnectivity not only denotes the spatial and behavioural changes within society, but it also emphasises the relevance of nature in the current era. It, therefore, depicts an active link between **community, architecture and social media** – Social Architecture.

Architects don't make golden ages in architecture; people and patrons do. Social media has awoken the public's interest in architecture—and the timing could not be better. So find an Architect. Hire an Architect. Work with us to build better buildings, better cities and a better world — because the stakes are high. Buildings don't just represent our society they shape our society
(Kushner, 2018)

Through his analogy of the pendulum, Marc Kushner's⁶ Ted Talk illustrates the connection between the innovation of architecture and society. On the one side of the pendulum

is technological innovation and on the other is symbols - representing safe design, a design that society can historically identify. He argues that social media's ability to rapidly share information amongst communities and give instant feedback-loops has allowed for both sides of the pendulum to co-occur. Communication in real time will enable architects to create innovative buildings (symbols) that communities can quickly identify (Kushner, 2014). Robert Venturi's work summarises this notion. He regards media as a tool to circulate symbols to people and people through symbols, with the viewers' perception always being the constant variable (Crysler, Cairns and Heynen, 2013).

One of the significant influences conveyed by social media is the notion of **shared space and shared experience**. Through its collection of images and sharing of data, social media allows people to experience a building without ever having to enter it physically. This sentiment has resulted in a greater emphasis being placed on a buildings' overall experience and its form, thereby depicting society's new demand for architecture to be unique and particular to a specific place and time. Due to social media's public interface, it has taken away the need for privacy by advocating for transparency within architecture. This means that buildings are expected to have open floor plans and dynamic spaces that are multifunctional (Myers, 2018). Social media (in this instance) can be seen as a digital tool for architectural representation. Thus changing not only the way architecture is perceived and experienced but also impacting the architects' speed and approach to space. It has had a direct impact on the architectural design process as architects try to navigate between the real world and the virtual realm. This notion aligns with Gilles Deleuze's concept regarding virtuality; that architecture is the dynamic tension between the actual and the virtual (Crysler, Cairns and Heynen, 2013). As architecture rises to the challenge of offering physical space within the virtual world, architects also need to realise the dynamics of technological progress (Fiamma, 2003). Therefore, technological innovation regarding digital tools, media and its diffusion into the architectural process has resulted in a golden era of experimentalism (Kushner, 2018).

⁵ Nature deficit disorder is a term initially used by Richard Louv in his book "Last Child in the Woods" to describe the societal disconnect with nature.

⁶ Marc Kushner is a practicing architect at HWKN and the CEO of Architizer

DIGITAL TECHNOLOGY

Digital technology has reduced the world into a collection of disembodied data that can easily be manipulated within a virtual context, without the complexities generated by the real world. Through programmes and algorithms, digital technology is increasing the possibilities of architectural design as well as its production. Thus, it has allowed architects to explore form through abstract geometries with formal or diagrammatic characteristics. It has, therefore, taken architecture away from traditional Euclidean forms into forms of a more dynamic and parametric nature. A prime example is the building's envelope. The architectural envelope is being used as the dynamism of architectural space and expression of architectural intent due to its unlimited potential for a dynamic form (Fiamma, 2003). This new approach to the building's envelope and form can be attributed to the innovation of digital technology, regarding computational and virtual simulation as well as construction technology. Advancements in these fields have allowed for the unlimited possibility of form and better actualisation, resulting in a direct relationship between what is designed and what can be built. With an emphasis being placed on form over function, what is being constructed is a sculptural architecture that is devoid of substantial meaning and scale.

An even bigger problem is that these applied significations only represent ideas about something outside of the reality of the object. They are purely mental constructions. Their meanings have no grounding in material reality; hence they are superficial and unstable in nature. If these buildings can be considered to carry meanings, then the latter is embodied not in some cheap contextual metaphor, but in an aspiration for material progress.
(Griffiths, 2018)

Despite the quest for unique forms - sculptural architecture - resulting in a loss of significant meaning, Sean Griffith⁷ doesn't see this as a detriment to architecture; instead, he deems that it is taking away the obsession imposed

by fake meanings and emphasising the material conditions of society, reflecting a culture driven by technological innovation and **globalization**; thus arguing for architecture that once again reveals the political, technological and material culture of the present (Griffiths, 2018). This is evident by the fact that technology is making architects more environmentally and socially aware, moving away from the visible structure and focusing on invisible servicing systems. Ergo, environmental performance is taking priority over materiality and structure. Regardless of critics arguing in favour or against the impact of digital technology on architecture, regarding the loss of meaning, scale and structural significance, it hasn't stopped computer-aided design and digital tools being diffused entirely into the architectural process. With these tools becoming prevalent to advance the architectural field and reflect contemporary society, they are continuously being developed to allow for more data input and machine-based learning. Therefore, as society is shifting into the world of the Augmented Age, the architects' role in relation to the machine is starting to be questioned (Crysler, Cairns and Heynen, 2013).

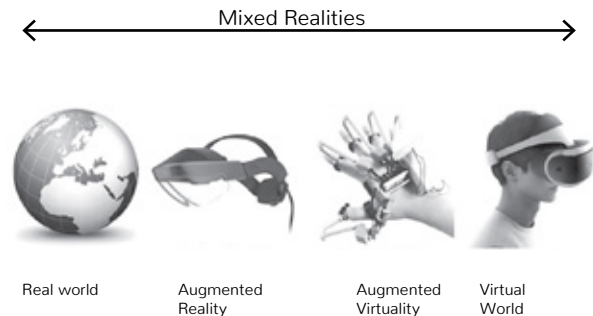


Figure 1.1 - Diagram of Realities Spectrum

⁷ Sean Griffiths is an artist, architect and academic who teaches at the University of Westminster

ARTIFICIAL NARROW INTELLIGENCE

The Augmented Age is characterised by the application of data collected from digital technology. Therefore, it is only natural that the principles (derived from the Digital Age) regarding public sharing, transparency and behaviour shift toward technological relevance, which has been enhanced within the current cycle of disruption. This transition into the Augmented Age, occurred primarily due to the constant innovation in the speed of micro-processing. This advancement allowed for the increase in data that could be circulated and stored, resulting in self-learning machines (Wood, 2018). At present, most of the Artificial Intelligence that society and architects have encountered, is considered to be Artificial Narrow Intelligence (ANI) also known as 'weak' intelligence. Artificial Narrow Intelligence outlined rudimentarily is a system that outperforms a human in a narrowly defined task through pre-programmed rules (Techopedia Inc, 2018). Constant innovation has allowed weak Artificial Intelligence to translate into our daily lives through wearables⁸, bioengineering and technology-led augmentation. Recent innovations like the Navida's microchip are shifting Artificial Intelligence - Artificial General Intelligence - into a deeper learning system that can adapt due to self-awareness (King et al., 2016). The experimentation and success of 'deeper-learning' Artificial Intelligence technologies, means society is reaching a point of singularity⁹.

... A future period during which the pace of technological change will be so rapid, its impact so deep, that human life will be irreversibly transformed. Although neither utopian nor dystopian, this epoch will transform the concepts that we rely on to give meaning to our lives, from our business models to the cycle of human life, including death itself.
(Kurzweil, 2005: 24)

Despite complete singularity being several decades away and Artificial General Intelligence a few years away, Artificial Narrow Intelligence has already been implemented into society. Its presence is exploding mainly within the design

field. With its implementation into design, commentators such as philosopher Nick Bostrom, believe that Artificial Intelligence will not only shape architectural design but also revolutionise all stages of the design process, thus, reflecting the augmented architect. This delineation of the future architect is reflected through generative design. Design software, like 'Dreamcatcher' ¹⁰, rely heavily on cloud computing to generate a series of optimal 3D design solutions - based on self-learning algorithm parameters (Wood, 2018). The forms generated are based on variables input by the architect into a computer and are often parametric. Design programmes are no longer just being used to derive form but are also exploring speculative and optimal design. Therefore, it is optimising environmental analysis, social interactions and spatial layouts (Simon, 2018). Tools such as Building Information Modelling (BIM) and Ecotect are allowing architects to tap into this data by simulating and evaluating site conditions with exact precision. This new approach to site analysis has resulted in the architect not having to physically engage with the site. Thus, practices aren't limited to their current location; instead one can take on projects abroad (Wood, 2018).

Similarly, wearables and apps are being used to collect information regarding social behaviour and interaction in real time. This means **new environments** will become more socially orientated whilst integrating the needs of the user. Even the construction industry, with innovations like computational architecture, is working with 'robotic craftsmen' to explore weak Artificial Intelligence in construction technology and fabrication. Exploration within the construction industry has allowed architecture to reach unimaginable forms, with an unseen level of detail while producing entirely new spatial sensations (Hansmeyer, 2018). It is evident that Artificial Narrow Intelligence is starting to impact all stages of the architectural process from site analysis, decision-making, to construction. Thus, as it transitions from weak to strong Artificial Intelligence, it is starting to alter the way we live, work and play.

⁸Wearables – Technology integrated into wearable garments or items

⁹Singularity is a point in time where technology will be smarter than human beings

¹⁰ A generative design tool designed by Michael Bergin

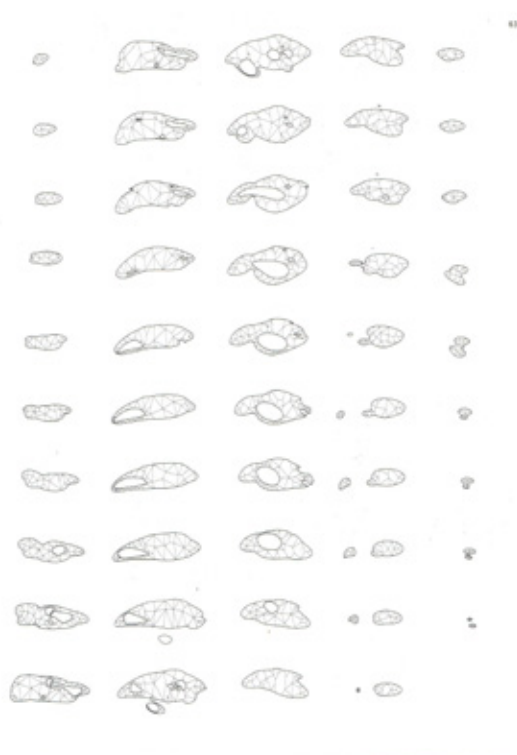


Figure 1.2 - Lars Spuybroek Illustration of Generative design process for Foam Home
Spuybroek, L. (2004). Nox. London: Thames & Hudson.

Unlike previous technologies, Artificial Intelligence will impact the service industry changing the nature of work. It is predicted that within the next decade, one in three jobs would be converted into either software, robots or smart machines, i.e. automated (Barajas and Barajas, 2018). The ongoing debate regarding man versus the machine has centralised around the question of anamorphic aesthetics and fear and their role in society. While this is a complicated dilemma, this issue falls outside the discourse of this thesis, but an aversion towards Artificial intelligence can be deduced. History has shown that despite this opposition towards it, technology will always prevail, making resistance futile. Hence, "...you'll be paid in the future based on how well you work with robots" (Kelly, 2018).

The implications of Artificial Narrow intelligence have been widely debated. Pessimists believe that automation will altogether replace the need for human occupation. Whereas, the optimists maintain that Artificial Intelligence will be used as a tool to assist with human occupation. Regardless of one's position, it is evident that this disruption will allow society to redefine their relationship with work for the first time since the Industrial Revolution. The introduction of automation will result in a generation driven by entrepreneurship and the ability to perform multiple tasks and careers at once. This shift is demonstrated by the large percentage of Generation Y opting for an alternative career path, like 'gigging' to counter the homogeneous 8-hour workday. This new approach to the working world has **compressed** the need for traditional office space and has spread work into the home, shared workspace and coffee shops (Corry, 2018). Weak Artificial Intelligence isn't only impacting the social aspects of society but is also changing the physical need for space and the cognition of space. These changes will only be enhanced by the implementation of Artificial General Intelligence.

ARTIFICIAL GENERAL INTELLIGENCE

A prominent manifestation of the industrial revolution was the automobile – a disruptive technology that made society car-centric. Prioritising the car over the pedestrian resulted in the reshaping of the urban landscape. The urban framework comprised of gridded streets, urban freeways and mandatory parking requirements and the proliferation of mobility caused by urban sprawl. With technological innovation advocating for an environment based on convenience and efficiency, it has allowed for urbanisation, thereby resulting in the reduction of open space and enhancing the separation between the individual and nature (Louv, 2008). Advancements in computer vision and machine learning have resulted in the development of the Autonomous Vehicle (AV). Thus, for the first time in centuries, innovation will start to question car-centralism resulting in a new urban landscape.

*If the 20th century was about cars giving us independence, the 21st will be about autonomous vehicles giving us independence from cars.
(Ju-tin Erlich¹¹ as cited in The Economist, 2018).*

As a prediction, let us imagine that it is 2030. To get to work, you take out your smartphone, programmed to request your automobile. The autonomous vehicle using its sensors, radars, and Lidars¹² will navigate its way to you and your work. After dropping you off, the car goes to collect other owners and drop them off at their destination. The car then makes its own decision to find a charging station and recharge for an hour. It negotiates a price for both the parking facility and the energy required to recharge. The supercharger is linked to the owners' wallets and paid for in kilowatt/hour. The automobile logs itself into a driver service similar to Uber renting out its services available for a given time until one of its owners requires its services again. This illustration by Brett King outlines the future of Autonomous Vehicles whilst highlighting the social, economic and environmental impact (King et al., 2016).

Today, this new paradigm of a shared economy

implemented by services like Uber is making architects reconsider the design of parking structures. The parking garage can be characterised as a massive concrete structure that monumentalises the vehicle. It disrupts the vibrancy of the street aesthetically and physically. Therefore, with the intent of autonomous vehicles forming part of the co-sharing economy it will reduce the number of cars on the road by a projected 60%. Not only do the projections show a decrease in volume but also in carbon emissions by up to 80% and road accidents and parking by up to 90%. Thus, depicting the transformation of the built environment physically, environmentally and socially. This means not only will there be a **reduction in the space** previously required for automobiles but also a pertinent change within the current urban landscape: land already given to vehicles will be put back into the landscape and ecological functions, resulting in more green spaces and biodiversity (The Economist, 2018). Although the reduction of space required is considered advantageous to the built environment, it also denotes the underutilisation of existing infrastructure. Therefore, with technological innovation increasing the longevity of architecture, it also makes architects more aware of designing for future implications. This notion can be expressed by LMN's proposal of a tower that is intended to withstand the next 50-100 years. Thus, with the advancements in transportation being actualised within the next few years, it has made architects rethink the design and the future utilisation of the parking structure (Overstreet, 2018).

¹¹ Ju-tin Erlich is Uber's head of policy for Autonomous Vehicles

¹² Lidar is a system that uses light pulses to create high-resolution 3D contextual mapping

The way that we will move in the future will be a shared vehicle. If you do use again, it'll be electric, it will be connected, it will be sustainable, and it will be autonomous.

(Interviewee A, 2018)

INTERVIEW A FINDINGS:

Technological innovation that occurs within a first world context has always been a point of contention regarding its implementation into a South African context. The cycle of adaptation is accelerating, however, some critics still believe the autonomous car is a distant reality for this country. After conducting interviews with Johannesburg-based energy and mobility experts, it became apparent that these experts shared an entirely different opinion. Based on their research and the statistics conducted by the International Energy Agency, they projected that Autonomous Vehicles will be globally implemented by 2030. It was also projected that Autonomous Vehicles will be introduced into a South African context as early as next year, with Jaguar having the first autonomous vehicles available; proving that the Autonomous Vehicle isn't as far a reality as some critics stipulate. Despite the evidence collected, it is important to comprehend it will be several years before Autonomous Vehicles becomes a viable option for public transport - i.e., fully implemented. Therefore, in response to the critics, Interviewee A had this to say: *Don't let anybody tell you that future is bleak or it is difficult, all that is nonsense. Opportunities are right here in Africa with South Africa being the leading technology hub of Africa.*

The current global population estimate for 2050 is expected to increase by 2.4 billion, with Africa comprising of 1.2 billion. With the significant increase in destiny, a change will be required to suit the existing infrastructure. Therefore, it suggests a shift from the use of individually-owned cars to a shared platform - public transport. The shared vehicle will align with a similar approach to the current system used by Uber. With statistics denoting that millennials are relinquishing the need for ownership, it is validating the demand for shared cars within the current context. The use of public transport reduces the amount of energy and carbon emissions emitted while reducing the amount of space needed for vehicles, as cars require space for both parking and driving areas, resulting in large amounts of underutilised space. Another reason in favour of this shift is to reduce the amount of time people waste sitting in traffic. This can be explained by observing the traffic in the streets of Cape Town. Statistics depict the average speed of a

car during peak hours is 20 km/h; therefore, people on average sit in traffic for at least two hours a day. Despite emphasis being placed on the motor vehicle, mobility isn't just about the car. Due to urban sprawl, cities were designed to focus on car-centralism. With advancements in technology, experts are challenging this notion, redefining mobility for the pedestrian. Movement within a city occurs because people want to be connected. Hence, when you start thinking about a modern city, you need to start thinking about the people and how they interact and connect. Some believe the solution is to move transportation into the air. This could be achieved by using a freight-system, thus, opening up the ground plane entirely to the pedestrian. Other experts feel streets need to change their material treatment to create a slower pace. Despite the different approaches, it is evident experts are in favour of re-prioritising the ground plane for the pedestrian. Thus, experts predict a future where electric cars and autonomous vehicles are the societal norms, advocating for more public and urbanised spaces.

For people still not convinced by this argument, a scenario can be considered: China, Japan and India all committed to going autonomous by 2030. This means that roughly half the world's population will no longer sell or make internal combustion engine vehicles. This will create a ripple effect causing America, Canada, England, and Europe follow suit. Therefore, with all these countries making changes and no longer using cars that require oil, it is unlikely that oil and petrol will be produced solely for South Africa. Therefore, with a high rate of poverty, South Africa is at risk of becoming a dumping ground for these oil-based cars. According to Interviewee A (2018), "...if Africa becomes clever, and I hope that with the Internet, and exposure to the right type of norms and standards, and seeing what the rest of the world is adopting, then this will not happen". Thus, South African architects need to start thinking about the prospective spatial implications of disruptive technologies, like the Autonomous Vehicle.

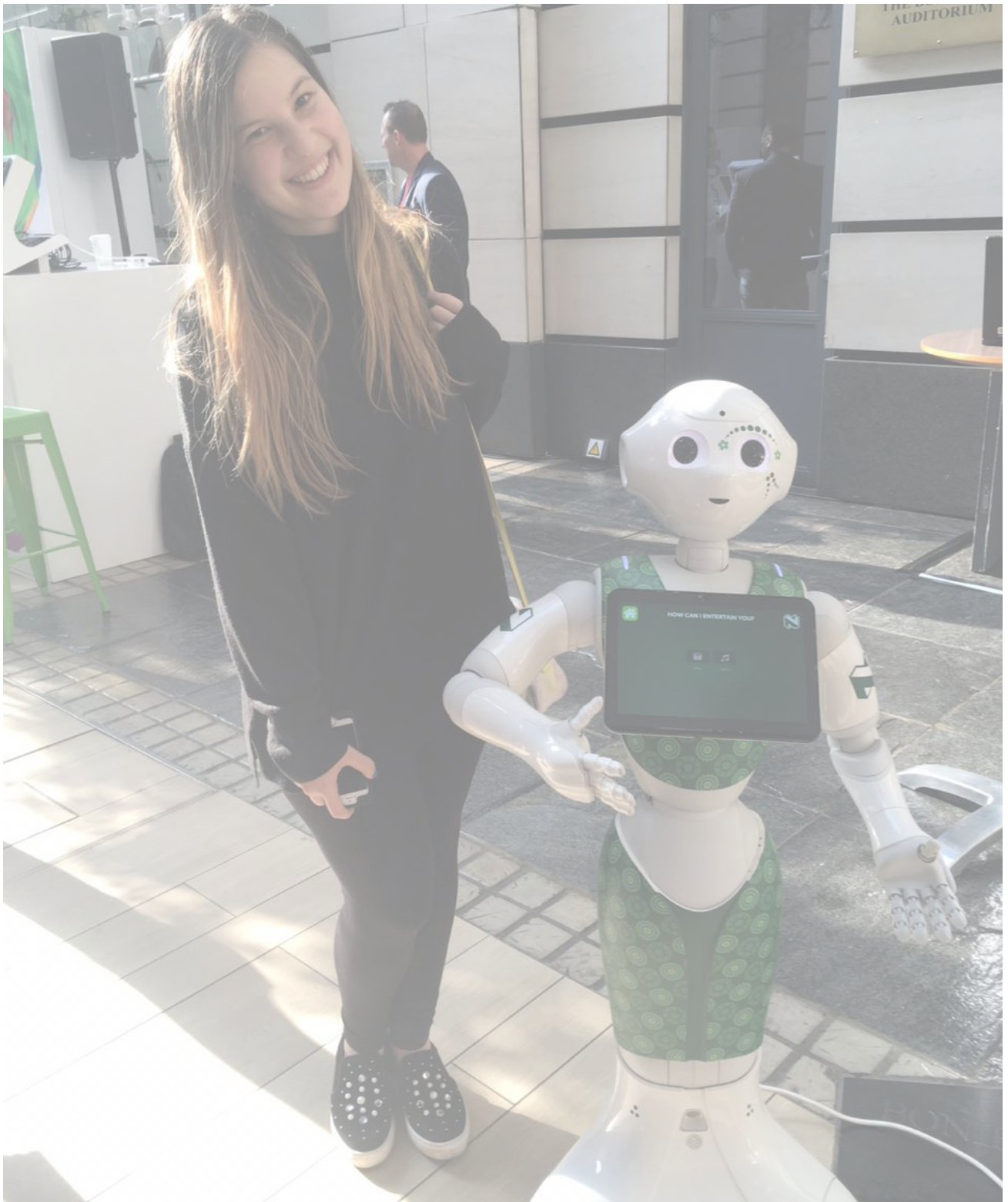
IN SUMMARY - New requirements

Technological innovation has resulted in people spending more time indoors and connected to their screens either via the computer or through the smartphone. This new dependency towards the screen has impacted society, not only by diminishing physical and social interaction between individuals but it has also reduced society's relationship with nature. To an extent, nature's degradation has become an inherent trait of our population's eternal progression. Hence, architecture needs to respond to these diminishing relationships by creating opportunities for spontaneous physical and social interaction/activity while establishing a connection between society and nature. With technology continuously growing and resistance to technology being futile, it is evident these issues cannot be solved through the reduction of technology, but possibly by bringing nature to the forefront of society's mindset. Thus, by lifting nature to match technology, it can start to restore these diminished relationships.

Despite these diminishing relationships, technology is also beginning to create new connections between society and space, by advocating for **shared space and shared experience**. Social media is blurring the notion of public and private space. Thus, it is redefining architecture to be public, reflecting a sense of transparency and **community** - allowing not only the users but also the public to access and experience the building continuously. Ergo, architects need to reconsider the public domain. Demand is being placed on buildings to be multifunctional to accommodate the pervasive nature of technology. **Globalization** has made it imperative for architecture to portray a unique form and experience to denote a specific place and time, thus, using form and fluidity as a tool to reflect and enhance the existing context.

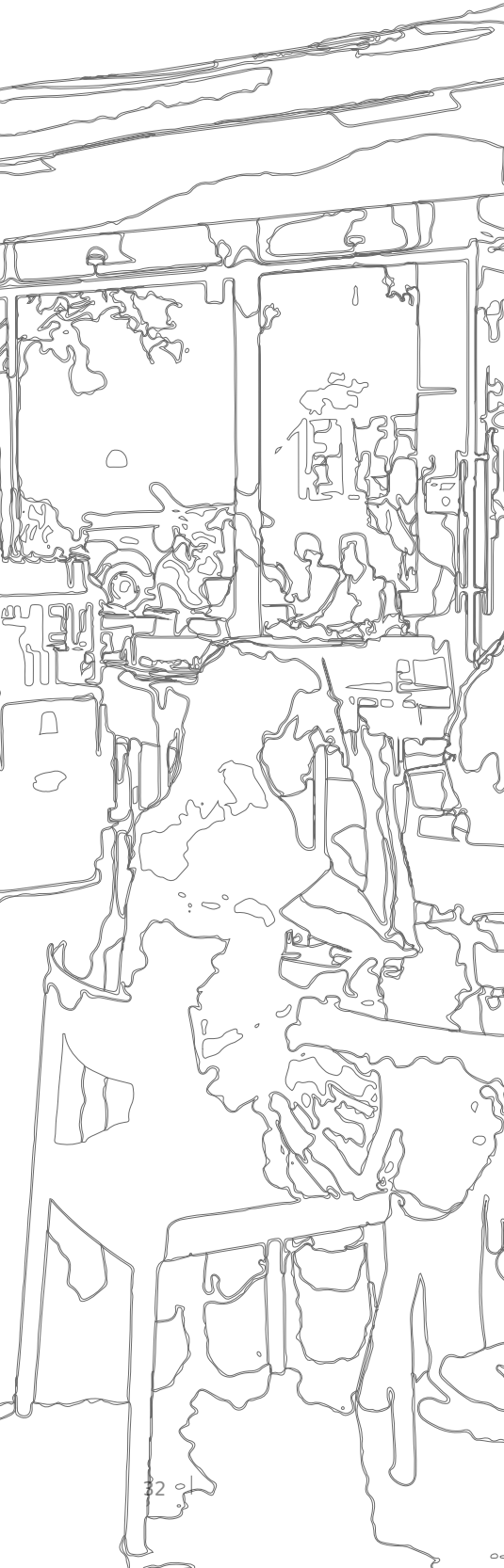
Architecturally, form has become more prevalent over function; therefore, architecture needs to reflect not only a technological society but also new possibilities and opportunities created by modern inventions. Architects

need to start responding to digital technology and Artificial Narrow Intelligence technology by including computer-aided design into their design process. This will not only generate multiple possibilities but also analyse and optimise the design process. With digital technology and Artificial Narrow Intelligence changing the way architects approach their work. It is inevitable that it has also changed the work dynamic across all sectors, due to the creation of the mobile workforce. By 'gigging' becoming more prevalent amongst society, it is demanding a new type of office and office environment, one that not only satisfies the requirements of the remote worker but also helps to restore the diminished relationships caused by technological innovation. With technology creating a demand for **new environments** for the mobile worker and Artificial General Intelligence resulting in **spatial compression**, it is architecturally creating opportunities for intervention. Arguably, architecture should not only respond to the disruption caused by technology (through its enablement) but should also start to restore the diminished relationships and appropriate underutilised space. Thus, as we allow data to inform personal decision-making and human behaviour, the way we approach and utilise space will inevitably change.



CHAPTER

EXPERIENCE DESIGN SPATIAL AND BEHAVIOURAL ANALYSIS



Processes that so revolutionize the objective qualities of space and time that we are forced to alter, sometimes in quite radical ways, how we represent the world to ourselves. I use the word 'compression' because a strong case can be made that the history of capitalism has been characterized by speed-up in the pace of life, while so overcoming spatial barriers that the world sometimes seems to collapse inwards upon us (Harvey, 1990: 240).

The propagation of the industrial revolution into modern society produced a world that was experienced socially and physically at a smaller scale. This is evident through the innovation of transportation and communication technologies. Advancements in transportation reduced the journey time, from days to a matter of minutes, despite the distance remaining the same. This was achieved due to faster modes of transport fostering an illusion of a shorter distance. Therefore, establishing a perceived notion of spatial compression, as alternative modes of

transportation allowed speeds to progress. Speed went from an average of 16 kilometres per hour to an average speed of 965 km/h (Harvey, 1990). In other words, since the 1500s to the present day the world is perceived to be 60 times smaller. This notion has been enhanced by what some theorists consider to be the Instant Age. With technologies such as the smartphone and the Internet, people can communicate with one another from any part of the world, instantaneously. The ability to contact someone at the other end of the world in a split second denotes spatial barriers are becoming obsolete. This is known as globalisation. It has allowed people to feel closer and the world to seem smaller by accelerating the velocity of people, goods and information. Therefore, the world feels smaller, despite social interactions being stretched over greater physical distances (OpinionFront, 2018). This denotes a disruption in both the temporal and spatial paradigms, resulting in what Harvey indicates as Time-space compression.

TIME-SPACE COMPRESSION

“Since phases of time-space compression are disruptive, we can expect the turn to aesthetics and to the forces of culture as both explanations and loci of active struggle to be particularly acute at such moments. Since crisis of overaccumulation typically spark the search for spatial and temporal resolutions, which in turn create an overwhelming sense of time-space compression....”

(Harvey, 1990: 326).

This section depicts the two main principles of Harvey's Time-space compression theory. The first principle is that time and space compression resulted in **globalisation**, which meant space was reformulated into emptied, universal, standardised dimensions that were no longer embedded into place or presence. This resulted in a lost sense of local identity and the reduction of spatial barriers (Harvey, 1990). A prime example of this was the telephone. Not only did the telephone expand the spatial range of social activities but also made all spaces appear equidistant from each other (Warf, 2018). In short, by bridging the areas effortlessly and bringing larger audiences into reach, telecommunication changed the **scale of the community**, thus, illustrating the direct impact on the spatial dimension within a social context. Today, the notion of placelessness is being enhanced by digital technology such as the internet and virtual reality. These technologies offer a networked experience of space that is not embedded in a specific place. Despite the widening of global networks, having a prevalent role in promoting a worldwide culture, both Kenneth Frampton and Rem Koolhaas consider the air conditioner to be the “main antagonist of rooted culture” (Frampton in Foster 1983:27). The air conditioner allows architects to create **new environments**, irrespective of the climate and local conditions, thereby resulting in contemporary architecture that is abstracted from its built environment to represent a global image through a universal style (Fry, 2010). The city of Dubai illustrates both these principles of ‘placelessness’ and abstract architecture as a symbolic image. Thus, it has caused a transition from local traditions to global culture resulting in the spread of capitalism, enhancing Harvey's second notion.

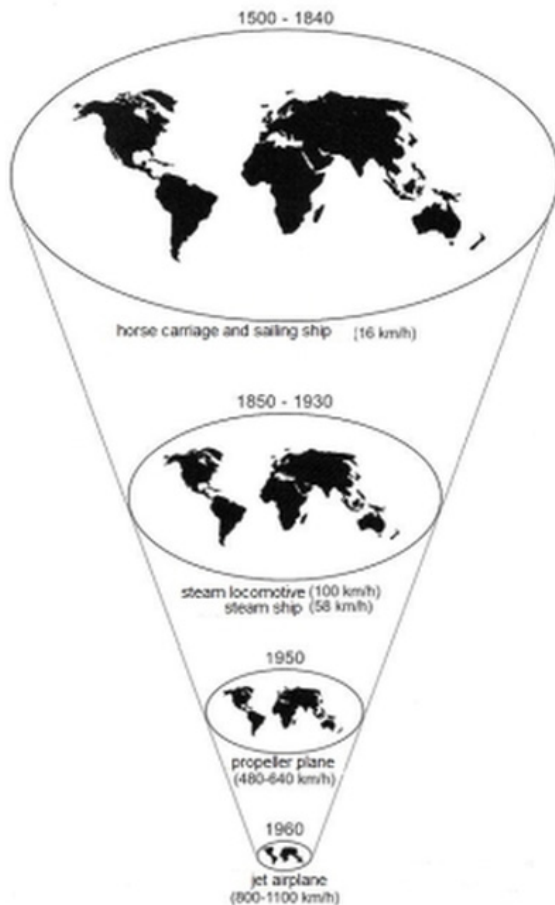


Figure 2.1 - Shrinking Map of the world

The second principle Harvey refers to is over-accumulation, a result of mass production. It is directly responsible for the disruption in both the temporal and spatial dimensions. Despite disrupting both paradigms, the emphasis for rectification has fallen mainly into the temporal dimension, resulting in technological innovation (Harvey, 1990). The need to annihilate space by time is fundamental to capitalism. It reproduces itself at an **ever-expanding spatial scale** and accelerates the rhythms of capital accumulation (Warf, 2018). Today, technology has become the standard for which time is measured. The constant advancements of disruptive technologies as outlined in the previous chapter (Chapter One) and its global distribution, have caused an acceleration within the temporal dimension. It has, therefore, resulted in a 'sped-up' lifestyle. This form of acceleration not only compresses the time in which we perceive reality but also disrupts society's perception and **experience of space**. These ideologies pre-empted a new cognition of space, awakening its exploration away from conventional perception. This disruption is happening to space on a global scale. In order to comprehend the new demands being placed on space due to this spatial disruption, an observational study was conducted within the current context. The study used environments that are currently being occupied by the mobile workforce. This not only provided evidence for Time-space compression within current society but also allowed for a better understanding of how millennials are utilising space, thereby identifying the new demands being placed on architecture and design.

INVESTIGATION- SPATIAL ANALYSIS

In order to understand the new spatial demands derived from millennials interactions, the researcher began to analyse the engagement of space and people within a technologically orientated world. This form of analysis was centred on an environment's ability to integrate people, work and technology. Therefore, this exploration was largely conducted within coffee shops as it allowed for an aspect of randomisation within a manageable environment. Refer to Appendix A for full observation analysis.

OBSERVATION SUMMARY

From the spatial analyses it can be derived that the spatial needs of society are changing, thereby prompting a new spatial organisation. All the spaces observed have a general open-plan approach with a free-flowing nature. Despite the open experience, there are social and cognitive hierarchies that are guiding not the only way people interact but are also generating a spatial sequence. It has become evident that the amount of space needed for an individual to work has been significantly reduced from a cubicle to a desk.

One of the most prevalent findings from the observation is that people don't like to sit directly across from each other but rather prefer to sit diagonally. This can be attributed to the fact that a diagonal position allows for a false sense of personal space, whilst offering a constant visual connection to the immediate surroundings, thus, allowing people to feel part of a collective while still offering a sense of privacy. This diagonal seating arrangement, as well as an individual occupying an entire table, created the opportunity for what can be considered as human sprawl. This notion refers to the spreading of personal belongings and papers all over the table, denoting that people like to occupy a larger space than what they require. This was reinforced by an individual repeatedly moving from a two-seater table to a four-seater. One may argue that the scattering one's belongings across the table is a strategy to denote the occupation of space. Thus, seating arrangements need to either allow for a diagonal arrangement or provide a space (a full seat) in-between people. This spatial application will convey a sense of personal space while allowing people to stay connected visually to each other. It will additionally provide a more comfortable environment offering both extensive space and opportunities for human sprawl.

Four types of areas were identified: short-term work, long-term work, meeting and social spaces. The successful work environments comprised of a general area consisting of short-term, meeting and social areas and a long-term

communal work area. Short-term work areas are often centralised. They are distinguishable by the use of stools, high tables or booth-like furniture. There are often are tables that are used for meetings around the short-term work areas. The social space is organised on the outer perimeter, encapsulating these two, leaving the long-term workspace to be separated from the general area by partitions or open archways and within proximity to the bathrooms. Despite all the spaces consisting of a slight variation to this organisation, the users' sequences were repeatedly the same. With the mobile worker first opting to work within the long-term or communal workspaces, followed by their attempt to sit within the short-term work areas. If no spaces were available in the short-term work areas, then the worker would move to the meeting area to conduct their business. This denotes a sequential hierarchy starting from long-term, moving to short-term and finally meeting spaces, all encapsulated within a social setting. This can attribute to both the lighting and social qualities of the area as concentration and comfort become prevalent within these spaces.

Through this analysis, society's inclination towards technology also became apparent, particularly within public libraries. Despite people engaging more with their devices and less with the books, it offered an alternative environment for the mobile worker - a quieter one. The spatial hierarchy is similar to the coffee shops, with the difference being reflected through the social activity and lack of meeting spaces. This is explained by the social activities being passive in nature. People within these environments were observed reading, listening to music or people whispering to each other.

IN SUMMARY

Based on Harvey's theory of Time-space compression, space needs to be understood and coordinated on a **global scale rather than in a local context**. It can, therefore, be speculated that architecture needs to be associated and designed within a broader context and not within an isolated event. To employ this principle, the design needs to form part of the existing context, while helping to establish a continuous link for both the global and local **communities**.

The selection of the site should be based on the principles of Time-space compression. An example of this was already explained in Chapter One regarding Artificial Intelligence and Autonomous Vehicles. This technological innovation will reduce the space previously needed for cars, which resulted in **the compression of space**. With the previous spatial requirements of the parking structure being removed, it has created the opportunity for design intervention and **greener landscapes**. Therefore, with the current changes in both the temporal and spatial dimension, it has created a demand for a **new work environment**, suggesting the intervention should start to address the needs and use of the mobile workforce, while **restoring man's relationship with nature**. Thus, not only does it reflect the organisation derived from the observational study i.e. long-term and short-term work areas, meeting and social, but also should be designed for a **shared economy**. A co-sharing workspace would achieve this notion. This application allows for the office space to be rented based on the time and space required, making it an ideal solution for the remote worker. Therefore, both noise and lighting conditions will need to be considered. From the observation conducted it can be deduced that work environments should comprise of three noise zones: quiet zone, a loud public zone and a zone with a medium level of noise.

These different work environments ensure people are always moving and connecting, resulting in the formation of **community**. The design will, therefore, have to consider both the existing context and the new spatial organisation, thereby notionally compressing the existing mobile worker's environments into a building.

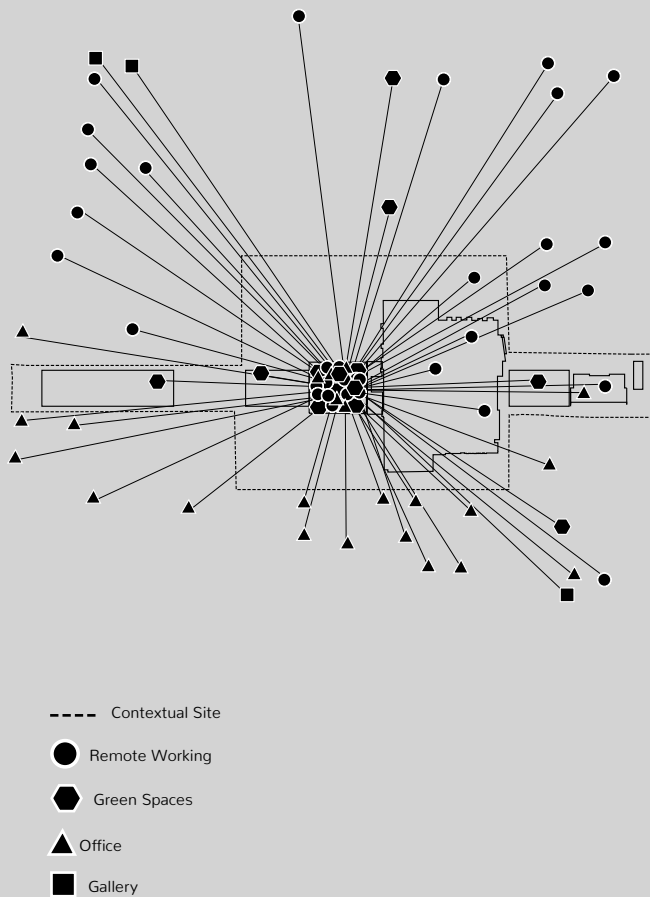


Figure 2.9 - Diagram of Time-Space Compression Application

CHAPTER

SMART STRUCTURE: DESIGN APPLICATION & CONCLUSION



THREE

We form the cities—then the cities form us.
(Jan Gehl, as cited in King et al., 2016)

The built environments and humanity have a symbiotic relationship; thus, technological innovation, which is making citizens smarter, is also reconstructing the materialisation of the built environments, advocating for an intelligent city - an augmented city. 'Smart' in this instance describes a building that uses information and communication technologies to improve performance by reducing the cost and consumption of resources (King et al., 2016:360). A building will only reach smart-status once it can respond to critical issues such as climate change and the utilisation of resources on its own.

Cities will need to be designed to incorporate all forms of technological innovation, ensuring a constant connection is created amongst its citizens. Therefore, machine-to-machine solutions and real-time data analysis will diffuse into everyday life, resulting in a drastic change to architecture and the built environments. Changes range

from the connection of communication technologies, that assist in producing new experiences, to transportation technology's reorganisation of the urban fabric. This, in turn, will re-engineer the urban environment to be grounded in smart employment, transportation and smart grids (infrastructure that responds in real time).

An augmented city will not only create an environment that increases the physical and intellectual capabilities of man but will also focus on the sustainability of the current climate. Therefore, technology will be used to advocate for a cleaner, greener and healthier environment (King et al., 2016). The overlaying of information on real-world objects (augmentation) will help to enhance the experience, history and understanding of any given place or person within the city; educating people on a city's cultural and traditional roots. This propagates for a more connected society with smarter citizens. In short, disruptive technology will bring a city to life through its infrastructure and connectivity, necessitating architects to design and create buildings that are smart, both physically and spatially.

FLUIDITY - COGNITIVE SPACE

Spatial recognition, also identified as cognition, is a man's ability to process, collect and organise data within their mind. Technological innovation has allowed researchers to study the human brain and its function with unprecedented insight and precision, particularly in the fields of cognitive neuroscience and neuropsychology. This new field of the investigation resulted in a further understanding of cognition, namely the mind-body-environment paradigm. This new paradigm of spatial perception is no longer centred around the physical aspects of space but instead on human experience. It is based on three main dimensions: the human body, the natural world and the social world.

...architects often privilege the concept of 'space' when they design, which they conceptualise as an abstraction, a geometric homogeneous void in which objects are placed at identifiable coordinates...
(Goldhagen, 2017:111)

These coordinates as described above allow our brains to update our position with the surrounding objects. Researchers have discovered our minds navigate us through space with a hexagonal grid. This grid allows for two objects to act as coordinates in relation to the human body, causing a point of triangulation within the human mind. These objects impact the cognition of the human experience through its translation of scale, pattern recognition and memory within our environment. Experience of these environments is both private (situated within our human bodies and the natural world) and public (situated within the social world) (Goldhagen, 2017).

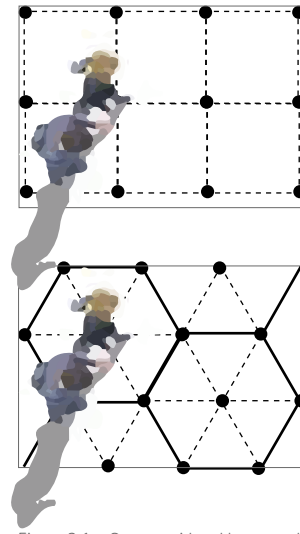


Figure 3.1 - Square grid and hexagonal grid

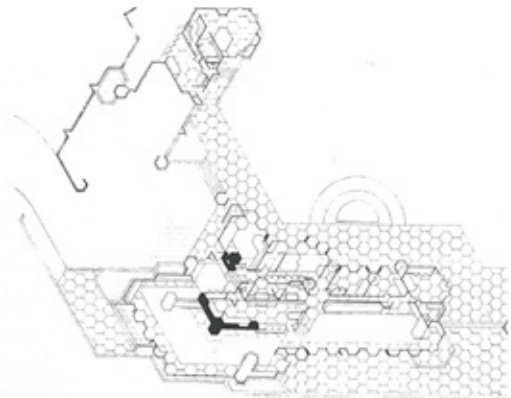


Figure 3.2 - Patrick Vale illustration of Hanna House (Frank Lloyd Wright) depicting the use of the hexagonal grid (Goldhagen, 2017: 68)

SCALABILITY

Human embodiment elicits fundamental principles that are directed by our non-conscious selves. Therefore, an emphasis is placed on space being scaled to the human form. A simple illustration of this is that researchers have found a direct correlation between environments and thought. For example, people think more creatively and respond more to abstract concepts when in a room filled with high ceilings, as they feel unconstrained. Another example is humans find curves to be approachable (Goldhagen, 2017). These examples prove cognition constitutes the core of any experience.

Humans are biologically programmed to recognise patterns. The pattern is used to help differentiate a place or a structure from its surroundings. This is achieved by generating architecture (a form) that is legible and coherent. Both proportional relationships (scale) and mathematically guided compositions (patterns) create a pleasurable experience within the human mind (Goldhagen, 2017).

Memory, or more precisely autobiographical memory, impacts environments through its assignment of meaning. Therefore, people are likely to respond better to an environment they can readily associate with, as denoted in Chapter One. However, due to man's inception of experience being focused on the prospects of space, experience needs to be both an egocentric and allocentric manifestation. Allocentric(ity) is based on collectivism – people focus their attention and actions on other people rather than themselves (Freksa and Freksa, 1998). Egocentric, a term derived from Jean Piaget's Theory of Cognitive Development, delineates one's ability to only think about themselves with disregard for others (Kashima et al., 1995). Thus, an environment needs to allow for experiences of both connection and isolation.

NATURE

An environment can be ecological, social, virtual or constructed; however, it is often closely assimilated with nature. This is denoted by the cities we live in being dominated by nature's rhythms and patterns, known as fractals. Fractals were implemented into the built environment as not only a response to none-scale derived by digital technology but also to create a natural connection to man. This is due to fractals being a biological structure (Crysler, Cairns and Heynen, 2013). Therefore, this denotes a strong correlation between the built environment, society and nature. This can be attributed to the fact that, intrinsically, human beings are a biophilic species; our genes are encoded to link our well-being with the natural world (Kellert and Wilson, 2013). Therefore, its significance is also denoted by architects designing buildings and environments that reflect a natural world, in response to the disconnection and isolation derived from technological disruption. The implementation of the natural world through large green spaces denoted the ideology of 'prospect and refuge', which illustrates humanity's attraction to enclosed areas - a place of refuge, coupled with views and access to open landscapes and a place for opportunities (Bergman and Appleton, 1978).

Researchers have already proven nature's ability to assist in man's well-being; therefore, their studies have transmitted into the workplace. A prominent finding was that the access to green spaces, open spaces and light increased productivity and workplace satisfaction, thereby improving the interpersonal relationships and psychological well-being of the worker (Kaplan and Kaplan, 1989). An example of this is when Herman Miller¹³ moved its employees from an outdated manufacturing facility into the 'Greenhouse'. Statistics showed that within nine months, their productivity had increased by 20%. Employees found themselves healthier, less distracted, more relaxed and motivated to work. Studies also showed that even people exposed to representations of natural landscapes showed

¹³ Herman Miller is a well-known furniture company based in America

improvement in both their mental and physical health (Kaplan, 1993). Working in and around natural environments can foster physical activity throughout the day, thereby promoting healthy behaviours in a typical sedentary venue. With nature's ability to reduce people's exposure to noise, pollution and extreme temperatures, it has resulted in an increase in physical activity. Hence, it is providing opportunities for exercise, social interactions and psychological restoration, denoting a positive correlation between walkability, greenness and physical activity around the workplace. People are willing to walk for longer periods of time and greater distances when exposed to green spaces (Marquet et al., 2018). Humans are so entrenched by nature that their experience isn't just delineated by green spaces, but also by light and natural materials.

Natural daylight is a primary entity within the built environments. It has a measurable effect on people's emotions. With a person's emotions being balanced by natural light, it is palpable that natural light allows for more comfortable social interaction. Natural materials, on the other hand, denote traces of their construction, enabling humans to simulate their manufacture mentally. Even the patterns and irregularities offered by these raw materials appeal to the human psyche (Goldhagen, 2017).

SOCIABILITY

$$B = f(P, E)$$

Kurt Lewin's¹⁴ theory denotes the spatial principle of the social world. The equation can be understood as behaviour (B) is equal to the function (f) of a person (P) within their environment (E). Hence, internal cognition and experience relate to people in their immediate surroundings (Lewin, Heider and Heider, 1936: 166).

In these environments, patterns are used to an extent where interpersonal spaces are impossible. These environments are programmed to prompt a specific pattern

of interaction regardless of demographics. Social space is designed to evoke different thoughts, emotion and behavioural patterns. Thus, it is based on the arrangement of human activities through design, the arrangement of objects in space and its association. The ideologies regarding socialisation are rooted in the built settlements. Attachment to these built settlements allows people to live in groups; the collection of people allows the built environment to create social order and perpetuate social life. Society's attachment to place creates a sense of well-being, stronger communities and an ability to broaden perspectives (Goldhagen, 2017).

In the built environments, two guiding principles perpetuate social interaction: action setting and affordance (Bélanger and Coolen, 2014). This merely means that environments such as buildings, streetscapes and landscapes create a context for socialisation; however, it's the arrangement of the object within space that creates informal cues resulting in the engagement of society. Humans are intrinsically social beings, making the built environment pervasive in shaping social interaction.

Based on Lewin's theory, it can be speculated that technology is reducing the function of a person through optimisation and has created two environments - a physical and a virtual realm. Based on the formula, it can be deduced that technology is diminishing the experience of the social world, thereby resulting in an empty interaction, despite its ability to connect people globally. This notion is illustrated by disruptive technology such as social media allowing for a more substantial number of people to connect universally but not necessarily interact personally. For example, social media 'likes' diminish the social experience. Therefore, this imposition has created a new approach to architecture named Social Architecture, that works towards the preservation and planning of social environments. Informed by theories regarding social science, it intends to enhance the flow of physical human interaction within the social world's physical space. This new form of architecture has created success, particularly with innovative workspace models. Through the use of technology, it is allowing for the optimisation of human interaction and productivity, as seen by millennial companies such as Weworks.

¹⁴ Kurt Lewin's was a German-American psychologist, known for his theories regarding social and organizational psychology.

FLEXIBILITY

Over the past decade, spaces such as innovation centres, co-sharing spaces and start-up spaces have grown considerably, globally. These spaces are a manifestation of a behavioural change created by economic, cultural and demographic forces. The changing nature of innovation has resulted in a connected society; therefore, the working environment is reflecting this notion through the convergence of professionals within an open and flexible space - advocating for collaboration across all fields. The changing demographics of workers, also known as millennials, are altering the design to be comfortable, social and collaborative with technology. Therefore, the architect's objective is to create environments which facilitate collaboration through serendipitous encounters, denoting its real-world implementation (Wagner and Watch, 2017). This has been particularly successful within the co-sharing work environments of WeWork.

Walter Isaacson¹⁵ describes the CEO of WeWork Adam Neumann (Gelles, 2018) as:
He has an instinctive feel for how millennials are going to want to have community work experiences without joining large corporations and like Steve Jobs and other great entrepreneurs, he knows how to connect the humanities with business and technology.

WeWork is a company that provides co-sharing workspace and services; it was established in 2010 with an emphasis on creating a sense of place through the community. Unlike previous offices spaces- influenced by the factory and the assembly line, WeWork looked at the office space as a way of life rather than a place of work; emphasising communication, learning and business development through service space and community. Despite not being the first company to develop this notion of co-sharing, WeWork has derived a formula that attributes to its success. Through its embrace of and implementation of technological innovation, it has attracted the attention of millennial workers: entrepreneurs, start-ups and giggers (Vado, 2018). With technology helping to connect the world at a rapid rate, the sharing of ideas and learning at a global scale has become more prevalent within modern

society, therefore making it a key factor in WeWork's spatial approach.

WeWork is comprised of two teams, a product strategy group and a physical product group. The product strategy team focuses on innovation regarding improving experience and design within the workplace. This is achieved through constant learning; constant analysis of existing spaces designed by WeWork and the comprehension of its success or failure. The physical product group is comprised of several teams involved in the physical and design manifestation of the building. Both teams use digital tools to enhance physical solutions and create more efficient experiences. These tools are used in every form of the design stage from the mapping and analysis of the existing building through 3D laser scanners; to designing efficient layouts with the use of BIM (Rhodes et al., 2018).

Their design team ensures all their buildings have dynamic spaces created through the implementation of energy zones, from loud to quiet. On one end, you have the loudest area comprised of shared public space. This is where people are the most active and most likely to interact. On the other end is the quiet zone. This zone uses elements such as phone booths and nooks to create privacy and isolation. In-between these two zones is the working area that affords the opportunity to both areas; a zone with a medium level of noise and interaction (Keohane, 2018). This layering of space ensures that people are always moving; thereby connecting and resulting in the formation of community. There are people largely from the X generation that believe WeWork isn't applicable to city's that don't have a high density or urbanisation; however, the reality is the perception and need for community are significant for millennials, outweighing their need for traditional office space. Therefore, it is evident that a new design model revolving around spatial experience will need to be created regardless of whether it's a model like WeWork or not. This shift in a paradigm can easily be denoted in a Johannesburg context by the offices created for the banking sector.

¹⁵ Walter Isaacson is an American journalist and writer responsible for the biographer of tech giants like Steve Jobs.

INTERVIEW B FINDINGS:

Based on the interviews conducted, it is evident that technology has created a more mobile and global workforce. It has therefore resulted in several companies encouraging staff members to work more from home. Although the estimates reveal that currently, only 30% of people are utilising this opportunity, the numbers are expected to increase drastically within the next few years. With staff members working from home, the number of people needed in the office space is reducing, but at the same time, digital technology has allowed for the workforce to be both international and global. The spatial organisation of the office is changing to adapt to this new flexible lifestyle of working, often seen through the implementation of collaborative spaces and hot-desking. Hot-desking allows businesses to deal with the influx and reflux of people, particularly within companies that have consultants and people who work abroad.

“From an open plan space went to a more flexible open plan, where we reduced partitions, brought in more communal spaces and with that became open communication, people became more responsive with each other” (Interviewee B, 2018). Therefore, social interactions becoming more frequent within the office place consequently result in a noisier environment, however, these collaborative spaces are designed to allow users the opportunity to either engage with the noise or find a different area to work. However, despite the reduction of people, spatial changes can also be attributed to digital technology. Today, many companies have opted for a completely wireless-system and print-less environment due to the ease created by digital technology. Interviewer B believes that despite the office floor plan being completely open and flexible, information within an banking office environment still requires privacy. Therefore, conference rooms and meeting spaces are supposed to be formal; however, glass walls are often used to give visual cues of openness.

Although technology has resulted in a new approach to the office and the workforce, it has arguably resulted in

an improved lifestyle, with technology being embedded into every aspect of the working world. Interviewer B reflects on the application of artificial intelligence, such as Nedbank’s Robot Pepper, into the working world. Although its implementation was met with some resistance, it is believed that it will make specific duties easier for people, thereby making people’s lives better and reducing the amount of overhead.

CONCLUSION

Disruptive technologies, particularly communication technologies from the computer to the mobile phone, have resulted in the complete transformation of the architectural process and the city. The full enablement of digital culture has resulted in a double process of local fragmentation and global connection. Although technology is allowing more spatially distant people to connect virtually - redefining community- it has resulted in a decentralised urban life, defined by Antoine Picon as 'The Digital Sprawl', thus changing the physical organisation of the city. As we shift from the Digital Age to the Augmented Age, the relationship between the real and the virtual, in which space is fundamental, has become incredibly diverse (Picon, 2010). In such a context, architecture acts as a level of intervention; therefore, it signifies the corresponding relationship between disruptive technologies and society, through a new spatial organisation.

In conclusion, technological innovation has resulted in a change in communication and transportation, allowing for society to become increasingly connected as seen by globalisation. By people entering into electronic environments, it has altered the way people communicate from a physical realm to a virtual one. Consequently, it has resulted in a lack of physical and social interaction and disconnection to the natural world. Therefore, architects are focusing on this issue through the implementation of nature, and social devices such as reorganisation and circulation of a building to encourage spontaneous social human interaction. This denotes the prevalence of sociability, fluidity, and nature within architecture. However, technology has also allowed for instantaneous communication and feedback between the architect and the user, perpetuating architecture into a new age of experimentation. This is mainly because globalisation resulted in a societal desire for architecture to be unique and specific to a given time and place.

Technological innovation has resulted in a new realm of experimentalism allowing for a more sculptural and formalistic approach to architectural design through the building's envelope. This is primarily because globalisation resulted in a societal desire for architecture to be unique and specific to a given time and place. Therefore, technological innovation has led to a new realm of experimentalism allowing for a more sculptural and

formalistic approach to architectural design through the building's envelope. With forms becoming parametric by nature, it is creating a need for the spatial organisation of a structure to reflect scalability. Scale is therefore used as a tool to obtain a connection between architecture and the human body. Despite form prevailing over function, architects are designing multifunctional buildings in an attempt to keep up with the pervasive nature of technology and society. Therefore, modulation is used as a tool to convey both scalability and flexibility within architecture while allowing for a spatial organisation to occur. Sustainable design is also a direct influence derived from technological innovation. Accordingly, architects are designing with broader social and environmental awareness. Technological innovation isn't just limited to its impact on buildings but is having a more significant impact on the built environments because advancements in mobility are changing the spatial quality and quantity of the urban fabric. Therefore, due to technology's affordance regarding the optimisation and amalgamation of space as outlined by the theories of Time-space compression, it is resulting in a universal reduction of space and left-over-space. This creates a strong argument for the utilisation and intervention of existing infrastructure. Thus, it can be derived that technology is starting to blur boundaries between the work and social environments, advocating for a new spatial sequence.

Thomas Allen and Gunter Henn believe "organisational boundaries are the biggest barrier to ... [getting people to talk to each other] ... because organisation boundaries separate cultures and the ways people think and do things" (Wagner and Watch, 2017). Therefore with technology breaking down social and physical barriers, it is changing the way society perceives and uses space. It has become evident that a new spatial organisation is required; an organisation that not only adapts to disruptive technology's impact on society but still meets the needs of the individual. This spatial reorganisation can be attributed to the natural world, the social world and the human body. Therefore, technological innovation and spatial cognition are advocating architecture that not only pertains to these three themes but also formalistically represents this new era of experimentalism which advocates for architecture to reflect principles of flexibility, sociability, fluidity, scalability, sustainability and nature.

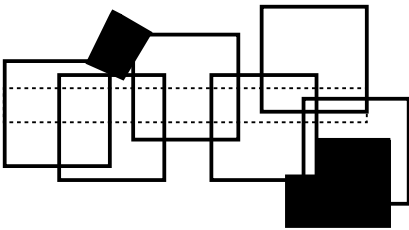
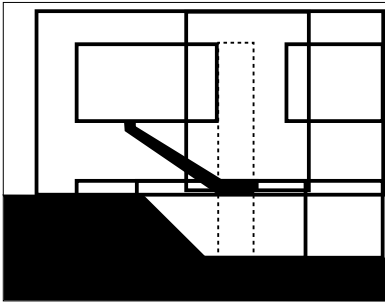
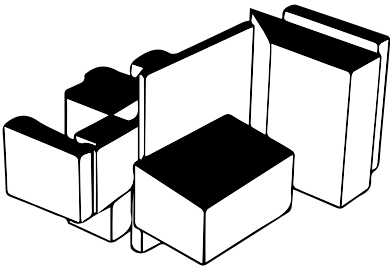
DESIGN RESPONSE:

A SPATIAL STRATEGY

The modification of and to space has remained throughout the disruptive cycle, thereby indicating that all forms of spatial exploration are linked to and derived from technological innovation. Explorations of space are prevalent within a contemporary and future context. Therefore, to derive at a smart spatial strategy, a comprehension of the first attempt at spatial exploration is required, namely Deconstructivism.

Deconstructivism, unlike the previous eras, aims to disrupt the traditional principles of architecture through the reorganisation of space, resulting in the forms and volumes of an experimental nature. The rejection of traditional ideologies such as rationality and purity of form resulted in the fragmentation, distortion and dislocation of architectural elements. Traditional notions were based on a previous cognition of space; therefore, deemed irrelevant due to the change in the insight and requirements of society. The main principles orchestrating Deconstructivism are centred on the philosophical ideologies of Jacques Derrida, derived from the semiotic analysis of his text. His findings are outlined as metaphysics of presence, centrality, trace, binary opposition and *La Différance* (Hoteit, 2015). Adaptations of these principles have been translated into contemporary architecture, with the aid of digital design tools. Today, many architects consider the digital design process to be a direct continuation of Deconstructivism but with a digital approach (Carpo, 2013). Therefore, a computer has become a Deconstructivist tool of choice. This is attributed to the computer's ability to produce new "strategies for dislocating vision," and to "break the gridded space of the Cartesian order" (Katz, 2002). Thus, through complex geometrical forms, it has resulted in the reprogramming of space.

The impact of digital technologies effect on contemporary architecture and the spatial dimension has a direct correlation to the principles outlined by Deconstructivism. By analysing the spatial strategies of Deconstructivist work, it will allow for a further understanding of the new cognition of space and its organisation within a contemporary era. Therefore, for the discourse of this thesis, the work of three prominent Deconstructivists, namely Peter Eisenman, Bernard Tschumi and Rem Koolhaas, was considered.

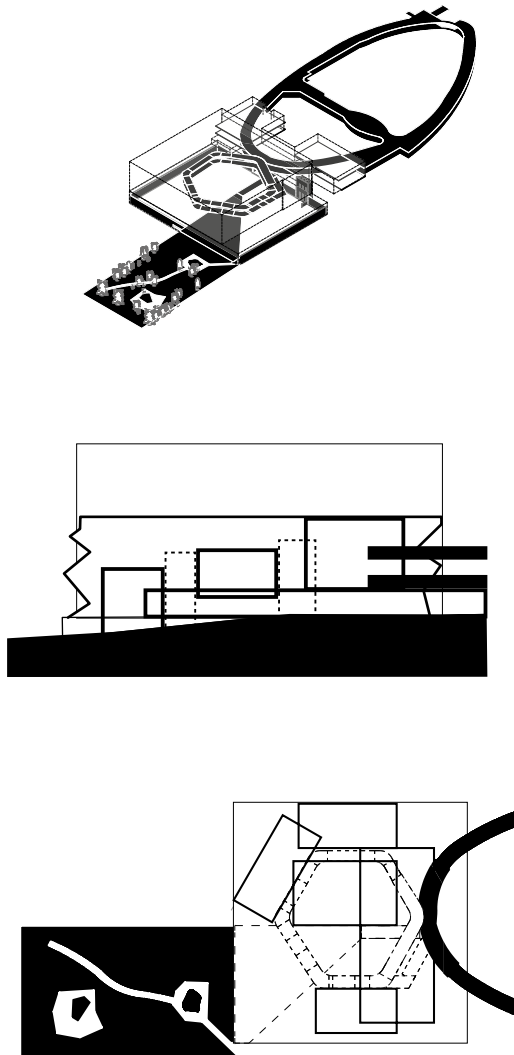


Overlapping of spaces deriving at a Form

Figure 3.3 - Diagram of spatial strategy in House II

NEW ENVIRONMENTS

Peter Eisenman's spatial strategy of Trace, also known as synthesised space, can be viewed as a response to the disruption caused by both digital technology and augmented reality. The strategy derived from Trace is the merging of layers onto an existing context to derive at a form. Eisenman's earlier architecture, denoted by the Guardiola house and House II, focused on trace and was purely syntactic; rejected notions of scale and function in relation to the site. His houses denoted Trace of the structure. This was done through the merging of layers relating to scale and context into a new element, denoting his approach to the spatial dimension as synthesised. His later work also primarily focused on trace with a new emphasis placed on presence. Metaphysics of presence and absence is reflected by the application of solid and void, allowing a new relationship to be derived between form and function as form is a signifier used to express function (Hoteit, 2015). These notions are expressed within his latest work, the German Jewish Holocaust Memorial, where absence is embodied through the application of Trace.



DESIGN APPLICATION

The principles derived from the application of trace became prevalent to the buildings relationship and response to the physical context. Thus, the building corresponds to both the adjacent mall and park through its spatial organization, ensuring a constant connection could be maintained throughout. This not only enhances the existing pedestrian route but also enhances the use of the natural world. This was achieved through the implementation of a new layer- a ramp system. The ramp system not only allows for an enhanced connection between the contextual levels- the mall, the park and the public domain- but also continue the park vertically and horizontally.

Generative and environmental studies were performed to ensure the building responded appropriately to the existing context and orientation. This strategy also enhanced the decision to use the existing structure to inform the new design. This was achieved through the preservation of the existing footprint while using the existing building's mass as a conceptual and abstract informant to explore a new solution. It utilised the existing restrictions and decisions into a speculative design. The form was then analysed and utilised to create a smart structure, meaning that the façade would require an invisible system that helped to sustain the infrastructure. This was done through the façade's ability to utilise and control the directionality and penetration of water, an invisible system.

By layering form, nature and trace it created both negative and positive spaces. The positive spaces denote the fixed function and are reflected by the fixed (solid) aspects of the building i.e. ramp-system and form. The negative space resulted in the formation of new and unique types of work and social environments. These environments are influenced heavily by nature and the greater context.

Figure 3.4 - Diagram of trace spatial strategy in design

A new experience design is created by the consideration and merging of existing and new layers to derive at different **environments**. From Eisenman's approach, it can be derived that there are two essential principles reflected by this strategy. The first principle is that **form** is used as a tool to express function, while the second focuses on **contextual correlation- Trace**.

Form– Digital Technology & Artificial Narrow Intelligence

Adaptation: The first principle, form, responds to the disruption caused by both digital technology and Artificial Narrow Intelligence. It therefore accepts and tries to implement the disruption caused by these technologies through its application of form over function. With form employed as a tool of expression, it becomes apparent that the meaning of the building is derived from its invisible servicing systems and environmental performances (disruption caused by digital technology). Thus, the envelope of the building should be derived based on principles of optimisation and sustainability, thereby enhancing the utilisation of digital and weak Artificial Intelligence tools within all stages of the design process. However, despite the importance placed on the form, the strategy of synthesised space also denotes the existing is prevalent to generate something new, placing an emphasis on the existing context.

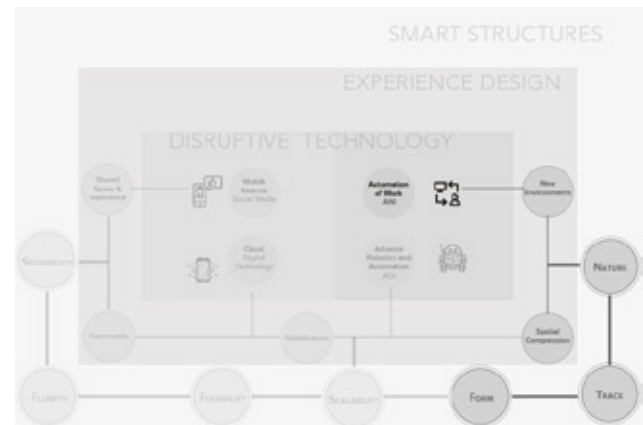
Trace– Artificial Narrow Intelligence

Adaptation : A building's ability to respond and create a relationship to its current context allows architects to respond to the disruption caused by augmented reality. Augmented reality allows the user to have a strong correlation to the existing context, while still having a personalised experience. This can be achieved through the enhancement of an existing route, axis or building's relationship to the current community. Therefore, by strengthening a design's response to the existing context,

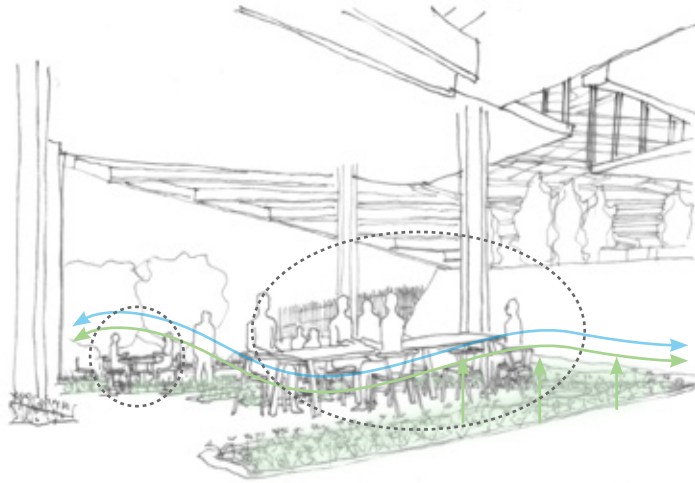
architects are able to achieve this experience within the physical world, thereby enhancing the connection to not only the existing context but also to the natural world. This in turn introduces a third concept relating to nature .

Nature– Mobile Internet

Restoration: While the first two principles enhance the disruption caused by technology (illustrating its adaptation), the principle of the natural world looks to restore the relationship between man and nature. Therefore, nature is used as a mechanism to restore the disconnection created by the mobile Internet. Nature's natural ability to reduce noise, pollution and extreme temperatures results in more activity. This creates new environments that encourage exercise, social interactions and psychological restoration. By using nature from the existing context and imploring it further into the design, it attempts to create an environment that allows people to connect back with the physical world despite being surrounded by disruptive technology. Thus, disrupting technology's ability for people to transcend the existing environment.

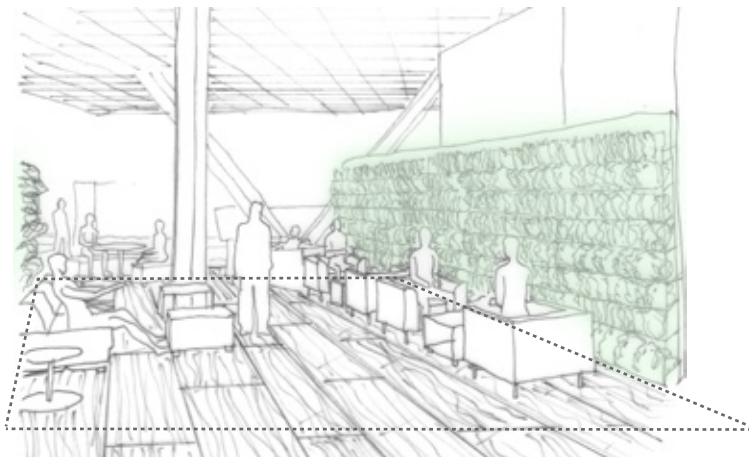


SENSORY WORK SPACE



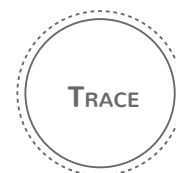
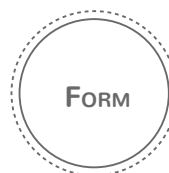
This work space occurs along the new path of movement. It corresponds to the adjacent park, by using vegetation as a natural spatial barrier. Thus, by creating spaces with flower pavilions it creates a unique work environment that excites the senses. This is achieved through the bold use of colour and the areas exposure to the natural elements. The shape of the area was determined by the negative layering of space in response to the positive pedestrian spatial movement. This influenced the various spatial scales within the new environment. Due to its connection to the adjacent park and the main axis route, this workspace is intended for the broader community. It is therefore accessible to both the building's occupants and the public. Its position also informed its function. This work space is a high-energy zone and is suitable for informal short-term work or as an informal meeting space.

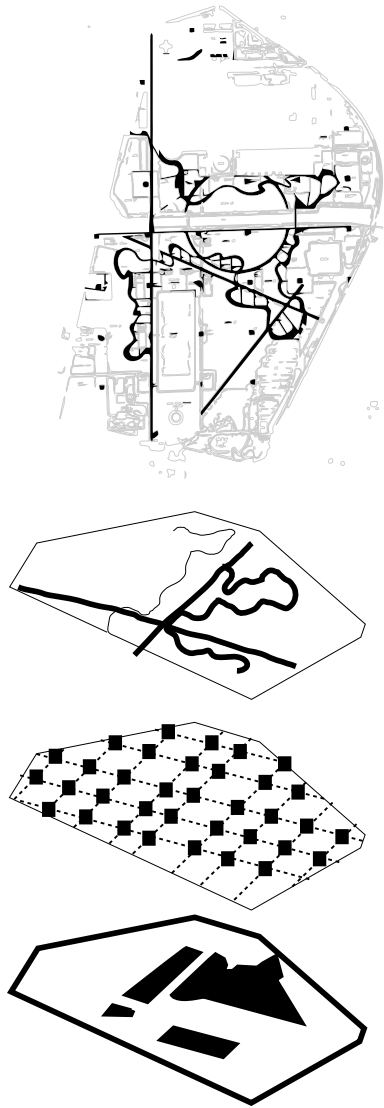
PASSIVE ENVIRONMENTS



The passive environments occur away from the new path of movement. It also corresponds to the adjacent park, by using two green walls to establish its spatial barrier. By using a green wall instead of a brick wall, it allows for spatial flexibility as the wall can be adjusted or moved over time. This barrier not only reduces visual access but also acts as a noise barrier, resulting in a low energy zone. Thus to enhance the passive experience within this environment, only natural tones and materiality are to be used. The furniture selected are based on comfort i.e. couches and cushioned seating. These environments are therefore designed as mini lobby spaces where people can wait, work or meet informally.

Figure 3.5- New Informal Work Environment



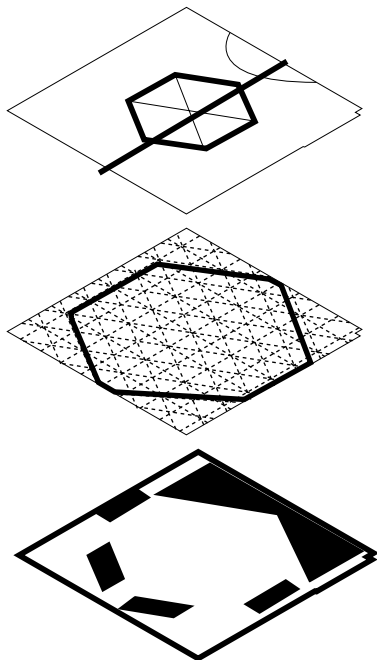
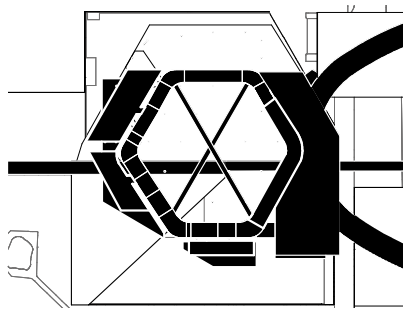


Layers superimposed into one plane

Figure 3.6 - Diagram of spatial strategy in Parc de la Villette

SPATIAL COMPRESSION

Bernard Tschumi's work juxtaposes the programming of space through spatial compression. The compression of space in this instance can be viewed as a spatial response to Artificial General Intelligence and Time-space compression, as Tschumi explored form through data input. Parc de la Villette is significant in illustrating his approach of compressing space based on the superimposition of three ordering systems. The first layer is identified as points. A point is used to denote activities within a specific environment, i.e., where a structure was placed. The cubic structures placed on these points have no programmed function and use binary formats to deconstruct the connection between form and program. This deconstruction generates flexible space. The second is a system of lines that determine the paths leading to these activity points. Unlike traditional spatial syntax, movement here is arbitrary as there is no narrative or coherence of historical significance. The final layer is surface – a large horizontal area. The aspects of the point, line, and surface are descriptive and reflect a mechanism used by Tschumi within his park. This mechanism reinforces a structure of organisation through the application of discrete geometries. Repetition of these geometries resulted in the principle of La Différance. His superimposition of these independent systems initiates physical and social interaction; thus, denoting the prevalence of social space within architecture (Van der Straeten, 2003).



Layers superimposed onto existing footprint

Figure 3.7 - Diagram of spatial compression strategy in design

DESIGN APPLICATION

The compression of space is about superimposing the different layers of input - i.e. physical, social and contextual - into a single building. The superimposition of a new hexagonal-grid system acts in a similar method to Tschumi's point system. The hexagonal-grid is used as a mechanism to define not only the spaces for where activity can occur, based on its modulation, but also to derive a new form. The use of modulation allows for the building to have a consistent spatial pattern. It also creates a building with infinite spatial opportunities due to its openness. This is a key aspect as designs need to be flexible to adapt to technological innovation.

A system of lines was used to denote movement both within the building and to the greater context. Therefore, the three contextual levels were superimposed to generate an emphasised pedestrian route and axis from the Gautrain Station to the park level. The design's primary function is to operate as a movement-system to connect each level. This was achieved through the utilisation of a ramp-system as it created a transition between the highest levels (retail) and the lowest (park).

The final method, a flat surface, indicates a large horizontal area where work activities can occur. The building's secondary function is achieved through not only its programme but by its ability to generate personal and collective experiences. This is possible through the use and variation of light, scale, nature and materiality to produce different types of work environments.

Spatial compression is the merging of multiple variables into a single plane. By using Tschumi's point, line and surface system, it can be derived that there are three essential principles reflected by this strategy. These include **flexible space, fluidity and scalability**.

Flexibility– Artificial Narrow and General Intelligence

Adaptation: The layer of points responds to Artificial Narrow and Artificial General Intelligence. It therefore accepts and attempts to implement the disruption caused by these technologies through the data input. Data in this sense is explored as both a physical and a virtual element; a grid-system. Thus, by utilising a grid-system, it generates a building with more spatial possibilities i.e. flexible space. The grid-system additionally uses patterns to allow for a constant spatial connection between the user and the building. Therefore, based on the cognition of space, buildings should have a hexagonal and not a conventional square grid-system. These virtual and physical grids mimic Artificial Intelligence's ability to generate algorithms and infinite solutions through data input. Hence, data is perceived as both physical and virtual. A virtual response will allow a building to become smart, responding to users' requirements based on feedback loops. This notion responds to and enhances Artificial Narrow Intelligence's impact on our daily lives through smart devices. It denotes the need for pervasive space to respond to disruptive technology.

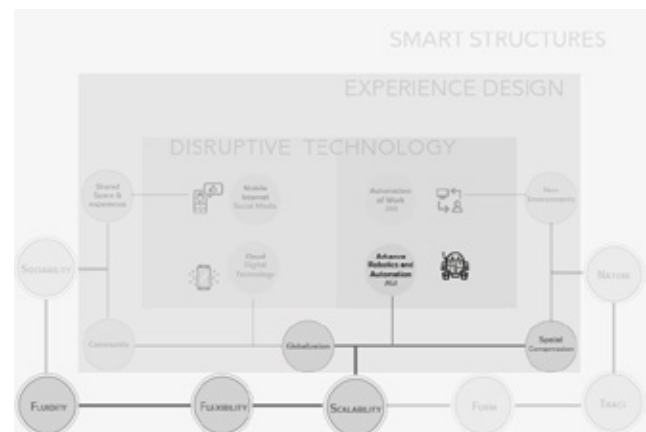
Fluidity– Artificial Intelligence and Time-Space Compression

Adaptation: Digital technology and artificial technology have made space limitless and without scale. Therefore, Tschumi's application of lines and surfaces is a strategy for containing and dividing up space through movement. The movement is used as a tool to begin compressing space through its utilisation. This response to Artificial Intelligence disruption reduces space and is also reflected by Harvey's Time-space compression theory; thereby illustrating that the utilisation of space is derived from movement and not a building's activity (programme).

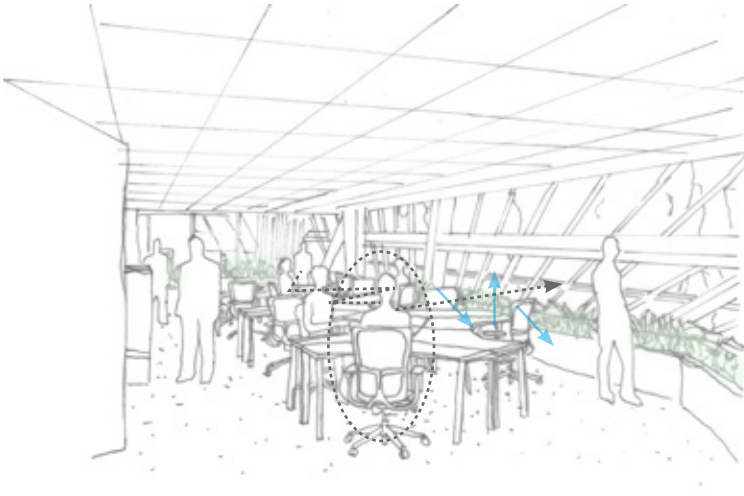
Movement in this regard refers to pedestrian mobility only. By emphasising human movement, it reinforces the shift towards pedestrianisation of the urban fabric (a disruption caused by Artificial General Intelligence). The decentralisation of the car and Time-space compression requires consideration at both a micro- and macro scale. The greater context needs to be considered, thereby denoting the principle of fluidity.

Scalability– Digital Technology and Mobile Internet

Restoration: While the first two principles enhance the limitless spatial implications of technology, scalability is used as a tool to redefine the relationship between man and space. From the research conducted, it is evident that digital technology has resulted in a loss of meaning and scale. Therefore, space needs to be rescaled to the human form and cognitive function. This can be achieved through the implementation of patterns and different environments within a single building. The scale in relation to the human form is used to produce different environments that focus on both connection and isolation, thereby creating an experience that focuses on both the collective and the individual. This disrupts the virtual community, derived by the mobile Internet and creates a physical community, thus enhancing the shift towards a shared economy and shared experience.

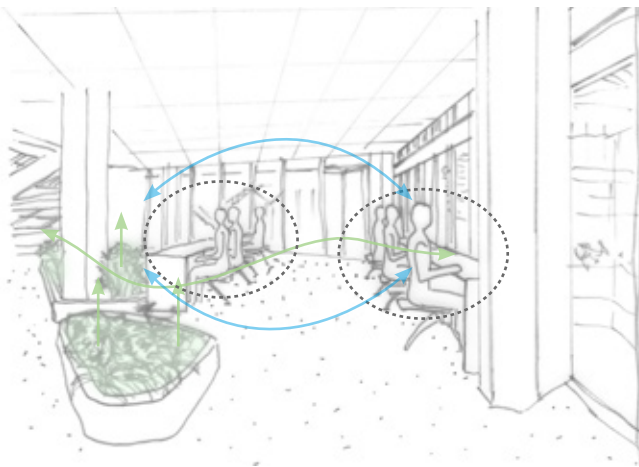


6- HOUR WORK CAPSULE



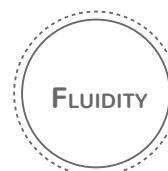
Spatial compression resulted in movement occurring centrally. This resulted in work activities occurring along the building's perimeter. Thus, this work capsule is designed as a formal work space, as it is isolated from the main ramp-system. It is enclosed by glass to increase privacy and reduce accessibility. Therefore, it is a low-energy zone, making it an ideal environment to focus. The capsule is open plan making these spaces highly flexible. This flexibility is enhanced by the implementation of modular desks. These desks are arranged diagonally to allow for a constant visual connection. These aspects allow for the mobile worker to be part of the collective, while still maintaining their personal space.

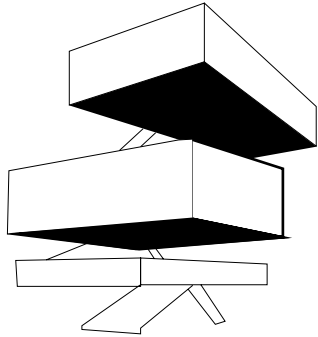
2- HOUR WORK PODS



Work pods are similar to the capsules, in that they are also designed as a formal work space. It is also enclosed by glass to increase privacy and reduce accessibility. Despite their similarities, the pod utilizes vegetation to enhance the sensory experience. Thus, colour and floral scents create a dynamic and fun work environment. Despite the pod being a vibrant workspace, the stimulation of the senses, overtime can result in the loss of concentration. Therefore, pods should be utilized for short-term work. With the pods being open plan, furniture is used to divide the floor plate, thereby creating a sense of scale. The desks are linear and placed on either side of the pod. This positioning optimizes the different views and allows the user to opt for either a personal or collective experience.

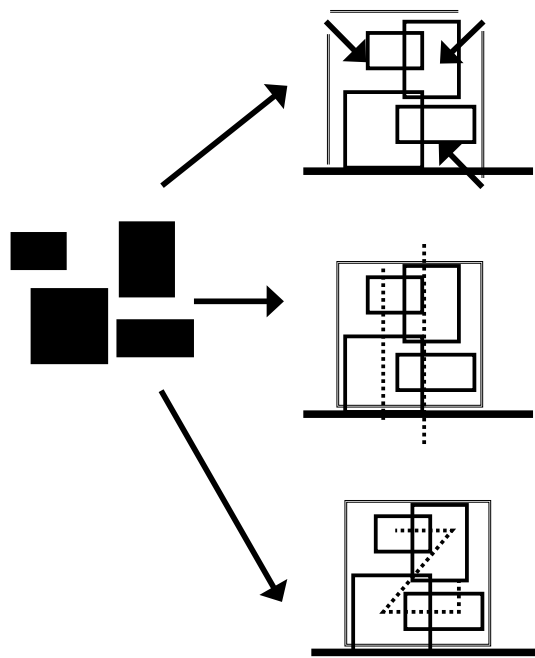
Figure 3.8- New Formal Work Environments





SHARED SPACE AND EXPERIENCE

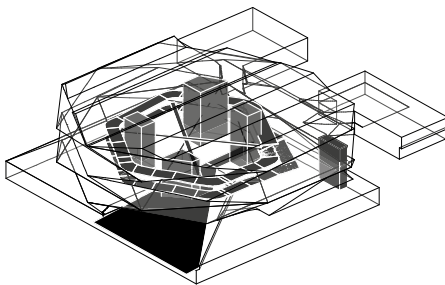
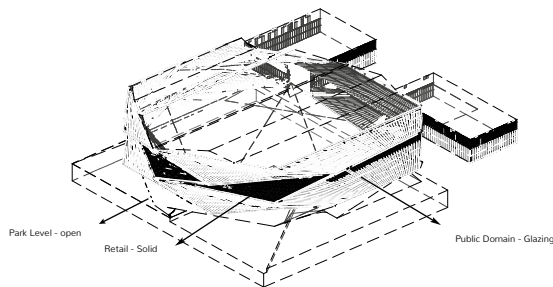
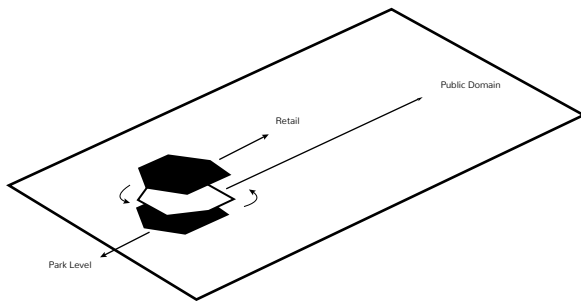
Rem Koolhaas also believed in initiating social interaction; therefore, his work primarily focused on producing an environment derived from space to impact cognition – a shared space. Thus, his strategy regarding shared space works as a respondent to social media and digital technology. His work explores the notion of space as an experience rather than a material entity with a distinct centre. This signifies his theory of ‘Bigness’ – that architecture should be concerned about the general effect and experience of a collection of buildings rather than with the details. The Seattle Central Library explores this notion through the principle of binary opposition, creating interaction amongst people through spatial juxtapositions. Glazing is used to contain and separate translation in space, therefore preventing the presence of ‘junkspace’.¹⁶ Spaces are divided into either primary or secondary space (Fox, 2008). The form is considered arbitrary and represents a direct derivation of space, which is caused by the pull effect on passive areas to maximise sunlight and heighten the user’s feeling of spatial tension.



Spaces overlap to ensure social interaction

Figure 3.9 - Diagram of spatial strategy of the Seattle Library

¹⁶ ‘Junkspace’ is a theory created by Rem Koolhaas to denote spaces that contain no architectural qualities or human interaction.



DESIGN APPLICATION

Shared space in this context refers to the opportunities created through the engagement of space both socially and physically. Within this design, dynamic space was created through the implementation of its two main principles: fluidity and sociability. Fluidity was addressed through the design by a central ramping system. This system not only allowed for continuous movement throughout the design but also helped to create a sense of transparency, despite spatial division.

These spaces were divided further through the quality of light, nature and materiality. Different energy zones were utilised to create different environments in an attempt to create shared space and shared experience through movement and social interaction. Thus, the objective of the design is to create opportunities for spontaneous social interaction, while creating a constant connection both physically and visually throughout the building. This flow enhances a typology that is open both publicly and spatially to allow for social interaction i.e. a pavilion. The flow of the building isn't just limited to the experience of the building but is also reflected in the physical form and façade.

The façade is utilised as a mechanism to express and symbolically represent the existing context. The progression of materiality - from open to solid - was intentional to denote a constant physical and visual connection to the contextual levels, thus adding to the building's symbolism through directionality and clarity. This is illustrated visually through the building's façade. The park layer is represented through a mesh system (open), the public domain through transparency i.e. glass and the retail level through its solidity - mimicking the existing mall infrastructure.

Figure 3.10 - Diagram of shared space spatial strategy in design

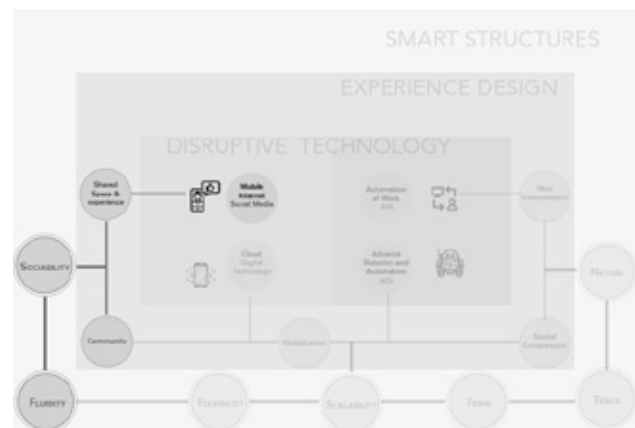
Shared space is the layering of space to ensure constant movement and connectivity occur within an environment. Therefore, this strategy uses binary opposition to define spaces and enhance social activity and interaction. Similar to Koolhaas' approach in dividing space into two distinct aspects, this strategy can be separated into two dominant principles. The first principle, **fluidity**, is used as a tool to define an environment based on flow and changeability. The second principle outlined by the **social world** focuses on sociability and interconnectivity. Ergo, Koolhaas' strategy places an emphasis on a **building's general experience based on its ability to initiate physical and social interactions**.

Fluidity– Mobile Internet

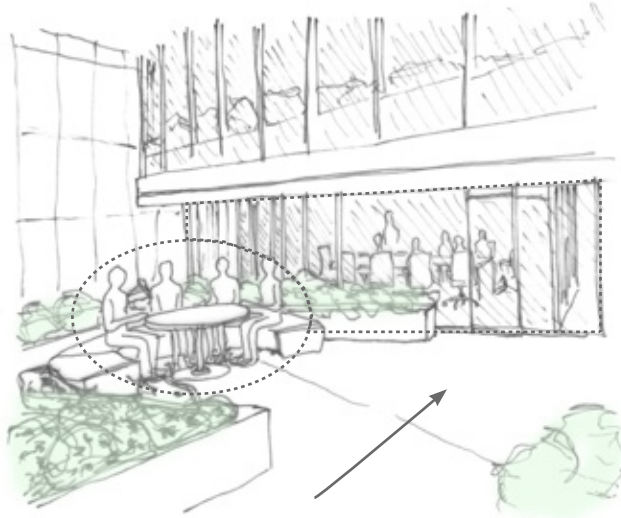
Adaptation: The first principle responds to the disruption caused by mobile Internet, particularly the smartphone and social media. It therefore accepts and attempts to spatially implement Deleuze's virtuality theory, regarding the tension between the actual and the virtual. This means flow (experiences) and contrast (binary opposites) are used as mechanisms to produce diverse spatial environments that can be identified. Examples of this are the utilisation of light and materiality. Light is capable of producing different spatial qualities and generating natural barriers based on its intensity and exposure i.e. light or dark spaces. Distinctive materials and textures are used to spatially express and enhance spatial division through symbolism, thus producing cognitive environments that are directional and identifiable. These environments generate numerous spatial experiences while allowing a building to maintain its transparency. This emphasises a shift towards communal space and shared experience, enhancing the disruption caused by social media.

Sociability– Mobile Internet

Restoration: While fluidity enhances the disruption caused by the mobile Internet (illustrating its adaptation), the principle of the social world seeks to restore it. Therefore, the social world's application of action setting and affordance is used as a mechanism to restore the empty interactions of society caused by the mobile Internet. This means that the building itself should be designed as a place for socialisation, whilst the spatial organisation should encourage and optimise social activity. Therefore, sociability is used as a tool to not only optimise human interaction and productivity but also to increase a user's well-being and build a stronger sense of community. Dynamic space is produced through the opportunity for social interaction as a social experience. This is achieved by generating different spatial environments, ensuring people are continuously moving.

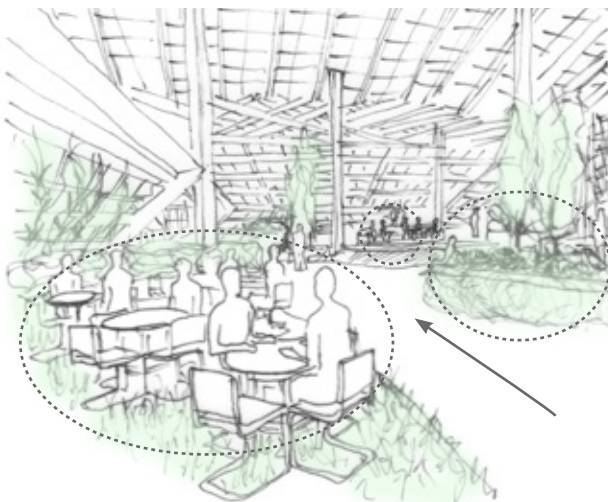


COLLABORATIVE SPACES



The building utilizes binary opposition to create two types of collaborative spaces: Open and enclosed. Open collaborative spaces are identified as high-energy zones, while the enclosed spaces are low. The reason for the different zones is largely due to their positions. The open spaces are located between the ramp-system and the pods - making them a transitional zone. These spaces create opportunities for shared space and shared experience as it navigates people between the public and semi-private areas. With this space being utilized by the broader community, it increases the number of people utilizing the space, therefore increasing the opportunity for social interaction. Unlike the open meeting spaces, the enclosed areas are situated along the perimeter of the building. These spaces are contained within glass walls, as it increases privacy while reducing accessibility. The use of glass reinforces the notion of transparency. Thus, a dynamic relationship and a constant visual connection can be maintained between these two types of collaborative spaces.

SOCIAL GREEN SPACES



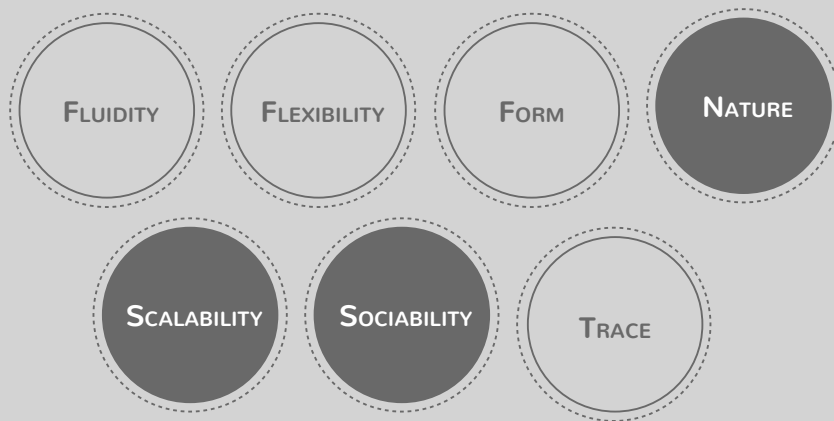
This shared space connects directly to the Rosebank Mall. Therefore, it requires the building to create new environments and opportunities for social interaction. Green social spaces use vegetation to increase a user's well-being, while building a stronger sense of community, based on shared experience. These green spaces are defined naturally and therefore use aspects like vegetation, light and materiality to spatially divide these areas. With the spatial barriers being defined by natural elements, it results in the creation of different environments at various scales. With the social green spaces ranging from passive to active activities, it is creating experiences for both the individual and the collective.

Figure 3.11- New Shared Spaces



FUNDAMENTAL THEMES OF DISRUPTIVE SPACE

Questioning the role of architecture through the following themes



FLUIDITY: How can architecture facilitate the exchange between public and private accessibility, allowing for a continuous motion spatially and contextually.

FLEXIBILITY: How can architecture adapt to the pervasive nature of technology?

FORM: How can architecture function as a delineation of society?

NATURE: How can the architectural platform disrupt the diminished relationships caused by technological innovation?

SCALABILITY: How can architecture facilitate the need for both personal and collective experiences?

SOCIABILITY: How can the architecture platform create opportunities for physical, social interaction?

TRACE: How can architecture facilitate in the improvement of the existing context - environmentally, physically and socially.

Figure 3.12 - Fundamental Themes
The themes above reflect the fundamental principles of the programmatic and design development methodology

02

DESIGN

DESIGN STRUCTURE

Design Exploration is structured into seven parts:

Chapter Four investigates the notion of trace through the site of Rosebank.

Chapter Five analyses precedent studies based on their relationship to nature or technology.

Chapter Six briefly outlines the feasibility and programme of the proposed design.

Chapter Seven explores aspects of superimposition. It illustrates the two design approaches of working within an existing grid or a new grid. This is done through generative design, sketches and models.

Chapter Eight looks at sustainable design and vegetation by using Ecotect to perform Energy and solar access analysis.

Chapter Nine uses the notion of dynamism to derive at a final design development.

Chapter Ten - Final design drawings.

Chapter Eleven - Technical design drawings that focus on the principle of smart structures.



CHAPTER

TRACE: SITE ANALYSIS

FOUR

ROSEBANK:

With the vast accessibility to multiple forms of public transport and the implementation of spatial development frameworks, Rosebank has been transformed into a regional node. The implementation of public transport has always been prevalent within Rosebank, denoted by its history of being one of the first two suburbs to have trolley-bus transportation. With a rapid transport system running through Rosebank, it has transformed Rosebank into a multicultural suburb with an outdoor atmosphere, advocating for public life and pedestrian use. Aside from being a transport orientated node, Rosebank was developed as one of the first primary mixed-use nodes outside the Johannesburg Central Business District

(Development Planning and Facilitation, 2018). It combines commercial centres, with residential and entertainment environments - epitomising the notion of living, work and play. With Rosebank's new spatial approaches advocating for urban densification, public environment and a broader sense of community, it has resulted in economic growth within the area, thereby resulting in a transformation of Rosebank's context both physically and socially. This, therefore, makes it an appropriate environment socially, contextually and economically for a public building, as it has the ability to respond to the pervasive nature of technology and it provides an application of the fundamental themes often damaged by disruptive technology.

MACRO ANALYSIS





Figure: 4.0 - Aerial Image of site
Image was taken by Paragon Group.
From the Rosebank Link development

BACKGROUND

Rosebank is a regional and mixed-use node - one of the first outside of the Johannesburg Central Business District. It is centrally located geographically within the Gauteng City Region and considered part of Region B - forming an interface between the City of Johannesburg and the Ekurhuleni Metropolitan. Rosebank facilitates access to office, residential and retail facilities. Thus, it encourages activities that relate to all aspects of the live, work and play lifestyle. This node encourages economic activities and several offices of major businesses can be located within this node (Baylis, 2017). Civic lifestyle is defined by the precinct of interlinking shopping centres that are centred around the Rosebank Mall. Residential densification is promoted, which has resulted in Rosebank being classified as 'D: Community Nest' and more specifically as a 'melting pot' - based on the Knowledge Factory classification (van Niekerk et al., 2013). This is due to Rosebank's existing context containing a range of different residential typologies and has, therefore, seen Rosebank being the most cultural and demographic diverse cluster. The area has become a melting pot cluster due to the largest percentage the demographic being young, single adults with Graduate qualifications. Thus, Rosebank's demographic is able to contribute to its economic growth.

Rosebank is known for having both formal and informal economic growth. This is evident by the high levels of construction and growth in employment, thereby attracting more people into this region. It is capitalising on this growth to promote retail and office revitalisation through new construction and the rehabilitation of existing buildings. This has resulted in the redevelopment of Rosebank's existing landscape to respond to public transport and infrastructure. This is achieved through the guidelines of both the Rosebank Urban Development Framework (RUDF) and the Regional Spatial Development Framework (RSDf).

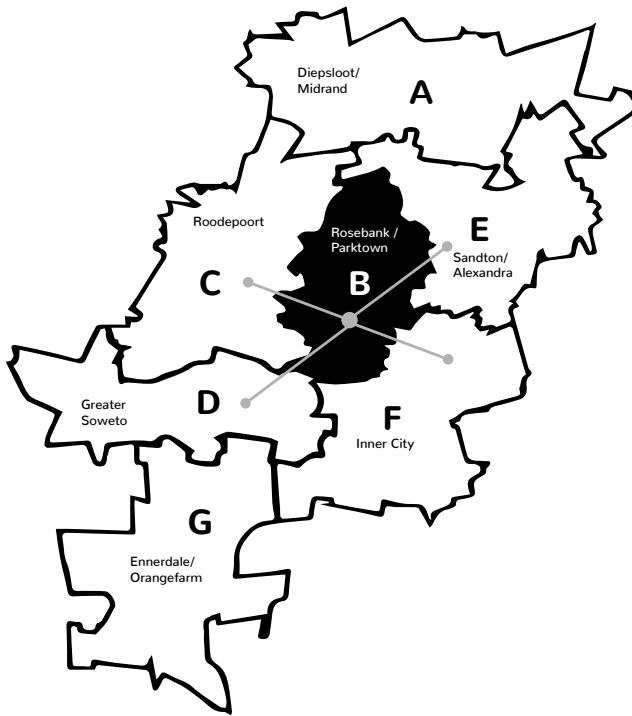


Figure 4.1 - Johannesburg Regions

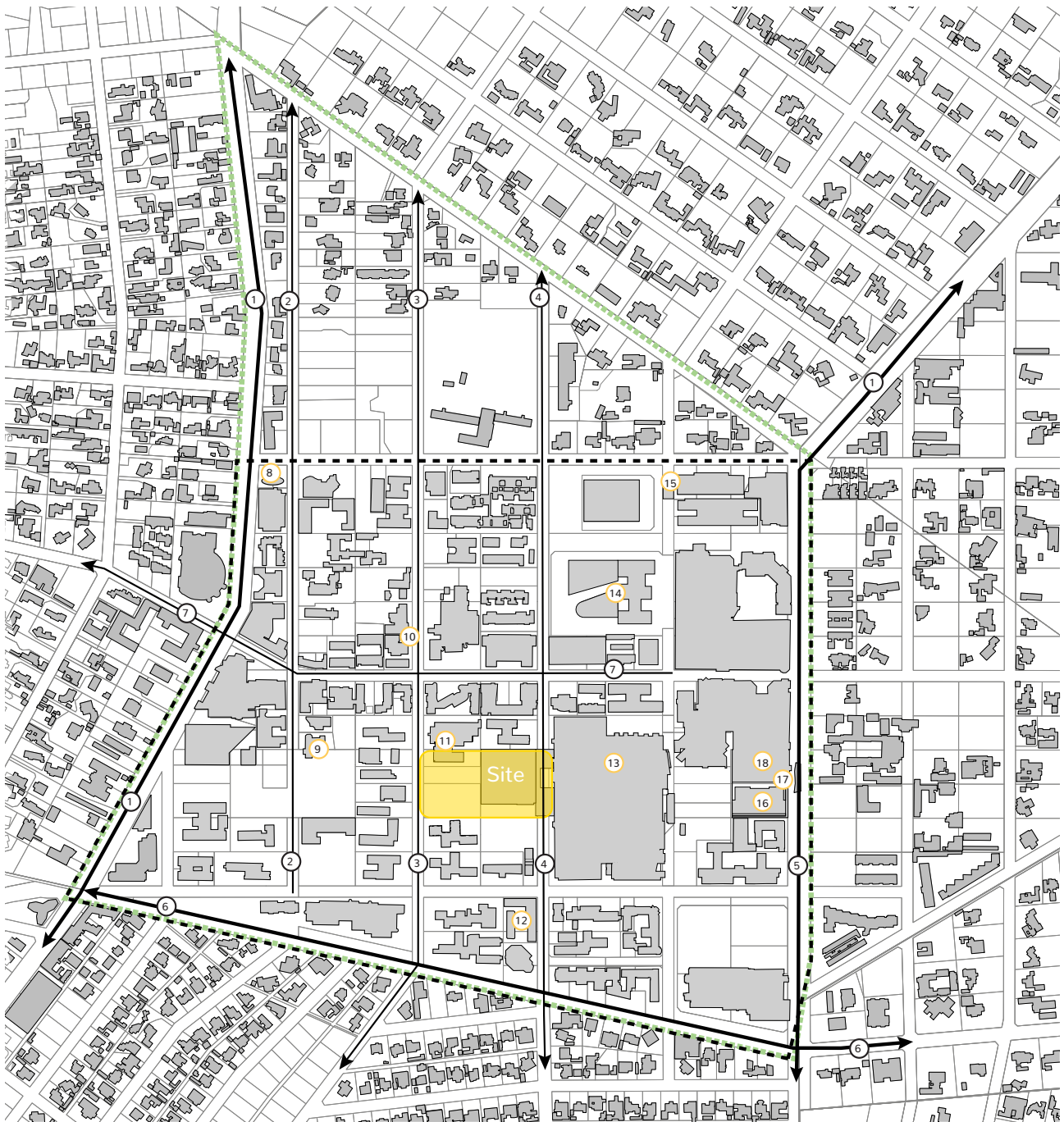
The RUDF objectives are to develop Rosebank into a more compact urban landscape. As it promotes the densification and integration of land uses while optimising the use of existing infrastructure, it also encourages the close proximity of retail and employment opportunities in relation to each other. This advocates for pedestrian-oriented streets, thereby improving pedestrian movement and activity at the street level.

The RSDF focuses on accessibility, mobility and level of community. Thus, its objective is to ensure that all communities have access to economic opportunities, infrastructure and social services. Although these two frameworks may appear similar in terms of their objectives, they address the context at two different scales. The RSDF focuses on Rosebank's broader connection (macro-scale) and its role as a transport-orientated node, while the RUDF focuses on the immediate region (micro-scale) and the opportunity for pedestrianisation. Therefore, the principles guiding the alteration to the existing landscape and natural landscape are based on the Rosebank Urban Development Framework, whereas, the Rosebank Spatial Development Framework is used to outline the changes and enhancements made to the transit landscape.

Due to the significant alterations happening in the Rosebank context, it became prevalent to analyse both the existing and future prospects of the area. Hence, the contextual analysis occurs at two scales. The first is the macro-scale, which focuses on the entire Rosebank region, however, the emphasis was placed on the Rosebank Box. The Rosebank Box is defined as Bolton Road, Jan Smuts Avenue, Jellicoe Avenue and Oxford Road, with the Rosebank Mall being the central attraction. The micro-scale concentrates on the site and its immediate surroundings and therefore is bound by Oxford Road, Bolton Road, Keyes Avenue and Tyrwhitt Avenue.

EXISTING LANDSCAPE

buildings have large setbacks from the street boundaries, suggestive of Rosebank's prevalence towards a pedestrian-oriented neighbourhood. It also depicts Rosebank's historical trace of initially being a farm - Rosehill Orchards farm. Currently, most buildings within the Rosebank Box are six to eight storeys. However, its densification and redevelopment have resulted in more high-rise structures, that will assist in defining the locality of the station as the centre of the node. Thus, these taller structures (12 - 14 storeys) act as landmarks, creating a need for more local nodes and focal areas to be situated in correlation to landmark buildings; with the largest and most central landmark being the Rosebank Mall.



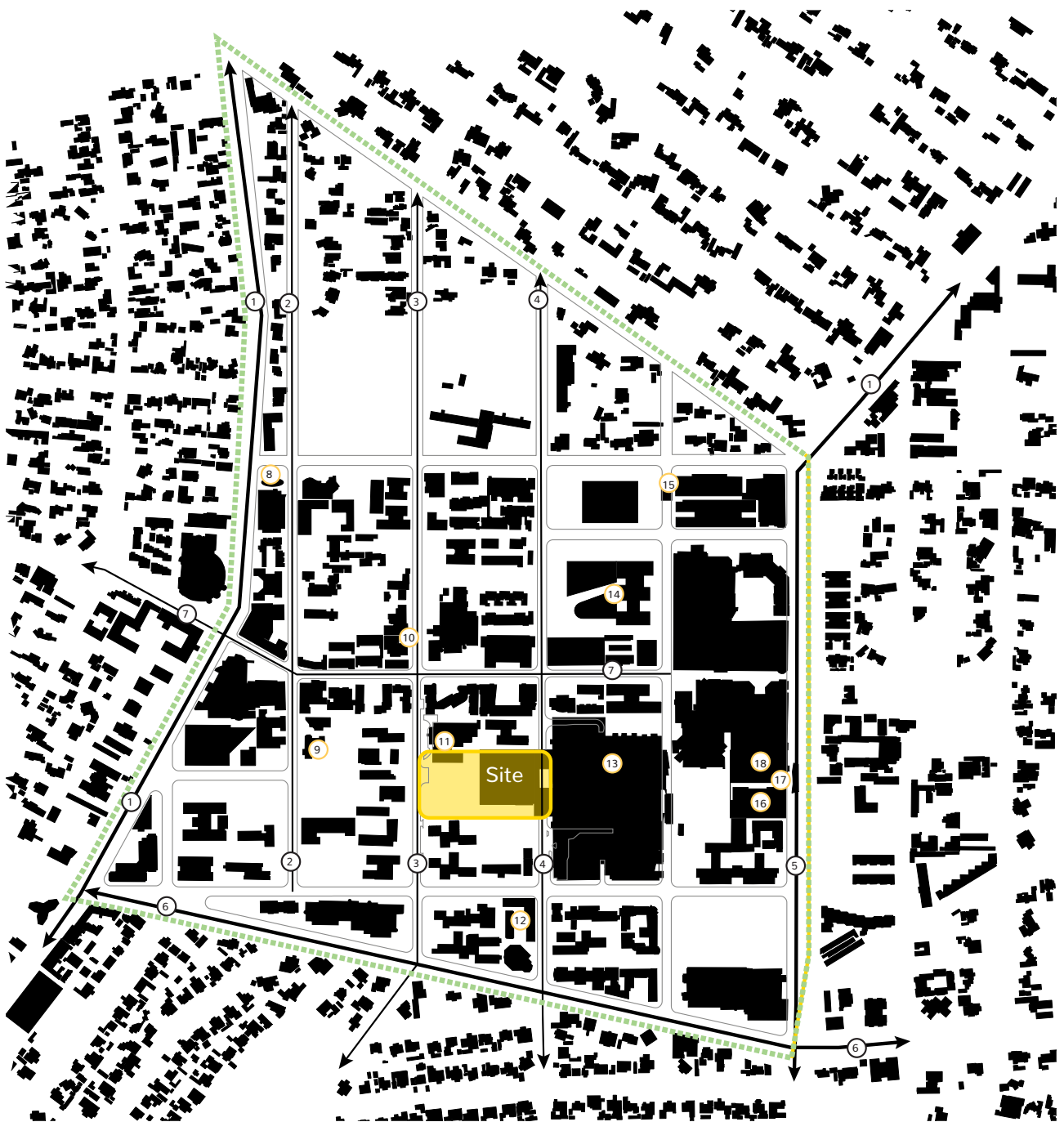
LOCATION KEY

- | | | |
|----------------|----------------------|----------------------|
| 1- Jan Smuts | 7- Tyrwhitt Ave | 13- Rosebank Mall |
| 2- Keyes Ave | 8- Circa Gallery | 14- Future: Galleria |
| 3- Sturdee Ave | 9- Public Library | 15- Taxi Rank |
| 4- Bath Ave | 10 - Police Station | 16- Future: The Link |
| 5- Oxford Rd | 11- Netcare Hospital | 17- Gautrain |
| 6- Bolton Rd | 12- Fire House 9 | 18- The Zone |

- Focus Area
- Region Boundary



Figure 4.2 - Rosebank Plan
Scale: 1: 8000



LOCATION KEY

- | | | |
|----------------|----------------------|----------------------|
| 1- Jan Smuts | 7- Tyrwhitt Ave | 13- Rosebank Mall |
| 2- Keyes Ave | 8- Circa Gallery | 14- Future: Galleria |
| 3- Sturdee Ave | 9- Public Library | 15- Taxi Rank |
| 4- Bath Ave | 10 - Police Station | 16- Future: The Link |
| 5- Oxford Rd | 11- Netcare Hospital | 17- Gautrain |
| 6- Bolton Rd | 12- Fire House 9 | 18- The Zone |

- Focus Area
- - - - - Region Boundary



Figure 4.3 - Figure Ground
Scale: 1: 8000

LAND USE

From the contextual analysis, it is evident Rosebank is organised to reflect a diverse and compact lifestyle. Its 'play' lifestyle is derived by civic activities of an art sector, open spaces and a strong presence of retail. Most retail occurs on the eastern side of the Rosebank Box. The retail within this vicinity comprises of the Rosebank Mall, The Firs, Rosebank Mews and the Future Galleria. The main art sector is located along Keyes Avenue with informal and formal galleries being located sporadically within the current context. Offices are located predominantly along the more visible and accessible edge of the Box (Oxford, Bolton, Jan Smuts and Jellicoe Avenue). Residential buildings and hotels are located centrally within the Box, along with institutional buildings. However, the enhancement of the Gautrain Station and other alternative forms of transport has resulted in the urban development and rapid transformation of the existing context. This is clearly depicted by the future zoning proposal in the Rosebank Urban Development framework, as it advocates for the implementation of high intensity mixed-use structures throughout the existing context.

The future land use aims to utilise the existing civic activities and transportation as a radial point to increase and densify land use. As illustrated by the future zoning map (Figure 4.6), most of the existing office areas will change to high intensity mixed-use. Thus, the majority of the future land-use is proposed for high intensity mixed-use with 70% being non-residential and 30% being residential. Offices are proposed outside the Rosebank Box and instead have moved to Rosebank Road, Keys Avenue, Jan Smuts Avenue and Chester Road. High-density residential use is proposed in the area defined by Rosebank Road, Keys Avenue, Jellicoe Avenue and Cradock Avenue, as well as the area west of Bath Street and Tyrwhitt Avenue.



LOCATION KEY

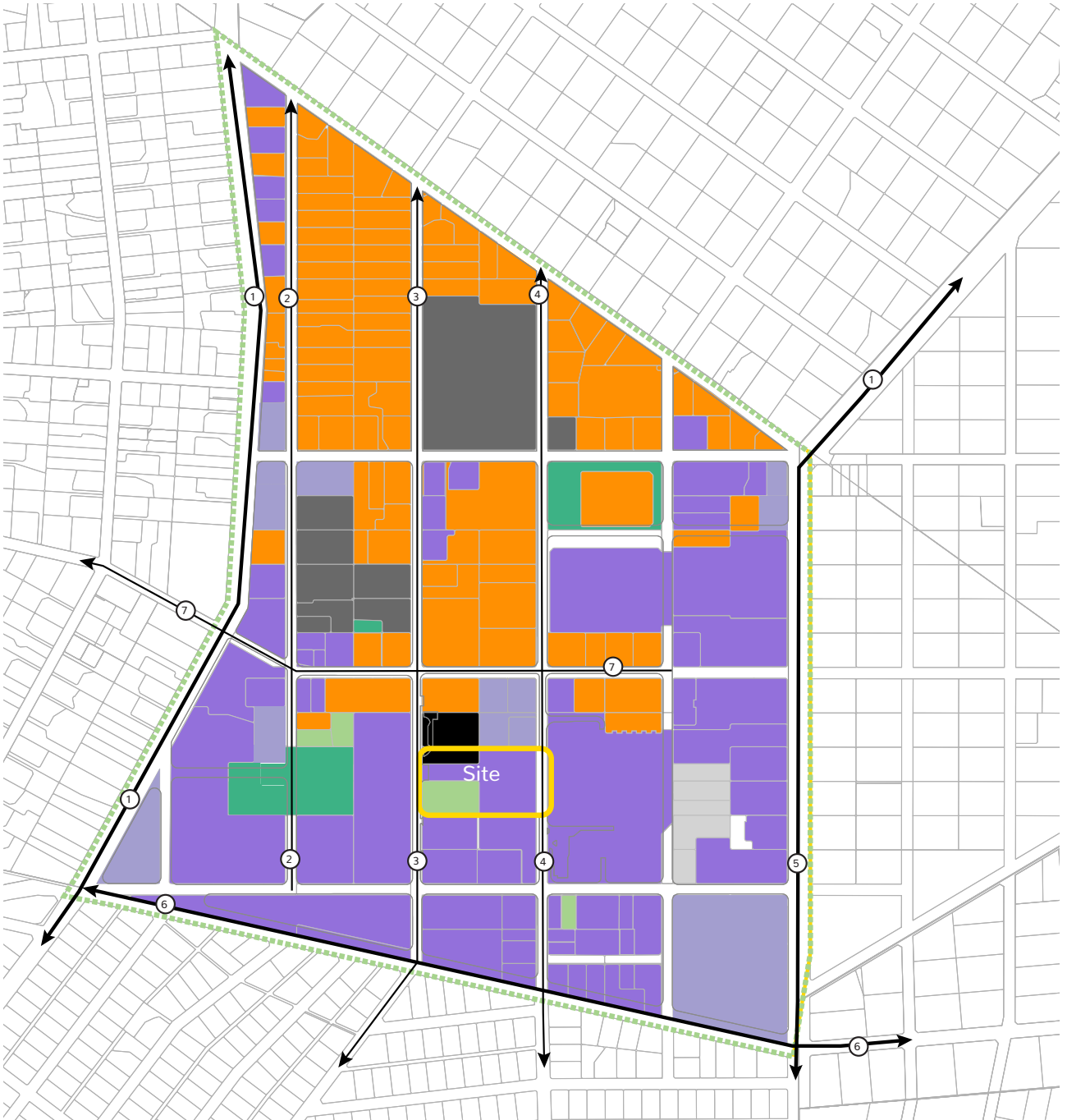
- 1- Jan Smuts
- 2- Keyes Ave
- 3- Sturdee Ave
- 4- Bath Ave
- 5- Oxford Rd
- 6- Bolton Rd
- 7- Tyrnwhitt Ave

■ Office	■ Residential	■ Medical
■ Retail	■ Hotel	■ Gallery
■ Mixed-use	■ Government	
■ Educational	■ Transport	

Focus Area
 Region Boundary



Figure 4.4 - Typology
Scale: 1: 8000



LOCATION KEY

- 1- Jan Smuts
- 2- Keyes Ave
- 3- Sturdee Ave
- 4- Bath Ave
- 5- Oxford Rd
- 6- Bolton Rd
- 7- Tyrwhitt Ave

- Education
- Open Space
- Government
- Institutional
- Mix Use
- Commercial
- Residential
- Parking

- Focus Area
- Region Boundary



Figure 4.5 - Current Zoning
Scale: 1: 8000



LOCATION KEY

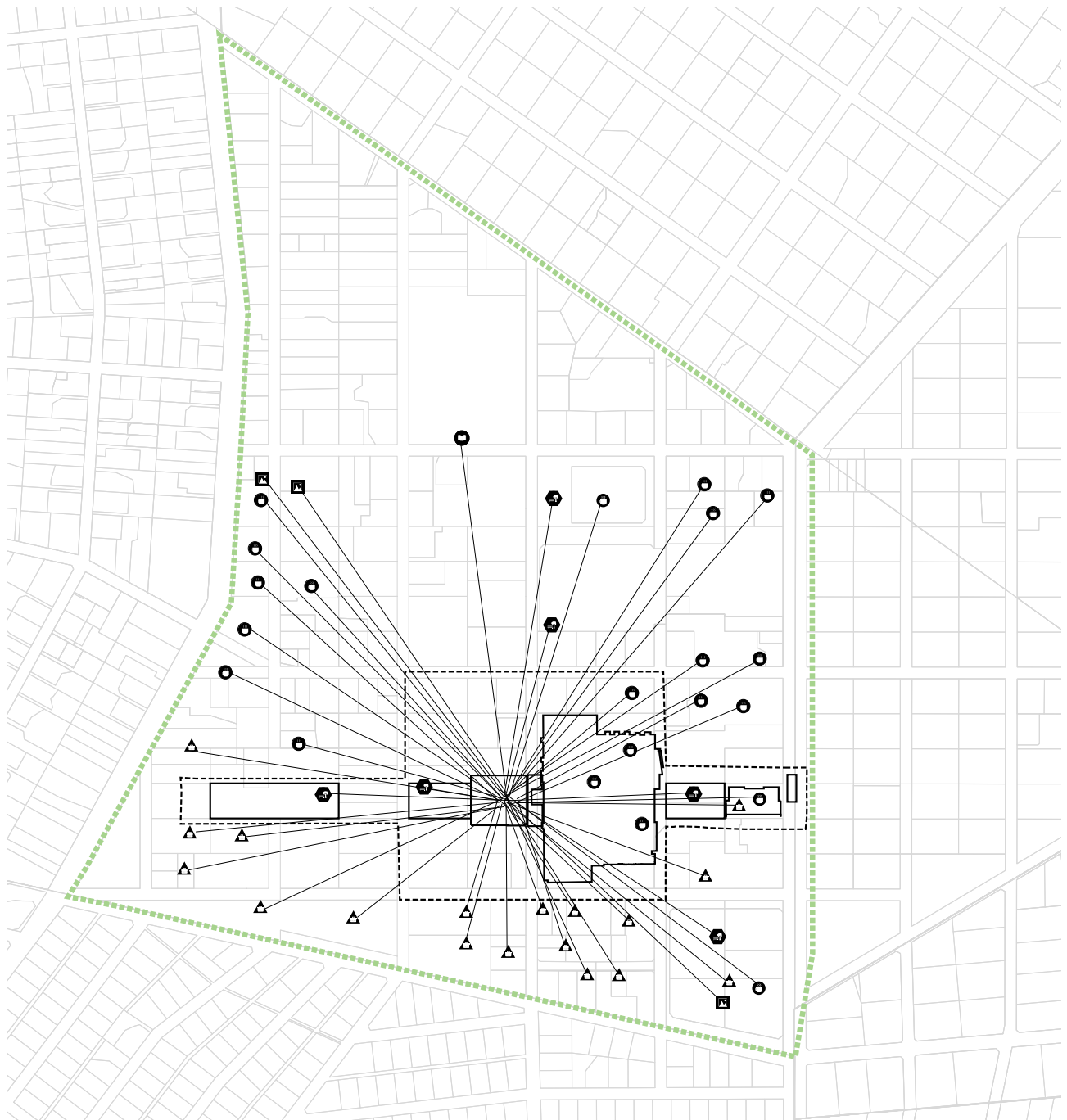
- 1- Jan Smuts
- 2- Keyes Ave
- 3- Sturdee Ave
- 4- Bath Ave
- 5- Oxford Rd
- 6- Bolton Rd
- 7- Tyrwhitt Ave

- Education
- Open Space
- Commercial
- High Density Residential
- High Intensity Mix Use

- Focus Area
- Region Boundary



Figure 4.6 - Future Zoning Proposal
Scale: 1: 8000



Art spaces



Green Spaces



Coffee shops



Offices



Focus Area



Region Boundary



Figure 4.7 - Site in relation to existing work spaces
Scale: 1: 8000

ENVIRONMENTS

The strategic nodal development of Rosebank supports transit-oriented principles. It has therefore resulted in the development of moderate to high-density mixed-use facilities that are in walking distance of basic amenities such as shops, public open spaces and jobs. With the close proximity to living environments and opportunities for work and trade, the future land use looks to enhance the use of alternative transport, while promoting safety and accessibility; thus not only corresponding to the magnitude and scattering of workspaces within the existing context but also the correlation between the compressions of the current context into the future landscape.

TRANSIT LANDSCAPE



Figure: 4.8 - Gautrain Pedestrian Entrance
The implementation of Gautrain resulted in Rosebank becoming a transportation node with various levels of transit available to the public.

PRINCIPLES

With compact and efficient cities being derived by both urban planning and transportation, it justifies Rosebank's transition into a transit-node. This transition has resulted in the growth of economic, social and environmental facilities within this regional node, perpetuated by Johannesburg City Council's decision to make Rosebank a regional node. Hence, Rosebank forms part of the poly-centric system of urban development i.e. a multi-nodal structure linked to transportation systems as outlined by the RSDF. This system was implemented to assist with the city's growth as congestion became increasingly problematic to its economic activity. Thus, as cities expand, the need for alternatives to the private car system become prevalent, making investments in public transport systems imperative. Through Rosebank's investment towards alternative transportation to the private car system, it has resulted in the reduction of the congestion levels on roads, reducing the number of cars while enhancing the pedestrian's experience (Baylis, 2017).

From the suburbs' beginning, Rosebank was set to become a transport hub as it was the first suburb to implement trams that ran into the city centre. In this manner, Rosebank comprises of a revitalised and integrated public transportation system. The investment of the Gautrain system and the Bus Rapid Transit system (BRT) represents a societal commitment to facilitate movement beyond the city borders, resulting in Rosebank as a more compact and efficient suburb that facilitates inclusivity and accessibility. It utilises the Transport Orientated Development (TOD) principles to enhance economic, social and environmental benefits in Rosebank through compact development and public transport.

Transport Orientated Development is not a modern concept but was popularised by Peter Calthorpe in his book *The Next American Metropolis*. Through his work, he illustrates the organisation of a city to be centred around

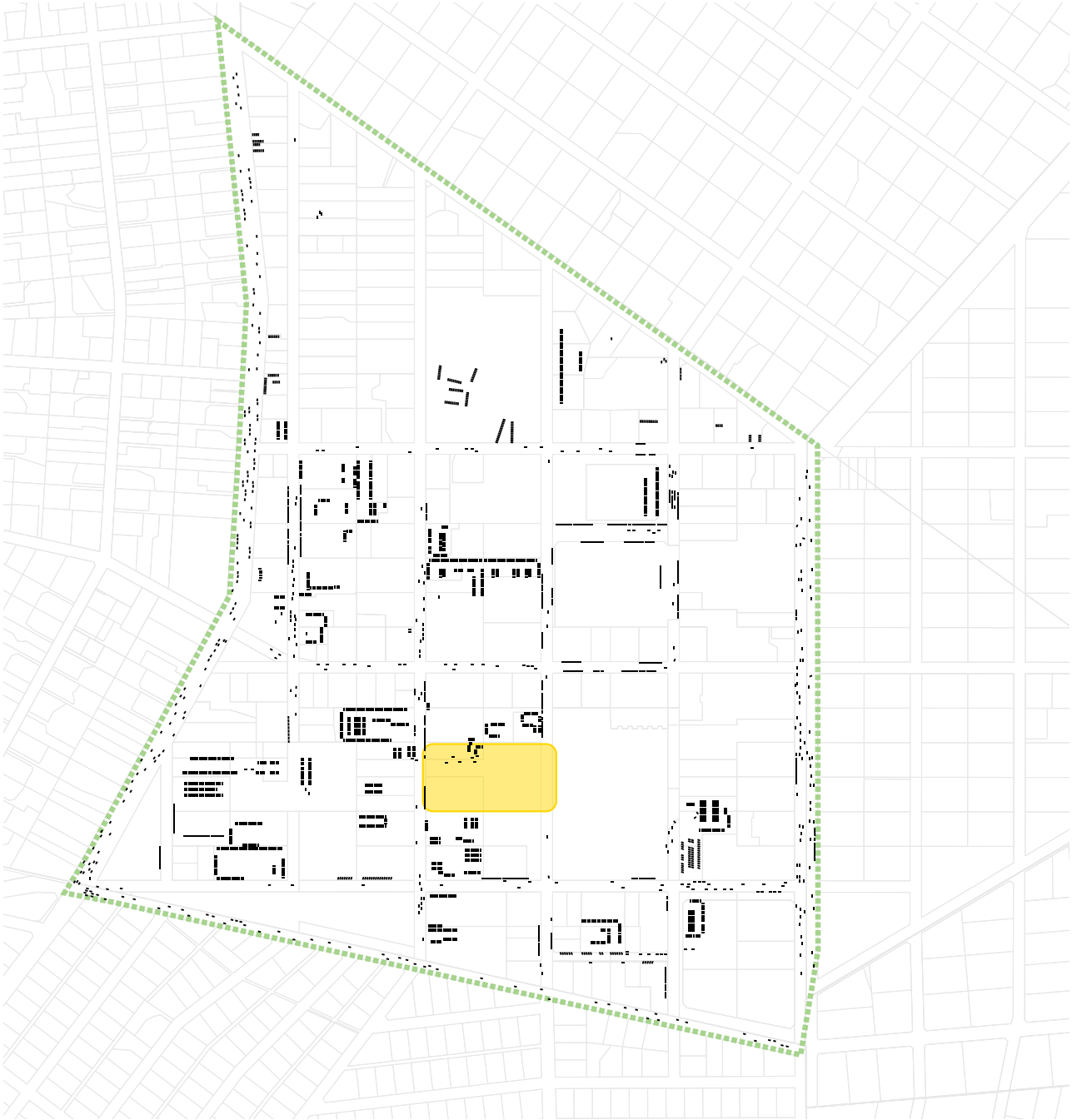
a transit stop. This stop will then be surrounded by highly dense core commercial space and open spaces, followed by offices and residential areas. Based on this principle of organisation, the TOD is defined by eight key principles, namely Walk, Cycle, Connect, Transit, Mix-use, Densify, Compact and Shift (Baylis, 2017). Thus, the TOD should:

- develop neighbourhoods that promote walking;
- prioritise non-motorised transport networks;
- create a dense network of streets and paths;
- locate development near high-quality public transport;
- plan for mixed-use;
- optimise density and transit capacity;
- create short commutes; and
- increase pedestrian mobility by regulating parking and road use.

MOBILITY

Rosebank is an advantageous location due to Bolton Road being a mobility spine and Bompas Road being a mobility road. Its proximity to these two roads allowed the area to effectively utilise forms of public transport such as the Rosebank Gautrain Station, Metro Bus Station and taxi ranks. It is not only suitable for public transport but has also accommodated private vehicles, cyclists and pedestrians. Therefore, many people are able to commute through and to Rosebank which has resulted in pressure on levels and standards of service delivery, mobility and access.

With several forms of transportation being utilised within Rosebank, it has resulted in congestion of specific routes based on the road's broader network and its primary mode of transport. Thus, a high volume of traffic is experienced on numerous roads in the Rosebank Box. From the analysis, it is evident that traffic in peak periods occurs on Oxford Road, Jan Smuts and Bolton Road. These roads are therefore designed for high intensity traffic and frequently serve as the primary route for motorised movement. However, with Rosebank being a transit-oriented node, it has resulted in its accessibility through several modes of transport reducing the overall congestion levels within the current context, establishing all forms of transport prevalent to Rosebank's current success. These include (in order of hierarchy): Gautrain, Metro Bus, metered taxis, minibus taxis, walkability and cycling.



TRANSIT

A snapshot of the transit activity within Rosebank's perimeter. Active roadways are in evident contrast to the parking clusters.

- Focus Area
- Region Boundary
- Site



Figure: 4.9 - Greater Transit Map
Scale: 1: 8000

MODES

Gautrain

The development of the Rosebank Gautrain Station in 2010 created several opportunities, unlocking development potential for more isolated commercial activity within the Rosebank Box. Distinctive and attractive communities were therefore built around the station's location, with the station giving rise to unique environments that provide a community portal to vibrant mixed-use areas and activities. Its objective is to promote the integration of surrounding activities as well as other transport systems. Therefore, feeder systems and accessibility in terms of motorised and non-motorised transport become pivotal to its success. Motorised systems are denoted by the implementation of the Gautrain Bus System. This bus service was used to enhance the existing transport service by allowing a broader connection. The stops for these buses are established on either side of Oxford Road and outside the Rosebank Gautrain Station. This was executed strategically to allow for quick pick-up and drop-off time. Access for non-motorised systems i.e. walking or cycling, is located by lifts near the pedestrianised section of Tyrwhitt Avenue on the West of Oxford road. This is enhanced by walkable connections through existing and future developments. The Gautrain has allowed more people to access Rosebank without the use of private vehicles, thereby reducing the dependency on private vehicle access.

Metro Bus- Motorized System

Access is enhanced by other motorised systems like Bus Rapid Transit (BRT) system. This system has several routes running through Rosebank that assist and compliment access to the Gautrain Station. There were two routes identified within the Rosebank Box; both routes utilise Oxford Road and Jan Smuts Avenue as the primary routes to connect to the greater Johannesburg areas. The primary route uses Biermann Avenue, Bath Avenue and Bolton Road as a connector between the two main streets. This is evident by bus stops being located on Biermann Avenue and Bath Avenue. The secondary route uses Keyes Avenue, Sturdee Avenue and Baker Street. Most bus systems utilise these routes, even city-wide services such as the Metro Bus. Therefore, buses utilised as a form of public transport

has increased access and accessibility to all parts of the city. Their primary function is to act as a feeder-system to Rosebank. This has allowed for a larger community within Rosebank, with a more diverse and extensive demographic.

Metered Taxis- Motorized System

Metered taxis, especially services such as Uber, are being used more frequently in Rosebank, as cars become less necessary within the area. This system also acts as a feeder and distributor for the Gautrain commuter. These trips are often shorter in distance and therefore utilise the existing motorised routes. Due to these vehicles being summoned telephonically and on a demand basis, there is no designated waiting zone in Rosebank. They can be found scattered around the existing context, predominantly near the mall and the Gautrain Station.

Minibus Taxis- Motorized System

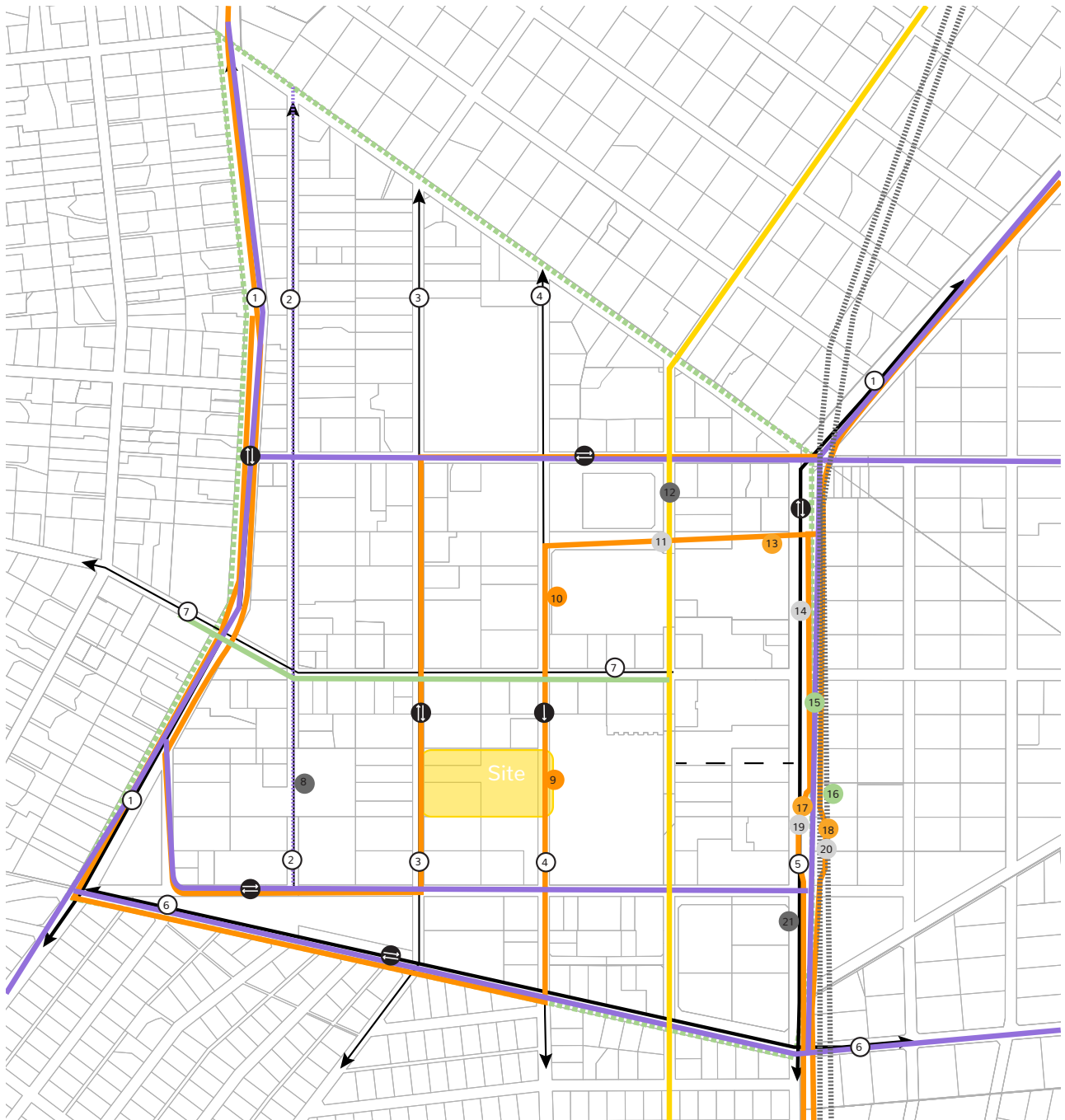
Even Minibus taxis were considered as they remain a prominent form of public transport within the South African context. This is evident by formal and informal taxi ranks within Rosebank. The formal minibus taxi rank located near Cradock Avenue (between Biermann and Jellicoe Avenue).

Cycling- Non-motorized System

The current cycle route that services Rosebank CBD occurs on Cradock Avenue. This route is used to connect Rosebank to Sandton, as it starts on Cradock Avenue and enters the Sandton CBD via Alice Lane.

Walking- Non-motorized System

Rosebank is already suitable for pedestrians and therefore allows for people to walk across its existing context. Currently, the primary axis for pedestrian movement occurs along Tyrwhitt Avenue as it is the most convenient access point to the Gautrain Station; there is no direct route from the Gautrain Station entrance. Pedestrian movement also occurs along Keyes Avenue. This is due to its revitalisation as an art precinct as well as the surrounding institutional buildings. With future developments increasing mixed-use activities both vertically and horizontally, it will directly emphasise and increase local pedestrian movement.



LOCATION KEY

- | | | |
|-----------------|------------------------|--------------------------------|
| 1- Jan Smuts | 8- Taxi Rank | 15- Gautrain Pedestrian Access |
| 2- Keyes Ave | 9- Bus Stop | 16- Gautrain Vehicular Access |
| 3- Sturdee Ave | 10- Public Library | 17- Gautrain Bus Stop |
| 4- Bath Ave | 11- Metered Taxi JM023 | 18- Gautrain Bus Stop |
| 5- Oxford Rd | 12- Taxi Rank - JR070 | 19- Metered Taxi JM095 |
| 6- Bolton Rd | 13- Tourist Bus Stop | 20- Metered Taxi |
| 7- Tyrwhitt Ave | 14- Metered Taxi JM113 | |

- | | |
|-----------------------|----------------------|
| Two-way | One way |
| Cycle route | Foot Traffic |
| Main Vehicular Routes | Main Bus Routes |
| Railway | New Pedestrian Route |

- | |
|-----------------|
| Focus Area |
| Region Boundary |



Figure: 4.10 -Mobility Routes
Scale: 1: 8000



Figure: 4.11 -Gautrain Link
Scale: 1: 10000

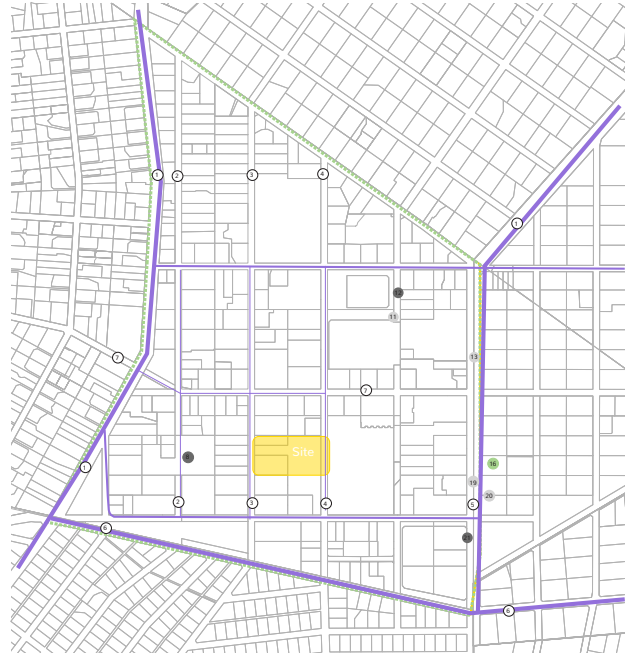


Figure: 4.12 -Vehicle Route
Scale: 1: 10000



Figure: 4.13 -Bus Route
Scale: 1: 10000

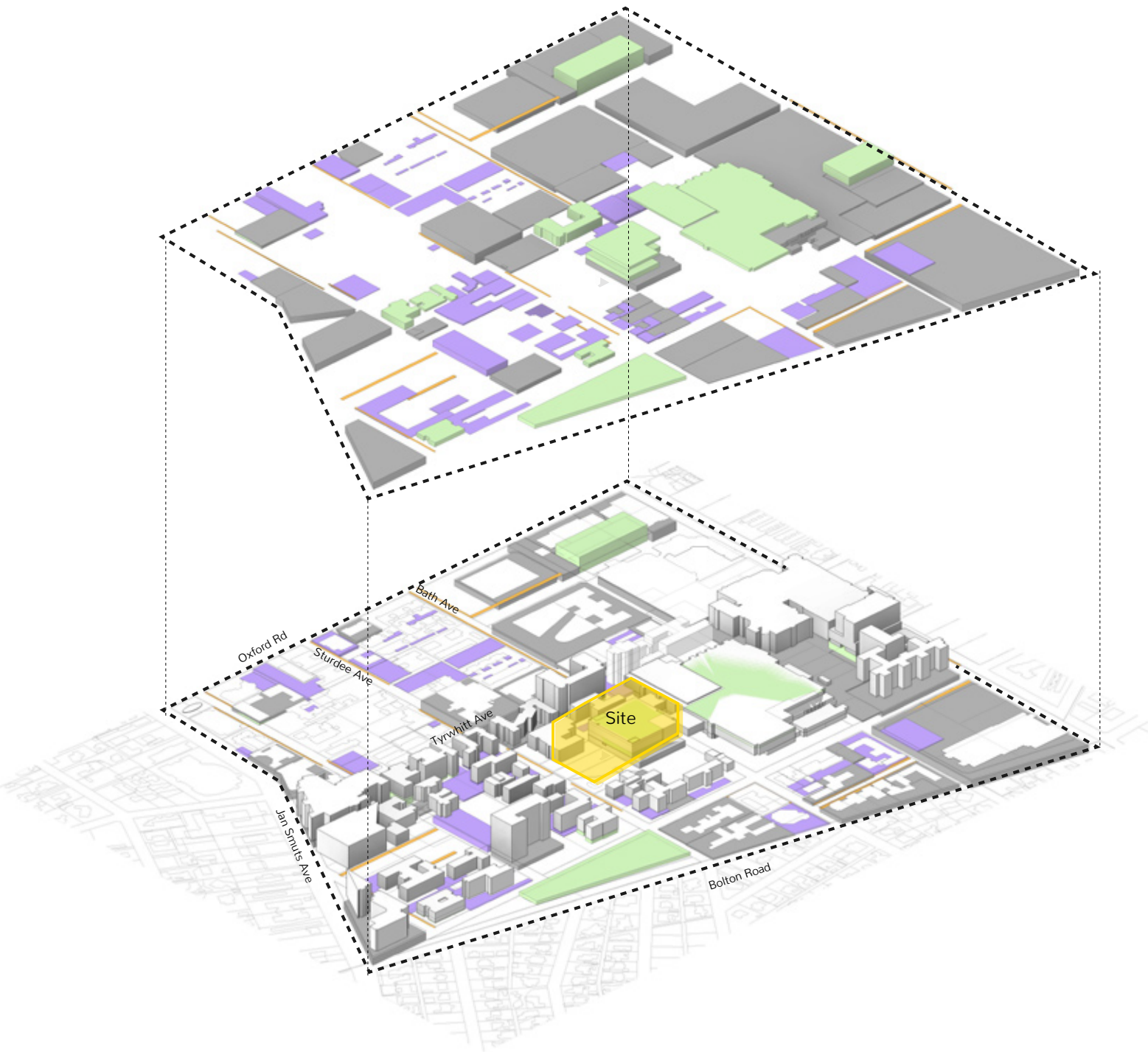


Figure: 4.14 -Pedestrian Route
Scale: 1: 10000

PARKING

In Rosebank, parking provisions generally fall into three categories: on-street, off-street-open-air (on grade) and off-street-in-structure (below and above grade). Rosebank schematic planning requires on-site parking i.e. most public parking to be in close proximity to the retail land uses. Thus, on-street parking occupies public street space, while off-street-open-air parking requires public street space for accessibility. Although off-street-in-structure parking doesn't occupy public street space, it requires a large amount of space. This is because the average space required for a parking space and manoeuvring is 25m². This means that roughly an equal allocation of the built floor area for office space is given to parking areas. Through the redevelopment of Rosebank, it has created a competitive market. This has resulted in high parking ratios and high-density off-street-in-structure parking. Unfortunately, this is contradictory to the development frameworks initiative to enhance and promote alternative forms of transport. Studies have established a direct correlation between the amount of parking and the type of transport used (Baylis, 2017). By reducing the parking supply, it will decrease the number of parking bays available, resulting in alternative modal transportation being selected.

Currently, Rosebank's parking is geared towards the provision of a predetermined number of bays per land-use, without consideration to alternative transport systems. Thus, the following ratios are used: one point two (1.2) bays per small dwelling and two point five (2.5) per larger dwelling units. Four (4) bays per 100m² of office space and six (6) bays per 100 m² of retail floor area (Baylis, 2017). Based on these estimates, it was determined Rosebank currently has 27 880 parking bays. This number is estimated to dramatically increase in the future due to its densification, consequently leading to an oversupply of parking. This can be avoided by utilising principles of the shared economy, thus making shared parking a more preferred option. This notion is enhanced by the mixed-use approach as it causes different peak-parking demands, resulting in better and efficient utilisation of parking. By reducing the space required for parking with shared parking initiatives, it will preserve land that can be better allocated for densification purposes, while reducing the dependency on private cars and parking.



- Above Grade
- On Grade
- On Street
- Below Grade

- Focus Area
- Region Boundary
- Site

Figure: 4.15 - Parking Position
Scale: 1: 6000

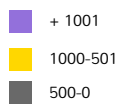
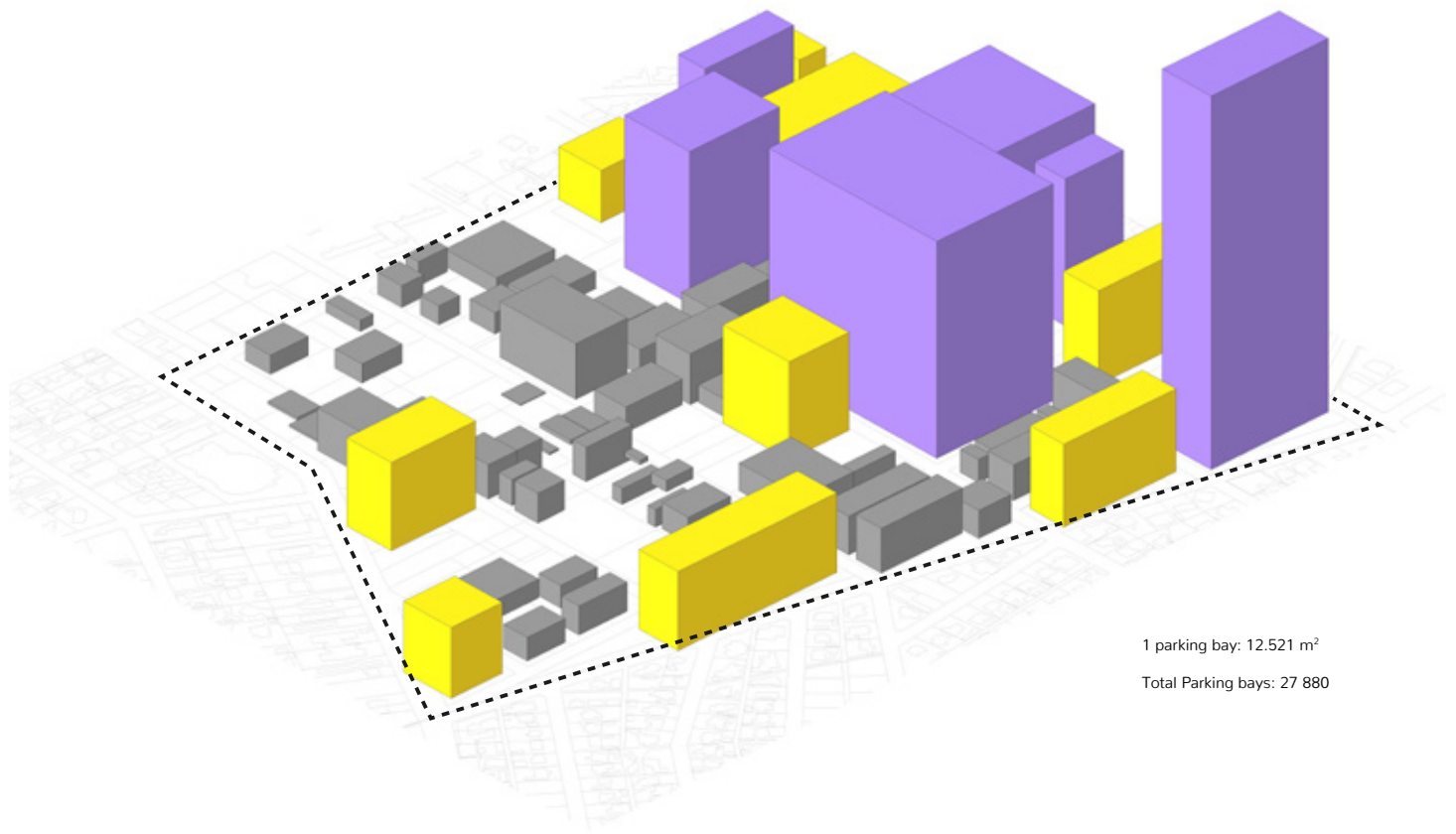


Figure: 4.16- Parking
Density
Scale: 1: 8000

PUBLIC DOMAIN



Figure: 4.17 - Sidewalk Under Mall Bridge
Wide sidewalk denotes a pedestrian orientated plane, however, the limited light and harsh treatment has resulted in a cold environment resulting in limited pedestrian movement along Bath Avenue

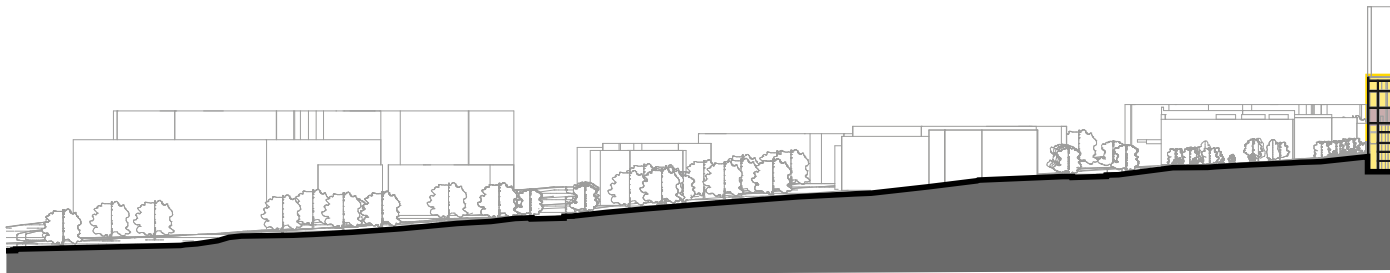


Figure: 4.18 - Public Spaces Scale: 1: 6000

PEDESTRIAN NEIGHBOURHOOD

The RUDF's primary initiative is to create pedestrian-oriented streets and increase people's accessibility to opportunities, which include goods, services and activities. This resulted in significant investments in the public spaces around the Rosebank Mall, the Gautrain and the Standard Bank building. This is illustrated by the improved pedestrian networks and piazzas. Despite the initiative to develop more public spaces, most of these environments are semi-private. Therefore, it has produced a demand for more inclusive and public environments, through the utilisation of open spaces and vegetation (van Niekerk et al., 2013).

Rosebank, as mentioned previously, is already suitable for pedestrians. This is enhanced by its pedestrianised character identified as special pavements, street furniture and greenery. According to the framework for pedestrians, mobility should occur on Oxford Road, particularly in the vicinity of the Gautrain and BRT Stations, thereby making Tyrwhitt Avenue and Bath Avenue strong pedestrian-oriented streets. To increase pedestrian movement and street level activity, routes need to be direct and convenient to and from transit points. Thus, by utilising the shortest route, it minimises the time and effort required to reach different activities and facilities, encouraging pedestrian mobility. In summary, by increasing the ability to walk and cycle establishes a compact and pedestrian-friendly neighbourhood.



KEY

- 1- Jan Smuts

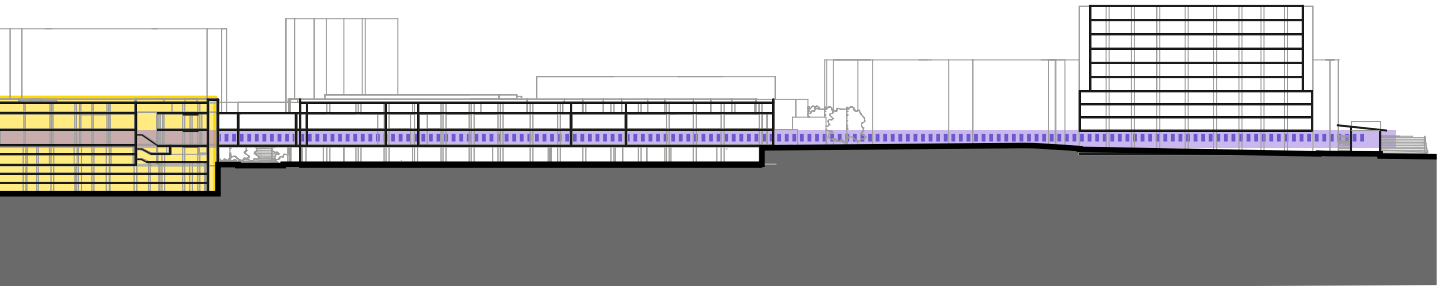
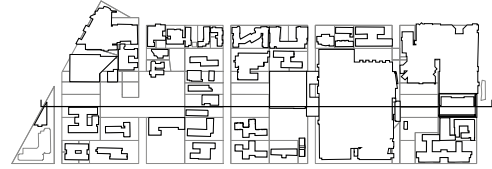
2- Keyes Ave

3- Sturdee Ave

4- Bath Ave

5- Oxford Rd
- New Thoroughfare

■ Public Domain

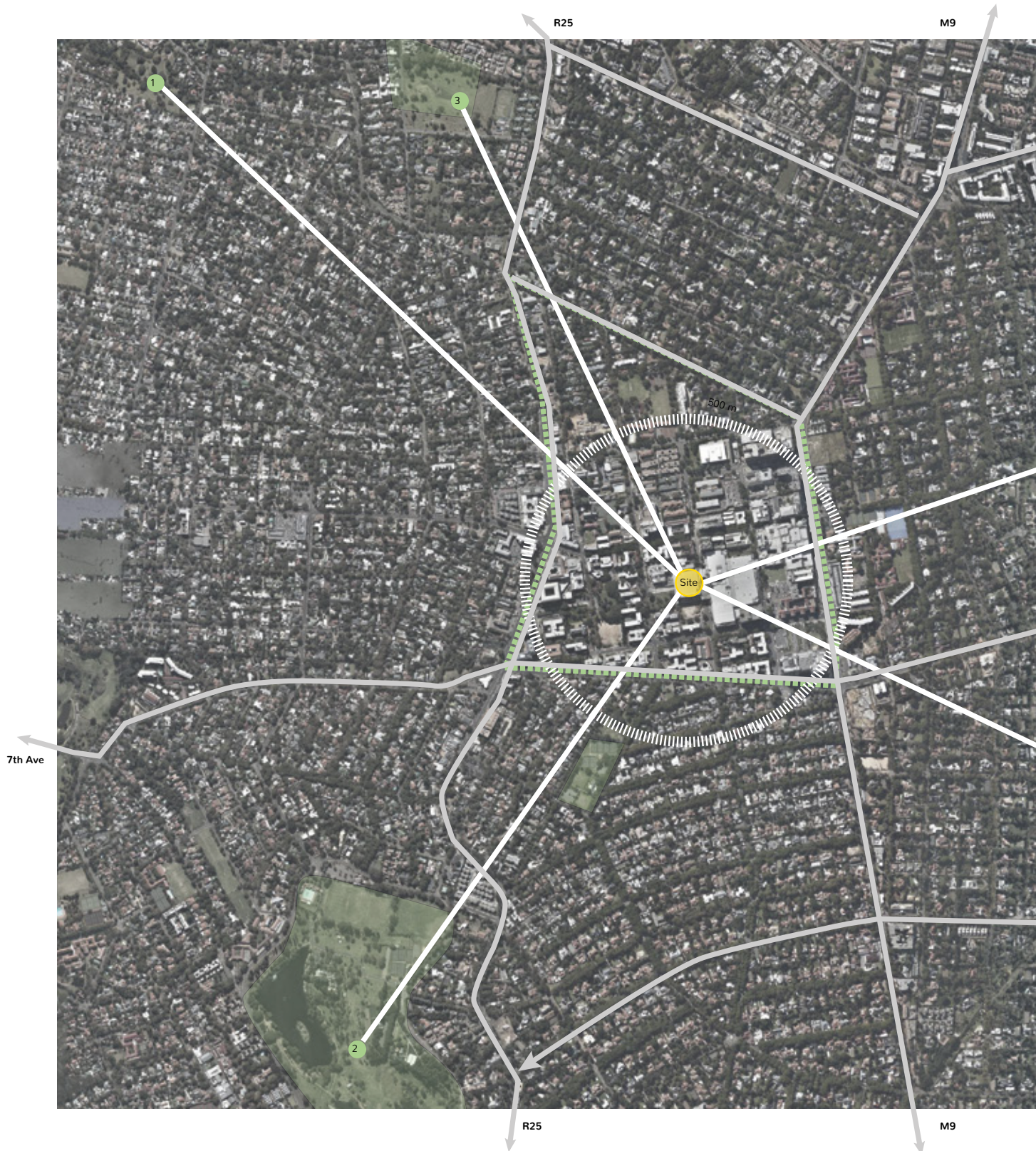


One of the strategies proposed by the new development - the Link- was to create a new direct thoroughfare from the gautrain station and through the Rosebank Mall, with the potential of connecting to the various parks. The intention is to create a continuous public plane along the East-West Axis. This Plane aligns with the parking structure's level two.

■■■■■ Focus Area
 ■ ■ ■ Region Boundary
 ■ Site

Figure: 4.19 - Public Plane
Scale: 1: 2500

NATURAL LANDSCAPE





- 1- Hamilton Park
- 2- JHB Zoo Lake
- 3- Hugh Wyndham Park
- 4- James & Ethel Gray Park
- 5- Algernon Road Park

- Green Belts
- Focus Area
- Region Boundary

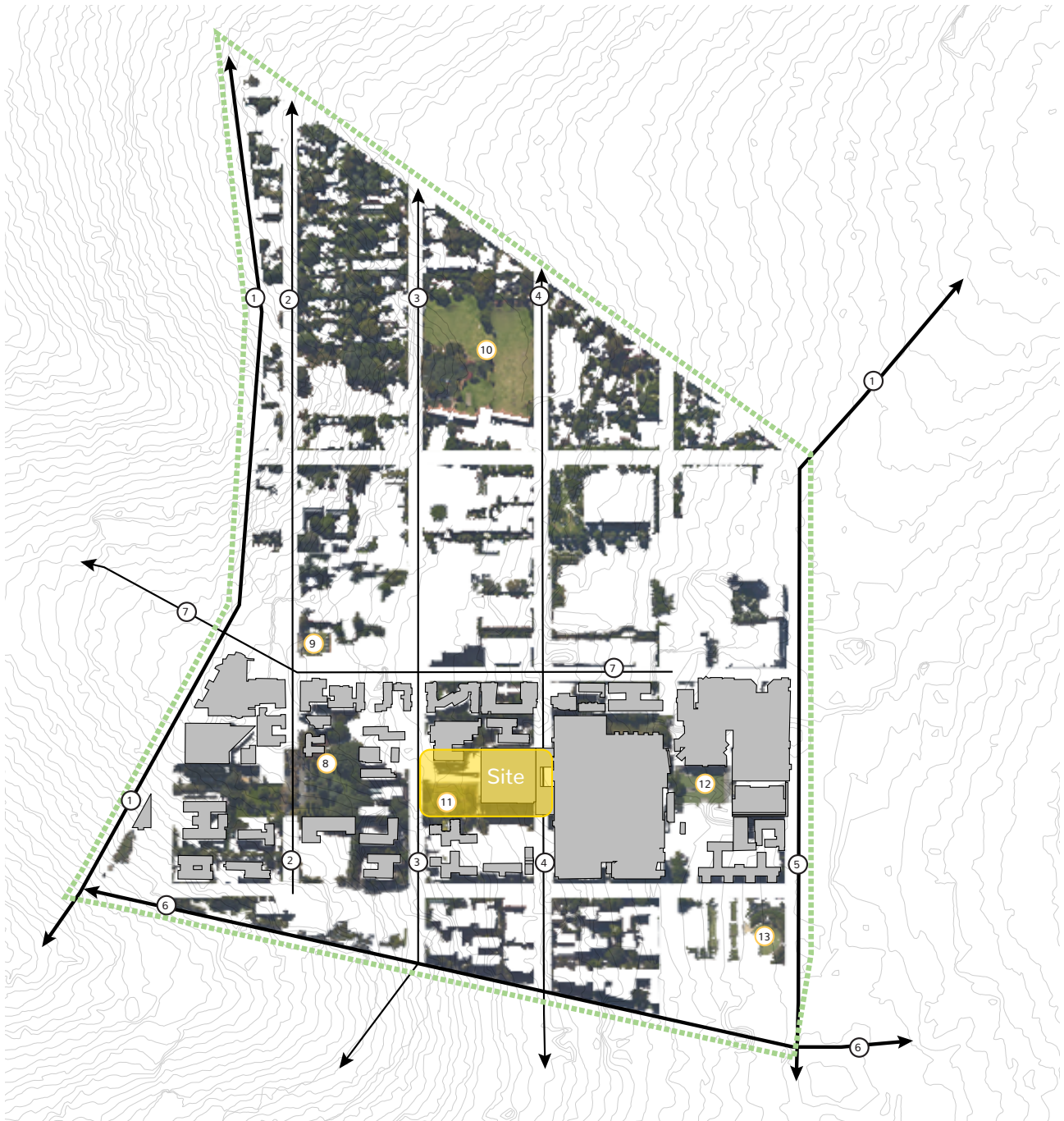


Figure 4.20 - Greater Green Landscape
Scale: 1: 15000

NATURAL LANDSCAPE

Nature portrays a prevalent role within the Rosebank context. Not only is it utilised to produce open spaces thereby attributing to Rosebank's character but it also acts as a connector to the broader context. With Rosebank initially being an orchard farm, nature is therefore used as a tool to denote historical significance. Thus, Rosebank maintains a strong relationship with nature.

The area is characterised by rows of trees located along all the sidewalks, as well as several green spaces which are scattered throughout the current context. These green spaces are utilised as squares or parks as they enhance and encourage social activities. These spaces are intended to increase as the frameworks stipulate 5% of each property to be utilised as open green spaces (van Niekerk et al., 2013). Therefore, nature and its connection back to an orchard farm fulfil a prominent role in all aspects of its development. This is suggestive of not only its historical relevance but also its connection to sustainability.



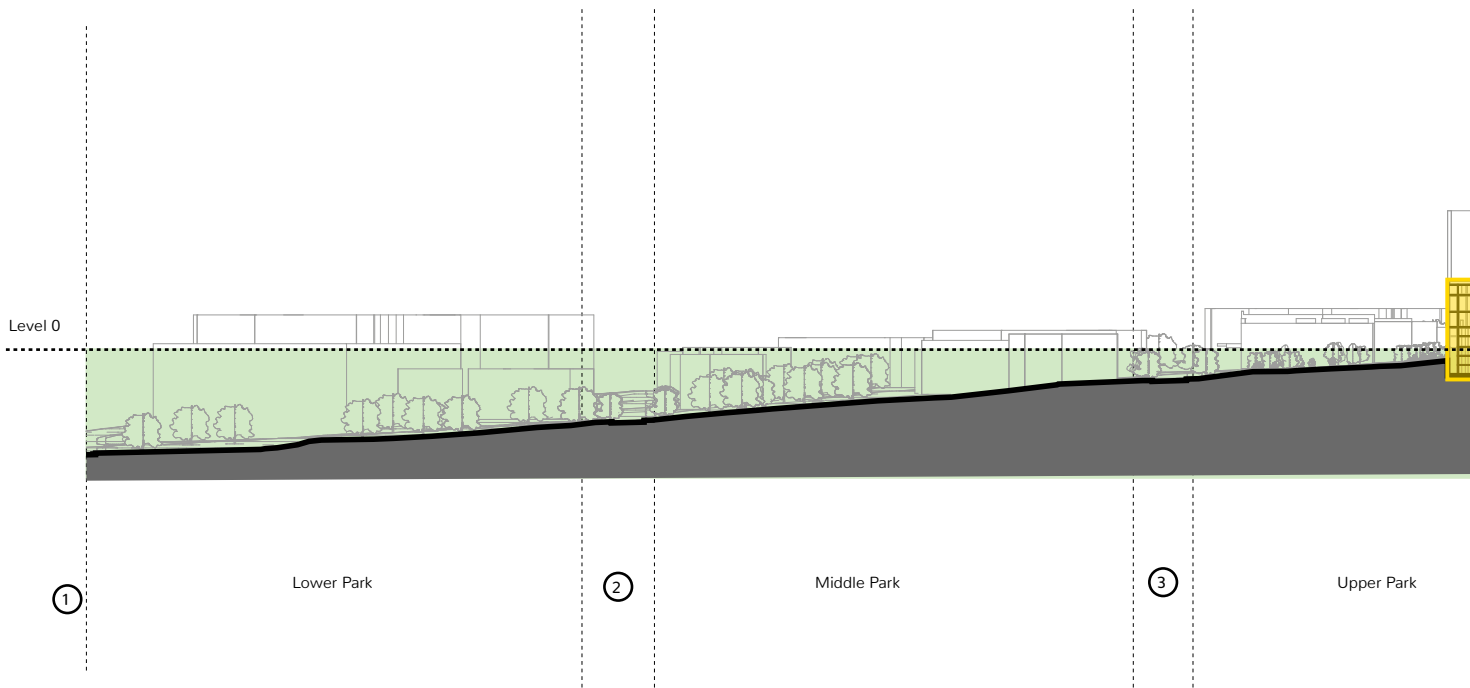
LOCATION KEY

- | | |
|-----------------|---------------------------|
| 1- Jan Smuts | 9- Open space |
| 2- Keyes Ave | 10- Primary School Fields |
| 3- Sturdee Ave | 11- Park |
| 4- Bath Ave | 12- Fire House 9 |
| 5- Oxford Rd | 13- Commercial Park |
| 6- Bolton Rd | |
| 7- Tyrwhitt Ave | |
| 8- Park | |

- Focus Area
- Region Boundary



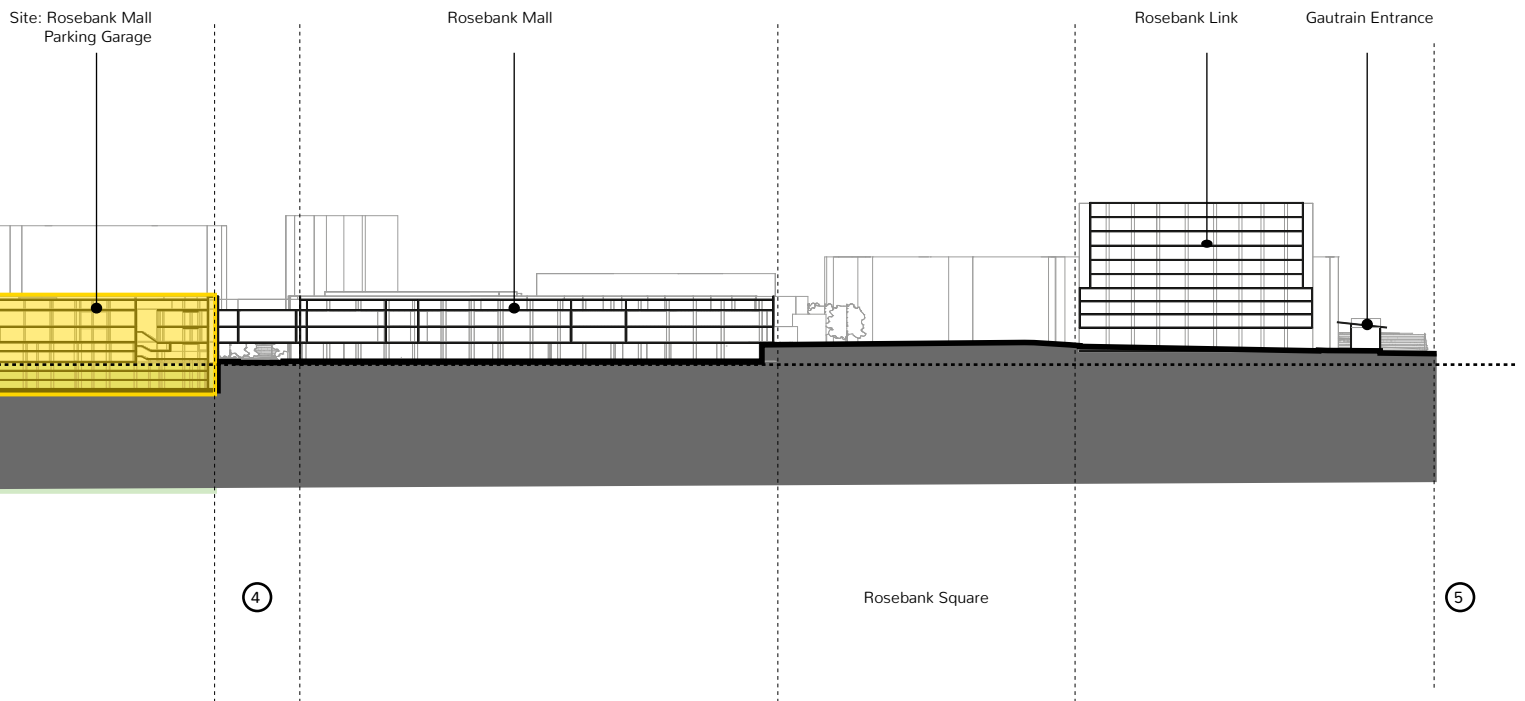
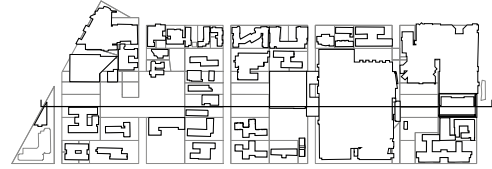
Figure: 4.21 - Natural Form
Scale: 1: 8000



KEY

- 1- Jan Smuts
- 2- Keyes Ave
- 3- Sturdee Ave
- 4- Bath Ave
- 5- Oxford Rd

Green Landscape



The sites currently cuts off the green landscape from continuing through the public square. Therefore, with the green landscape aligning with the Ground floor, the building has the potential to connect the parks, and the Rosebank square with a new green space, advocating for a conceptual linear park within the Rosebank context

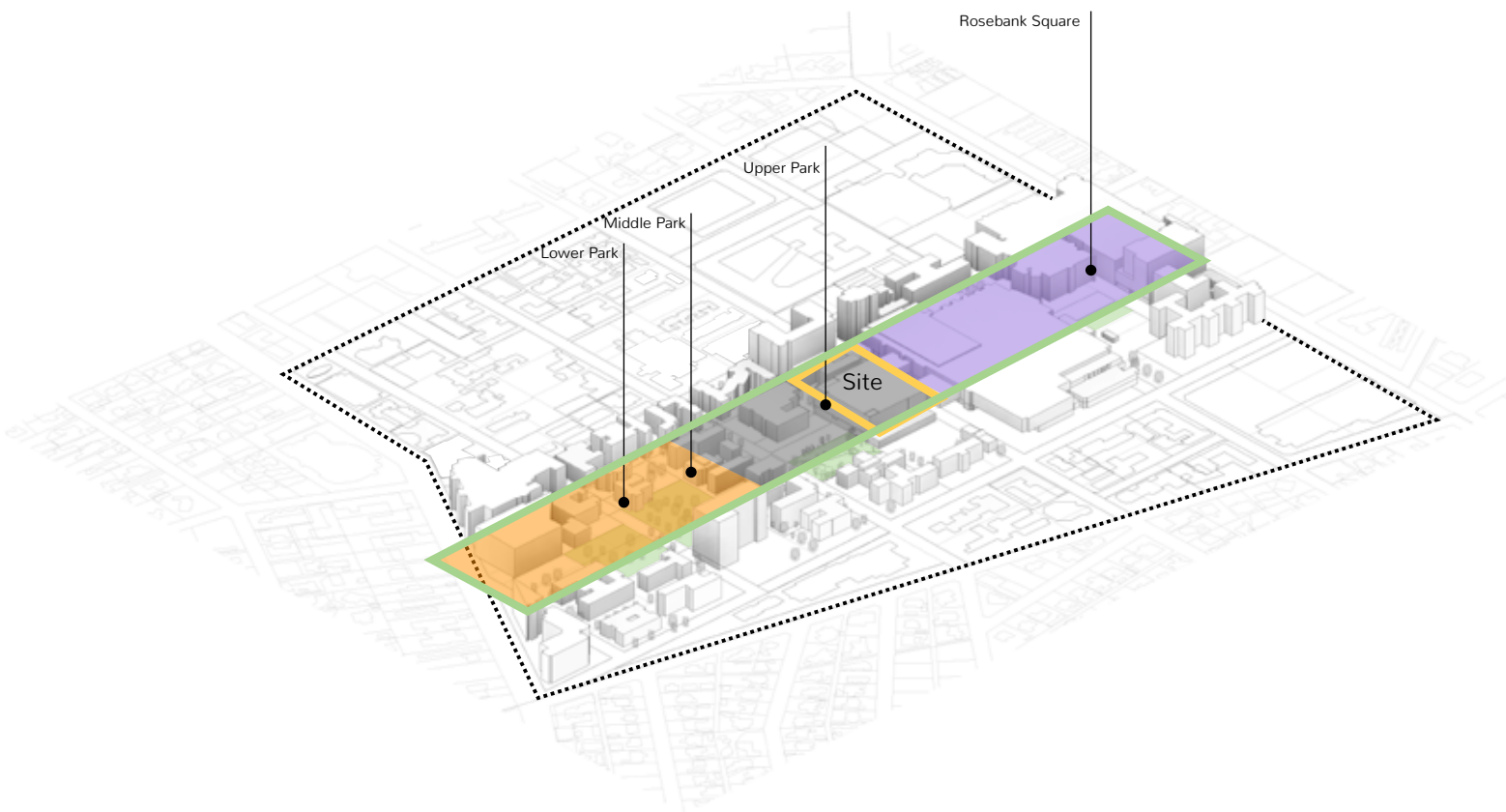
■■■■■ Focus Area
 ■ ■ ■ Region Boundary
 ■ ■ ■ Site

Figure: 4.22 - Green Plane
Scale: 1: 2500

STRATEGY

From the site analysis, it became evident that the proposed design would have to acknowledge the opportunities created by the Gautrain Station, existing public amenities, neighbourhood character, mixed land use, pedestrian-based movement systems and trade opportunities. In order to create a pedestrian-oriented neighbourhood, new routes would have to be created. These routes would be direct and convenient to and from transit points, to encourage and promote alternative forms of transit especially walking and cycling. Mixed-use activities both vertically and horizontally emphasise local pedestrian movement; these activities will increase services and employment opportunities. With Rosebank's increase of density, the range of housing and alternative forms of transportation, it has generated a larger and diverse community; enhancing the notion of public space and shared experience.

With distinctive and attractive communities being developed around the station's location, it has given rise to unique environments. These environments provide the community with vibrant mixed-use areas and activities to reflect all aspects of daily life. Hence, a spatial strategy was developed to enhance this notion with a focus being placed on the primary pedestrian axis derived by the Gautrain Station entrance. As illustrated in figure 4.23.1 this axis comprises of a civic lifestyle located near the main transport zones. It then progresses into economic activity with a residential zone being placed on the end near Jan Smuts. This region has four open green spaces: Lower Park, Middle Park, Upper Park and Rosebank Square. All these social spaces are disjointed and therefore there is an opportunity to increase social interaction through its connectivity, thus resulting in the spatial proposal to produce this linear park that accommodates all aspects of living, work and play. This makes the design's response prevalent to not only the horizontal context but also the vertical context, requiring the consideration of the connection and transition between the three contextual levels identified within the Rosebank precinct i.e. park, public domain and retail.



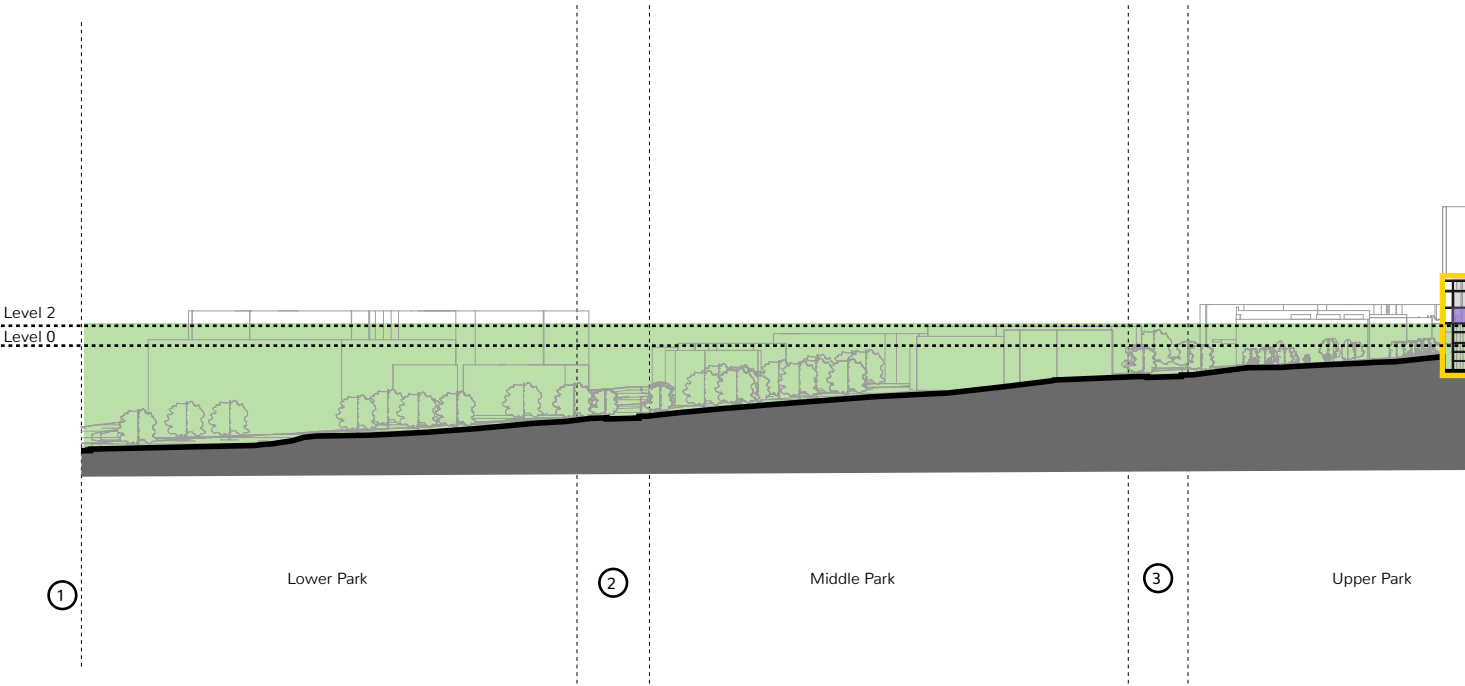
PROPOSAL

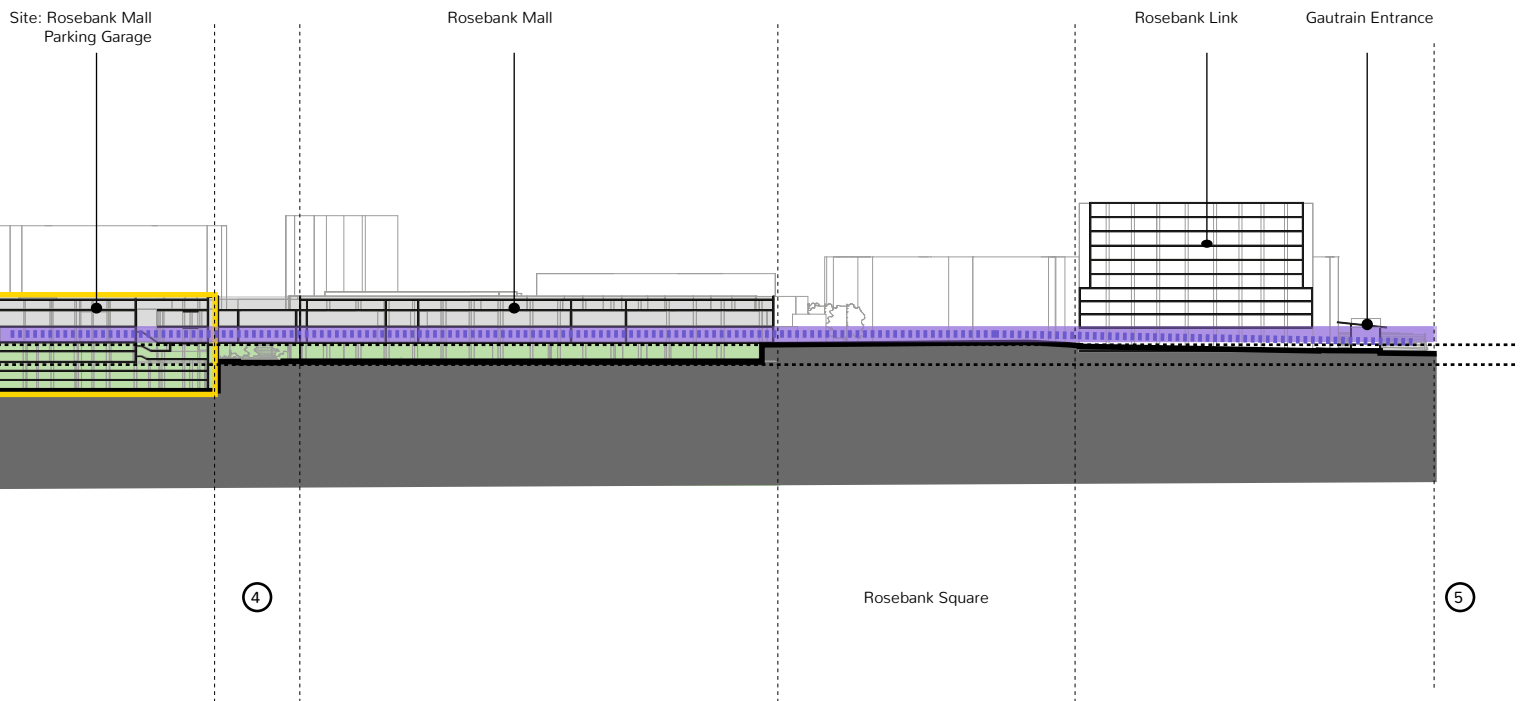
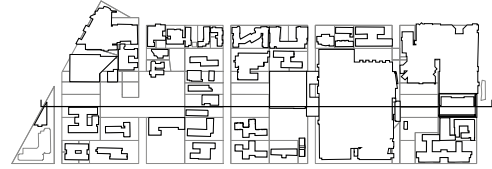
- Leisure Zone
- Work Zone
- Live Zone
- Green Space Boundary

- Focus Area
- Region Boundary
- Site

Figure: 4.23.1 - Linear Park
Proposal
Scale: 1: 6000

CONTEXTUAL STRATEGY





The strategy derived from the mapping denotes the existence of three predominant levels within the current context. Thus the design proposed needs to derive a connection between all three levels both physically and visually.

■■■■■ Focus Area
 ■■■ Region Boundary
 ■■■ Site

Figure: 4.23.2 -
Relational Planes
Scale: 1: 2500

MICRO ANALYSIS



EXISTING LANDSCAPE



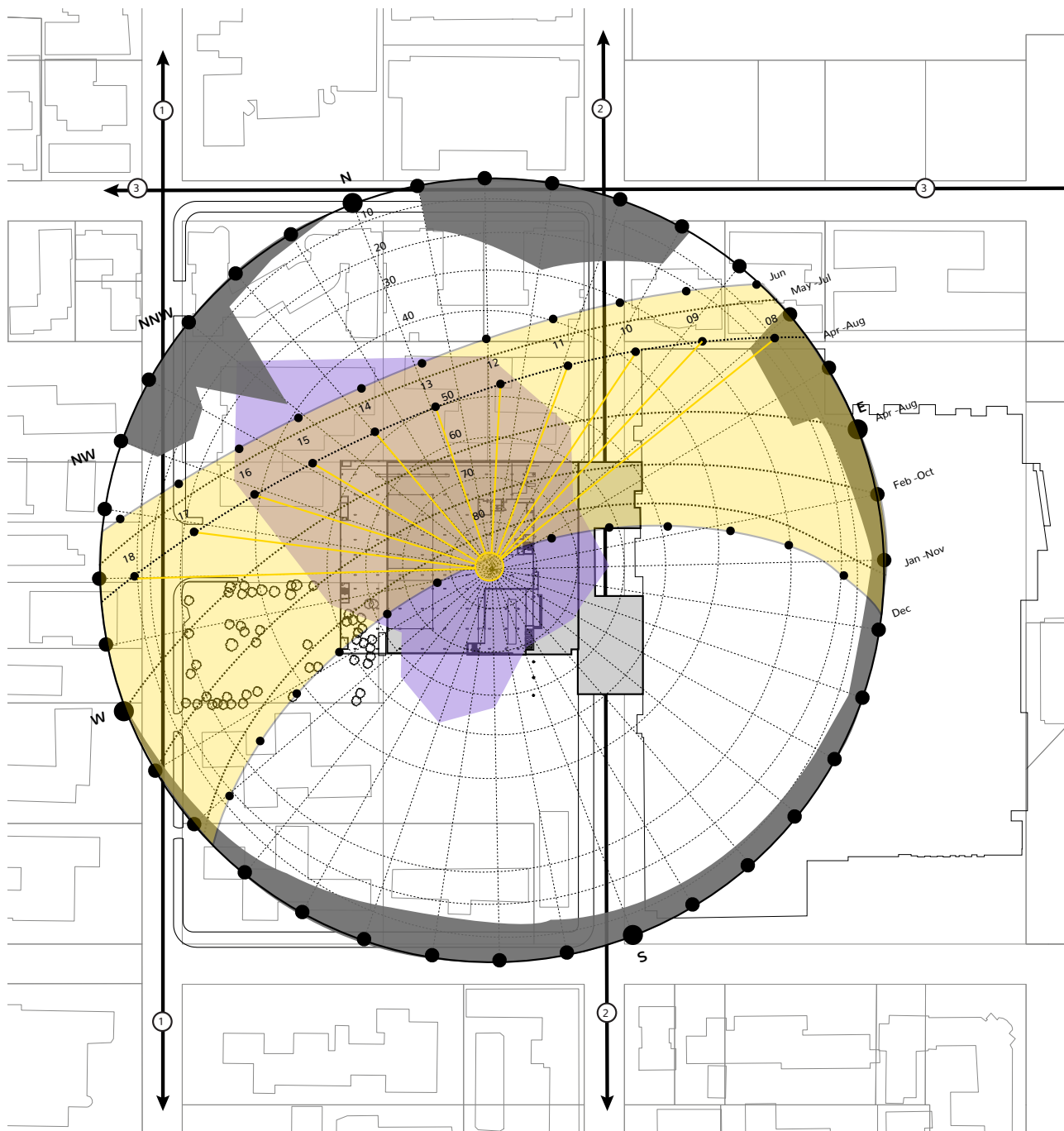
Figure: 4.24 - Parking Garage Sturdee Ave Entrance

SITE SELECTION/ THE ROSEBANK MALL

The selection of the existing parking structure (on Bath Avenue and Sturdee Avenue) was strategic in that it reflected both the principles outlined by the theoretical and analytical research. In order for the prospective design to enhance the social experience and derive a stronger physical connection, a site along the primary axis between the park and the Gautrain Station needed to be selected. This is so that a stronger connection and a direct route could be established. With most of the sites allowing for this access to be open and visible, the existing parking structure concealed this connection. Its location also disrupts social activity as it disjoints all the public and open spaces. The fact that it is a massive parking structure also suggests its inefficiency and redundancy, especially within the future context. However, despite all these aspects being counter-intuitive to the spatial frameworks, its connection to the Rosebank Mall makes it ideal with regards to the research and its theoretical underpinnings. This is largely expressed through shopping centres' historical significance and society's shift towards electronic commerce (E-commerce).

There has habitually been a direct correlation between commerce and public life in the urban landscape. This is due to retail historically being pivotal in generating social activity - the Agora. However, the rise of E-commerce in recent years has altered this relationship both physically and socially. With the shift to online platforms, it has resulted in the reduction and underutilisation of the retail sector. With E-commerce being prioritised over the physical experience, it has spatially resulted in the decoupling of the retail building typology and the reduction of social activity. Therefore, with retail having a diminishing social experience it has resulted in what one can consider as a superficial experience. It has also resulted in a disconnected place and value (Van Berkel, 2019), thus transforming retail could be the first step towards contributing to a city's civic life.

With disruptive technology placing a higher value on bringing people together, it is also emphasising pedestrian mobility. Therefore, foot traffic can be used as a tool to assess the performance of retail space in its ability to create public value. This approach provides room for intervention, diversity and innovation as it removes retail space from speculation. It creates opportunities for pedestrian mobility based on economic value and community; redefining retail to be a platform for local and community-based needs (Van Berkel, 2019).



LOCATION KEY

- 1- Sturdee Ave
- 2- Bath Ave
- 3- Tyrwhitt Ave

- Sun Rays
- Shadow Cast
- Wind Intensity and Direction



Figure 4.25 - Climate
Scale: 1: 2000

TRANSIT LANDSCAPE



LOCATION KEY

- 1- Sturdee Ave

2- Bath Ave

3- Oxford Rd
-  Foot Traffic

 Vehicular Routes

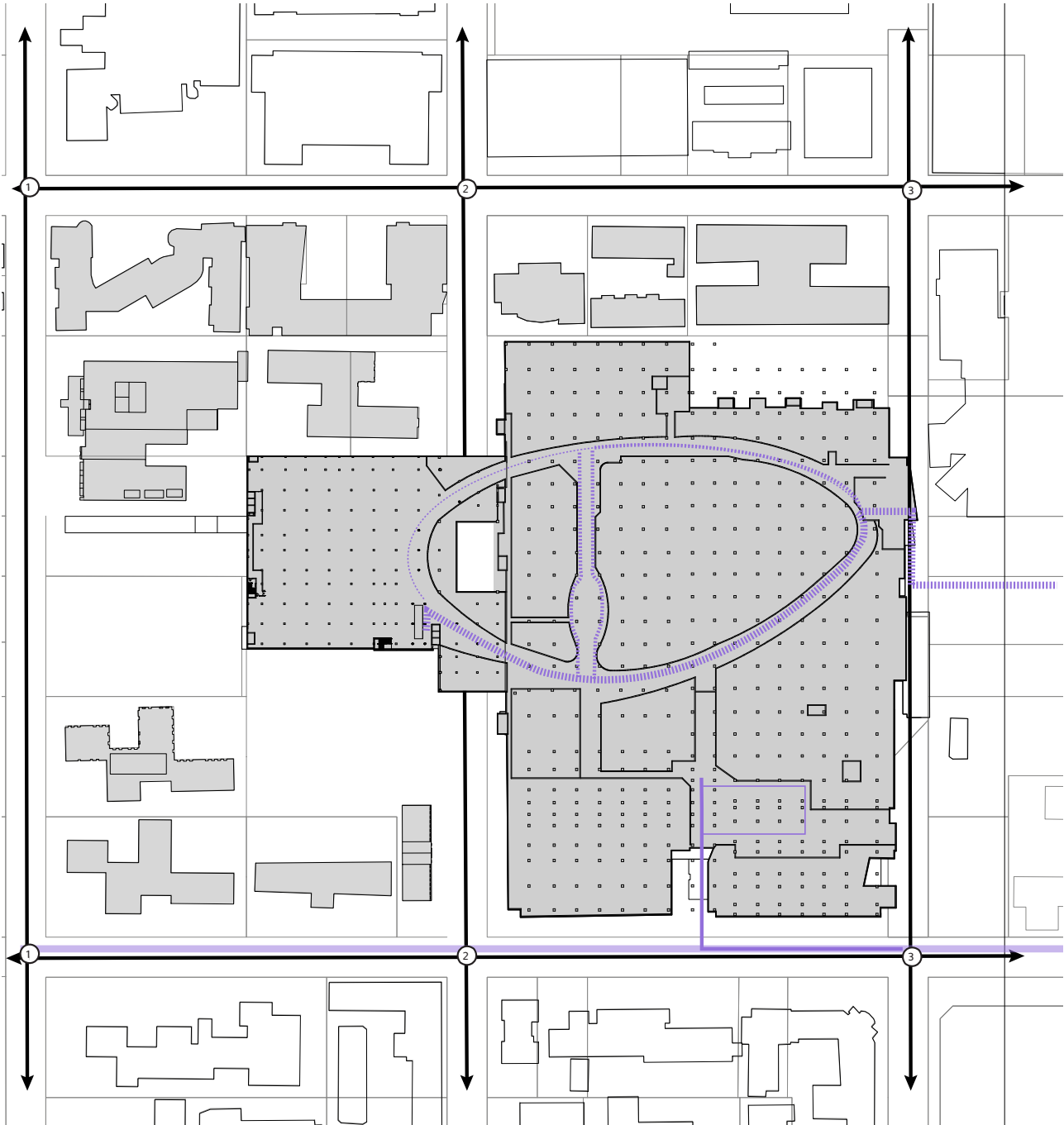
 Service Vehicle



Figure: 4.26 - Green

Level Mobility Routes

Scale: 1: 2000



LOCATION KEY

- 1- Sturdee Ave
- 2- Bath Ave
- 3- Oxford Rd

- Foot Traffic
- Vehicular Routes
- Service Vehicle



Figure 4.27- Public Domain Level Mobility Routes
Scale: 1: 2000

NATURAL LANDSCAPE





Figure: 4.28 - Adjacent Park

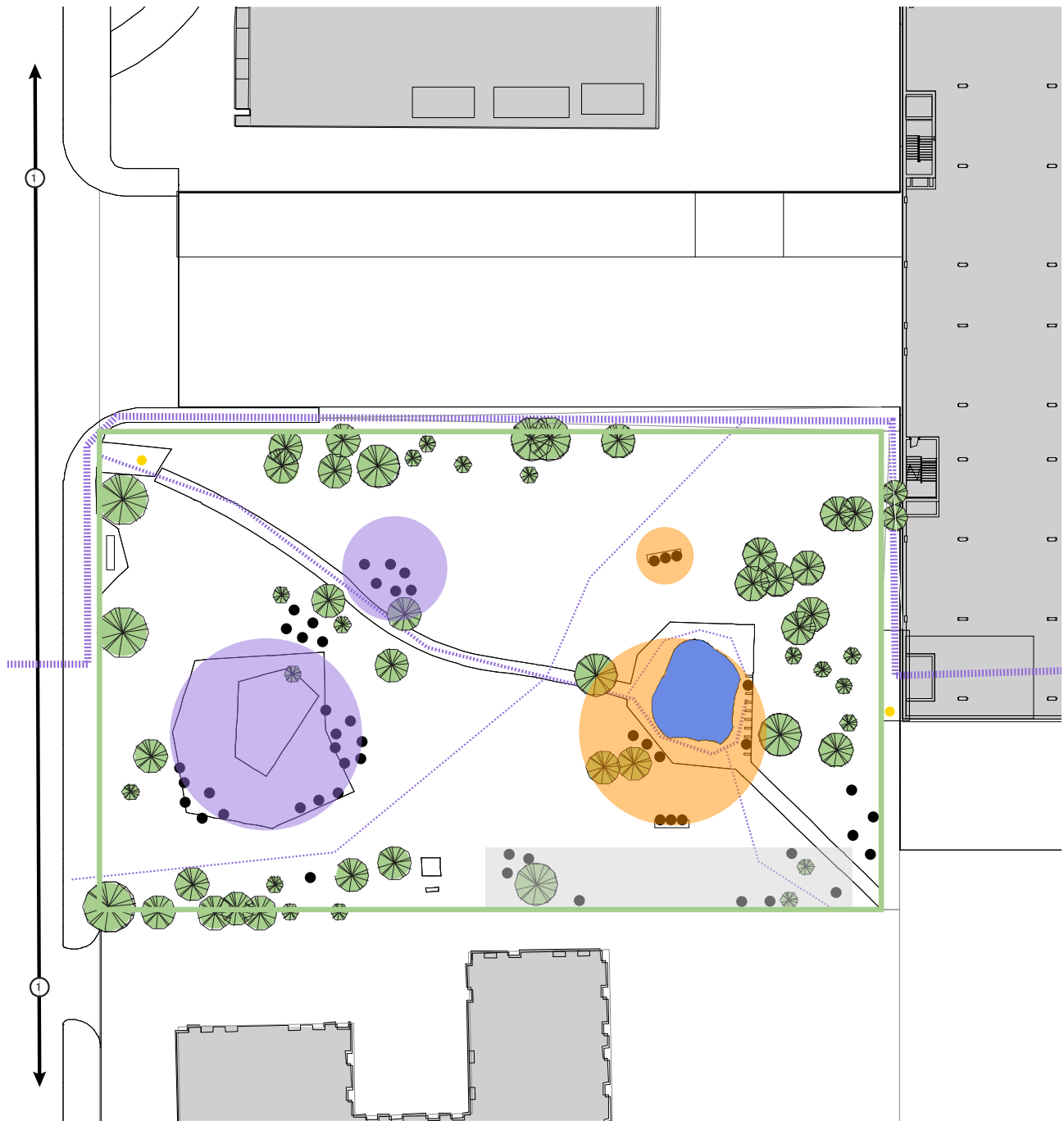


LOCATION KEY

- 1- Keys Ave
- 2- Sturdee Ave
- 2- Bath Ave
- 3- Oxford Rd
- 5- Tyrwhitt Ave



Figure: 4.29 - Green Block
Scale: 1: 3000



KEY

- 1- Sturdee Ave
- Tree
- Occupant
- Security
- Foot Traffic
- Social Area
- Sitting Area
- Sleeping Area

- Focus Area
- Park Boundary



Figure: 4.30 - Park Analysis
Scale: 1: 500

DESIGN STRATEGY

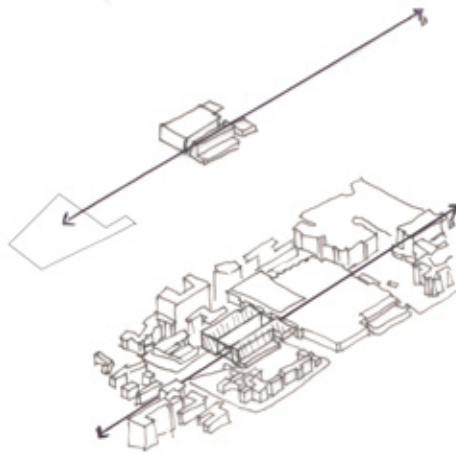


Figure: 4.31 - Axis

A New Axis of movement needs to be created to enhance pedestrian activity from the Gautrain Station to the Lower Level Park. The building currently hinders this route. Therefore a possible strategy is to make the ground plane open as this route visible and easily accessible.

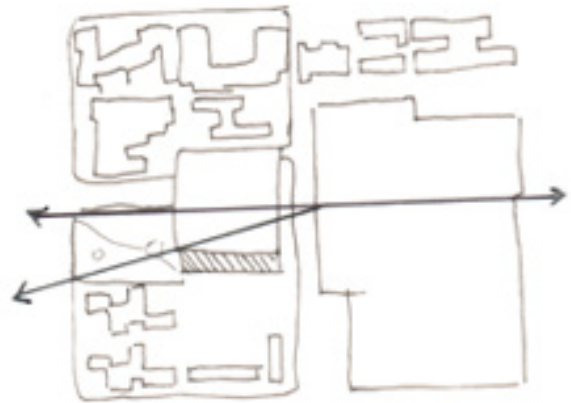


Figure: 4.32 - Ground Plane Movement

The ground plane should allow for the direct access and continuous movement from the Gautrain Station. Therefore, the direct relationship to the Rosebank Mall became significant to allow for this transition. A strategy to also allow for more than one part of departure is suggested to allow for people to deviate from the main axis of movement.



Figure: 4.33 - Contextual Levels

From the study it became evident that there were three contextual levels. Therefore, the building has an opportunity to illustrate these three levels. This depicts its division and the ability each level having a different form and identity.

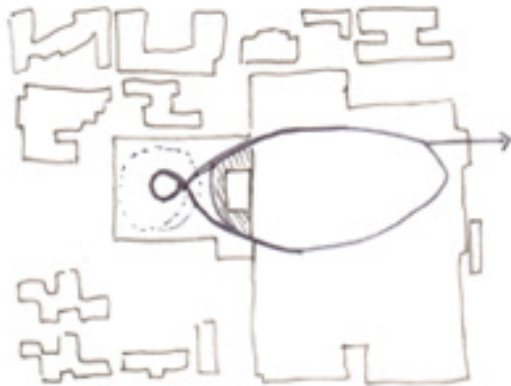


Figure: 4.34 - Upper Level Movement

The design should prioritize movement over its programme. Based on the contextual levels, it also means that access should occur at each level. Therefore by creating a ramp system it allows the building to effortlessly transition between levels.

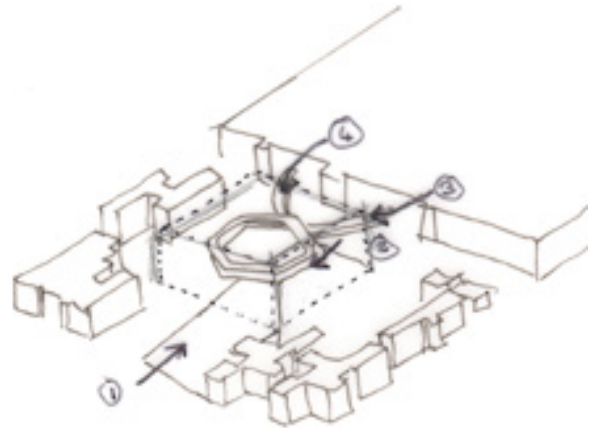


Figure: 4.35 - Points of Entry

The design should prioritize movement over its programme. Based on the contextual levels, it also means that access should occur at each level. Therefore by creating a ramp system it allows the building to effortlessly transition between levels.



Figure: 4.36 - Adjacent Site Relationship

The site is located between a park and the Rosebank Mall. Therefore, a strategy is to create green planes on the Park and Retail level. The movement ramp system can also be utilized to make greenery continuous thereby utilizing nature horizontally and vertically.



Figure: 4.37 - Height

The context steps and therefore it has resulted in the buildings falling within a diagonal line of sight to ensure a constant visible connection throughout the site. Therefore, it was important not to disrupt this line and the visible access of the park. Thus, the building's height would be relatively low roughly six storeys. This also helps to identify Rosebank Mall as a significant landmark.

PRECEDENTS

Through the discourse of this thesis, it has become evident that technology has become diffused into society, enabling its disruption through adaptation. With technological progression continually changing, its implementation becomes essential to understand, thus advocating for both technology and architecture to be designed concurrently. Despite the advantages created by technology, it has also consequently, resulted in diminished social interaction and disconnection to the natural environment. With the resistance to technology being futile, its diminished relationships need to be addressed. Therefore, with experts regarding nature as the antithesis of technology, it can be regarded as the solution to the disruption and diminished relationships caused by technology. Ergo with nature starting to have an increased societal importance, thereby making its translation into architecture imperative in a technological society, it has resulted in architects considering technology and nature with equal importance.

Thus the precedents were analysed in two categories. The first category looked at the relationship between architecture and nature in a technology-driven society and

the second category examined precedents that showed the relationship between technology and architecture in the current era. The following buildings were analysed:

NATURE AND ARCHITECTURE

MFO Park – Burckhardt+ Partner

High Line Park – James Corner Field Operations with Diller

The Vessel – Thomas Heatherwick

Detroit Rock City – Stan Allen

TECHNOLOGY AND ARCHITECTURE

2V Labs for unstable Media – NOX

1111 Lincon Road – Herzog and De Meuron

Seattle Public Library – OMA

The Shed – Diller Scofidio and Renfro

RELEVANCE

NATURE AND ARCHITECTURE

MFO Park – Burckhardt+ Partner

MFO Park is a real life example of a vertical botanical garden within an existing infrastructure; therefore, it pertains to this thesis regarding two aspects. Firstly its approach regarding its intervention of an existing infrastructure and secondly its approach to flexibility creating a strong link between the social world, natural world and the human scale.

High Line Park –James Corner Field Operations with Diller Scofidio + Renfro \

The High Line Park serves as a primary example of approaching social and public spaces through the implementation of nature. The design and its response to a dilapidated structure holds relevance towards this thesis due to it having a similar approach regarding the reuse of an existing structure, the implementation of the natural world all with the intention of creating physical social interactions.

The Vessel –Thomas Heatherwick

The Vessel was designed as a lattice structure that is surrounded by gardens. The structure not only combines with the natural landscape but also initiates social interactions between its users and non-users. Its relevance comes in its ability to physically connect people while offering an alternative to public space within the urban landscape emphasizing the human experience and shared experience within a public platform.

Detroit Rock City –Stan Allen

Detroit Rock City is a vertical botanical garden that is situated within an abandoned factory. Allen implores the use of nature along with a flexible work program to encourage social interaction. Even the furniture is design in a way to invoke flexibility and socialization within a confined area. Reflecting a similar aspiration with regards to program and design within this thesis.



Figure: 5.1 - MFO Park Exterior¹⁷

¹⁷ Archidose.blogspot.com. [Image] Available at: <https://archidose.blogspot.com/2007/08/mfo-park.html> Accessed 3 Sep. 2018).

MFO PARK

Burckhardt + Partner

MFO Park in Zurich, Switzerland is an urban vertical park that combines both hard and soft surfaces to represent spaces of both a plaza and a park within an industrial context. It transformed an underutilised factory by stripping down the existing infrastructure down into its framework. The building is a vine-covered, multi-level structure, what Liat Margolis and Alexander Robinson call “a series of spectacular immersive living volumes” (Hill, 2018). Located in the Neu-Oerlikon District of Zurich, the park’s structurally expressive solution picks up on the area’s industrial past, while acting as an armature of plants reaching for the sky. Two parallel, multi-level structures define the long sides of the rectangular open space. One end, of the short side, is closed by structures connecting the long sides, with the last side open to the street, inviting people into the open yet covered space. Visitors access the structure via stairs, reaching a sun-deck, loggias, and cantilevered lookouts that give an overhead glimpse of the space below. At this lowest level are benches, pools, and the start of the vines following cables that taper outwards in a conical shape towards the roof. Depending on the time of year one visits, the vegetation “walls” are sparse, full, or colourful.

The technical aspects of MFO Park are perhaps more integral to its success than a typical park, with a ground-cover, trees and planting on grade. The architects could cover vertical structures by using a raised trench to collect water allowing for an additional level of vines thereby allowing for the integration of structure and vines to be treated in a manner that the latter will not harm the integrity of the former. While the project may not dramatically alter the purpose of an urban park, its design elevates what a park can be in an urban context: vertical and spatial, architectural and green.

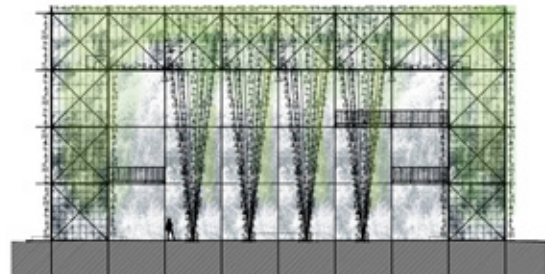


Figure: 5.2 - Cross-section

Cross-section showing Scale of internal space, and light but expansive structural system

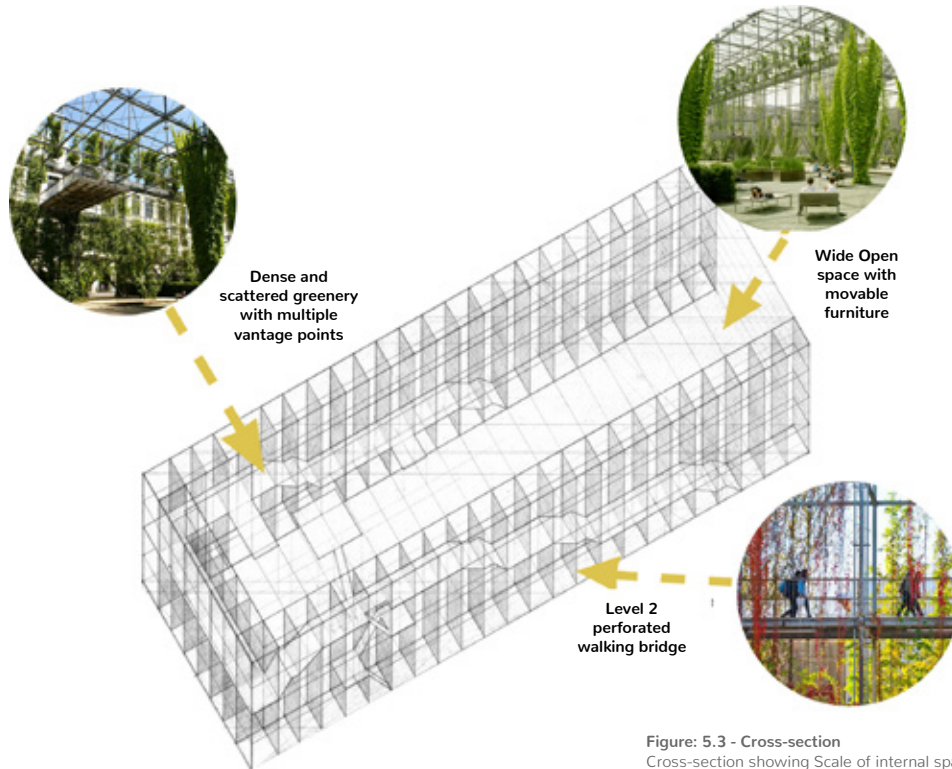


Figure: 5.3 - Cross-section
Cross-section showing Scale of internal space, and light but expansive structural system



Figure: 5.4 - Interior
Bright and colourful seasonal plants¹⁷



Figure: 5.5 - Bridge System
Roof like system - a play on verticality of urban life



Figure: 5.6 - High Line Park¹⁸
 18 Cilento, K. (2009). New York High Line. [Image] Available at: <https://www.archdaily.com/24362/the-new-york-high-line-officially-open>
 [Accessed 3 Sep. 2018].

HIGH LINE PARK

James Corner Field Operations with Diller Scofidio + Renfro

The Highline transformed an abandoned elevated railway into one of New York's most profound landscape projects. Inspired by the action of nature to regain urban infrastructure, regarded as a post-industrial instrument of leisure, life and growth. By changing the rules of engagement between plant life and pedestrians, the strategy of 'agri-texture' combines organic and building materials in a mixture of proportions amending and adapting to nature, culture, intimacy and hyper-social behaviour (Cilento, 2009).

In sharp contrast to the speed of Hudson River Park, this parallel linear experience is characterised by slowness, distraction and the otherworldliness; the natural world. Providing flexibility and adapting to the opportunities and desires of the dynamic context, the proposal is destined to remain eternally unfinished, with emerging growth and sustained change over time.



Figure: 5.7 - City Route
 The highline has visual shifts as you progress through the route

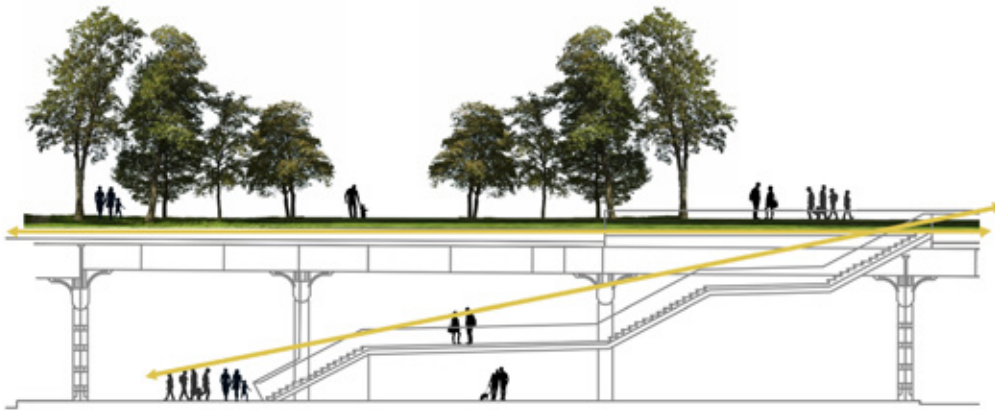


Figure: 5.8 - Structure and Light Intervention Methodology

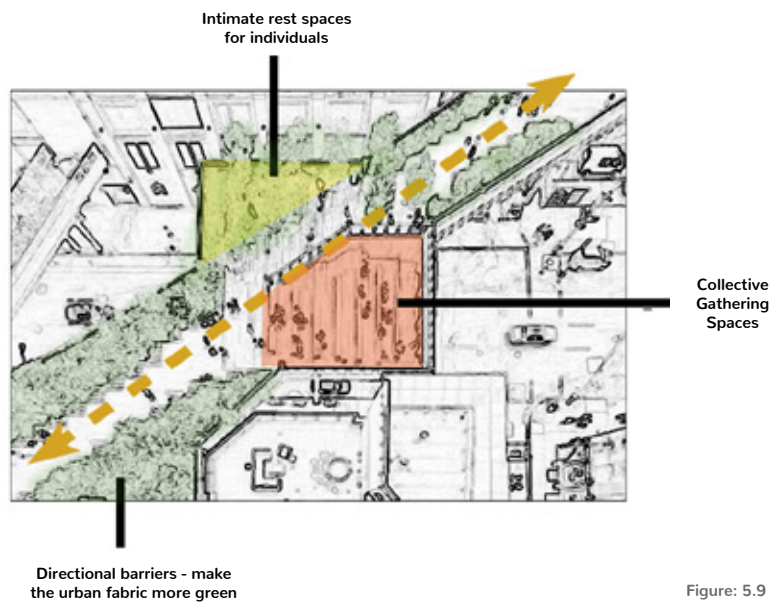


Figure: 5.9 Spatial Organization

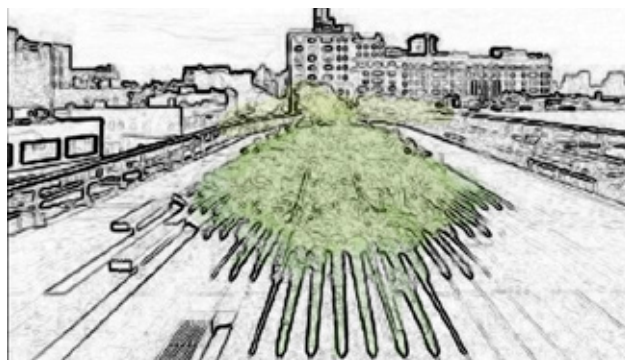


Figure: 5.10 - Materiality
Floor Materiality illustrates the elevated railway's decay and nature's relationship to decay



Figure: 5.11 - Render of the Vessel in Hudson Yard¹⁹
 19 Heatherwick, T. (2013). Vessel – New York, United States. [Image] Available at: <http://www.heatherwick.com/projects/infrastructure/> [Accessed 3 Sep. 2018].

THE VESSEL

Thomas Heatherwick

Thomas Heatherwick's intention with the Vessel was to challenge current building and city approaches by designing an installation that reflected the needs of contemporary society. The Vessel was designed as a public centrepiece for New York's Hudson Yard. Unlike traditional buildings, the architecture is comprised completely out of staircases, making it an interactive structure for people to explore and experience. Comprising of 154 interconnecting flights of stairs, the installation will offer a variety of ways to engage with the city's urban landscape by offering new pathways above the existing public gardens. The elevated platforms allow people to see each other amongst the skyscrapers, giving back a sense of scale to the public. It also means that the perspective on people and the world around is altered to offer a new experience. The building, despite not being commemorative of anything (having no meaning), serves as a platform to encourage physical social interaction between people.

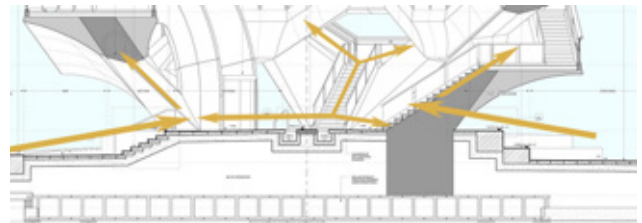


Figure:5.12 - Circulation
 Open circulation at base of structure. Stairs allow for multiple views and continuous circulation

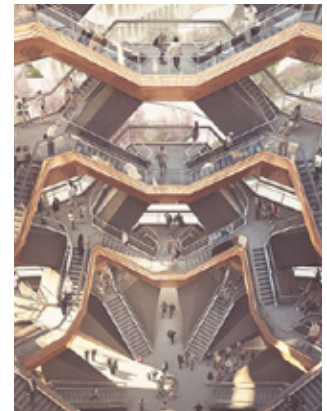


Figure: 5.13 - Structure¹⁹
 The structure is made up completely from staircases. The structure resembles a vertical playground with viewing decks - collective social spaces- at every level .

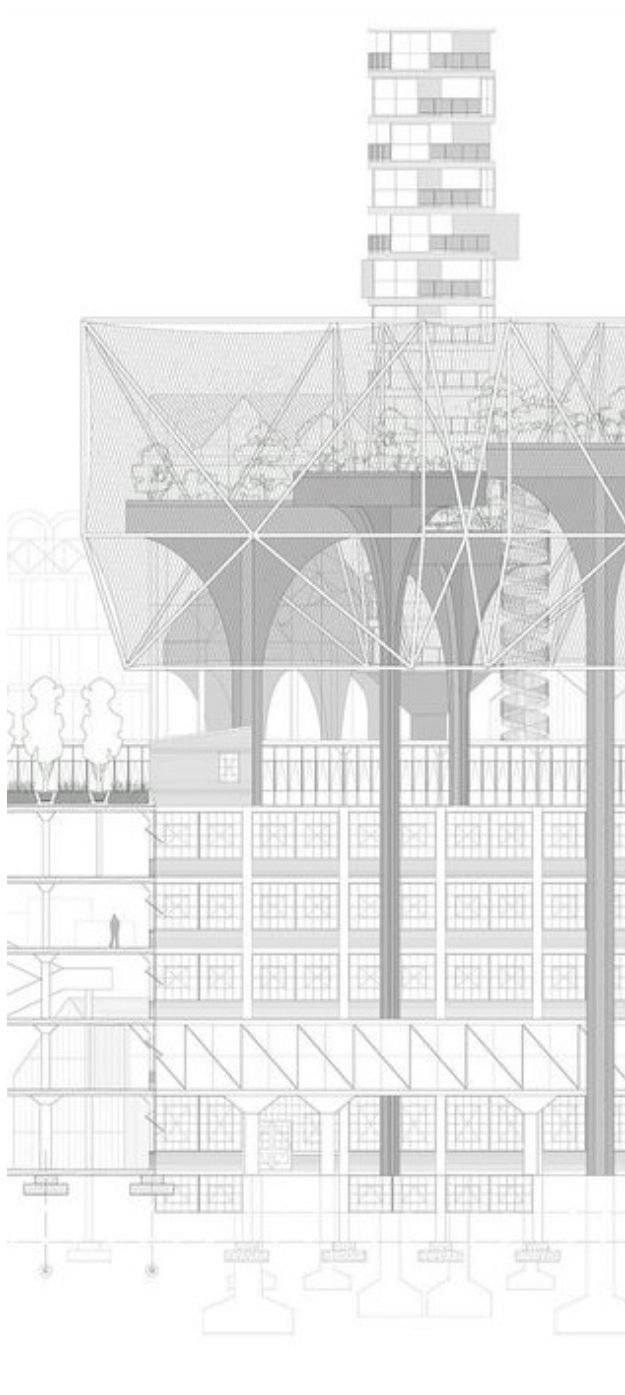


Figure: 5.14 - Elevation of Stan Allen's Design²⁰
 20 Benedict, S. (2017). Detroit Rock City: a vertical botanic garden by Stan Allen Architect. [Image] Available at: <https://www.metalocus.es/en/news/detroit-rock-city-a-vertical-botanic-garden-stan-allen-architect> [Accessed 3 Sep. 2018].

DETROIT ROCK CITY

Stan Allen

Stan Allen's project was created and exhibited at the biennial Venice architecture show of 2016. The intent behind exhibition, was to re-imagine the Detroit landscaped to the impact created by social decline resulting in a changing landscape. Although based in Detroit it serves as a global platform for architects to share ideas and inspiration to city around the world. In this project Stan Allen addresses the decline in the automobile industry by proposing an adaptive reuse of an existing empty automobile industrial building. He takes advantage of the horizontal surfaces by proposing an urban landscape that not only allows for flexibility through adaptive and modular furniture but also allows for social interaction - allowing for both an individual and shared experiences. The project forms part of a progressive, rethought program for ecological urbanism.



Figure: 5.15 - Floor Plan²⁰
 Linear floor plan helps to create urban park. Spaces are divided up by furniture and landscaping .

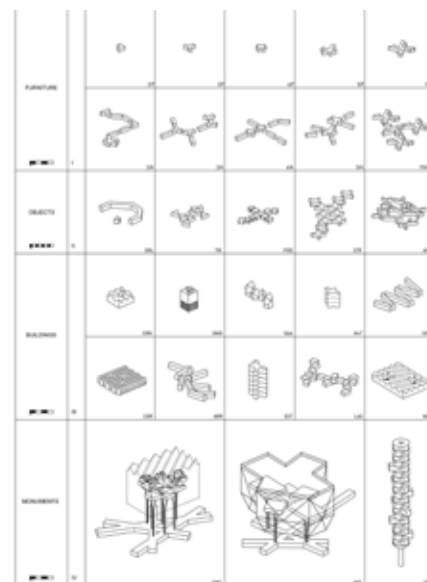


Figure: 5.16 - Modulation²⁰
 This diagram depicts the use of modulation that was implemented from a small scale (furniture) to a large scale - the building's form

DESIGN APPLICATION

MFO Park – Burckhardt+ Partner

Principles: The central principle translated from this precedent is its ability to translate a park from a horizontal aspect into a vertical experience. This was achieved by the use of nature in a variety of methods – from a hanging lattice- system to an on grade implementation – ensuring a connection to nature was maintained throughout the design. Ergo, the different types of vegetation systems and heights were implored, to allow for the park to be translated both horizontal and vertical throughout the design as well as creating a building that has a predominant experiential quality. Other principles derived from this precedent included its ability to maintain a constant connection through movement and visibility – vantage points.

High Line Park –James Corner Field Operations with Diller Scofidio + Renfro \

Principles: With the Highline, arguably, considered one of the most successful urban parks created, its utilization of space and movement became imperative in the spatial organization of my design. Reflected by a dominant circulation route with working and social spaces hanging off of it. This approach implored in the Highline denotes a sense of scalability as it allows people to be connected to the larger scheme while reducing the building into smaller spaces – allowing users to interact with the building at a variety of scales. This also allows an experience that is both egocentric and allocentric creating opportunities for interaction both on a personal and collective level.

The Vessel –Thomas Heatherwick

Principles: This precedent is evidence of how continuous movement can be implored to create different forms of exploration and social connectivity, throughout a building. This notion has been directly translated into my design through a continuous ramping system, as it not only creates a broader link to the existing urban landscape – encouraging walkability but offers a new experience and perspective to the public and the users creating more opportunities for spontaneous social interaction.

Detroit Rock City –Stan Allen

Principles: By combining a work programme with a park programme, Stan Allen is able to achieve social interaction through the implementation of landscaping to define spaces, by reducing the need for walls – a spatial barrier. Thus this principle has been reflected in my design, with the lack of spatial separation created by walls landscaping is used to not only continue the park vertically but also to create new spaces and opportunities for utilization.

RELEVANCE

TECHNOLOGY AND ARCHITECTURE

V2 Labs for unstable Media – NOX

V2 Lab is the primary example of how technology is being used to transform architecture both as an enablement and an extension of technology. Therefore the precedent not only illustrates the implications of digital technology within a real world example but also denotes the prevalence of the human scale and how architecture and technology can be used to generate social interactions.

1111 Lincon Road – Herzog and De Meuron

This building became prevalent in that it shows how current architects are thinking about the future of space and architecture. Herzog and De Meuron take this notion of future space and applied it to their design of a parking structure. The parking garage is transformative in that it encompasses other functions as well as social aspects within it so that over time as parking becomes redundant the space is still habitable and prevalent throughout the ages.

Seattle Public Library – OMA

Rem Koolhaas has always been aware of the implications of technology, however, its disruption and translation into architecture can be seen in OMA's approach to the Seattle library. The library not only spatially redefines the institution but also places an emphasis on human interaction through its fluidity.

The Shed - Diller Scofidio and Renfro

The shed implores the aspects of technological innovation and architecture by creating a moving building. This building is applicable to this thesis due to its innovation and creative approach regarding its implementation of technology and spatial approach thus illustrating that architecture and space are no longer fixed entities but flexible and dynamic as well as the importance of the builds envelope.



Figure: 5.17 - Image of Thick Plastic Wall²¹
 21 Spuybroek, L. (2004). Nox. London: Thames & Hudson.

V2 LABS FOR UNSTABLE MEDIA

NOX

The V2_Engine consists of a central void that will be partially finished with synthetic translucent fabric and will protrude noticeably from the façade. This space will be filled mainly with sounds and images, generated by a specially developed software engine that will roam the Internet in search of webcam images of other façades around the world. These images are then projected from the inside onto the fabric of the façade, together with other images: live portraits of people working at V2, pictures from projects being developed at that time within V2_Lab. The façade will stick out far enough to be visible from the Witte de Withstraat (the main street nearby). This concept is not based on the classical distinction between media and architecture where the hole, the void filled with light, is positioned against the material, static and solid architecture or even as architecture as a carrier and media as image.

This concept is the result of a literal media criticism of architecture because within a medium events progress by waves, not just within the topological continuity of the medium itself, but more to induce movement within this continuity by passing on forces within the field. The Euclidean distinction between a point and a line prohibits this, as each point rather effectuates the separation of lines than stimulates their joining. By contrast, here this point constitutes a knot, capable of shrinking and expanding, scientifically known as a 'spring', a non-static point capable of passing on the force. Within the computer model which has been developed for the entire V2_Engine, this spring is the place where the void, the three-dimensional window where the audience will enter the building in the future, will be located, according to the organisational diagram. All forces within the spring are channelled towards the extremes of the building by way of 'strings' which will all be located in the vicinity of the V2_Lab, the extra floor, the new hall and the façade. These forces are transported to the extremes by waves and they continuously return as waves, interfering with new forces. All the forces from the central projection space move in four opposite directions through twenty strings, to return again from these extreme points to where, eventually, in the topological continuity, active and reactive forces can no longer be distinguished and end up in a process where the inflexions of the strings are no longer predictable. The resulting design is then no longer a form that can be overlaid on an organisational diagram but becomes a forming process where topological

coherence consists of the soft coordination of thousands of simultaneously operating diverse forces, making motion and time part of the organisation.

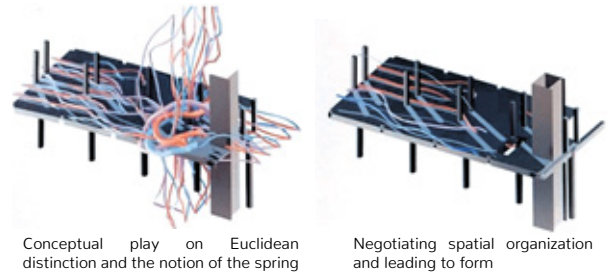
For V2_Lab, V2_Media Lab, the international Lab for Unstable Media, this concept is essential, as media here is not perceived as belonging to a comfort creating, servile instrument familiar for engineers, interface designers and system operators, but as something that accelerates and destabilises reality. The virtual is not a so-called parallel world that exists somewhere safely on the other side of reality. It is something that continually charges up the present.

Instead of regarding the renovation as something that tranquillises the existing structure through refurbishment, the architecture here assumes the attitude of the furniture and the textile. Thereby, it introduces movement into the existing situation, accelerates it, vectorises, seduces and flexes. In this way, we progress seamlessly from a computer-generated process of forces, vectors and springs, to inflexions in plywood sheets and PVC pipes, to (literally) the vibrations in the tables. Then to the undulations of the floor, to the chairs with adjustable spring legs, to tensions in the four millimetres thick plastic wall (stretched with steel cables and springs), to the flowing transition between the floor and tables and then to the tensions within the human body – the arm and leg muscles that provide a constant neuro-electrical background to all human behaviour. It is the background to behaviour that may fall outside of the diagram, outside the concept of work, the background to all human media showing on the foreground. This is depicted through aspects such as piles of paper, coffee cups, old newspapers, the glow of computer screens, clothing and voices. The design attempts to produce a shift from the optical domain where architecture is judged.



Figure: 5.18 - Facade ²¹

Facade Idea that does not appear to have been realized Regarding the projection of other architectural façades on a Fabric addition - relating back to Proliferation of Media and to Architecture as a 'Carrier' of the media as Image



Conceptual play on Euclidean distinction and the notion of the spring

Negotiating spatial organization and leading to form

Figure: 5.19 - Conceptual Diagrams



Figure: 5.20 - Rubber Wall

A representation of flexibility and vagueness between artist and office

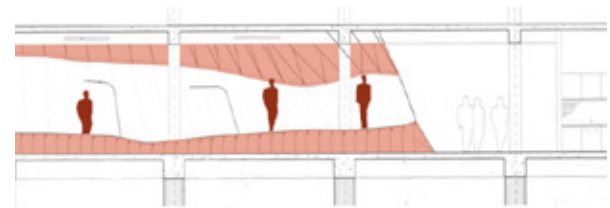


Figure: 5.21 - Articulation

Deep floor and ceiling articulation as waves, act as an extension of their conceptual model with regards to waves and forces within the 'Spring'

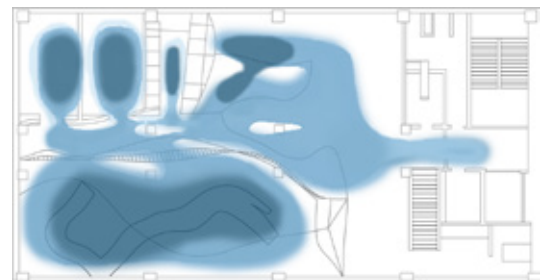


Figure: 5.22 - Circulation and Usage



1111 LINCOLN ROAD

Herzog and De Meuron

Herzog & de Meuron's 1111 Lincoln Road is a multi-storey car park in Miami Beach. It is located on the west end of the street at the intersection of Alton Road. The five-story structure not only includes 300 parking spaces but starts to transform the parking structure into an inhabitable space. This is achieved by incorporating social spaces - event, retail and restaurant spaces - with working (office space) and living facilities (condominiums). The developer of the project, Robert Wennet, wanted a structure that spoke of the city's past, as well as transforming the parking structure into a more civic-orientated and central gathering space. Residential units were designed with courtyard gardens, skylights, and a two-parking garage space. The parking space set on top of a glass box has varying heights to accommodate and depict the various programs. There are shorter spaces for cars and taller volumes for retail and special event spaces – ranging in height from 2.4 – 9.7 meters. The open-air space requires no mechanical ventilation and the building uses low energy lighting with solar panels on the roof to supply electricity to the building's penthouse.



Nest of Stick-like Vertical Columns



Traditional Monolithic Parking Garage

Figure: 5.23 - Exterior Perspective²²

²² Garrido, N. (2010). 1111 Lincoln Road / Herzog & de Meuron. [Image] Available at: <https://www.archdaily.com/59266/1111-lincoln-road-herzog-de-meuron/5009016e28ba0d27a7001223-1111-lincoln-road-herzog-de-meuron-image> [Accessed 4 Sep. 2018].

Figure: 5.24 - Conceptual approaches

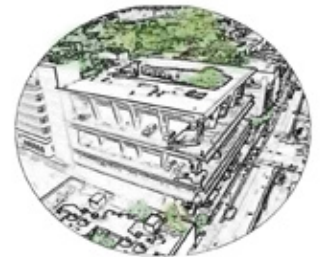
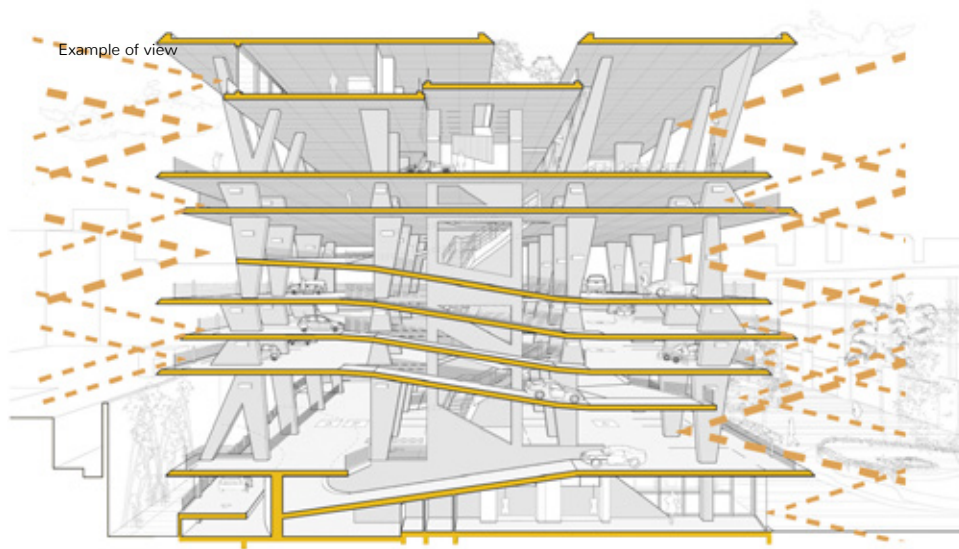


Figure: 5.25 - Visual Connection

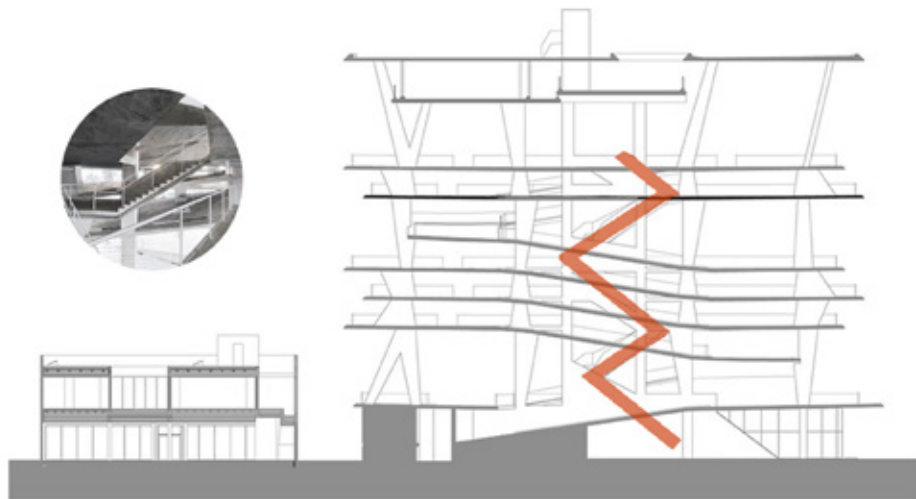
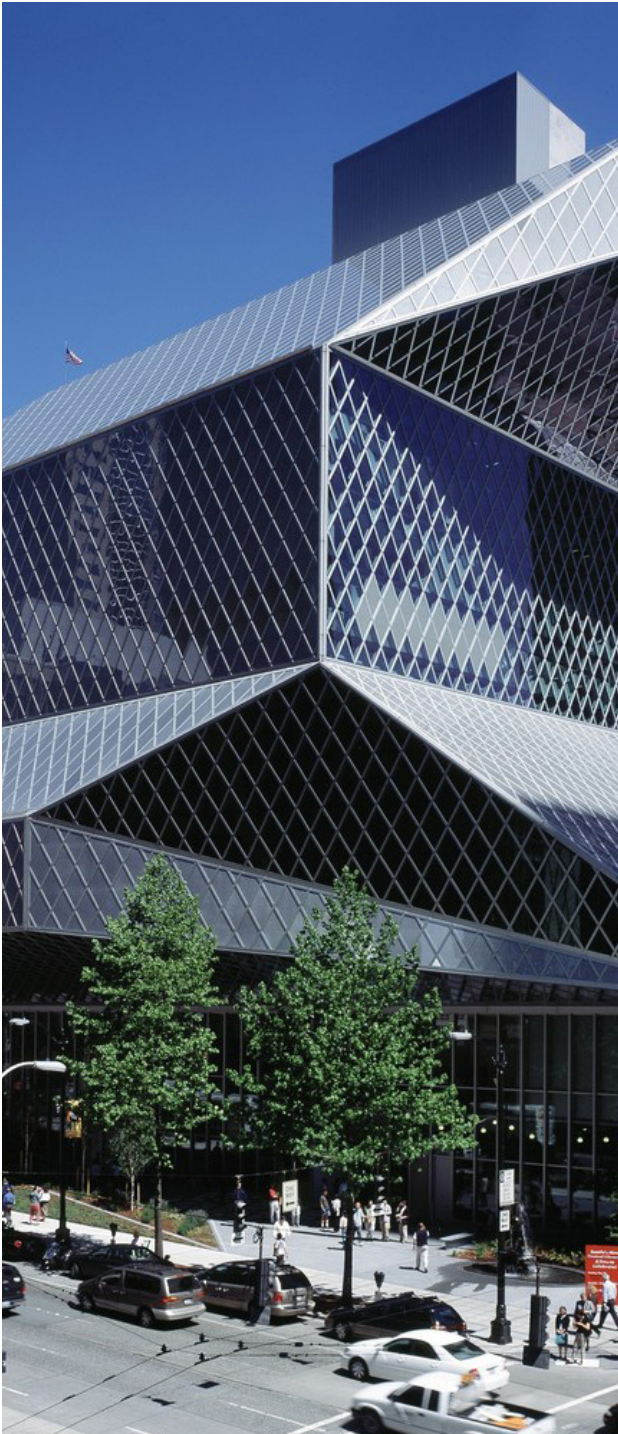


Figure: 5.26 - Pedestrian Circulation



SEATTLE PUBLIC LIBRARY

OMA

The concept involves the reinvention of the library as an access point to information presented in a variety of media. The building was designed to be flexible for future expansions, with the possibility of grouping spaces according to the needs of the building. The platforms connected to the study would provide open spaces, work, and social interaction. The Seattle Central Library redefines the library as an institution no longer exclusively dedicated to the book but as an information store of all media, old and new.

Programs are not separated, rooms or individual spaces are not given unique characters. In practice, this means bookcases define open reading areas. However, with the relentless expansion of the book collection, it has inevitably encroached on the public space. In short, this form of flexibility strangles the very attractions that differentiate it from other information resources.

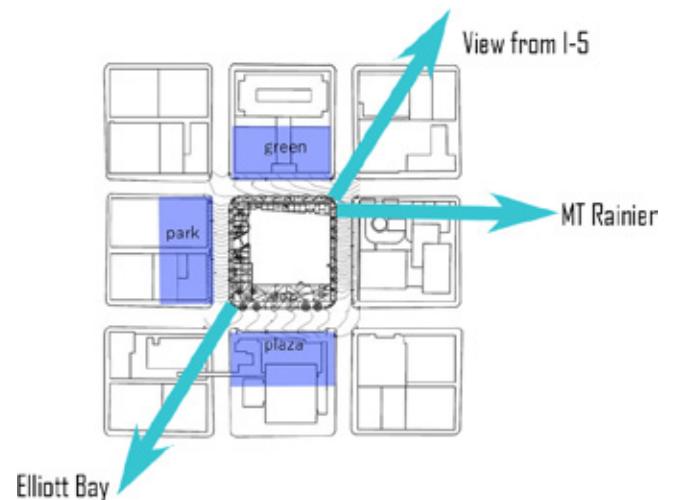


Figure: 5.27 - Seattle Library Exterior²³

²³ Ruault, P. (2009). Seattle Central Library / OMA + LMN. [Image] Available at: <https://www.archdaily.com/11651/seattle-central-library-oma-lmn> [Accessed 3 Sep. 2018].

Figure: 5.28 - Contextual Site Plan

Showing line to major landmarks

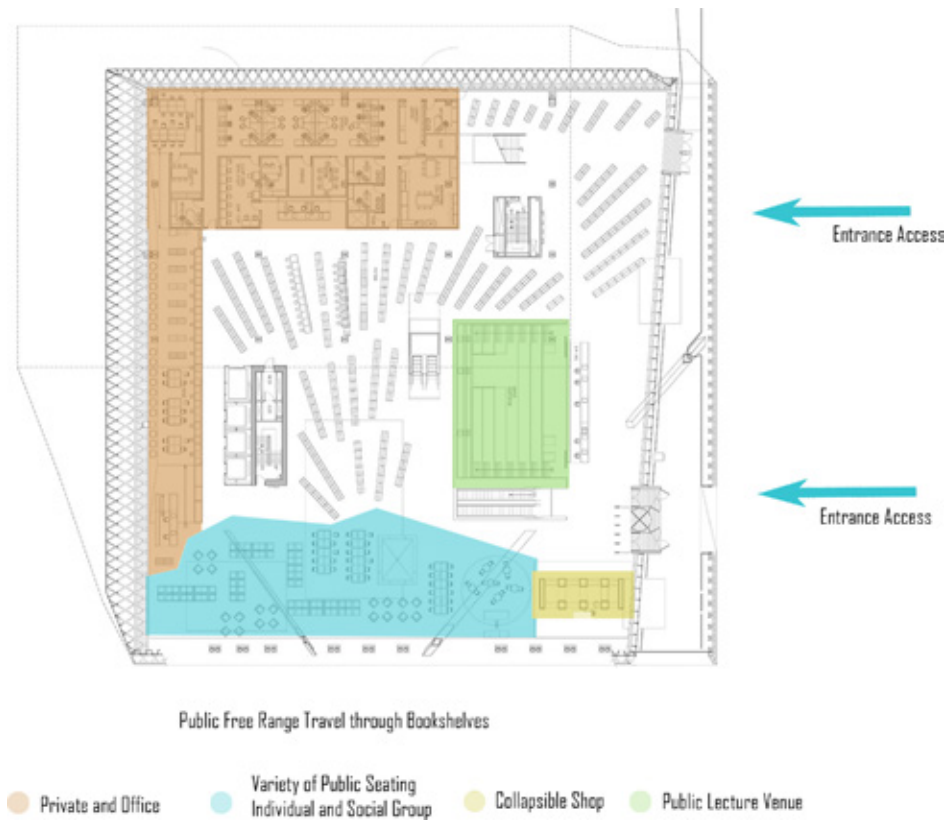


Figure: 5.29 - Plan Organization

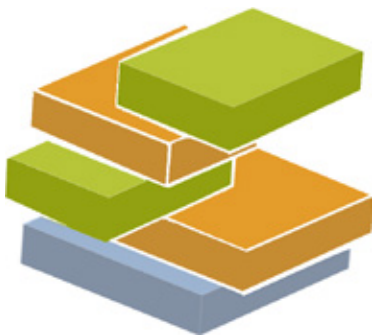


Figure: 5.30 - Organization and Form

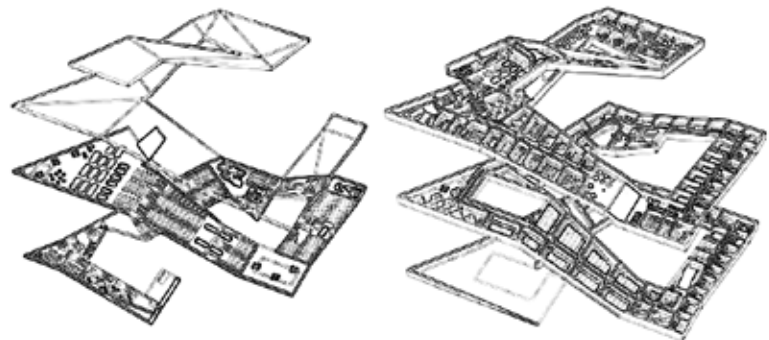


Figure: 5.31 - Circulation
Entire program rest on a ramp which spirals up the entire building



Figure: 5.32 - Render of the Shed²⁴
 24 Scofidio, D. and Renfro (2018). The Shed. [image] Available at: <https://dsmy.com/project/the-shed> [Accessed 4 Sep. 2018].

THE SHED

Diller Scofidio + Renfro

The Shed is a building that adapts to the artist. The building's ability to physically transform through the movement of the façade produces an array of spaces. Hence it allows for more ambitious artwork and performances, as art is no longer confined to a fixed space. The building's envelope deployment (moves off the base and expands) creates a temperature-controlled hall that can serve an infinite variety of uses. When the shell is placed over the base building, it creates a public plaza. This space can be used for outdoor programming, with the eastern façade serving as a surface to project on. The Shed's kinetic system is inspired by the industrial past of the High Line and the West Side Rail-yard. Through the use of conventional building systems for the fixed structure and adapting gantry crane technology to activate the outer shell, the building is able to accommodate both large-scale indoor and outdoor programming. This denotes a continuously flexible building that responds to prospective future needs, a variety of scale, media, technology and the pervasive needs of the artist.

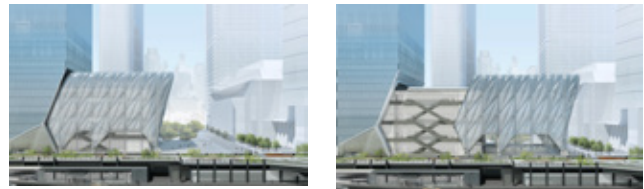


Figure: 5.31 - Images of Facade Mobility²⁴
 The facade expands or contracts depending on spatial requirements needed

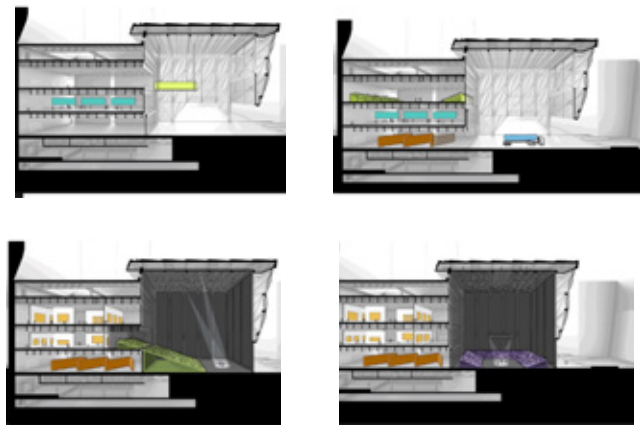


Figure: 5.33 - Spatial Reiterations²⁴
 Spatial versatility with multiple wide openings allowing for multiple uses

DESIGN APPLICATION

V2 Labs for unstable Media– NOX

Principles: The V2 Lab is, arguably, the optimal response to digital technology. From Nox's approach, it has become apparent that architecture can no longer reflect euclidean form advocating for a new spatial approach translated through a new organizational diagram. Thus within my design, this principle is achieved predominately through a hexagonal grid system. Unlike traditional grid systems that advocate for linearity creating a sense of separation, the hexagonal grid denotes a continuous connection. Thus it allows for motion and time to be reflected through its organization.

1111 Lincon Road – Herzog and De Meuron

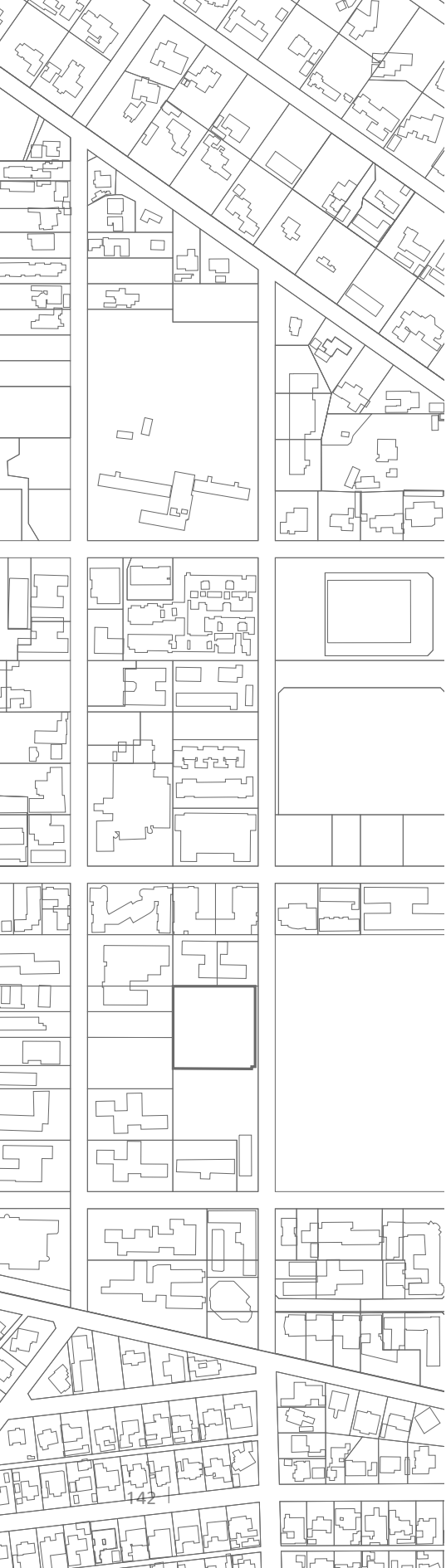
Principles: This precedent serves as evidence of the need to reconsider parking and transform them places for social interaction, by using programmes that not only encourage public use but also opening the building to allow for public gathering. Therefore, within my design, the public aspect became pivotal in its approach, ensuring the public had continuous access both physically and visually. Another principle implored was its approach to sustainability by devising a type of open-air environment within my design to reduce the need for mechanical ventilation.

Seattle Public Library – OMA

Principles: The Seattle Library denotes the implementation of new sequential spaces in response to technological innovation. With the building's sequence being continuous throughout the building, it implores a ramping system to create natural progression between levels. Thus, the continuous movement and the implementation of a ramping system become a crucial principle within my design. Another principle derived from this precedent was its translation of spatial organization through its form. Therefore, my design implores a similar notion through the floors rotation and representation of materiality within the façade. Thereby denoting a spatial response of each level to the existing context.

The Shed - Diller Scofidio and Renfro

Principles: The Shed highlights the importance of the façade to create a new sense of spatial exploration. Therefore, within my design, the façade was implored to navigate the relationship between the building's internal spaces and its spatial connection.



CHAPTER

FEASIBILITY AND PROGRAMME

EXECUTIVE SUMMARY

Technological innovation has resulted in a societal shift into a shared economy that is encouraging the formation of the independent worker. Technology has changed the way society operates on a daily basis and reduced the amount of space required. Consequently, it has also created diminished social and environment relationships. Therefore, this project aims to respond to these societal changes (caused by technology) by creating an environment that focuses on collaboration, community and technological innovation. It will also try to restore these diminished relationships through the implementation of nature.

With technology compressing the amount of space previously required by society, this project proposes an intervention to an existing parking structure, cited in Rosebank. It proposes a pavilion that can be utilized as a co-sharing workspace. Due to the lack of green spaces within Rosebank and the new societal prevalence placed on nature (outlined by this thesis) the adjacent park will be integrated into the design. Thereby it will create a horizontal

and vertical park. By combining nature with a co-sharing work environment, it will produce an environment that encourages spontaneous social interaction, productivity, physical activity and efficiency for its members. It will also offer a green landscape to the urban fabric.

With the nature of work changing and the rapid increase of millennials into the workforce, it has created a demand for an alternative work environment. A work environment that meets the requirements derived by the gig economy. Thus intended user of this co-sharing work pavilion is aimed at the mobile workforce, i.e., the independent worker and the start-up companies. The intention is individuals will pay to use the office facilities based on a membership fee that applies a time-used rate; therefore, members are paying to rent out a desk space at an hourly rate. This system not only promotes a sense of community but also offers office like facilities at an affordable monthly rate. Thereby making it an ideal opportunity for the rising generation of independent workers.

CLIENT

The client proposed for this project will likely be Hyprop Investments Limited. This is due to two main aspects: Hyprop has a sizeable financial strength and higher risk tolerance as it is a development company) and they are also the owners of the land and the existing parking structure. Thereby, resulting in an incentive to invest within this project. This is evident by the shift to a co-sharing economy and technology reducing the number of parking bays needed to just 20%, i.e., from 769 bays that are currently available to 154 bays. This will result in the existing structure being grossly underutilized. Thus projecting a considerable loss in revenue, as most of the income received for this building is dependent on the rental and use of these parking bays. This means that the building will become a liability resulting in a net loss; therefore, indicating the need for intervention. Through the implementation of an Owner-operator Model, Hyprop Investments Limited will be both the developers and the owners of this co-sharing work pavilion.

USERS

With the design comprised of a primary co-sharing work component and a secondary park component has allowed for two types of building users. The first and predominant occupant is aimed at the Millennial workforce - the remote and independent worker. The secondary user is aimed at the general public. Through the combination and navigation of two different types of building occupants it not only increases the scale of community but also increases the opportunity for social interaction.

SOCIAL FEASIBILITY

Market research has determined three macro drivers that are influencing this new shift into co-sharing workspaces: Technology, Demographic and Economy. The advances and innovation relating to communication technology have enabled a mobile workforce. Therefore, people can conduct work effortlessly at any time and in any location. With technology helping to connect the world at a rapid rate, the sharing of ideas and learning at a global scale has become more prevalent within modern society. Denoting a change in needs and behaviour of millennials resulting in a change in the way people live, work and consume.

Empowered by technology millennials are driven by convenience, value, and experience; thereby, preferring access to ownership and the sharing of ideas and workspace. This has enhanced the need for collaboration and community within the office space, as well as, perpetuated the freelance and sharing economy. Therefore, there has been a surge in an independent workforce, through entrepreneurship, freelancing and small to medium businesses. Unemployment has also contributed to this surge. South Africa currently has an unemployment rate of 27.7% that is continually growing; therefore, this new form of working offers a form of relief, for the rising generation (Writer, 2018).

This market research proves the viability and feasibility of this development, due to the innovations surrounding technology and the shift to a sharing economy. Denoting that there is a strong demand for co-sharing workspace concerning a social, physical and economical aspect. The market research also deduces the target market for this type of building. Therefore advocating for the users to be independent workers that form part of the gig economy.

ECONOMIC FEASIBILITY: INCOME

The economic feasibility of this project and its design is reliant on three production factors. The first fundamental production factor is space. The space provided by the building needs to consist of open desk areas. It also requires the facilitation of meeting rooms and offices supplies as well as providing high-speed Internet. Service is an advanced production factor. This is where Hyprop may enter into a strategic partnership with external service providers to offer business services at a discounted price to its members. The partnership formed is beneficial to both partners, and all members receive high-quality services at a preferred rate; service providers have access to secure distribution channels, and Hyprop will earn revenue without changes of product development, inventory, and overhead. The final production factor is the community. This aspect is what distinguishes a co-working space from alternative innovation workspaces. The design of the space, events and technological implementation all hinge on the community, with a desire to inspire out the box thinking and facilitate meaningful connections (Thai, 2010).

Unlike traditional office space that is leased at a given rate per square meter, this new office model uses co-sharing financial strategies to generate income (Thai, 2010). This means that the return from this building will be based predominantly on desk space- leased out at a rate per time-used- and a membership fee that provides flexible access. Therefore, revenue is generated on a membership fee based on two platforms, of a base fee and a service fee for additional services and additional time.

By having short-term and long-term memberships, it enhances the buildings spatial flexibility. It therefore ensures a sense of stability regarding income especially from long-term members and constant use of the building creating a more conducive environment. This strategy allows for revenue to be generated both within an economic downturn or upturn. In an economic downturn, the new and adaptable time offered by memberships makes this co-working space a more attractive and affordable option

than traditional office space, thereby reducing the loss of members and maintaining revenue from the membership fee. An economic up-turn denotes a more substantial number of independent workers resulting in an increase of membership as start-ups have more significant opportunities and easier access to capital growth. Allowing for more memberships to be sold than desks available by staggering the using time on a centralized reservation system.

The average membership fee and the total number of members largely determine the fixed income. Addition revenue will be generated by leasing out the social spaces, advertisement and flexible income – the additional hours available for desk rental.

DESIGN BRIEF

The new work environment needs to enhance the community while encouraging social interaction. Therefore, based on the aims regarding the feasibility of this project, the programme will be divided into two primary aspects: Office and Park. The first section will comprise of workspaces that encourage social interaction while meeting the needs of the current mobile-workforce. The Park component will act as a platform to facilitate the socialization and interaction created by designing public and dynamic spaces. Thus, the building will allow for public and private fluidity through a vertical and horizontal park. A secondary programme will be implemented to enhance social interaction through more formal facilities. Thus, it's the interplay between the social world, natural world and human scale that not only creates a new office environment but also focus on creating a sense of community. This is achieved both within the building and its contextual surroundings. Therefore, the programme corresponds to the existing contextual levels: Park level, Public Domain and Retail level. With park elements being placed on the park level- as a continuation of the existing park and on the retail level- creating a sense of relief from the busy mall. The main office component is placed in between these two levels corresponding to the public domain level.

PRIMARY, SECONDARY AND TERTIARY PROGRAMME

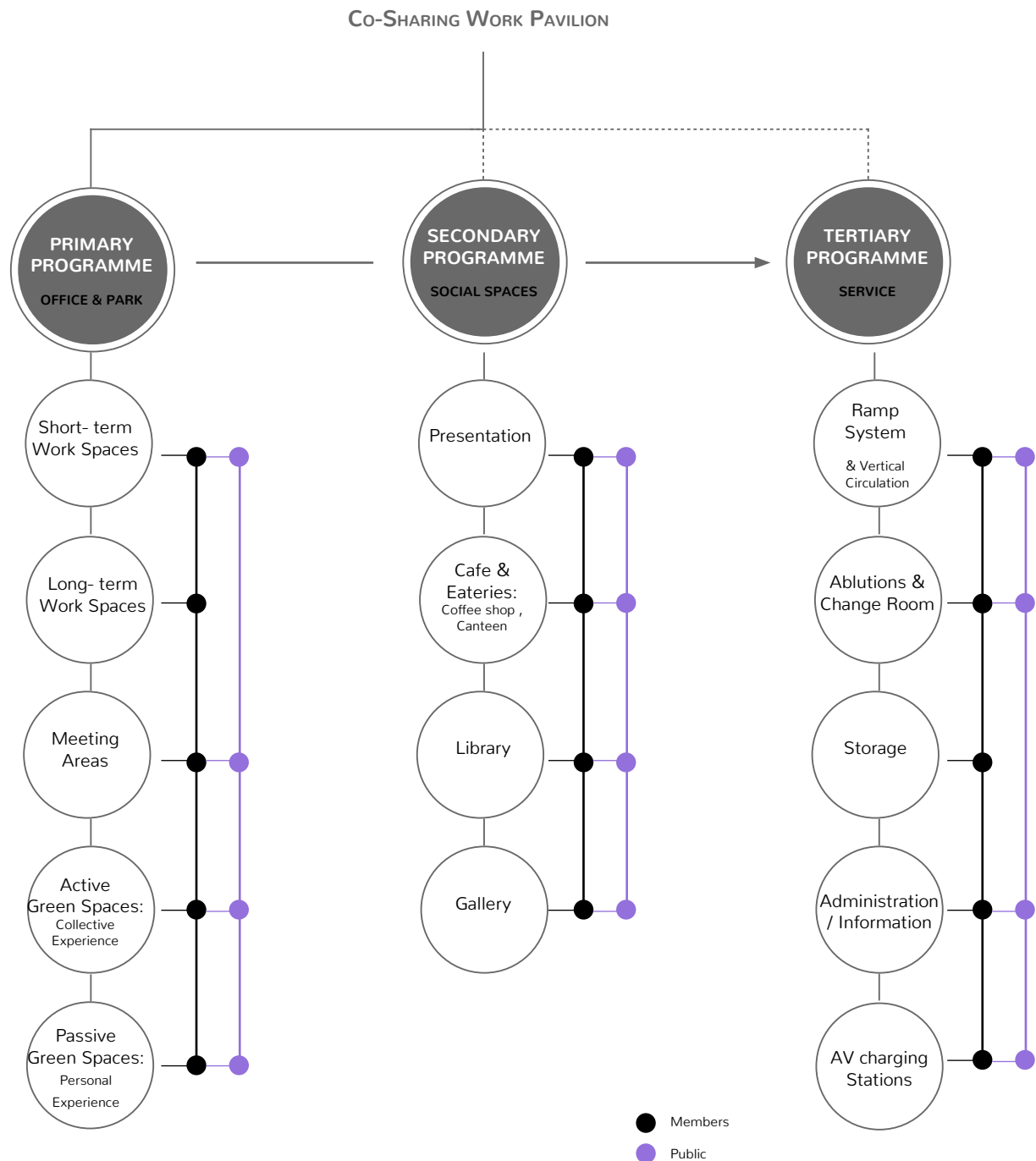


Figure 6.1 - Primary, Secondary and Tertiary Programme
Also indicated within this diagram, is the level of public accessibility for each programme element

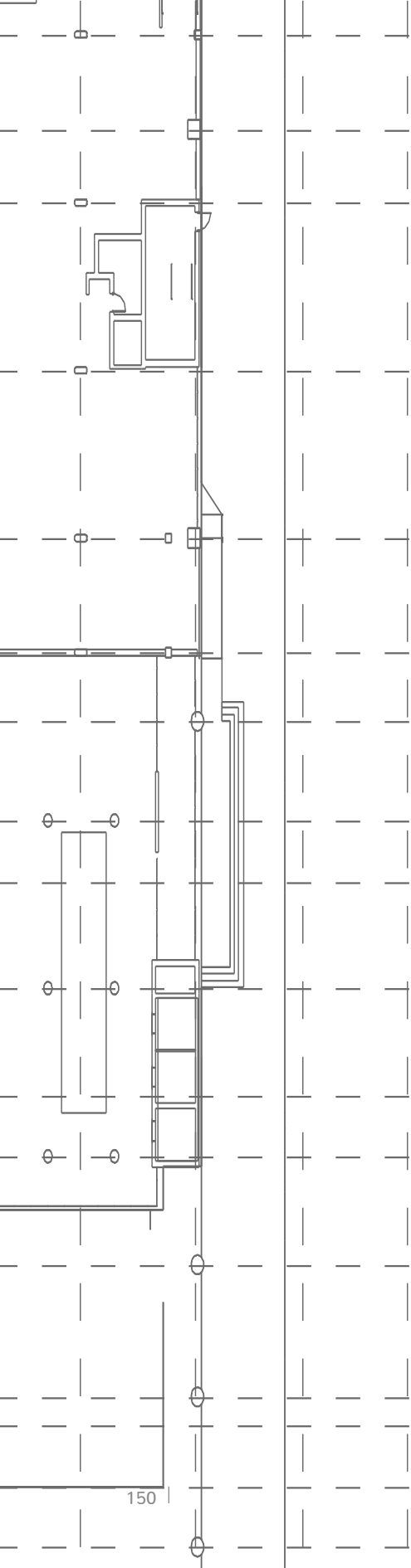
PROGRAMME BREAK DOWN

Programmatic Areas

	Building Programme	Unit	QTY	Areas	
Park Level Programme	1 Park Level				4500 m ²
	Primary Spaces				
	Flat Planes	100	4	400	
	Florist	80	1	80	
	Flower Pavilion	200	1	200	
	Forest Lounge	150	2	300	
	Fruit Orchard	400	1	400	
	Herbarium	80	1	80	
	Secondary Spaces				
	Auditorium	400	1	400	
	Collective	150	1	150	
	Foyer	200	1	200	
	Multi-purpose Hall/	455	1	455	
	Restaurant/ Canteen	150	1	150	
	Tertiary Spaces				
	Ablutions	22	2	44	
	AV Charging stations/ drop off Zone	25	12	300	
	Change Room	10	2	20	
	Fire Escape Stairs	20	2	40	
	Foyer	200	1	200	
	Information/ Reception	50	1	50	
	Lifts	15	5	40	
	Lift Lobby	120	3	360	
	Kitchen	90	1	90	
	Restaurant/ Canteen	20	2	40	
	Storage				
Public Domain Level Programme	2 Public Domain				3100 m ²
	Primary Spaces				
	Green Planes	300	-	300	
	Green Planes - Social	25	4	100	
	Long Term-Work Areas	100	1	100	
	Meeting	200	1	200	
	Short Term-Work Areas				
	Secondary Spaces	120	1	120	
	Collective/ Coffee	100	4	400	
	Gallery	420	1	420	
	Retail	20	3	60	
	Tertiary Spaces				
	Ablutions	22	2	44	
	Change Room	10	2	20	
	Fire Escape Stairs	20	2	40	
	Information/ Reception	50	1	50	
	Lifts	15	5	40	
	Lift Lobby	50	2	100	
	Ramp (exclud. greenery)	450	3	450	
	Storage	20	2	40	
Retail Level Programme	3. Retail				2900 m ²
	Primary Spaces				
	Contemplation/ Reflection Garden	1000	1	1050	
	Green Planes	300	4	100	
	Green Planes - Social	25	1	150	
	Long Term-work areas	150			
	Short Term-work areas		1	200	
	Secondary Spaces	200			
	Collective/ Library	120	1	120	
	Tertiary Spaces				
	Ablutions	22	2	44	
	Change Room	10	2	20	
	Fire Escape Stairs	20	2	40	
	Lifts	15	5	40	
	Lift Lobby	50	2	100	
	Ramp (exclud. greenery)	450	3	450	
	Storage	20	2	40	
					10500 m ²

CHAPTER

CONCEPTUAL DEVELOPMENT



SEVEN

Based on the research conducted it became speculated that only 20% of the existing parking amount would be required from the current structure. This meant the existing parking structure would need to be reduced to just two levels to accommodate the new requirements depicted by technological innovation. Levels -B4 and -B3 would suffice as each contains 86 parking bays resulting in a total of 172 parking bays. Thus, with just two out of the eight levels of the parking structure being utilized, it allowed for the complete intervention on the remaining mass (six levels). With such a significant reduction resulting both spatially and physically, it would require a substantial intervention. Therefore, a strategy would need to be generated. A viable strategy that reflects not only the current socio-materiality but also is economically feasible. Thus two predominant methods of intervention were explored for this project: adaptive reuse and retention. Adaptive reuse would allow for the design to be implemented within the existing grid structure, while retention would allow the possibility to work within a new grid system.

EXPLORATION STRATEGIES

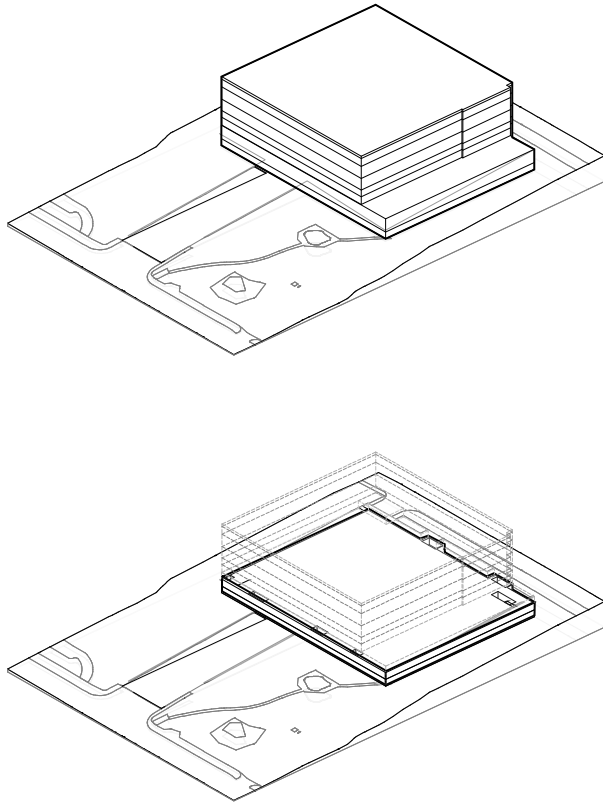


Figure 7.1 - Existing Structure Reduction
Parking structure is reduced to two levels of utilization

WORKING IN AN EXISTING GRID

The first approach considered the complete reuse of the existing structure, thereby working within the existing grid. This method utilized the current structure for the design proposal. It explored the spatial quality and physical structure of the existing environment. Thus, it was evident more light was needed. Thus, it implored a method of subtraction. By cutting into the existing slabs, it allowed for light to penetrate into the new building, while keeping the structural integrity of the existing structure. Although this method could be considered as a more sustainable approach, it would require more economic consideration. This is evident by its strategy of cutting into and manipulating the existing structure.

WORKING IN A NEW GRID

This method implored demolition and retention as a primary strategy. It allowed allow for an entirely new structure to be generated based on the essence of the existing building. This approach deems the previous methods of construction and design principles to be insufficient and outdated. Therefore reflecting the current socio-materiality and emphasized the derivation of a new structural form. With a new structure being the objective, it would require elements of trace to be reflected. Thus prioritizing aspects of preservation, with the existing structure complete demolition.

Both methods emphasize different aspects of consideration concerning the economic and environmental issues of this project. Thus, its translation of a technological society was used as the predetermined factor for this project. Therefore emphasizing the reflection of technological disruption and spatial perception throughout the design exploration.

WORKING IN AN EXISTING GRID

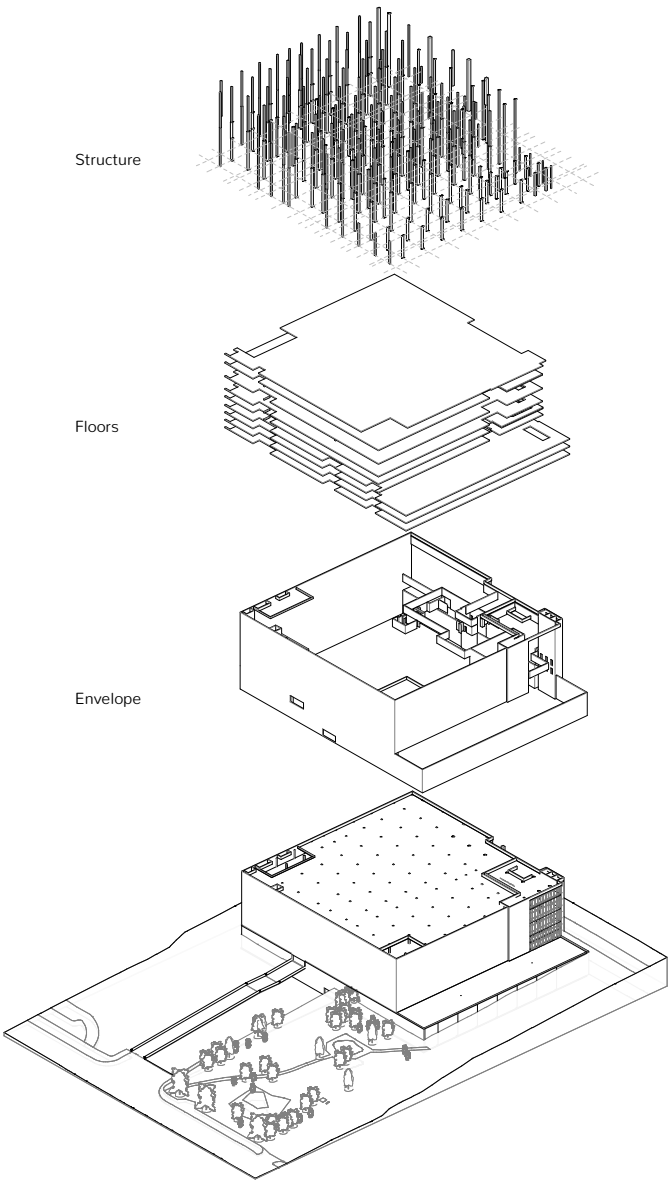


Figure 7.2 - Existing Structure

STRUCTURE

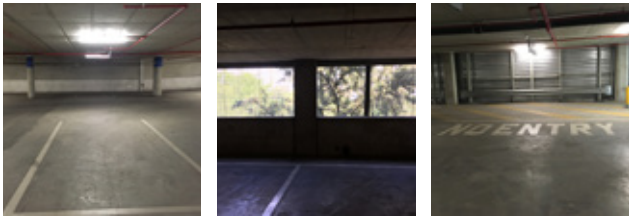
The current structure implores a beam and columns system. The column grid, however, is unusual for a parking structure due to its inconsistency and size. The longitudinal grids are relatively consistent with a spacing of 8.87 meters, while the latitudinal grids spacing varies in size ranging from 2 meters to 8 meters.

FLOORS

The structure comprises of eight levels: three levels of basement, three levels of upper parking and two levels of retail. The parking levels have relatively low heights. The basement levels are 2.9 meters in height and the upper parking levels range between 2.9 meters and 3.1 meters. The retail levels have large volumes with a double volume height of roughly 5 meters.

ENVELOPE

The existing envelope comprises of different material qualities and conditions that relate to its orientation. The West façades overlooking the existing park are perforated in various methods. This allows natural ventilation within the existing structure, as well as a constant visual connection to the adjacent park. The general facade treatment implores a solid approach with the south façades repeatedly having sheeting to enclose certain openings.



General

West Facade

South Facade

Figure 7.3 - Parking Envelope Conditions

DESIGN CHARRETTE

The Design Charrette is an experimental studio. It was my initial attempt at exploring the theoretical underpinnings of this project. Models were utilized to implore principles of fluidity, flexibility and nature while trying to work within an existing structure.

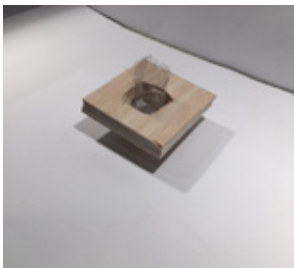
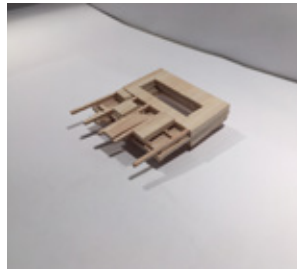
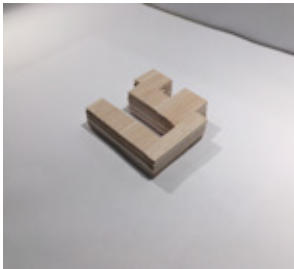


Figure 7.4. -Charrette Models

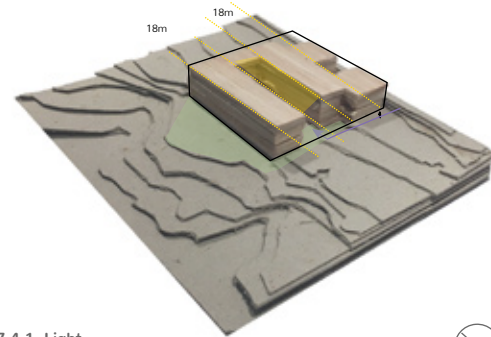


Figure 7.4.1 -Light



This model looked at cutting into the existing structure to create efficiency for light. It created a central atrium space allowing for nature to feed into the building.

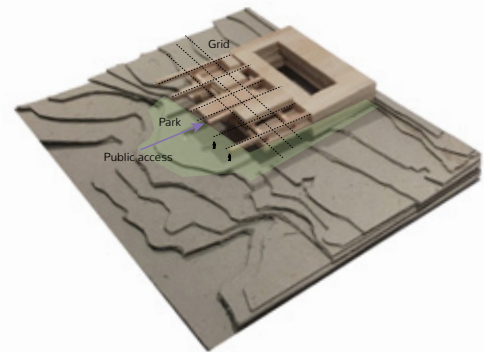


Figure 7.4.4 -Grid



This model explores the notion of extending the existing grid structure to create a deconstructed grid with a modular. This approach resulted in a completely open structure, with a dynamic form of expression.

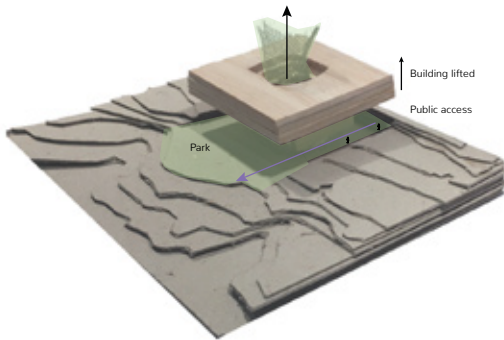


Figure 7.4.2 -Nature

This model explored the concept of brining nature into the building both horizontally and vertically. By elevating the existing structure off the ground plane, it allowed for complete public access on the ground plane.

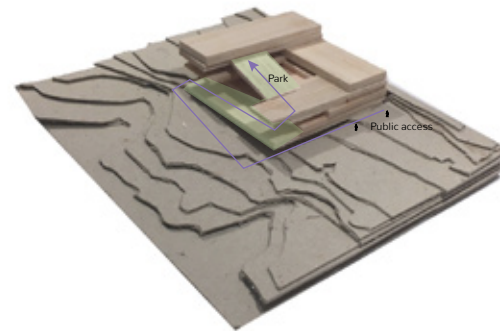


Figure 7.4.3 -Fluidity

This model was about using the existing ramping system as an extension of public access and the park. By focusing on fluidity it created a dynamic system for continuous movement.

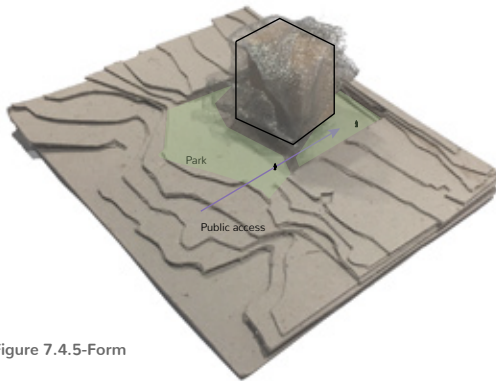


Figure 7.4.5-Form

This model explored the notion of creating a dynamic envelope over the existing structure. Thus it used the existing mass as a template to derive at a new form.

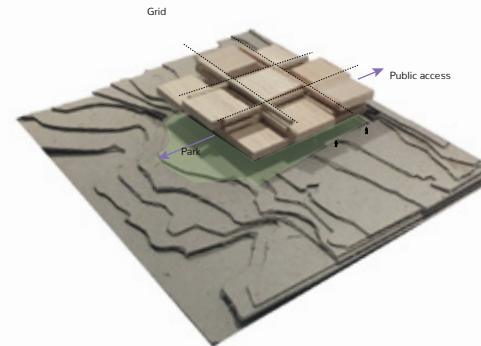
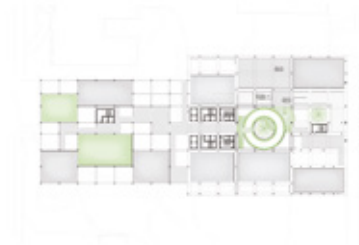


Figure 7.4.6 -Modulation

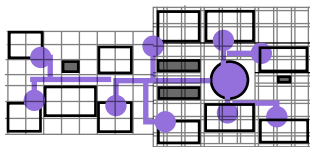
This model reflects all the themes explored in the charrete. It tries to bring nature into the existing structure by using a grid system to produce an open building. This result in more light and accessibility to occur within the existing structure.



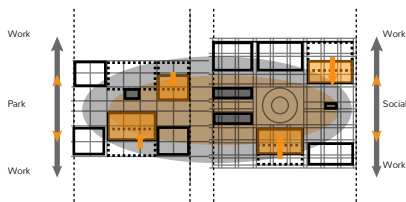
DESIGN APPLICATION



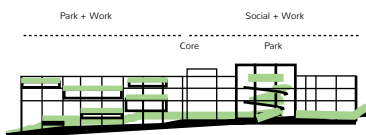
Plan



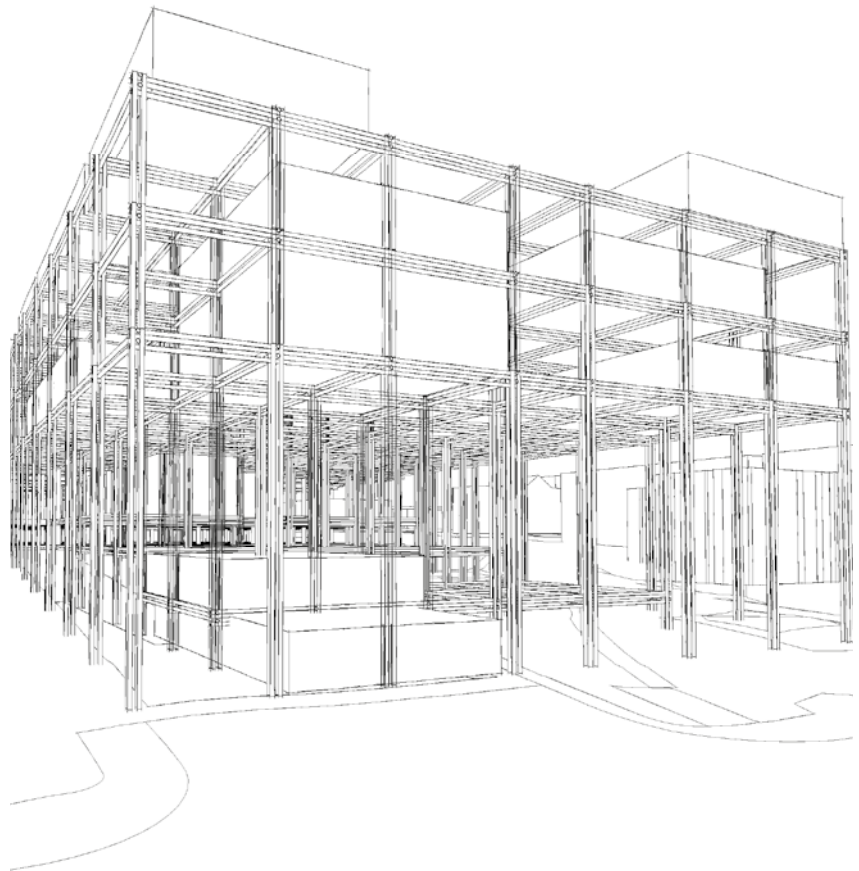
Networked Circulation



Plan Approach



Ground Plane Manipulation



Perspective

Figure: 7.5 - First Design Attempt

Taking the principles from the design Charrette and applying them into a design that focused on using the existing grid-structure.

REFLECTION

This design used the existing beams and column system, as the principle framework for its intervention. It implemented a central circular ramp system. This system attempts to bring the natural landscape vertically into the building, while creating opportunities for social interaction. Showing a strong correlation, that is successful, between movement, nature and sociability. Thus depicting the principles of fluidity, nature and social interaction. Despite this successful aspect, the design itself is mainly unsuccessful.

The design failure is due to its inability to reflect any elements of socio-materiality- formalistically or spatially. This is arguably due to the linearity of the existing infrastructure. The lattice framework resulted in sequential spaces. Thereby suggesting that movement, in this case, has become one-directional - following the grid. The division created by the grid structure will therefore produced spaces that are exclusive, thus promoting a separate experience. By using the existing grid it also reduced the opportunities for flexibility, despite its modularization. Although the reuse and adaptation of the existing grid structure seemed promising in concept, this design attempt has illustrated its issues. Therefore, it has demonstrated the demand for a new spatial and structural approach.

Linear, Sequential, Exclusive, Separated, One Directional

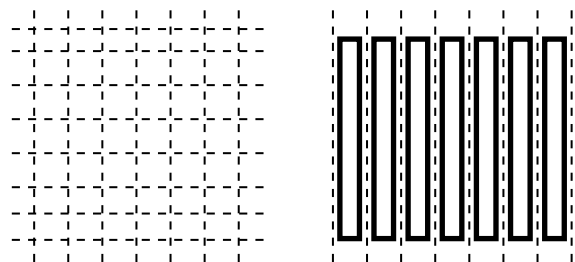


Figure 7.6 -Analysis of Existing Grid

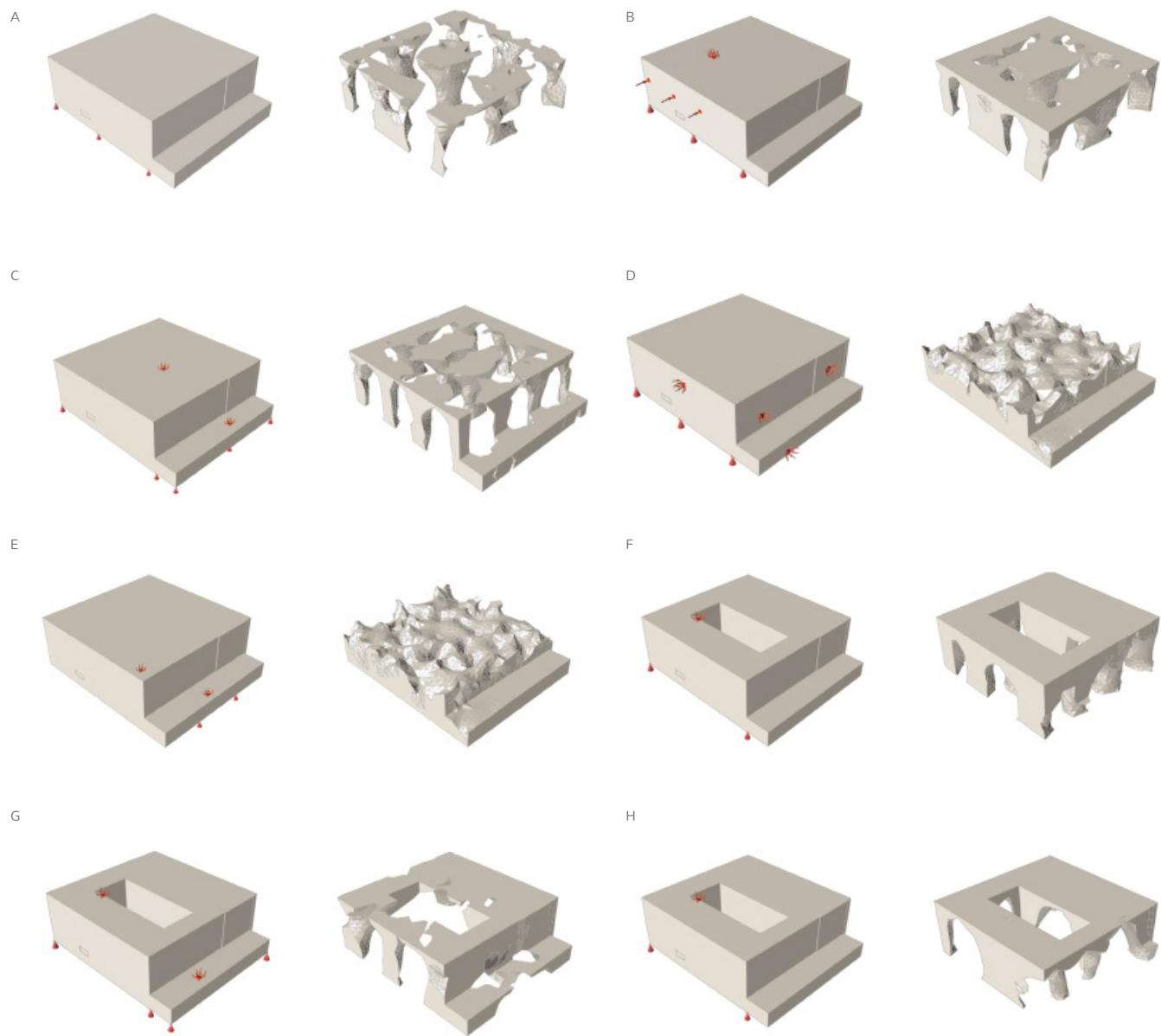


Figure: 7.7 - Generative Design
Results derived from the programme 'Inspire', in optimizing the mass of the existing parking structure

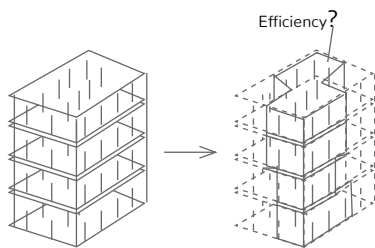


Figure: 7.8 - objective for Generative Design procedure

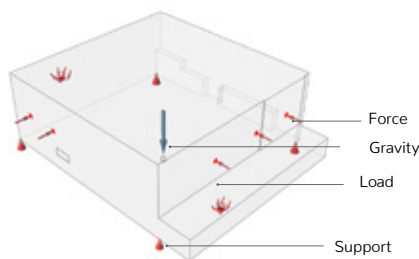


Figure: 7.9 - Diagram of data input

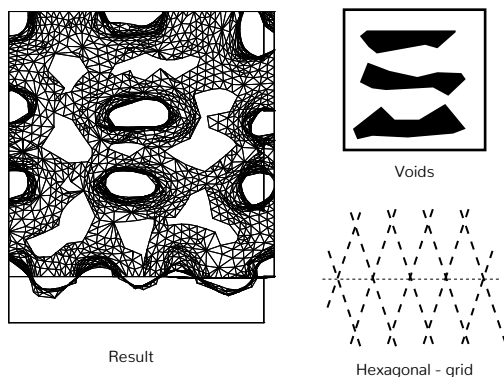


Figure: 7.10 - Diagram of principles extracted from simulation

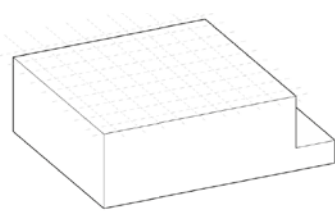
GENERATIVE DESIGN

The generative modelling procedure is derived from a set of objectives and conditions within an initial frame. Based on the prescribed constraints, the program will produce a new form based on optimal performance, mass-reduction and structure. This technique assists designers to disrupt the baselines of ordinary modelling and inspire new conceptual ideas. Therefore with the failures derived from initial human input (first design attempt), this thesis implores generative design as a form of conceptual exploration. Therefore, a simulation was conducted through a generative design programme, in an attempt to attain an optimized mass, with the intention of deriving a form. The programme used is called Inspire Therefore to obtain an efficient form, the following inputs were required: Supports derived from the existing column structure; load; gravity and forces - wind loads. The current structure's footprint was utilized as the base form for the generative design analysis as it denoted the existing site restrictions.

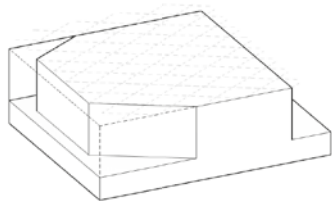
REFLECTION

The simulation was limiting as a square is an optimal shape. This explains why the generated results still reflected an orthogonal form. However, despite this setback, two fundamental abstractions were derived from this simulation. The most critical principle was a computer use of the hexagonal-grid system. Hexagons were broken into triangles to calculate a new solution for every design both formalistically and spatial. Therefore the hexagonal-grid should be implored over the linear grid to reflect an augmented architect - derivation of technology and the designer. The second aspect denoted by this simulations was the notion of solid and void. Therefore based on these simulations the new form optimally would need to reflect three voids (skylights). These skylights allow for the optimal penetration of light into internal spaces of the existing footprint.

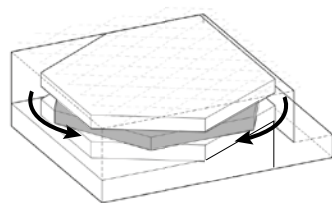
WORKING IN NEW GRID



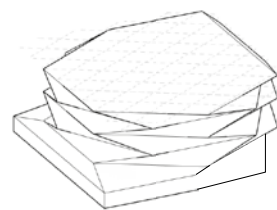
Existing :
Current form and
grid system



Superimposition:
New Grid system
superimposed - corners
cut away to allow light
and accessibility



Contextual link:
Public domain level
rotated to show visible
distinction - also creates
opportunity for new
views onto adjacent
park and light filtration



Form :
To reduce materiality
required the separate
masses were joined
to form a single
dynamic skin

Figure: 7.11 - Derivation of Form
This shows how form was derived from the
implementation of a hexagonal-grid structure

DESIGN APPLICATION

Network, Real-time, Communicative, Open, Multi-directional

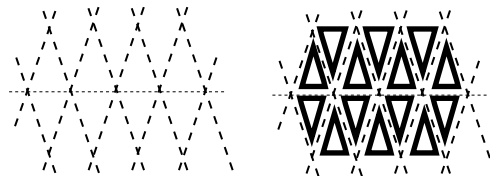


Figure 7.12 -Analysis of New Grid

The implementation of a new grid system allowed for the derivation of a form. It also produced a unique spatial quality within the design, that is a clear delineation of disruptive technology. The form was therefore derived by superimposing the hexagonal-grid system onto the existing footprint. This overlay denoted the need to reduce the current mass to fit into the new spatial-grid. Thereby also creating an opportunity for more light to filter into the structure, while reducing the building's exposure to the harsh East and West lighting. The hexagonal-grid system not only allowed the formation of a new form but also started to promote new aspects of spatial exploration. Similar to a rectangular-grid system a hexagonal-grid system also is comprised of a method of modulation, allowing for adaptation and flexibility within the design. Hence making it prevalent to future developments and adjustments. Unlike the linearity created from the old grid system, the new grid system is based on a network system. Therefore, it initiates more social interaction. It not only expresses the building spatially from the way people understand and perceive space, but also starts to open up the building. Thus producing fluidity that isn't fixed or linear. By implementing a hexagonal-grid system the design is able to reflect principles of **flexibility, fluidity, form, scalability and sociability**.

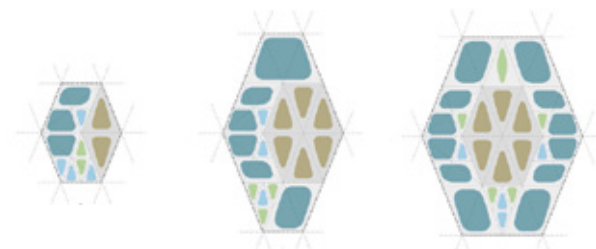


Figure: 7.13 - Modular Design Framework
Denotes an adaptable framework that can cater for a range of future scenarios

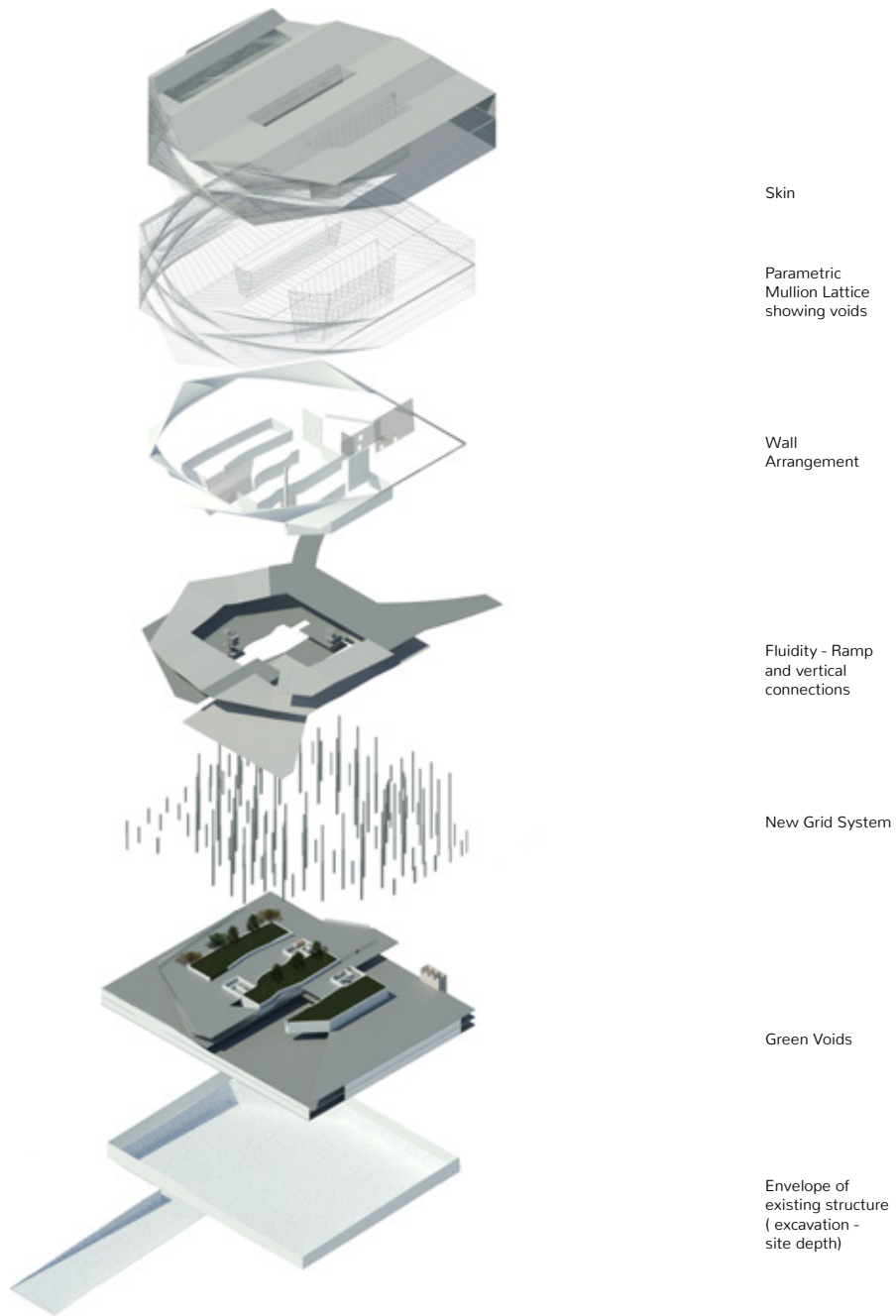
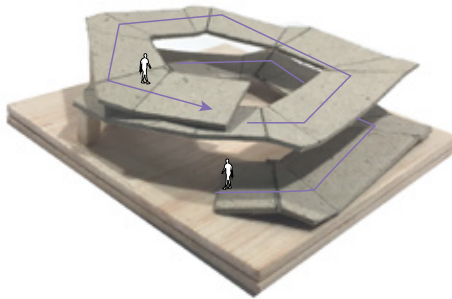


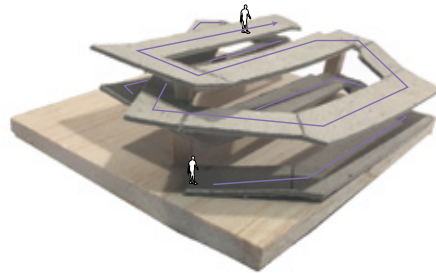
Figure: 7.14 - New Design Entities

RAMP-SYSTEM

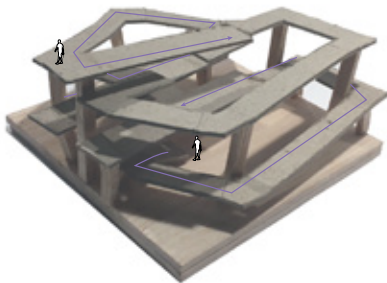
The fundamental principles of nature, sociability and fluidity are reflected predominately through the implementation of the ramping system. This continuous ramp-system would therefore function as a primary method to translate the disruptive space principles. Therefore different types of ramp systems were explored and reflected upon.



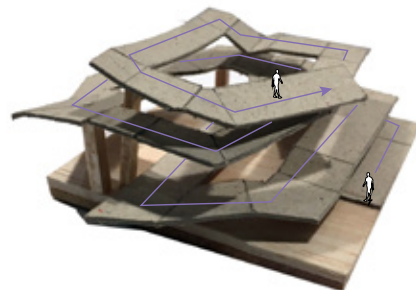
Continuous ramp-system



'S'-shape ramp-system



Split ramp-system



Overlapping spiral ramp-system

Figure 7.15 -Ramp Models

CORRESPONDING DESIGN THEMES OF DISRUPTIVE SPACE

Underpinning design intention

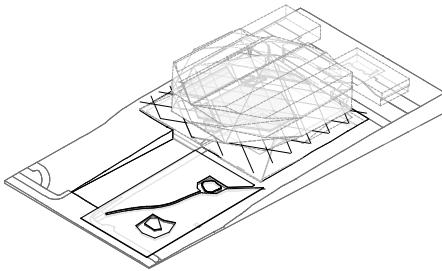


Figure: 7.16. 1 - Flexibility and Scalability

Hexagonal-grid used to improve aspects of flexibility and scalability through modulation.

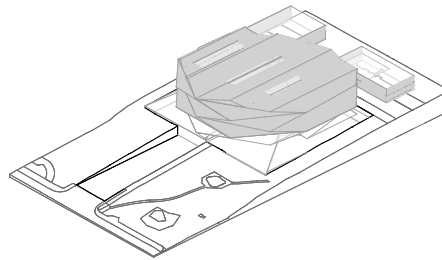


Figure: 7.16. 2 - Form

Parametric form used to generate an experiential quality to promote social exchange.

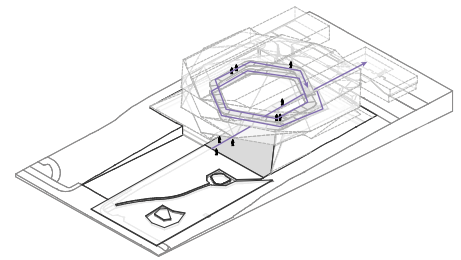


Figure: 7.16.3- Fluidity

Fluidity is explored through a continuous ramp-system. It also acts as a transitional element to link the contextual levels.

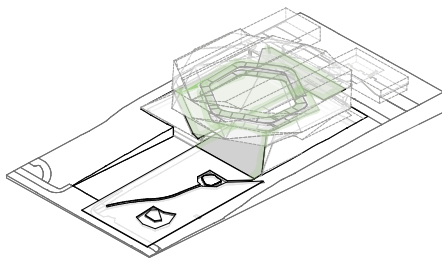


Figure: 7.16.4 - Nature

Nature is used in correlation to fluidity and sociability. It is utilized both vertically and horizontally as a natural spatial barrier- defining areas. Flat green planes are presented on the Park and Retail level, with vegetation occurring intermediately along the ramp system.

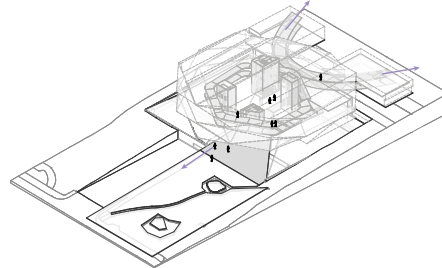


Figure: 7.16.5 - Sociability

Opportunities for social interaction are achieved through the implementation of a universal ramp system, multiple cores and spatial layering. The connection to the existing context allows for a larger scale community - increasing the chances for social exchange.

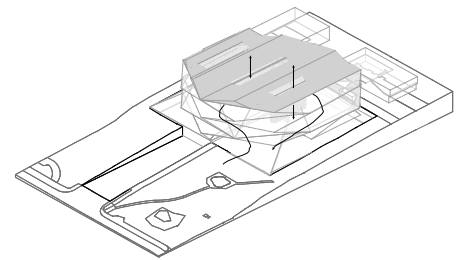
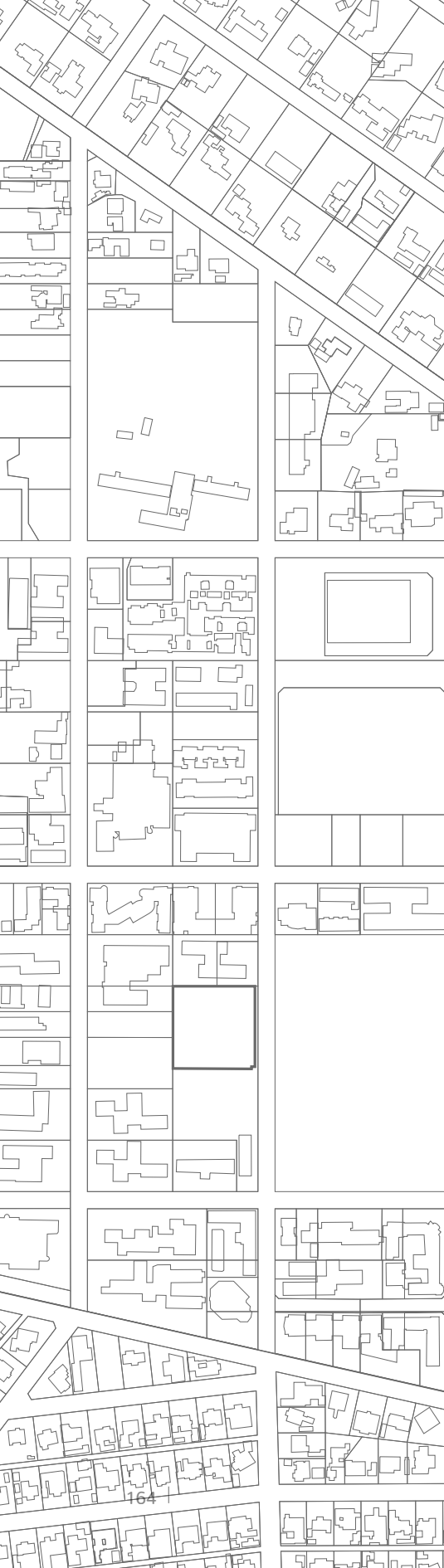


Figure: 7.16.6 - Sustainability

The building utilizes aspects of sustainability through its facade. Penetrations are used to allow for natural light and ventilation. These opening also suggestive of a water reticulation system that need to be considered and utilized.

CHAPTER

CLIMATE SIMULATION & ANALYSES



EIGHT



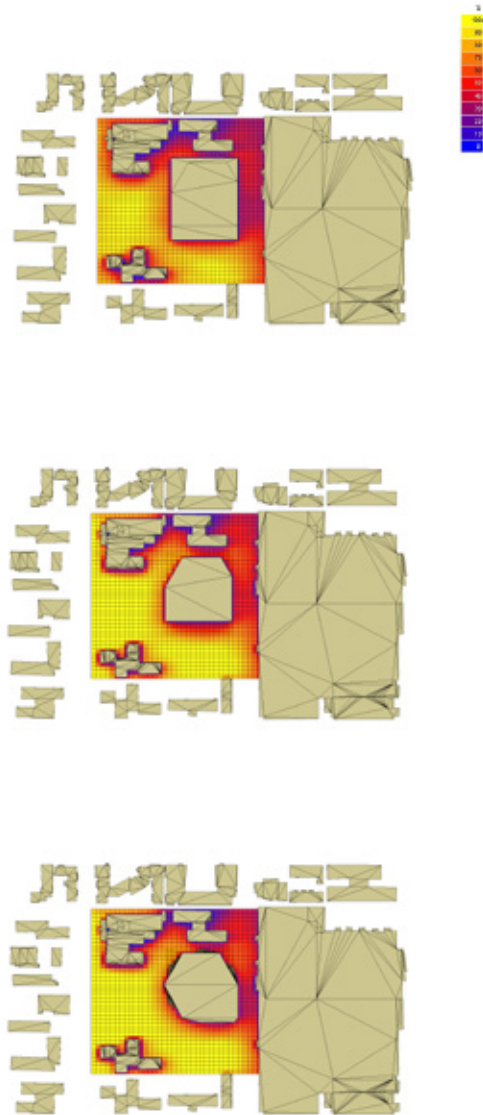


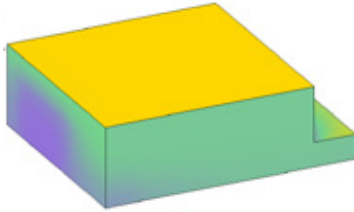
Figure 8.1 -Light and Shadow Simulation

FORM COMPARISON

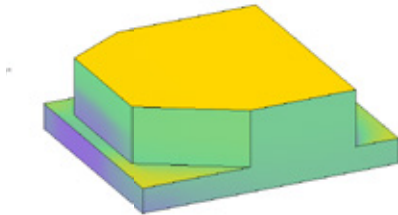
In the previous chapter the two methods of designing within an existing or a new grid-system was explored. A form was derived through the application of a new-grid system and human intuition. Therefore, with the generative design process reflecting a square to already be optimal and efficient, a second test would need to be conducted to reflect different environmental variables. To check if the new parametric form would be optimal in comparison to the initial conceptual mass. Thus by running a basic simulation on the new forms progression, it delineates these stage to illustrate if the new form is a sustainable solution. Thus, this required another computerized simulation to be conducted. This time focusing on the lighting quality and energy consumption of the new form in relation to the existing mass.

LIGHT AND SHADOW ANALYSIS

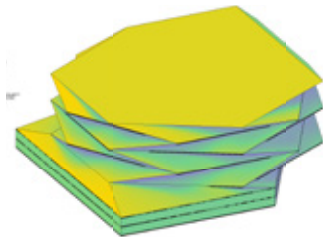
This analysis was created by Ecotect - an environmental analysis tool that simulated the existing site conditions onto a digital platform. From the analysis conducted we can see the initial footprint received a relatively low percentage of direct light - making for a cooler and darker environment. This is appropriate for a parking garage but not for an inhabitable environment. Therefore by superimposing the new-grid system it resulted in the North facade being pushed back. This simple notion took away the deep shadow that was created by the adjacent building. Thereby it allowed for more Northern light to enter the new form. The new grid also meant cutting away the corners to fit into the hexagonal system. This inadvertently reduced the amount of direct West light that the building would be exposed to. Therefore based on this simulation it can be deduced that the new form exposes the building to better light conditions making it conducive to better spatial environments.



CUMULATIVE INSOLATION:
11 878 027 KW



CUMULATIVE INSOLATION:
11 692 513 KW



CUMULATIVE INSOLATION:
10 130 001 KW

ENERGY ANALYSIS

An energy simulation was conducted using the programme Insight. From this analysis it was determined that from stage one the new hexagonal grid system started to reduce the amount of energy the building required. This reduction is presumably due to the decrease of harsh west and east façades. Thus, this reduction also enhances the environmental sustainability of the new form, from a technical standard. This is due to the initial mass having a higher cumulative insolation outcome, therefore by reducing this number it reduces the amount of energy required to keep the building at a comfortable temperature.

Figure 8.2 -Insolation Simulation

VEGETATION CONSIDERATIONS

Indoor plants can be divided into three groups according to their physiological responses to light. The first group includes extreme shade plants like Aglaonema, Maranta, and Spathiphyllum. These plants require a shallow exposure to light and can grow in most environments when not exposed to direct sunlight. The second group is termed sun-shade, often referring to plants that require moderate indirect light. These plants can adapt to a wide range of interior light levels. Some examples include ZZ plants, Dracaena and Ficus. Sun plants are the third type of foliage. They often require a high light intensity to bloom, like the Hibiscus. These plants are often considered to be flowering plants, requiring prolonged periods of sunlight. It is important to note that although these plants need direct light to bloom, some plants can still thrive in indirect light conditions, they will just not bud. Therefore based on foliage being divided into three groups determined by its exposure to light: Low light, moderate/indirect light, and high intensity. Thus, an analysis of the building's daylight access was conducted to understand the types of vegetation that can be implemented within the space required.

Therefore the plants that were considered pertained to these three categories. They were selected based on their ability to adapt to indoor environments as well as their application, allowing for different experiences within the building. The following plants were considered:

Shaded Plants

Mother-in-law's Tongue (Snake Plant): Low maintenance plant, very durable and can tolerate large amounts of darkness, irregular watering/dry soil

Parlour Palm: grows in dark corners, requires minimal care and minimal light

Devils Ivory (Golden Pothos/ Money Plant): extremely low-maintenance vine that requires no direct light, Also considered an air-filtering plant

Liriope: used often as a ground-cover or an edging plant, it stays evergreen year-round in many climates

Aptenia Cordifolia: for retaining walls and dry patches of soil where other plants may struggle. It is rich-green in colour, with dainty pinkish-red flowers and can spread rapidly, helping to cover an area in a short space of time.

Begonias: produce flowers all year round and feature an array of geometric foliage patterns and colours.

Sun-shaded

Ficus Benjamina/Weeping Fig/Ficus tree: requires a warm environment and indirect light and humidity - requires constant moisture. English Ivory is a climbing plant, great on trellises, fences and other places that allow vines to grow — prefers indirect light but can tolerate low light

English Ivory: Climbing plants, great on trellises, fences and other places that allow vines to grow- prefers indirect light but can tolerate low light.

ZZ plants (Zamioculcasi): evergreen plant, can thrive in very low light, — air-filter, very tolerant of occasional neglect – low water requirements

Sun plants

Cast Iron plants: pieces prefer bright light but are ideal for this climate as they can survive in shaded spots and rooms lacking natural light

LIGHT AND VEGETATION ANALYSIS : PARK LEVEL



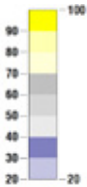
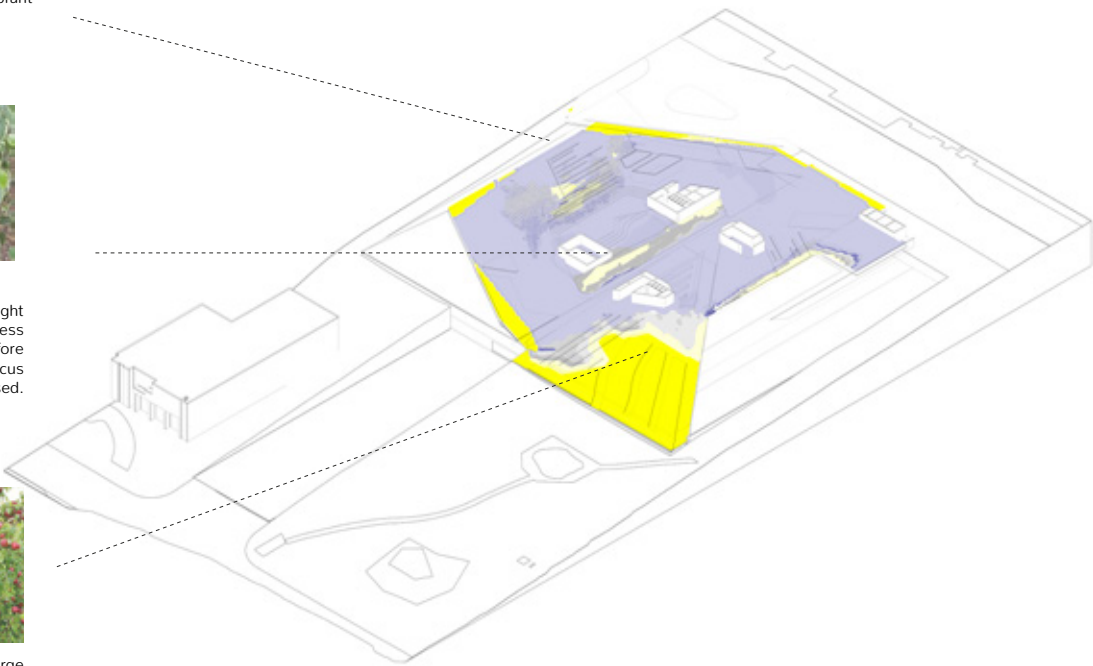
Low levels of light across edging can use Liriope to create a vibrant threshold.



Medium levels of light exposure, and access to moisture therefore plants like Ficus benjamina can be used.



Exposure to large amounts of direct sunlight makes it an ideal location for large trees or flowers that require direct sunlight to bloom.



The results displayed were acquired using a programme called insight. The simulation was based on the average light accumulation being 10 hours a day or 3650 a year i.e. 100%

Figure 8.3 - Cumulative Daylight Access
Also indicates the type of foliage to be implemented

SPATIAL QUALITY



Low levels of light



Medium levels of light



High levels of light

As per the research conducted, the lower levels of light are utilized for their isolation. The darker spaces allow for a more contemplative and more quiet environment. They are often located around the edges, suggesting a visual connection rather than a physical one. This is enhanced by the selection of plants as they are utilized to denote a green threshold. They are often ever-green and help to create a constant variable and sense of timelessness that counter acts technology's and society's pervasive nature.

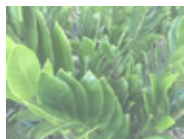
A medium, light quality is ideal for work and social environments. These environments are often located centrally and allow for the user to have both a personal and a collective experience. Thus, these spaces should often encourage collaboration. This is enhanced by the selection of plants due to their curve-like shape and soft appearance. The plants help to create a relaxing and comfortable environment, ideal for focus. Thus, it creates an appropriate work environment, not only due to the light quality but also due to its quality. These spaces are also considered open and warm to attract people. This is theorized by the fact humans are intrinsically attracted to curves, thus creating an open and warm environment, conducive to a shared experience.

The areas exposed to direct sunlight are ideal for social spaces and activities. This area often occurs around the edges and therefore will be high in energy and visibility. The implementation of these types of plants will add to the high energy by creating vibrancy and dynamic space. This vibrancy is indicated not only through its utilization of colour but also its enhancement of the senses.

LIGHT AND VEGETATION ANALYSIS : PUBLIC DOMAIN LEVEL



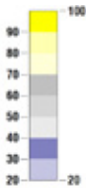
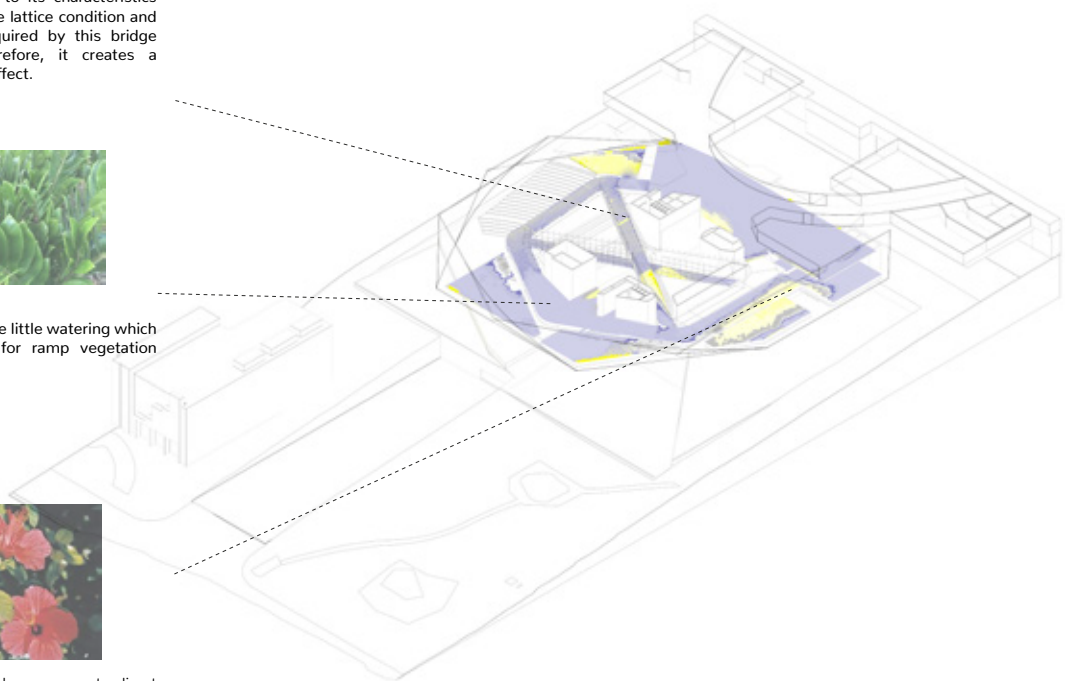
Devils Ivy is a climber plant. Therefore, due to its characteristics it is ideal for the lattice condition and light levels required by this bridge structure. Therefore, it creates a green vertical affect.



ZZ plants require little watering which make it ideal for ramp vegetation treatment.



The edges that have access to direct sunlight, plants that bloom like the hibiscus can be used.



The results displayed were acquired using a programme called insight. The simulation was based on the average light accumulation being 10 hours a day or 3650 a year i.e. 100%

Figure 8.4 - Cumulative Daylight Access
Also indicates the type of foliage to be implemented

SPATIAL QUALITY



Low levels of light



Medium levels of light



High levels of light

The public domain level is essentially broken up into three layers. The inner most layer is comprised of linking lattice bridges that are connected to the main circulation ramp system (second layer). The second layer then feeds into the outer layer which is these pod-like environments. Despite the division into three layers, each aspect creates the opportunity for different spatial and social activity.

The lattice bridges create a prime environment for climber plants. These plants are utilized for both their aesthetic and technical abilities to create a personalized experience. This is due to the fact that these plants act as both a device for privacy and noise reduction. Therefore, it allows opportunities for limited visual connectivity while creating a spatial zone and barrier internally. Thus spatially they create a personalized experience, while allowing people to reconnect to the natural world.

The main ramp-system utilizes greenery to enhance movement and sociability. Therefore low planters are used to create an inner and outer barrier. Due to the constant movement and activity dedicated to this area, it requires low-maintenance plants, an environment through air-filtration. The plants in this area are ever-green to create a constant variable in the pervasive nature of the building and its activity. Thus due to its ability to stay green-all year round it uses greenery to encourage walkability and sociability. This is based on the research conducted that greener environments increase walkability and well-being.

The suspended pods on the edge of the structure are enclosed glass environments. Thus enhancing the notions of shared space and shared experience. These environments use mechanical ventilation to allow for a more comfortable environment to allow for work to occur for longer-periods of time. Therefore due to the lack of air filtration needed and the opportunity for direct light plants that bloom were used. This allowed the environments to create a sense of time and place unique to the seasons. It also utilizes all the senses to create a more dynamic and aesthetic environment.

LIGHT AND VEGETATION ANALYSIS : RETAIL LEVEL



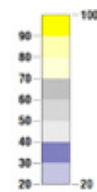
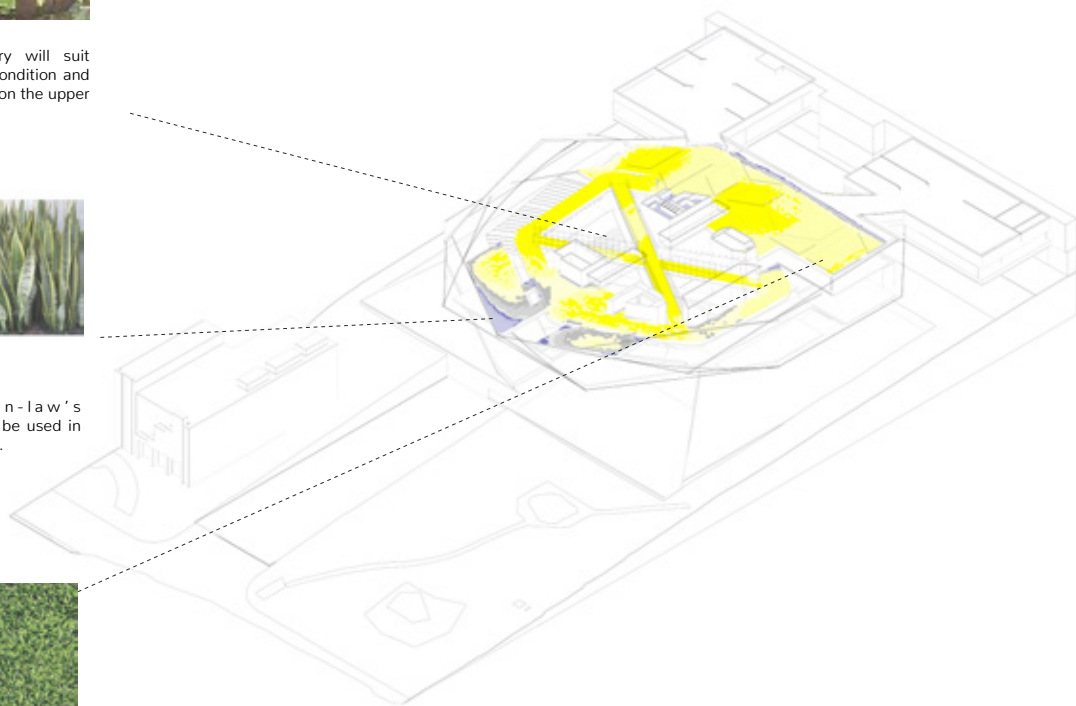
English Ivory will suit the lattice condition and light quality on the upper levels.



Mother-in-law's Tongue can be used in dark corners.



Exposure to immense amounts of sunlight means the upper level can be used as a flat green plane, where a grass like plant can be implored.



The results displayed were acquired using a programme called insight. The simulation was based on the average light accumulation being 10 hours a day or 3650 a year i.e. 100%

Figure 8.5 - Cumulative Daylight Access
Also indicates the type of foliage to be implemented

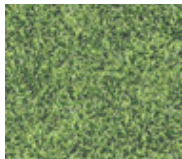
SPATIAL QUALITY



High levels of light



Low levels of light



High levels of light

As per the research conducted, the lower levels of light are utilized for their activity. The bright spaces allow for a more illuminate, dynamic and vibrant environment. The brightness also helps in illuminating the unlimited possibilities while assisting in the growth of various plants. This correlates to more movement and social interactions. Therefore the large volumes assist in cognitively associating unlimited possibility both creatively and emotionally. Thus, an enclosed green-house was implored on the highest level. This space is used as an antithesis to the superficialness of the mall. It creates a large volume for where the social and the natural world intertwine through more substantial and physical connections. Hence deriving at collective experience.

English Ivy is similar to the Devils Ivy, however, it is both a climber and a hanging plant. Thus, it is also used to aesthetic and technical abilities to reduce noise and create a sense of privacy. Its ability to hang and climb starts to give the bridges a sense of complexity as well as symbolism to cognitively create a sense of direction per level. Therefore the utilization of a different ivory creates vertical spatial barriers making space be perceived physically in three dimensions. The notion of privacy once again alludes to an individual experience.

Darker areas situated along the edges are defined using shaded plants. As mentioned earlier these darker spaces allow for a more contemplative and more quiet environment. This makes them ideal to be placed in working spaces as they create an atmosphere for complete focus, while creating a green threshold between the user and the form. Thus applying a transitional layer between experience and the physical form.

VEGETATION : METHODS OF IMPLEMENTATION



Figure: 8.6 - Green Planes

Green planes create opportunity for pausing, relaxing and social interaction. Allow for both a personal and collective experience through a constant visual connection.

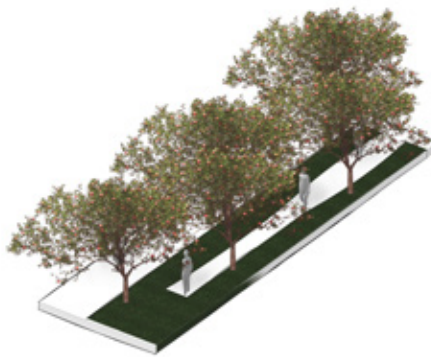


Figure: 8.7 - Fruit Orchard

Fruit orchards create the opportunity for society to engage with their sense of taste. Meandering pathways are formed next to a main path of circulation. The density and height of trees allow for a more personal social experience.

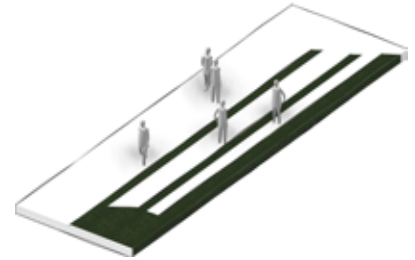


Figure: 8.8 - Flat Planes

On grade greenery, creates opportunities to engage with both the notion of sight and smell - through flowers and grass-like vegetation. Allow for both a personal and collective experience through a constant visual connection.

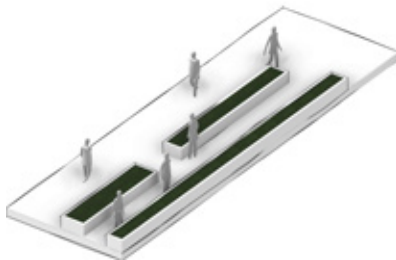


Figure: 8.9 - Planters

Planters are at the height of 450- 600m, creating a new level of engagement with nature. It is used for spaces like the herbarium and where sitting or pausing areas are needed in a hard environment.

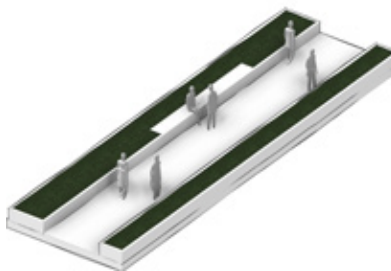


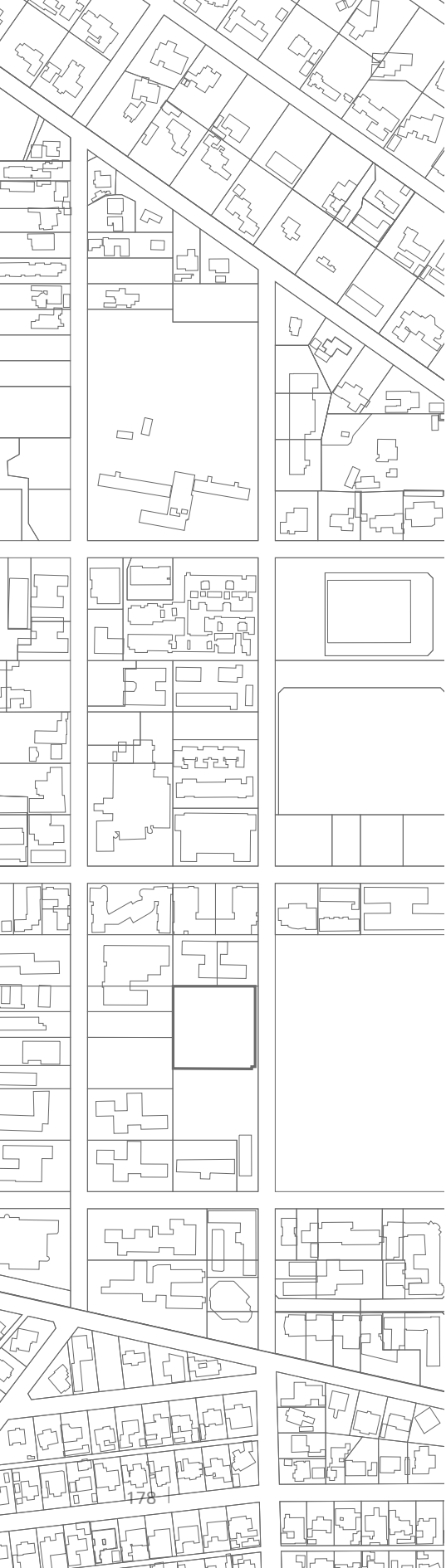
Figure: 8.10 - Main Ramp System

Ramps have landscaping on either side, with a constant 3-meter walkway. The greenery expands and contracts to create opportunities for social engagement. The Ramp will implore planter box and hanging plant systems



Figure: 8.11 - Interconnecting Ramps

Interconnecting ramps are to be made from a light steel structure creating the opportunity for creepers to be used.



CHAPTER

DESIGN DEVELOPMENT

NINE



SITE RESPONSE

Response to Existing Site Condition

During design development, several contextual decisions were made in response to the existing conditions on site. These actions ranged from demolition, retention and the improvements of certain contextual elements.

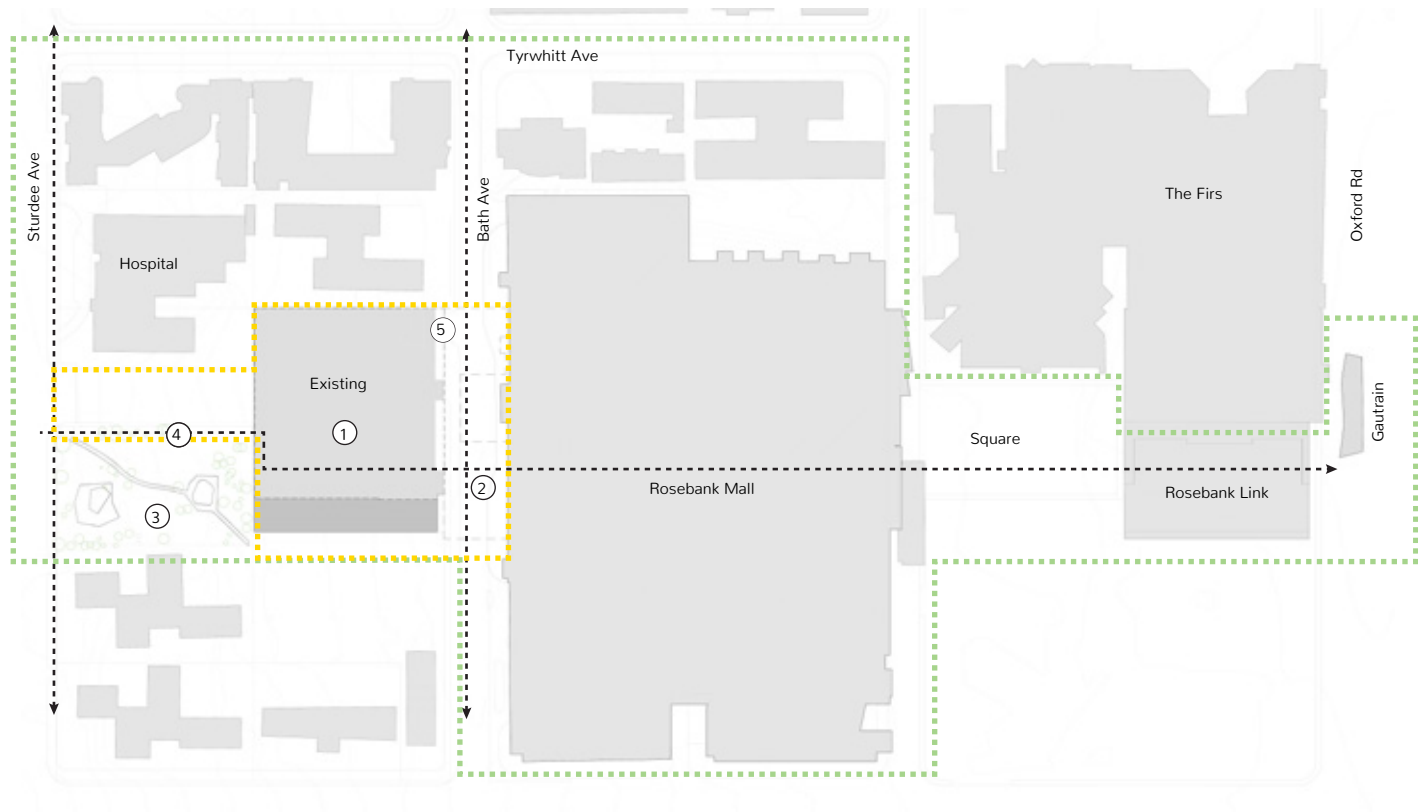


Figure: 9.1 - Site Response Description

- 1 - The Existing structure will have its envelope retained at basement level and will be incorporated within the proposals lower-ground floor. The rest of the structure will be demolished
- 2 - The Existing Pedestrian access on the upper levels will be retained and improved to allow for better spatial quality on ground floor
- 3 - The adjacent park on the Western edge will be retained and extended into the design proposal
- 4 - The existing Pedestrian access dissecting the existing structure will be retained and improved upon
- 5 - A new drop-off Zone will be proposed on the Eastern perimeter of the existing building.

Site
Contextual Site



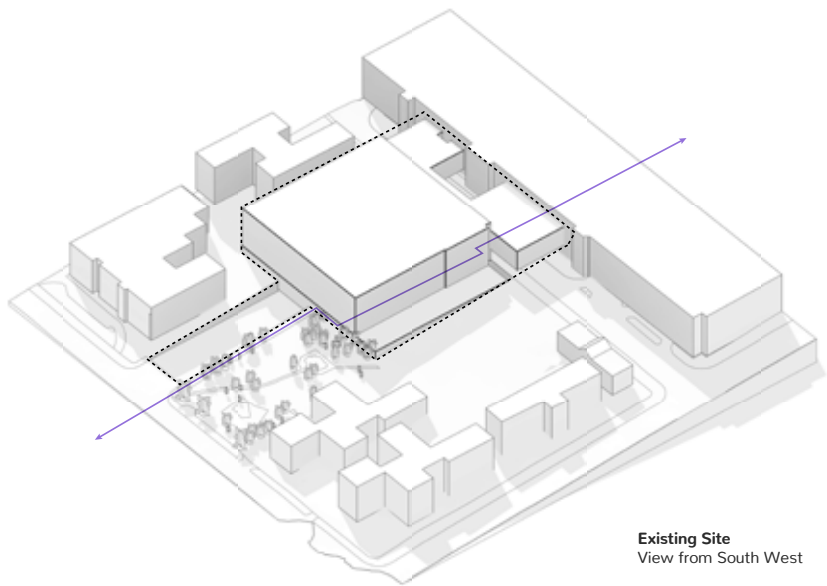
Site Plan
Scale: 1: 3000

SITE RESPONSE

EXISTING SITE

Figure: 9.2 - Description

The sites physical location is 35 Bath Avenue. It is located West of the Rosebank Mall. It is currently inhabited by an existing structure that comprises of two levels of retail and six levels of parking. The site exists at the edge of the adjacent park and is an active conduit for people moving through Rosebank Mall and its perimeter. Creating a strong axis from the Gautrain Station to the lower level parks.

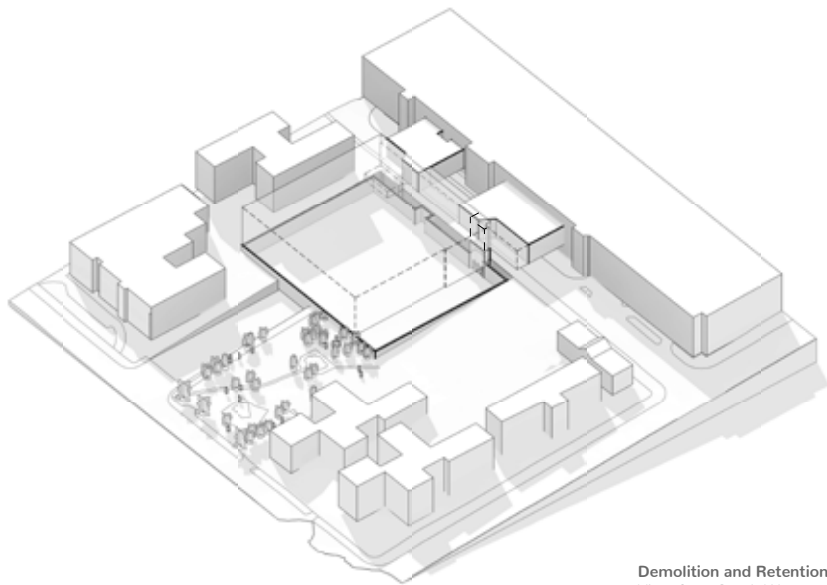


Existing Site
View from South West

DEMOLITION AND RETENTION

Figure: 9.3 - Description

The existing structure on the site ended up being demolished due to the requirements derived for a new grid-system. However, despite the demolition of the upper levels, the bridge link and the building's basement level envelope and circulation core were retained and adjusted. The bridge link maintained was modified to allow for more light to reach the ground floor plane - creating a better spatial quality below the bridge, while ensuring that the modification would not disrupt the current activity and movement of the linking structure. Therefore the proposed building will absorb any retail that it removed.

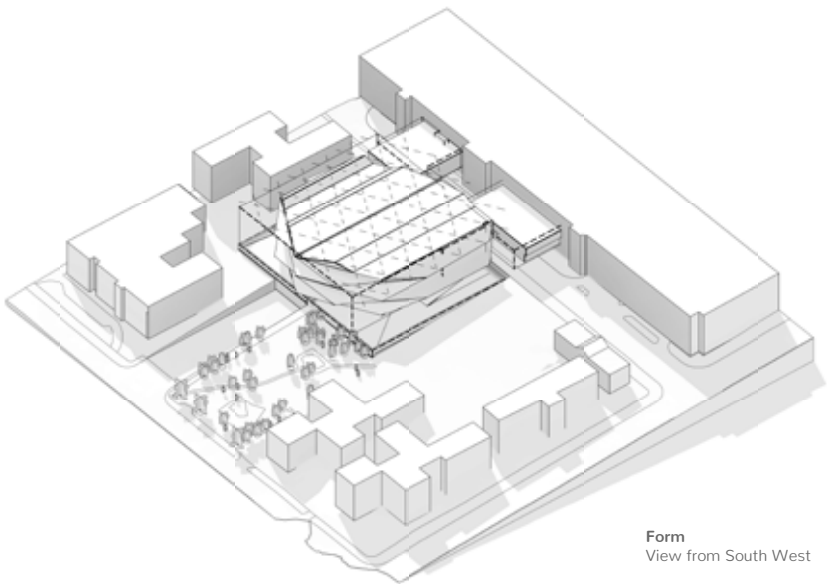


Demolition and Retention
View from South West

DESIGN INTEGRATION AND ORGANIZATION

FORM

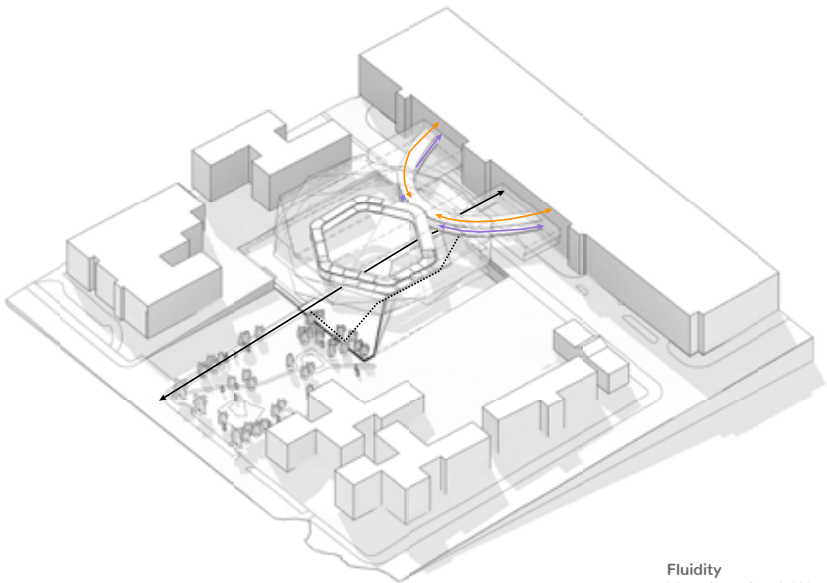
Figure: 9.4 - Description
Initially, the existing structures form was used as a conceptual boundary. Then a new rational grid system - hexagonal grid- was implored. The grid system was then superimposed onto the conceptual framework to derive at a new form that reflects the socio-materiality of current society.



Form
View from South West

FLUIDITY

Figure: 9.5 - Description
A hexagonal-grid system was employed to spatially derive at a solution. This solution would allow for the transition between contextual levels, as well as establishing the building as a significant link within the existing context. The building looked to increase the movement on the Park level by making it a direct central axis. Unlike the previous route which required people to turn multiple times, this new axis allows for a more convenient visual and physical route. A hexagonal ramp is implored centrally to allow for the full translation between the three contextual levels. Therefore, the building is publicly accessible from multiple points and levels but is centrally contained. This allows for more social interaction to occur while ensuring a sense of control and safety can be implemented.

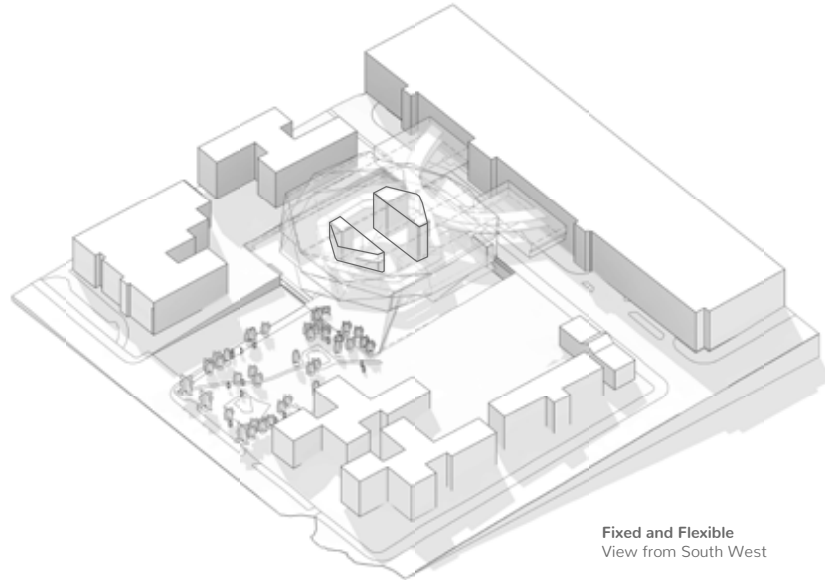


Fluidity
View from South West

FIXED AND FLEXIBLE

Figure: 9.6 - Description

It's already been denoted how the new grid-system can create flexibility and scalability through its modulation. However, certain aspects require a fixed position; therefore the ramp-system acts as a mediator between fixed and flexible. With the central East and West Axis defined for fixed entities like cores and services, the exterior perimeter of the ramp is dedicated to the flexible activity. Despite the ramp and the pods being a fixed structure, the programme and activity that occur on it are entirely flexible, allowing for future adaptation and casual social encounters.



Fixed and Flexible
View from South West

NATURE

Figure: 9.7 - Description

Nature is the antithesis of technology, and therefore its implementation became vital. The ramp-system established a connection contextually and socially to the existing platforms. Therefore, it was equally capable of continuing the adjacent park, horizontally and vertically - exploding it through the design. Despite the ramp-system spreading nature throughout the building, there are two primary green levels located on the top and bottom level (leaving the intermediate area for the office component). The first green level occurs on the park level. This area is intended to be more of an active and collective green space, whereas the other green spaces (on the Retail level) serve as a passive area. Therefore, creating environments for contemplation and relaxation, allowing for a more personal experience while providing a new environment to and for the Rosebank Mall. Thus establishing a spatial hierarchy that goes from an active plane to a passive environment.

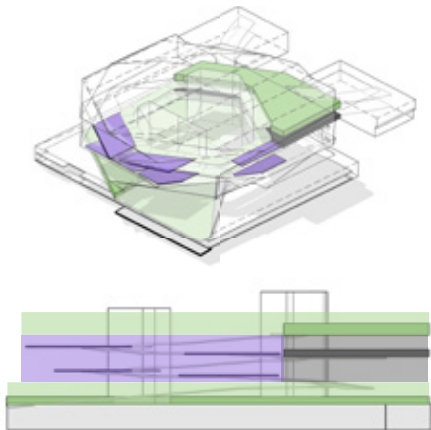


Nature
View from South West

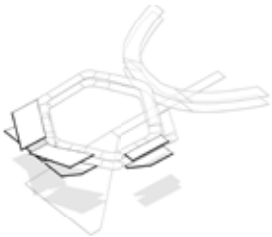
ORGANIZATION

Figure: 9.8 - Description
 The building's organization was primarily derived from the hexagonal-grid structure. It utilized the ramp-system as the central principle to derive at its organization. Hence, the ramp-system defines the areas for fixed entities - cores and services. With the top and bottom of the ramp system being defined by green planes, the ramp becomes an extension of the adjacent park. Therefore, the design illustrates principles of fluidity, sociability, and nature. The inner perimeter is used for platforms that become an extension of the social and green spaces on the ramp. The ramps external perimeter becomes the planes for where work and the office component occur. Thus, it uses the ramping-system, light and greenery to naturally define spaces. These notions allow for the building to be open to the public both visually and physically, while enabling experiences for both the collective and the individual.

- Park programme
- Office programme
- Social programme



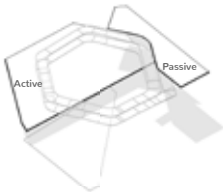
Organization
 Diagram of programme organization



Work Planes



Social Planes



Green Planes



Fixed



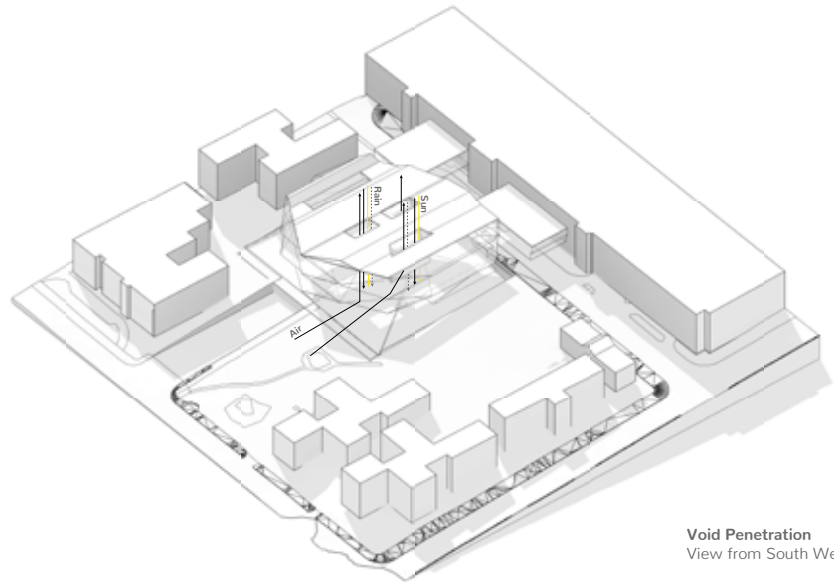
Ramp-system

Organization
 Depiction of how ramp-system used to create spatial organization

VOID PENETRATION

Figure: 9.9 - Description

Voids dissect the buildings form vertically allowing for both light and natural ventilation to enter into the building. The use of open voids also exposes the user to the natural environment, while utilizing the natural elements to grow vegetation. The utilization of natural elements is also reflected within the buildings facade. The facade uses a gutter-like system to control water along the facade and into the building. Therefore, planter boxes were placed below these voids to collect this water. It also allows for a sustainable approach as the building is open in certain sections resulting in little to none mechanical ventilation needed.

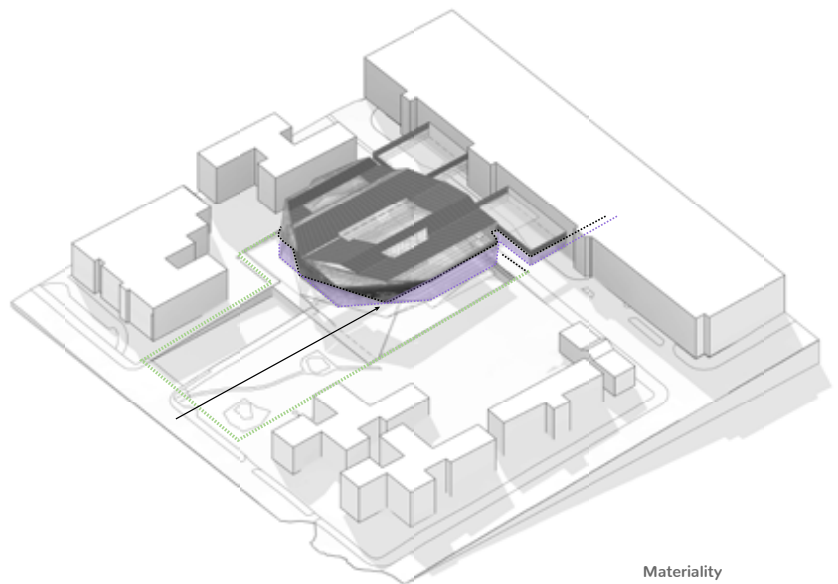


Void Penetration
View from South West

MATERIALITY

Figure: 9.10 - Description

The building is just a small piece working within a broader context. It therefore utilizes materiality from solid to transparent and open. Thus the building starts deriving at a symbolic and representative relationship with the existing context. Thus, the most public and active area - the park level uses a mesh facade. This allows the building to be completely accessible, on the Park level both visually and physically. The Public Domain level is denoted through glazing - a transparent material. This produces a visual connection that is maintained throughout its level. The Retail level is solid to reflect the relationship with the adjacent building- the Rosebank Mall. With the three levels having distinctive characteristics the remaining facades used a transparent treatment to allow for more light to enter into the building. This was done strategically to allow for more diverse environments and for the growth of vegetation.



Materiality
View from South West

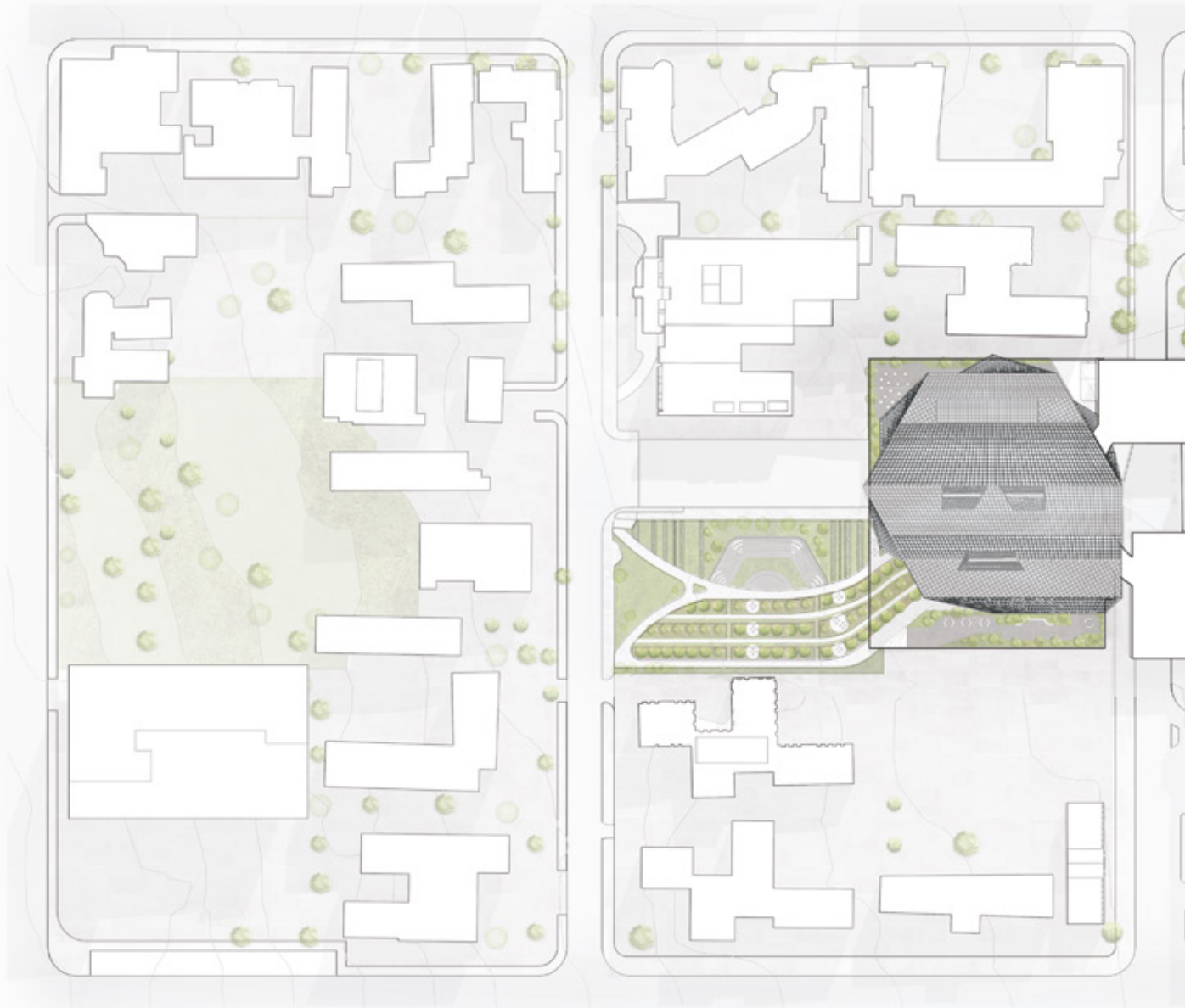
CHAPTER

FINAL DESIGN



TEN





LOCATION KEY

1. Rosebank Public Library
2. Lower Level Park
3. Middle level park
4. Netcare Rosebank Hospital
5. Rosebank Mall
6. Rosebank Square
7. The Firs
8. Rosebank Link
9. Gautrain Station Access

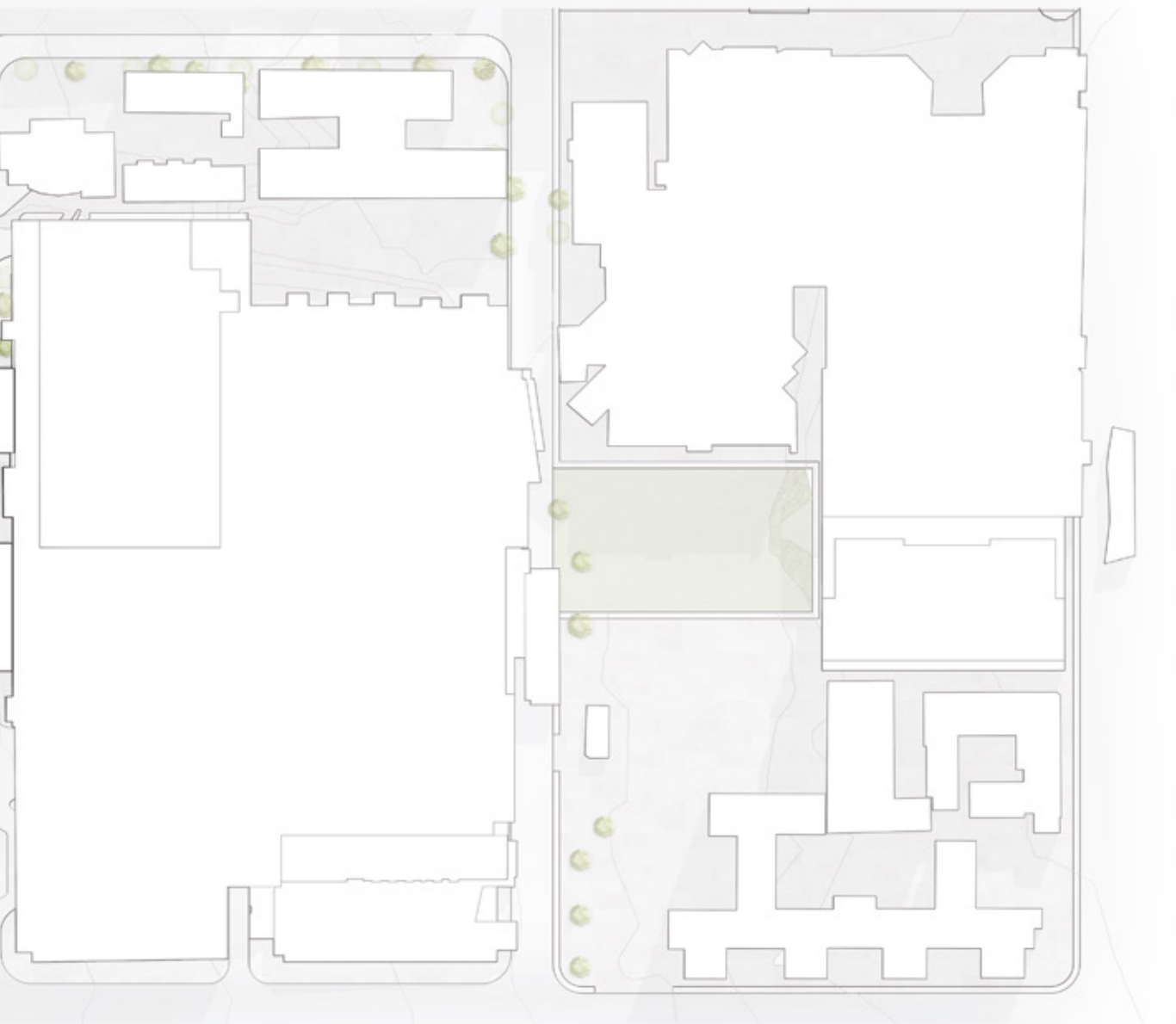
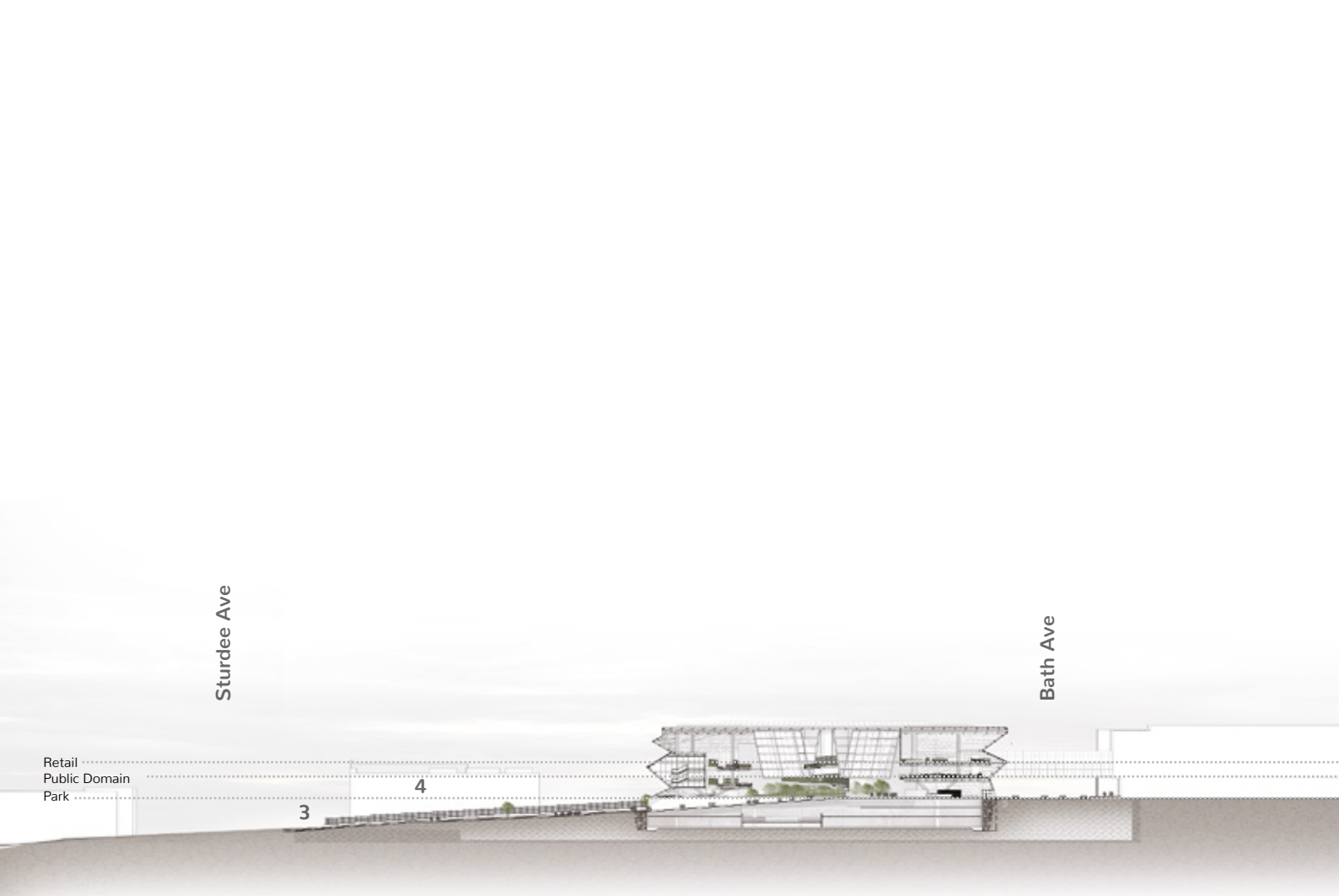


Figure 10.1 - Site Plan
Scale: 1: 2000

CONTEXTUAL SECTION

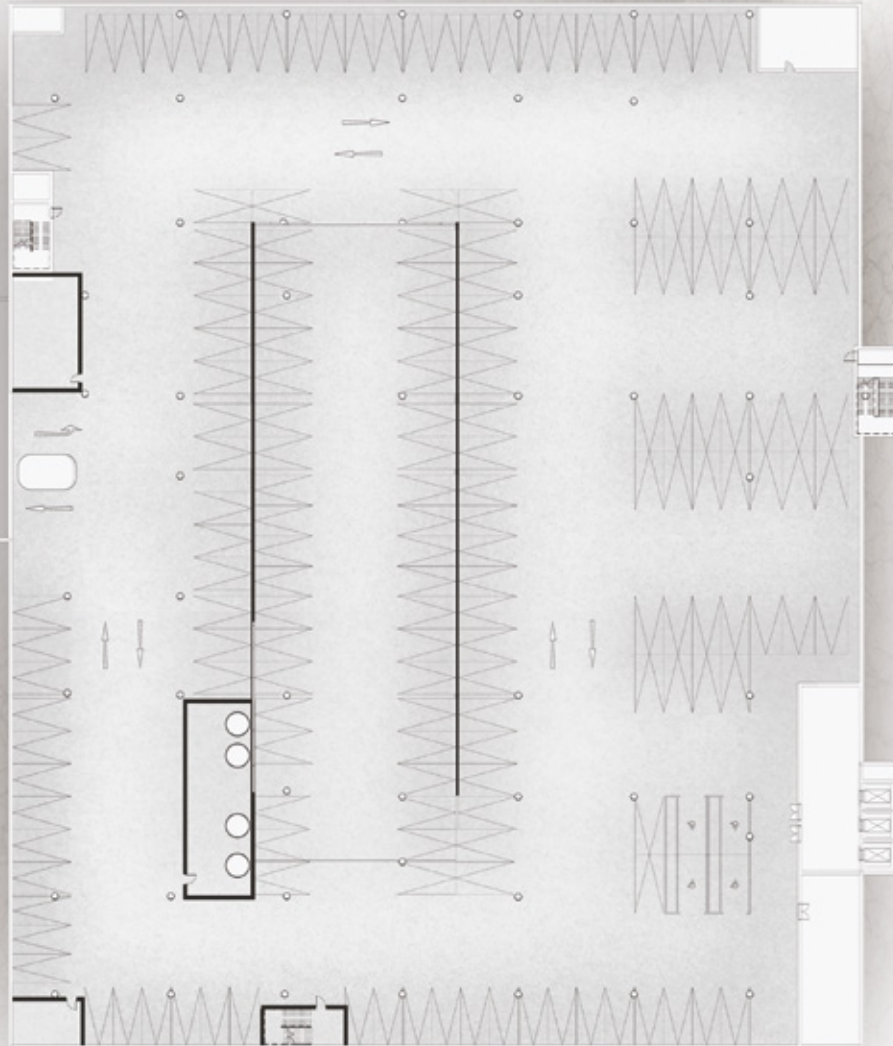


LOCATION KEY

- 1. Rosebank Public Library
- 2. Lower Level Park
- 3. Middle level park
- 4. Netcare Rosebank Hospital
- 5. Rosebank Mall
- 6. Rosebank Square
- 7. The Firs
- 8. Rosebank Link
- 9. Gautrain Station Access



Figure 10.2 - Contextual
Section
Scale: 1: 2000



LOCATION KEY

1. Vehicle Entry
2. Security Point
3. Water System
4. Storage

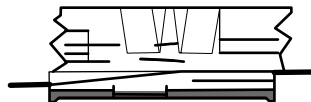
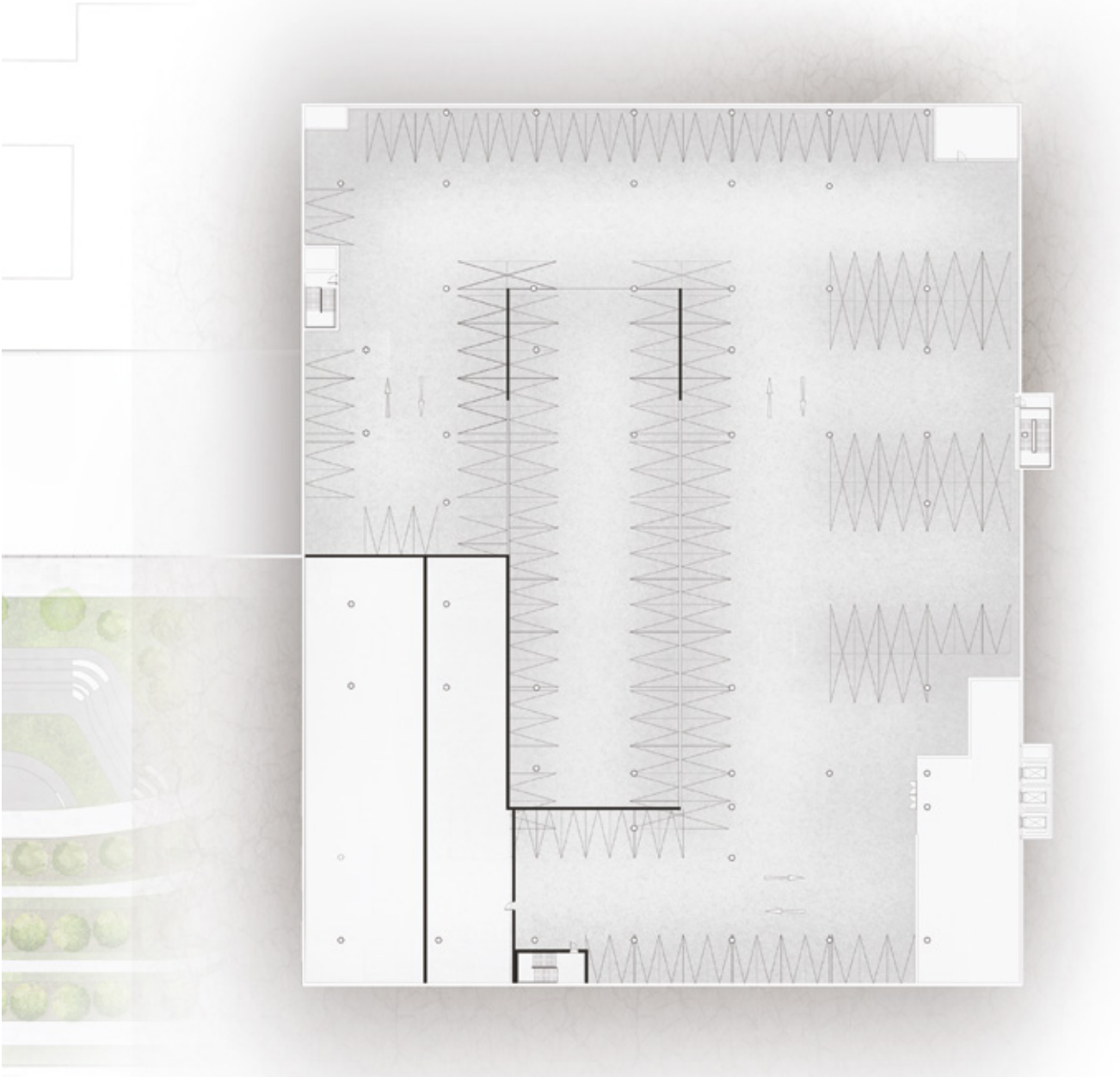


Figure 10.3 - Basement P1
Scale: 1: 600

PARKING PLANS



LOCATION KEY

- 1. Vehicle Entry
- 2. Security Point
- 3. Water System
- 4. Storage
- 5. Soil Retention

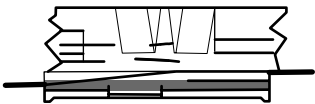
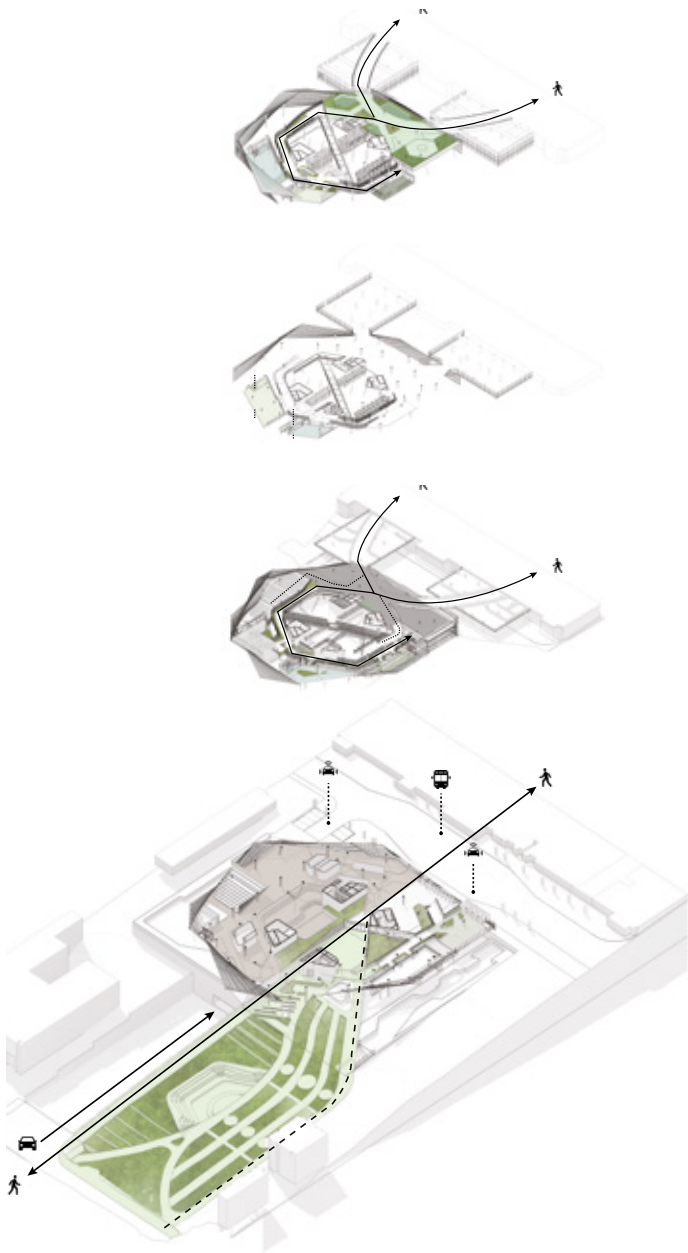


Figure 10.4 - Basement P2
Scale: 1: 600

PROGRAMME



LOCATION KEY

- 1. Park
- 2. Lobby
- 3. Forest Lounge

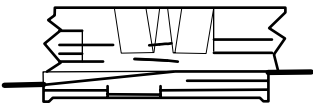


Figure 10.5 - Programme
View from South West

Retail Level

Library 250 m ²	Short-term Work 300 m ²
Agile 100 m ²	Green House 1200 m ²
Long-term Work 200 m ²	

Mezzanine Level

Short-term Work 200 m ²	Long-term Work 250 m ²
---------------------------------------	--------------------------------------

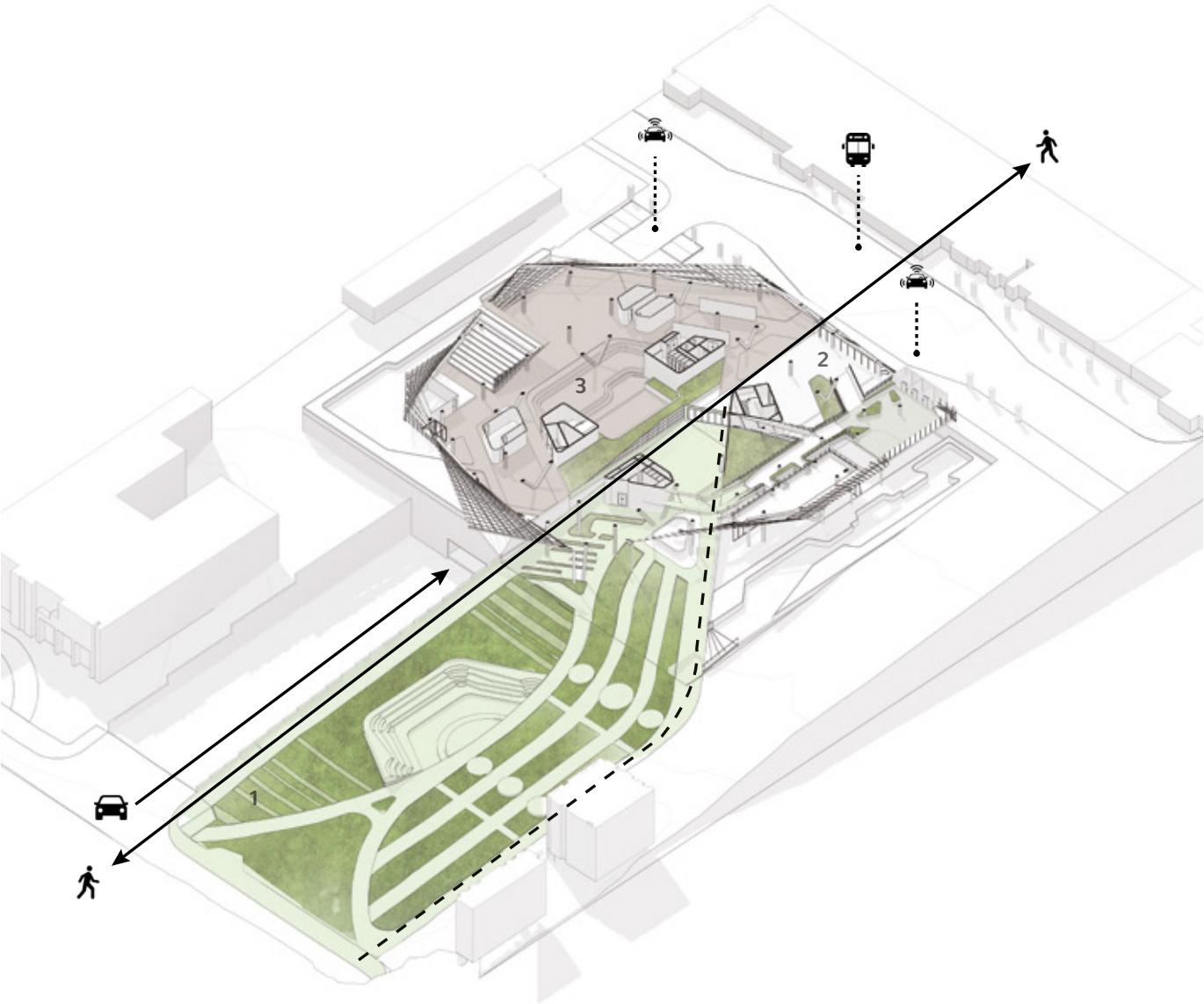
Public Domain Level

Coffee Shop 200 m ²	Long-term Work 200 m ²	Seating Area 200 m ²	Hardscape circulation 400 m ²
Agile 100 m ²	Meeting 250 m ²	Info/ Coffee 100 m ²	
Short-term Work 200 m ²	Seating Area 200 m ²	Reading area 100 m ²	Gallery 400 m ²

Park Level

Orchard 1500 m ²	Outdoor Auditorium 500 m ²	Flower Pavilion 500 m ²	Green Plane 450 m ²
	Herbarium 200 m ²	Pond 200 m ²	
Entrance Lobby 500 m ²	Drop-off 250 m ² AV Charge 250 m ²	Podium Garden 700 m ²	Outdoor Seating 700 m ²
Reception 60 m ²	Storage 60 m ²	Work (collab) 100 m ²	Restaurant 100 m ²
Florist 170 m ²	Work (informal) 100 m ²	Bar 100 m ²	Auditorium / stairs 500 m ²
			Multi- purp Hall 400 m ²

PARK LEVEL PLANE



LOCATION KEY

- 1. Park
- 2. Lobby
- 3. Forest Lounge

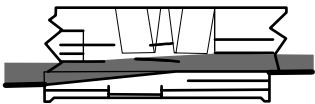


Figure 10.6 - Park Level Zone
Scale: 1: 600



Population



Public and private



Light



Greenery



Environments





LOCATION KEY

- | | | |
|-----------------------|---|---------|
| 1. Amphitheatre | 9. Canteen And Bar | |
| 2. Fruit Orchard | 10. Auditorium / Grand Staircase | |
| 3. Flower Pavilion | 11. Autonomous Vehicle Charging Station | Vehicle |
| 4. Herbarium | 12. Drop Off-Zone | |
| 5. Entrance Lobby | 13. Coffee Shop | |
| 6. Florist | 14. Long-Term Work Area | |
| 7. Storage | | |
| 8. Multi-purpose Hall | | |

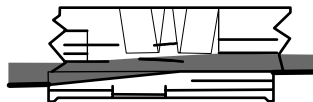


Figure 10.7 - Park Level Plan
Scale: 1: 600

WORK ENVIRONMENTS



Figure 10.8 - Multi-purpose Hall
Internal View

PUBLIC DOMAIN PLANE



Population



Public and private



Light



Greenery



Environments

LOCATION KEY

- 1. Short-term Work
- 2. Social Spaces
- 3. Long-term Work
- 4. Meeting
- 5. Hardscape

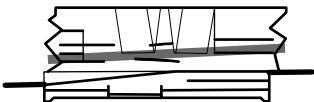
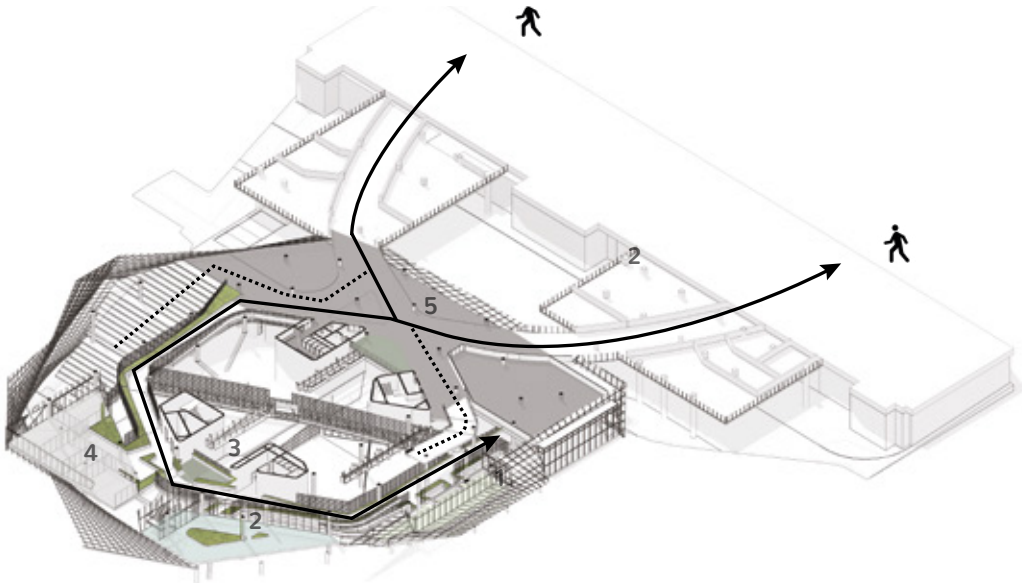
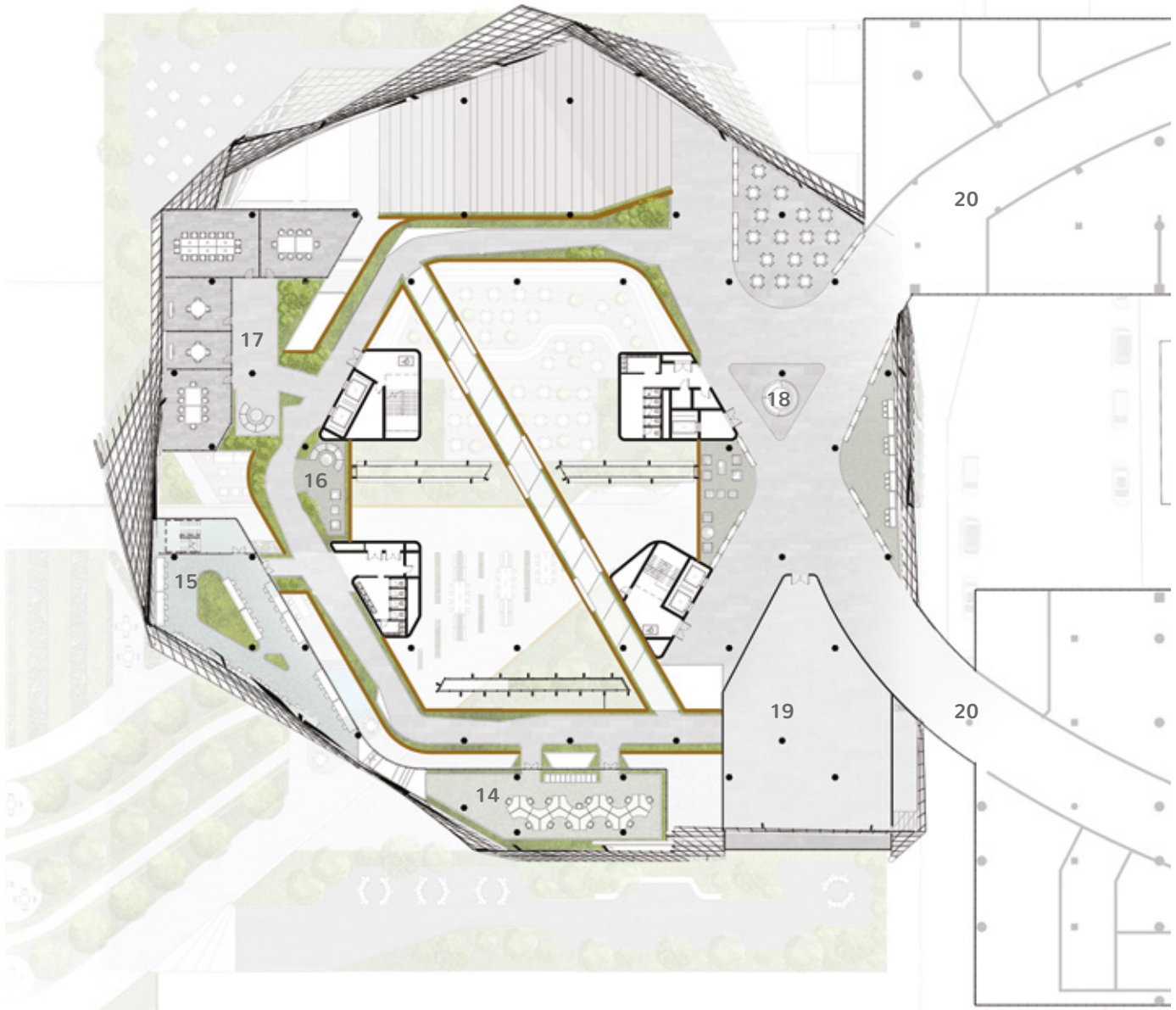


Figure 10.9 - Public Domain Level Zones
View from South West



LOCATION KEY

- | | |
|-------------------------|----------------------------------|
| 14. Long-Term Work Area | 18. Coffee Station |
| 15 Short-Term Work Area | 19. Gallery |
| 16 Agile Space | 20. Existing Bridge Link To Mall |
| 17. Meeting Rooms | |

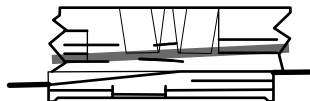
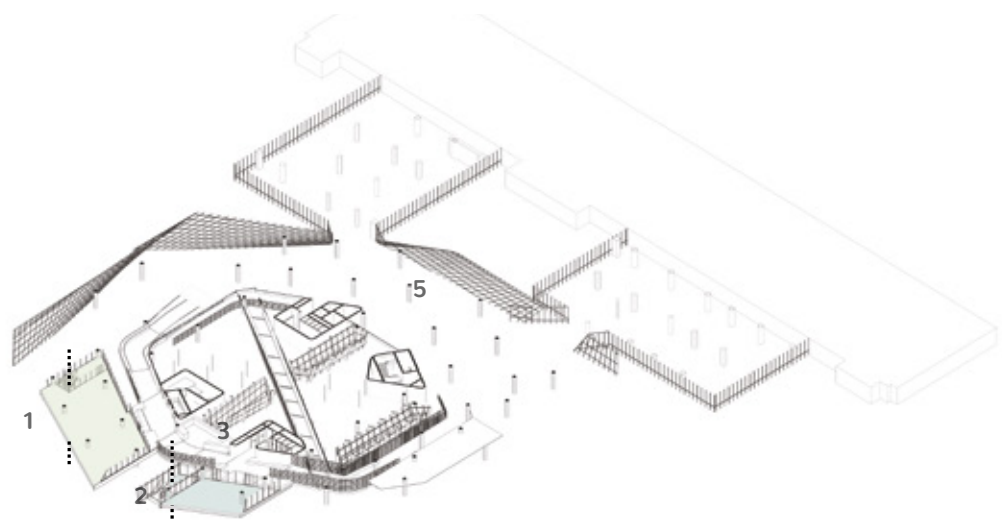


Figure 10.10 - Public Domain
Level Plan
Scale: 1: 600

PUBLIC DOMAIN MEZZANINE PLANE



LOCATION KEY

- 1. Short-term Work
- 2. Long-term Work

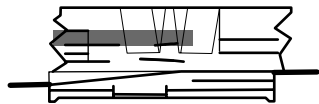
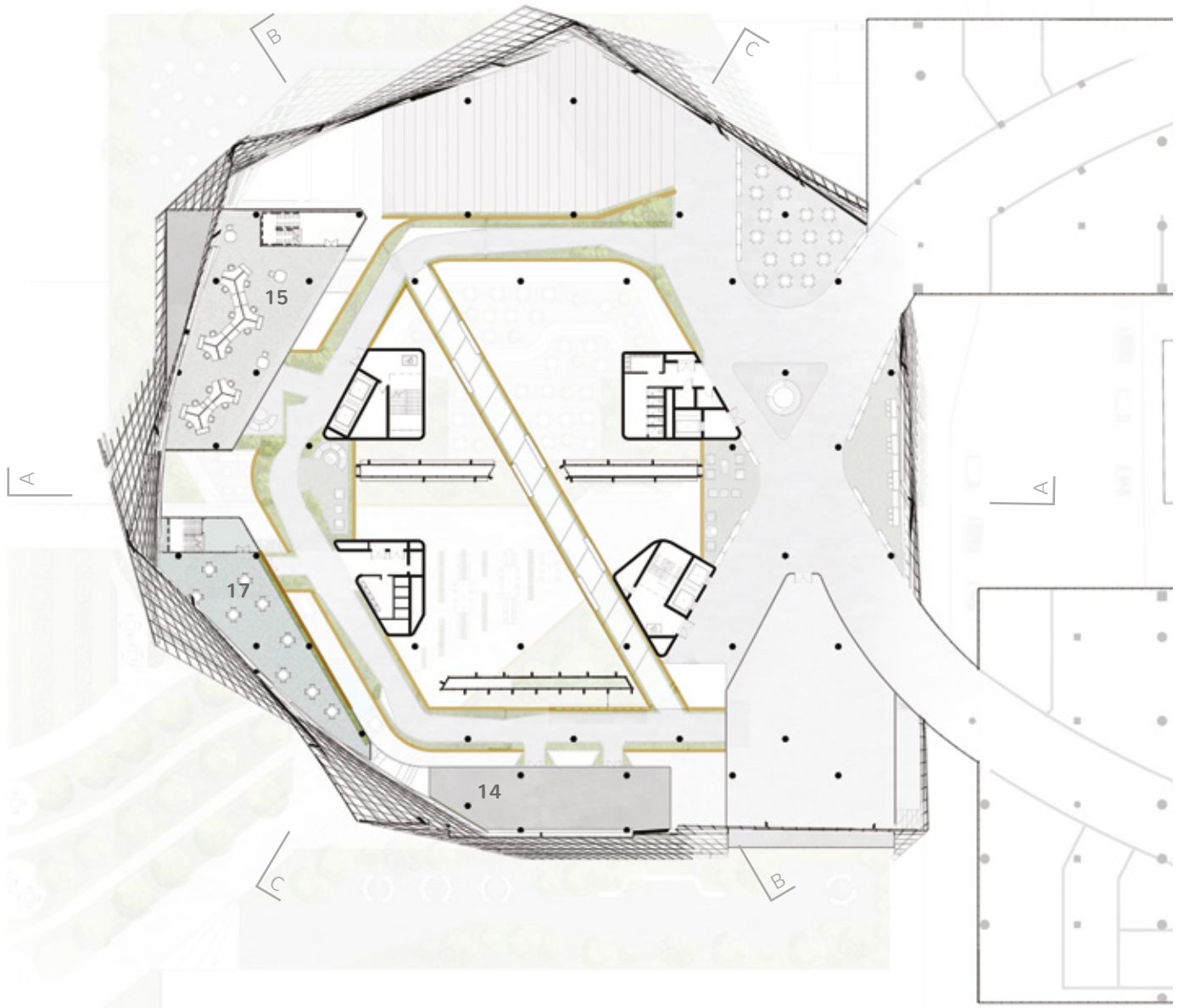


Figure 10.11- Public Domain Mezzanine Level Zones
View from South West



LOCATION KEY

- | | |
|-------------------------|-----------------------------|
| 14. Long-Term Work Area | 18. Coffee Station |
| 15 Short-Term Work Area | 19. Gallery |
| 16 Agile Space | 20. Existing Bridge Link To |
| 17. Meeting Rooms | Mall |

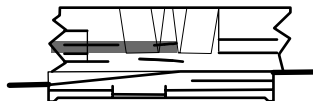


Figure 10.12 - Public Domain
Mezzanine Level Plan
Scale: 1: 600

WORK ENVIRONMENTS

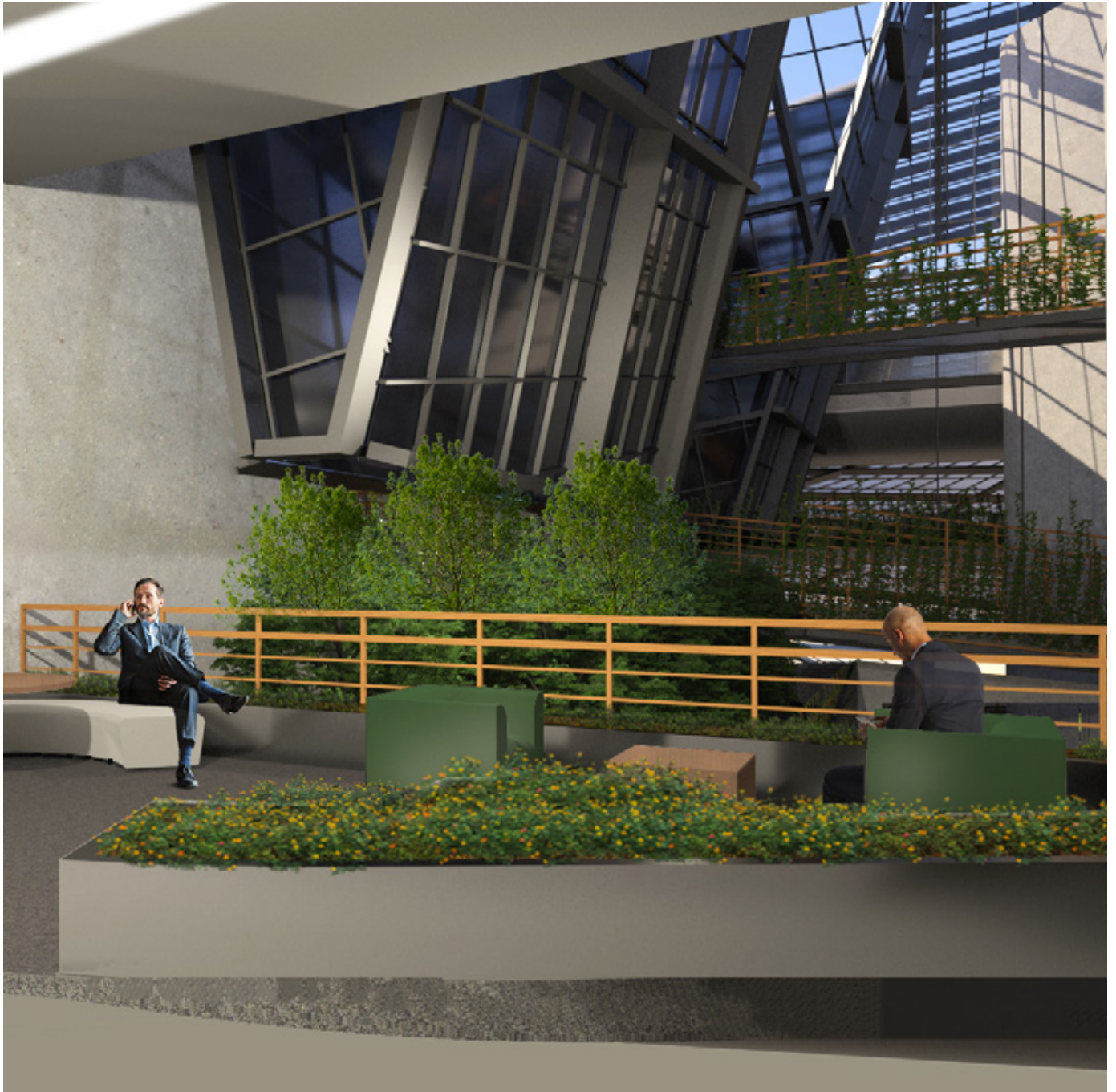
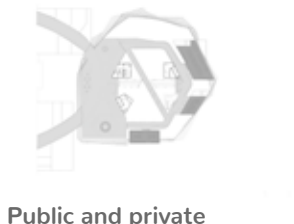


Figure 10.13 - Agile Social Space
Internal View

RETAIL LEVEL PLANE



Population



Public and private



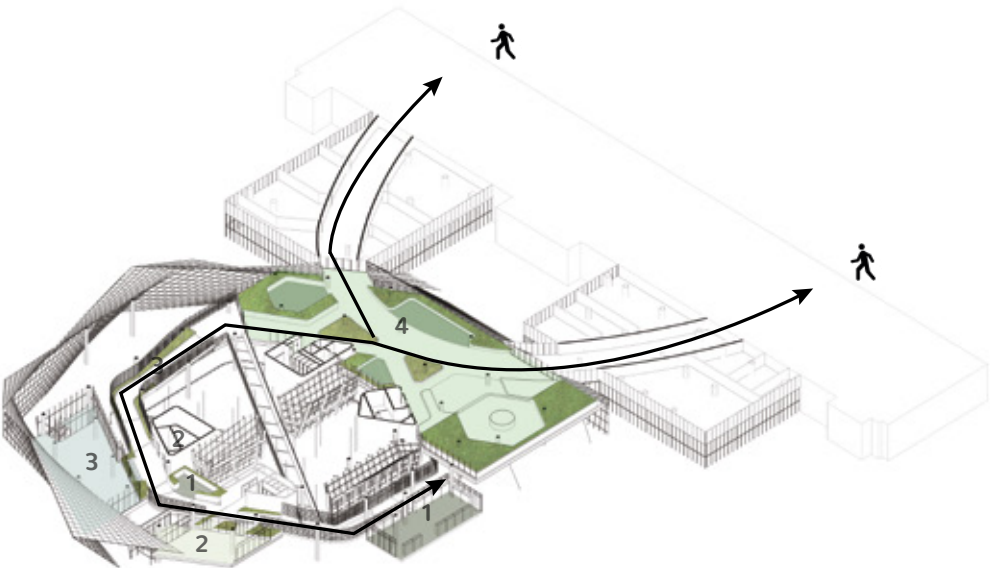
Light



Greenery



Environments



LOCATION KEY

- 1. Social Spaces
- 2. Long-term Work
- 3. Short-term Work
- 4. Greenhouse

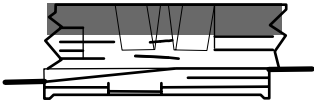
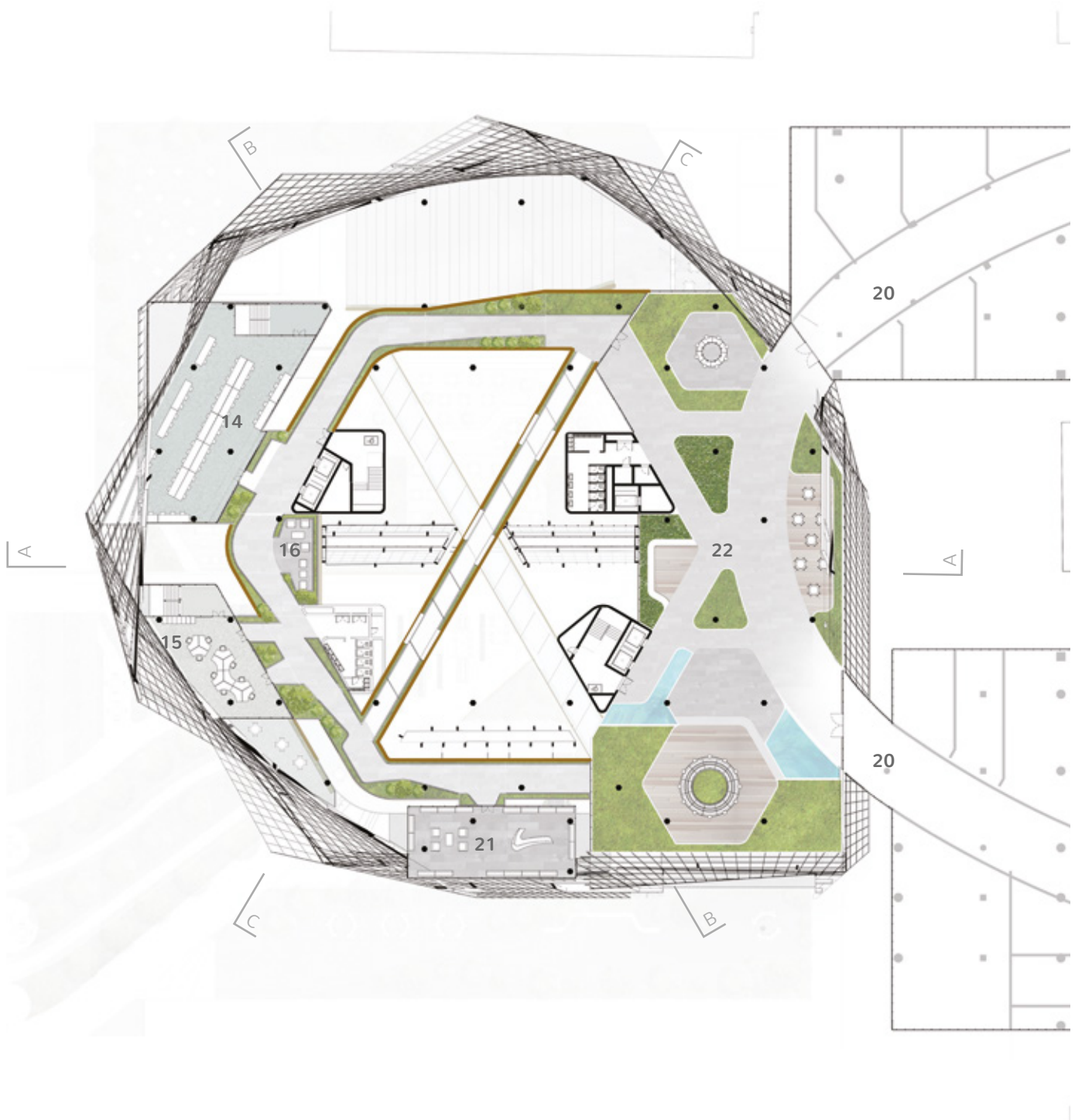


Figure 10.14 - Retail Level Zones
View from South West



LOCATION KEY

- | | |
|--------------------------|----------------------------------|
| 14. Long-Term Work Area | 19. Gallery |
| 15. Short-Term Work Area | 20. Existing Bridge Link To Mall |
| 16. Agile Space | 21. Library |
| 17. Meeting Rooms | 22. Greenhouse |
| 18. Coffee Station | |

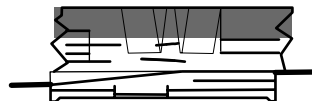


Figure 10.15 - Retail Level Plan
Scale: 1: 600

SECTIONS

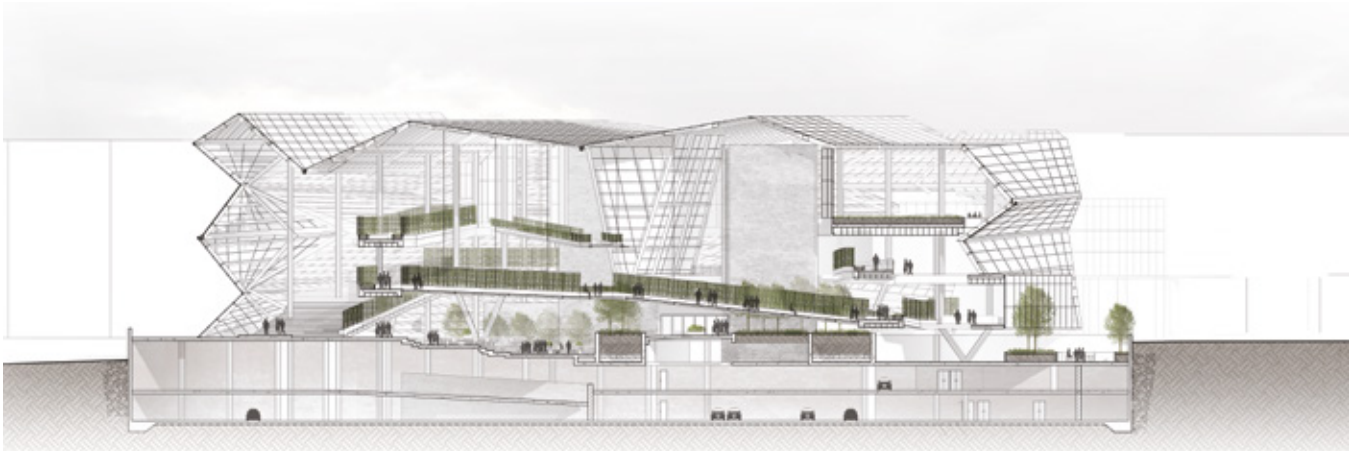


Figure 10.16 - Section B-B
Scale 1:600

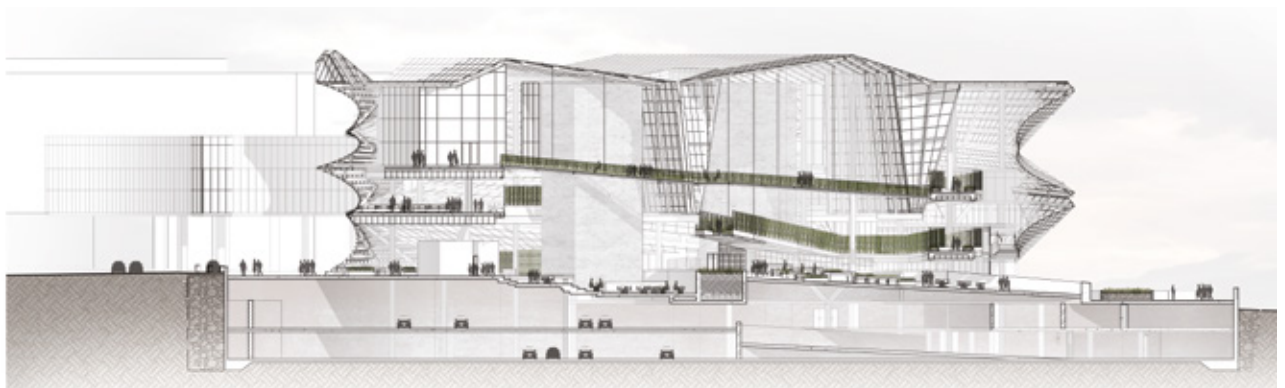


Figure 10.17 - Section C-C
Scale 1:600

EXTERIOR

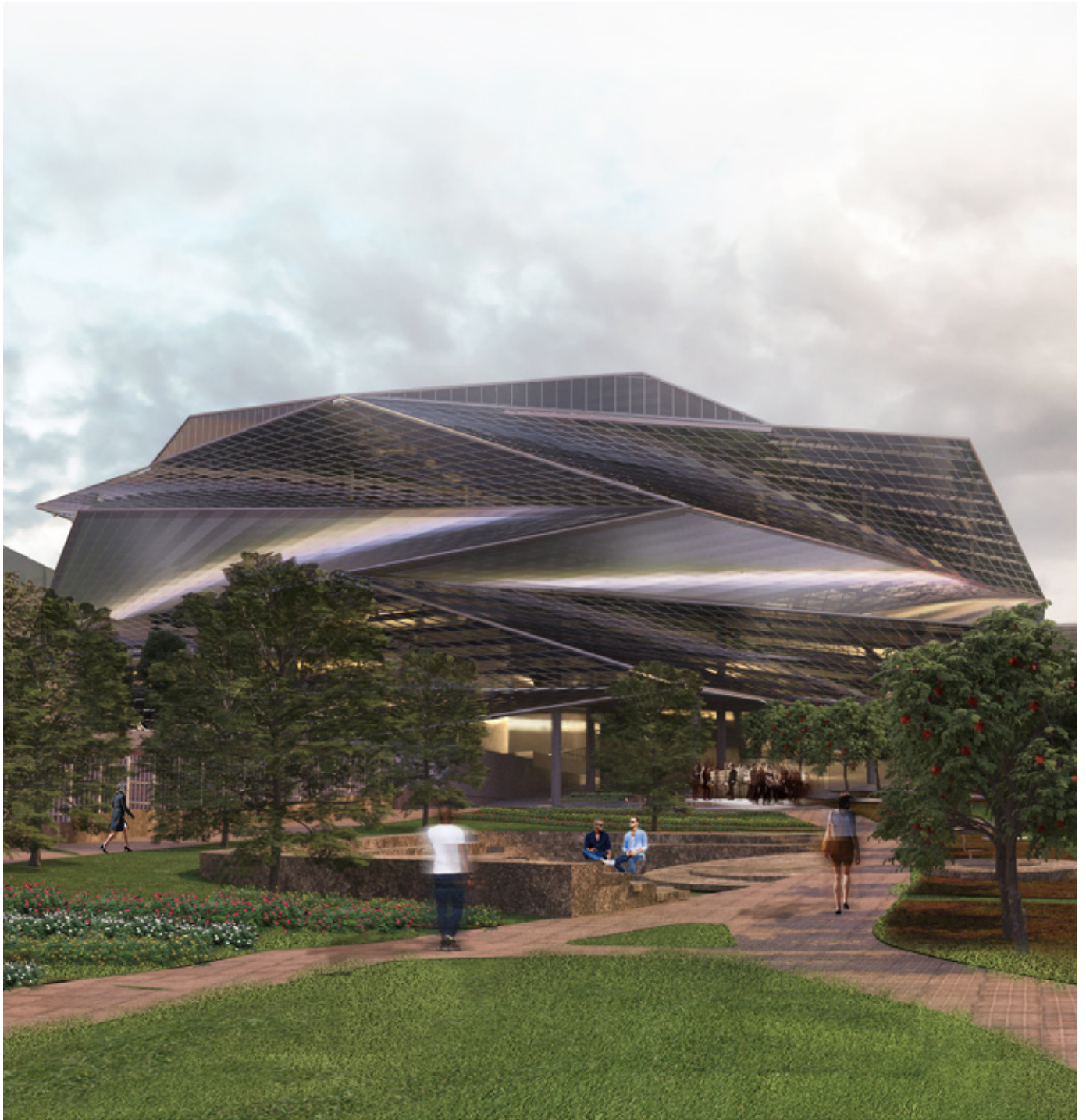


Figure 10.18 - Park Level Entrance
External View

ELEVATIONS

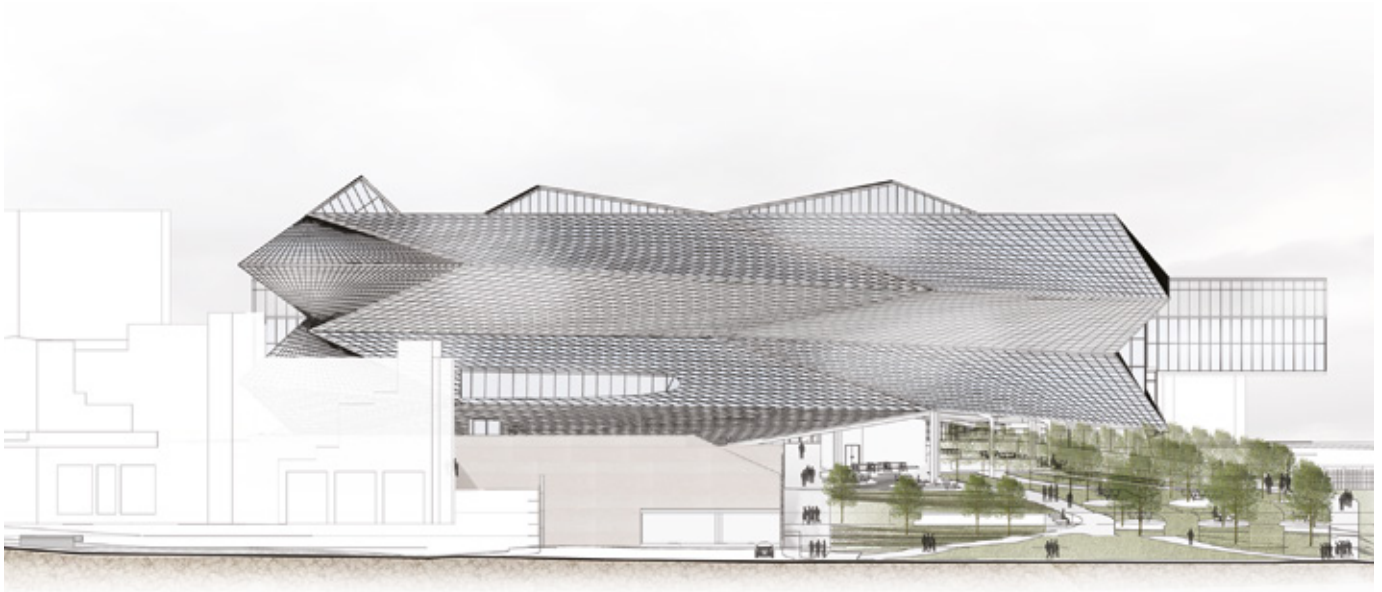


Figure 10.19 - West Elevation
Scale 1:600



Figure 10.20 - East Elevation
Scale 1:600

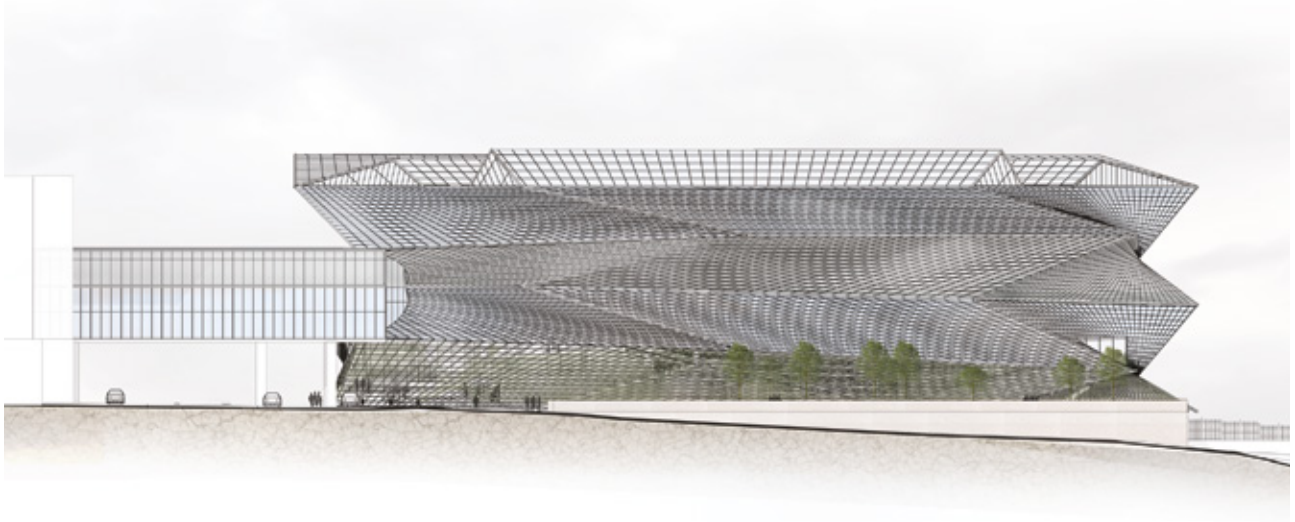


Figure 10.21 - North Elevation
Scale 1:600

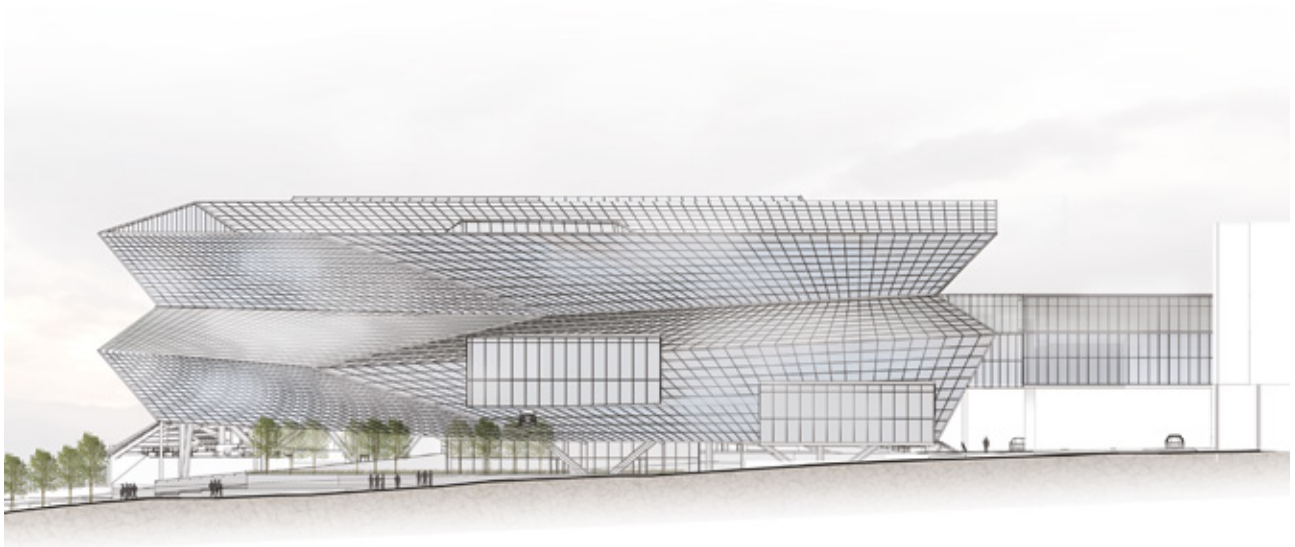


Figure 10.22 - South Elevation
Scale 1:600

CHAPTER

TECHNICAL DESIGN SMART STRUCTURE



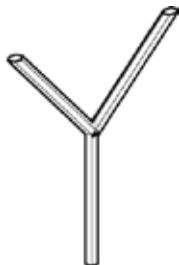
ELEVEN



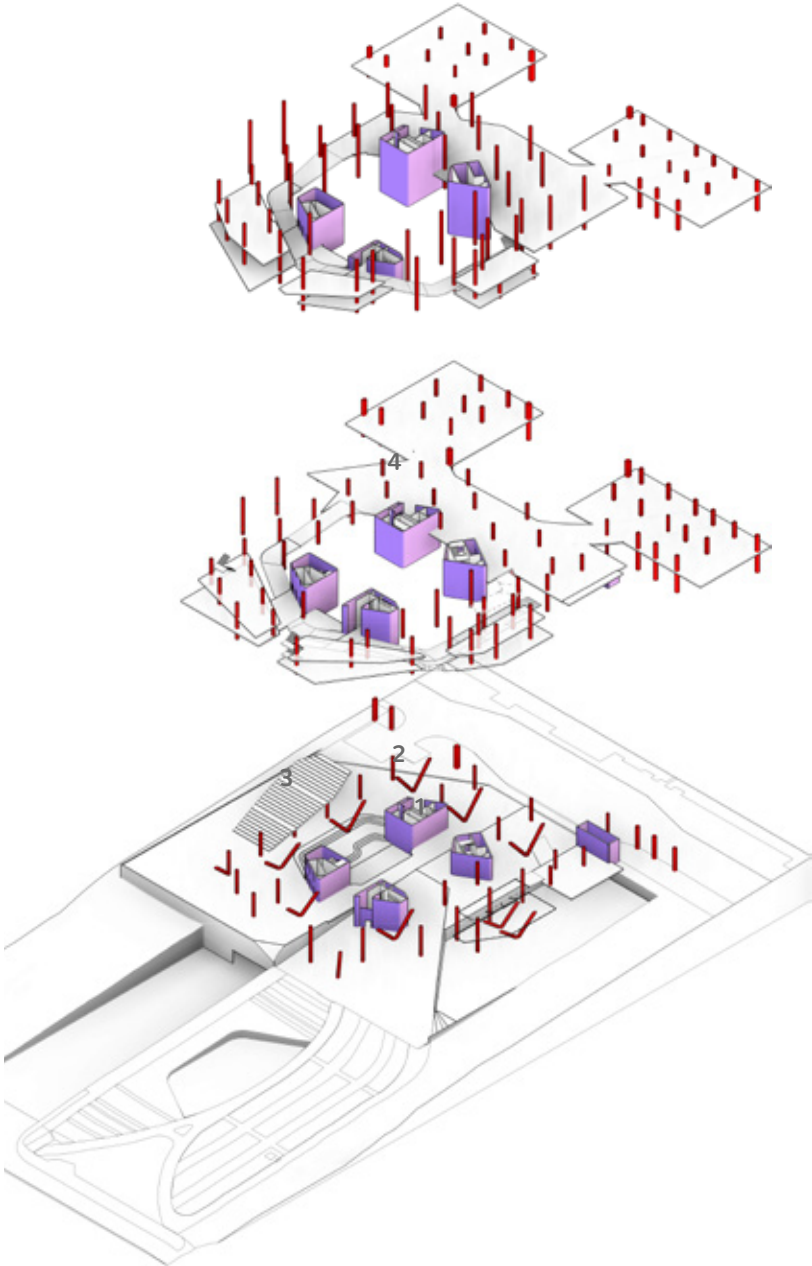
INTERNAL STRUCTURE



Straight columns were used on the Public Domain Planes and the Retail Plane. They vary in length as the Retail Level had double volume columns while the Public Domain Levels were limited to a single story height. Therefore, the building uses scale to cognitively divide itself spatially between the contextual levels. Thus, illustrating the building as a smart structure.



V columns i.e. tree columns were utilized on the Park Plane to also spatially divide the level. Symbolically it illustrating the users direct association to the green zone. It also assisted with the transition of grid. As a typical rectangular grid-system was used for the basement level- for its parking efficiency- while a hexagonal-grid system was utilized above ground.



LOCATION KEY

- 1. Core
- 2. V Column
- 3. Grand Staircase
- 4. Typical Column

Figure 11.1 - Internal Structure
Exploded Axo

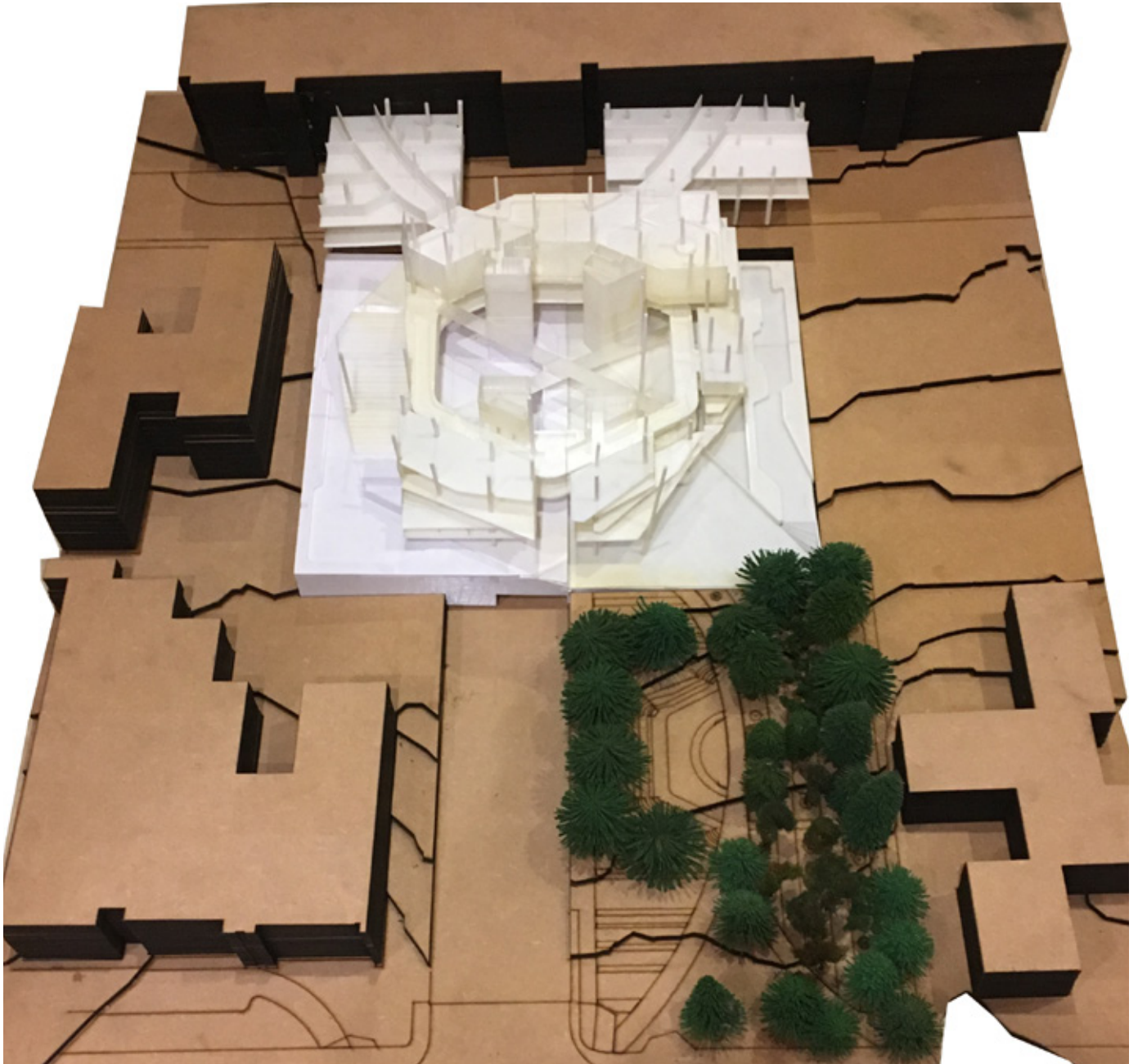


Figure 11.2 - Internal Model
3D Printed and Lazor Cut

EXTERNAL STRUCTURE

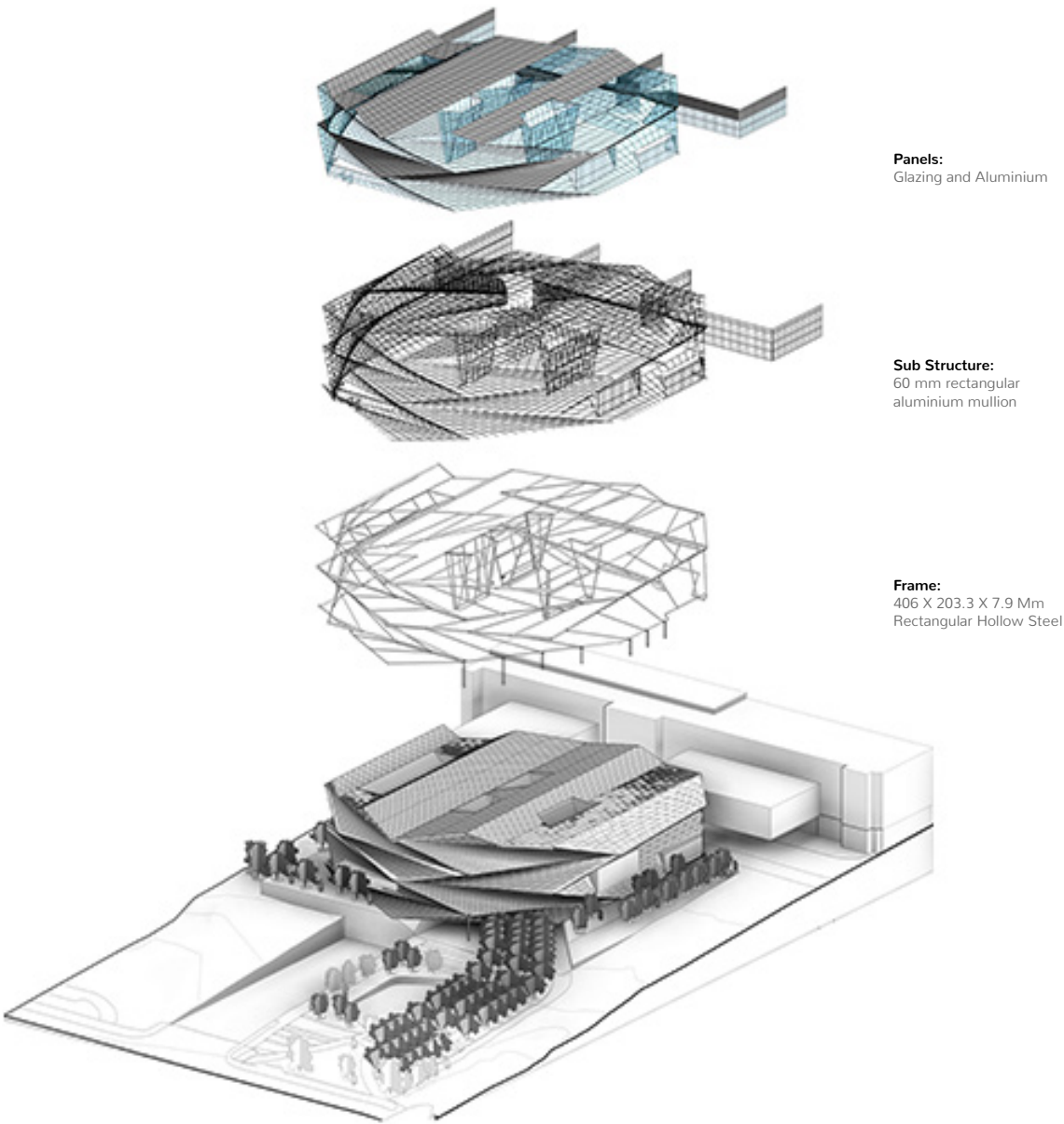


Figure 11.3 - Facade Deconstruction
Exploded Axo

THE ENVELOPE

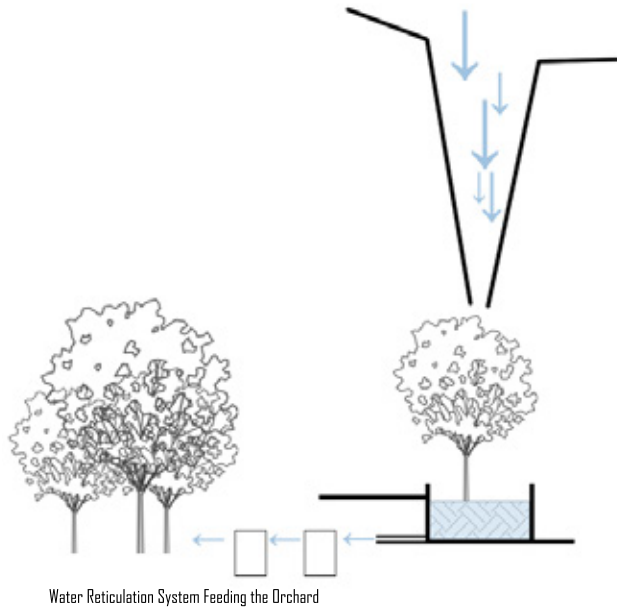
The envelope was designed to be experiential and therefore it required for the structure to be self-supporting. This was achieved by utilizing a main frame structure and a sub structure. The frame uses horizontal and vertical supports. The vertical beam deal with the envelopes overall load, while the horizontal beam resists the wind load. Therefore, the horizontal supports are tied back into the concrete floor structure (where applicable).

The substructure reduces the frame structure into a manageable scale, thereby making all the panels a unified size. This approach will reduce both cost and time, while creating a unified aesthetic regardless of its materiality.

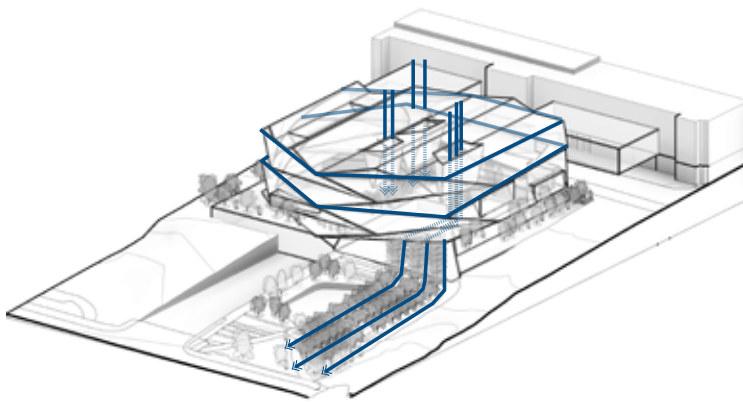
There are three types of panels in the facade: mesh, aluminium and glazing. The mesh panels are implemented on the Park plane to enhance the green landscape and its connection to the adjacent park. The glass pannels are placed on the Public Domain and the roof of the structure. This was done to create a sense of transparency and optimize lighting conditions. The aluminium panels were used on the Retail Plane and corresponds to the adjacent buildings overall look and approach. Thus, the buildings envelope is representative of the different contextual levels.

The buildings overall form was designed to be optimal and efficient. Therefore computational studies were done to derive at the final form. The building's envelope was then utilized to create an invisible service system that could make the building self-sustainable.

SMART STRUCTURE - WATER RETICULATION



The facade strategically utilizes catchment systems and penetrations to reticulate water along the facade and into the building. It implores both mechanical (Pluvia system) and natural systems (gutters). The design uses these systems, to reticulate water into large green plater boxes. These boxes filter the water. The water subsequently goes into the basement where it is stored. When it is required, The building mechanically pumps the water back up into the building as part of its irrigation and sprinkler systems. Therefore, the building is able to sustain its vegetation limiting the building's reliance on human intervention. This depicts the buildings response to Artificial Intelligence as it self-operates and utilizes its invisible servicing system, to sustain itself. Thus, with limited human intervention required for maintenance, the building places a deeper focus on the experience and social interactions within it.



The sustainable principles are therefore based on the utilization of water, vegetation and air. These natural principles assist in cooling down the building, while allowing for the filtration of air and water. This is achieved by the building's form, as it strategically responds to the natural elements.

LOCATION KEY

1. Sunlight
2. Hot air
3. Cold air and rain

Figure 11.4 - Water Reticulation
No Scale



Figure 11.5 - External Model
3D Printed

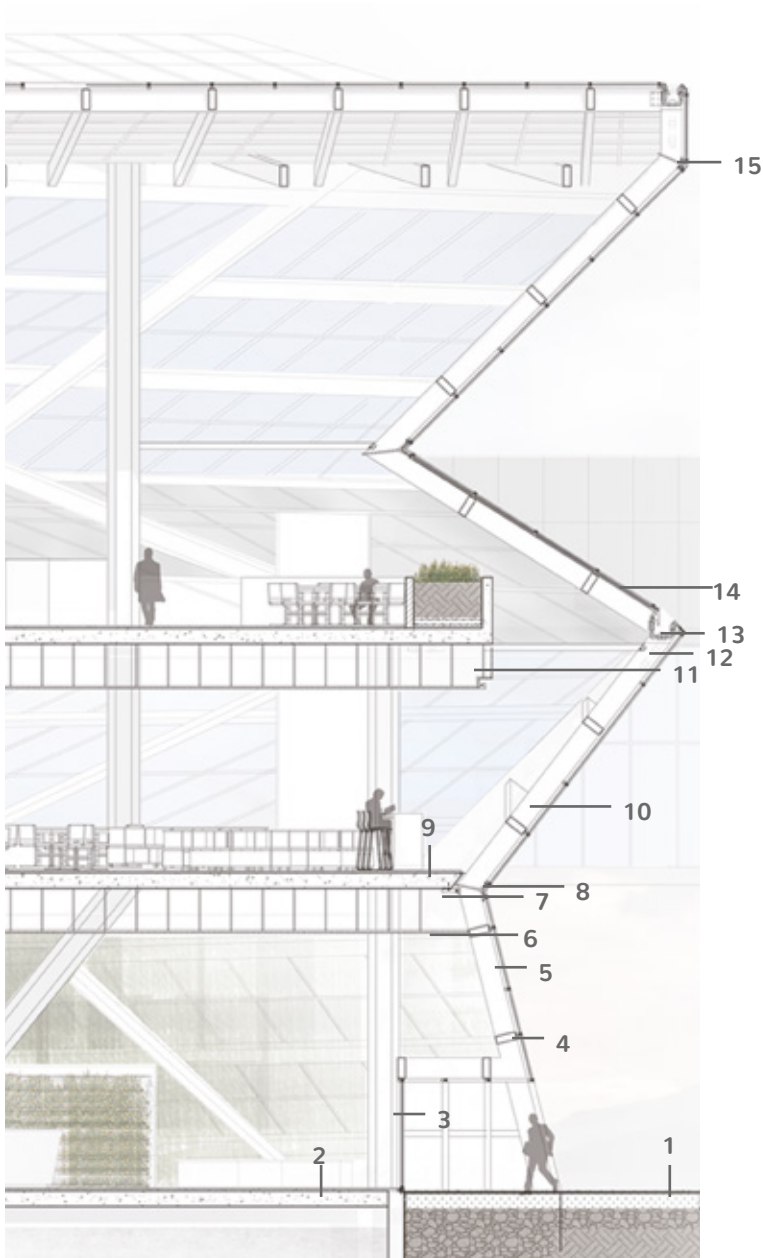


Figure 11.6 - Perimeter Section
Scale: 1: 100



Figure 11.7 - Facade Details
Scale: 1: 50

LOCATION KEY

1. 85 x 115 x 239mm Aqua Trojan pavers on min 50mm aggregate bedding course on geotextile filter on 75mm
2. 12 mm ceramic tile on 40 mm grout on 255 mm RC Slab, to Str. Eng detail and spec.
3. Schüco FWS 60, aluminium façade system fixed from slab to beam.
4. Schüco FWS 60 mm rectangular aluminium mullion
5. Schüco FWS 60, HI 28 mm double glazing
6. 9.5 mm Tapered edge flush plaster Ceiling with 3mm skim coat plaster
7. 150 x 12mm Corten steel anchored to 255 mm concrete slab
8. Corner Condition Refer to Detail BB
9. 7 mm Low VOC carpet tile on 40 mm grout
10. 406 X 203.3 X 7.9 mm Rhs column at 9500 cc

- to be fixed to slab and Facade sub-structure
11. 9.5 mm Tapered edge flush plaster Ceiling with 3mm skim coat plaster
12. Pluvia Roof drainage system
13. Gutter condition refer to detail AA
13. 406 X 203.3 X 7.9 Mm RHS
15. Corner condition refer to detail AA

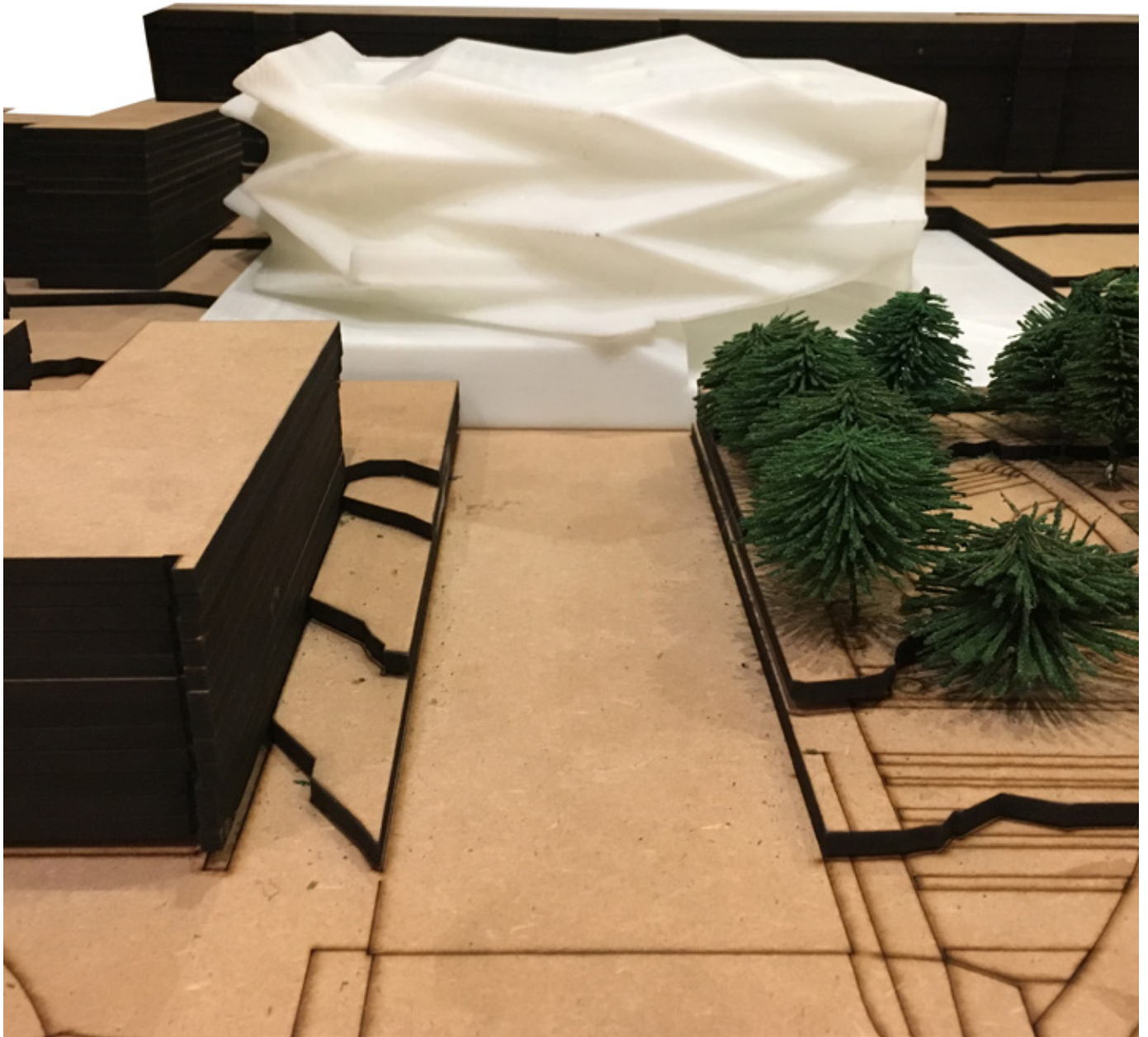
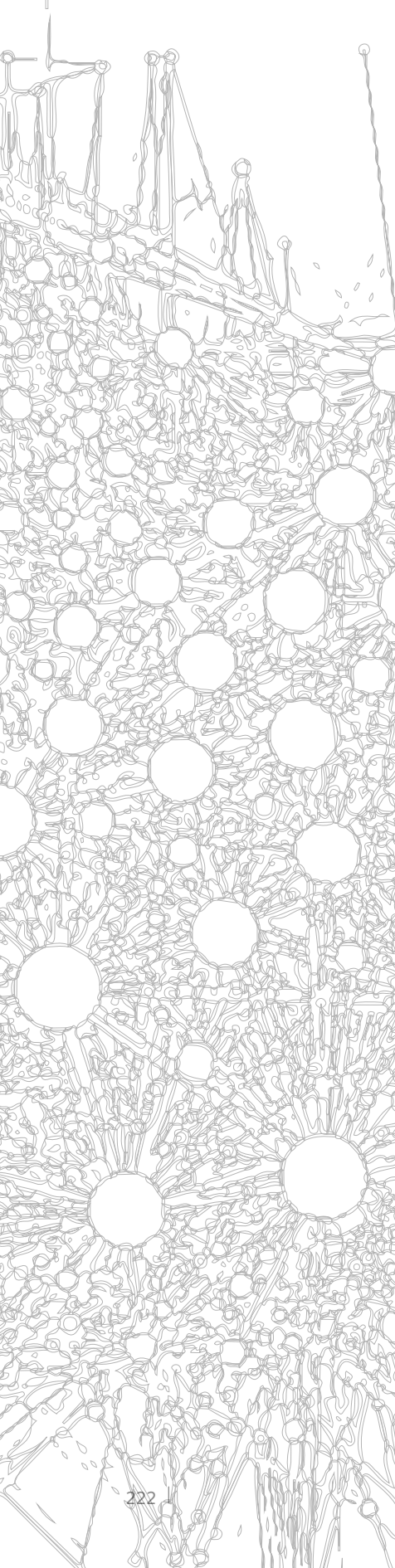


Figure 11.8 - Facade Model
3D Printed



CHAPTER

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APPENDIX A- OBSERVATIONAL STUDY ANALYSIS

COFFEE SHOP A



Figure: 2.2- Coffee Shop A

OBSERVATIONS

In Coffee Shop A layout is divided up into three sections: a partitioned room at the back of the shop, a general floor area in the middle and an outside covered area. It was observed that people who wanted to work would first attempt to sit in the room at the back. If this area was full, they would then settle for the booths located in the general area or lastly use the tables in the central area. From observing the way people were used the spaces it became apparent that there was a social and spatial hierarchy. People who wanted to work for longer periods of time were located in the back room. This can be attributed to its isolation and artificial light setting making it an easier environment to concentrate in. People who worked for 1 - 2 hours were more comfortable in the general area surrounded by social activity as well as artificial and natural lighting. Social activities including business meetings would happen on the outer perimeter of the general area. The couch area in the far-right corner was often used as an area for people-watching.

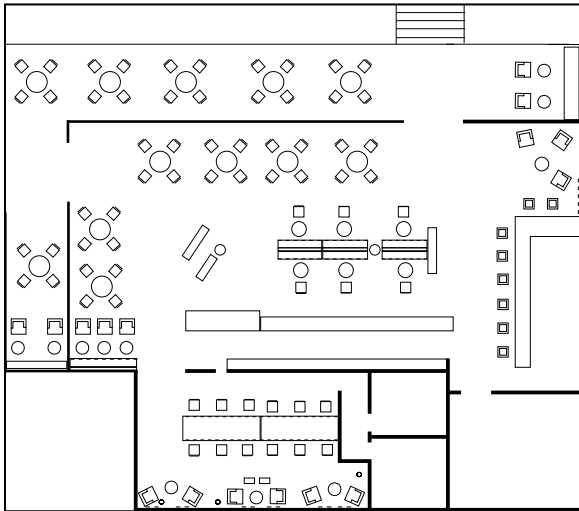


Figure 2.2.1- Coffee Shop A Physical Layout

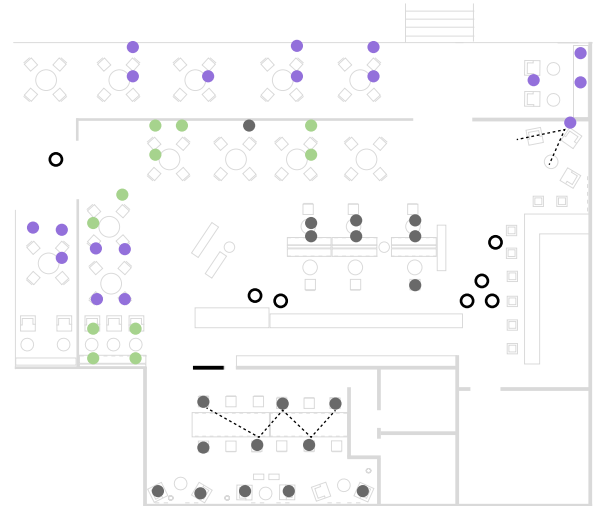


Figure 2.2.2- Coffee Shop A Use

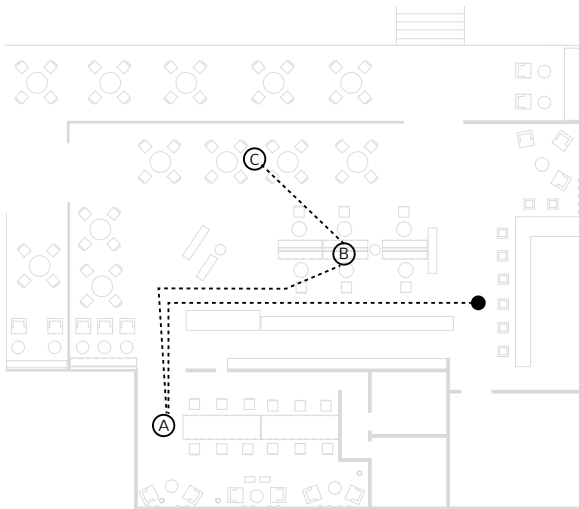


Figure 2.2.3- Coffee Shop A Prioritized workspaces/ movement

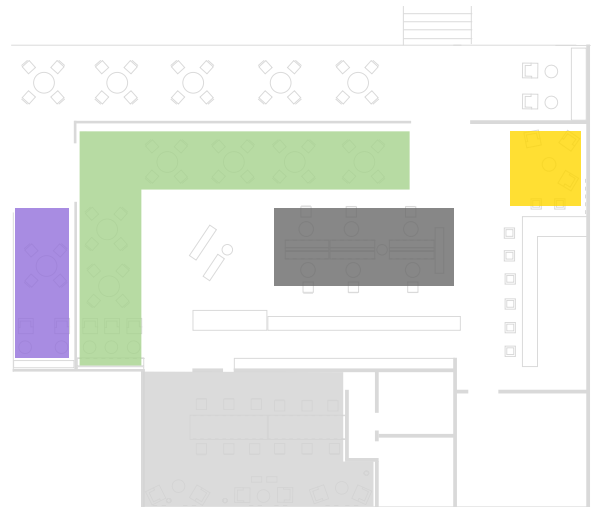
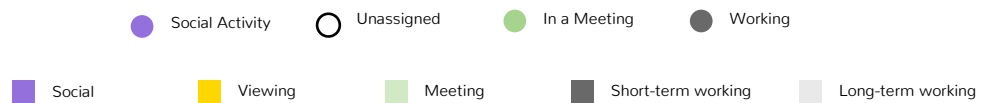


Figure 2.2.4- Coffee Shop A Spatial Analysis



COFFEE SHOP B



Figure: 2.3- Coffee Shop B

OBSERVATIONS

Coffee Shop B had a similar layout to coffee shop A. It is also divided up into three sections: a partitioned room at the back, a general floor area in the middle and an outside area. Similarly to the first observation. It was observed that people who wanted to work would first attempt to sit in the room at the back. If this area was full, they would then settle for a high chair and stool located in the general area or lastly use the table in the general area. People who wanted to work for longer periods of time were located in the back room. People who worked for 1 - 2 hours were more comfortable in the general area. The meeting and social spaces were divided in this shop perhaps due to its small scale. Meetings would occur in the far left of the shop suggesting a need for a more intimate space with no direct daylight. Social activity occurred in the front of the shop and outside. An interesting observation was when people used the shared high table and stool they would often sit diagonally from each other depicting a need for privacy but also visible human interaction.

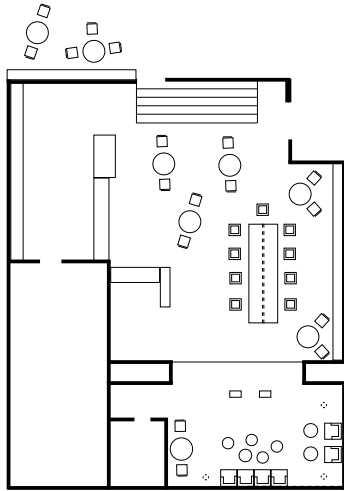


Figure: 2.3.1- Coffee Shop B Physical Layout

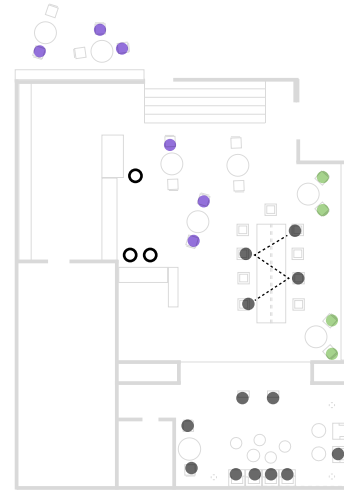


Figure: 2.3.2- Coffee Shop B Use

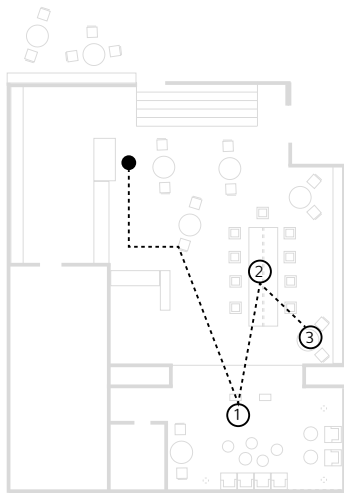


Figure: 2.3.3- Coffee Shop B Prioritized workspaces/ movement

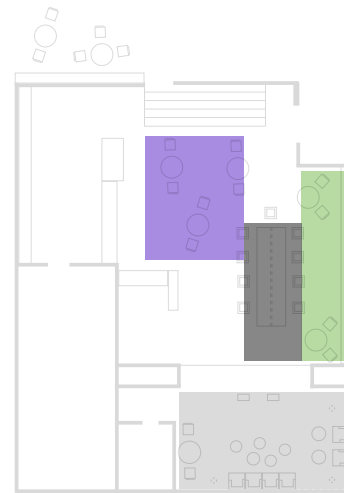
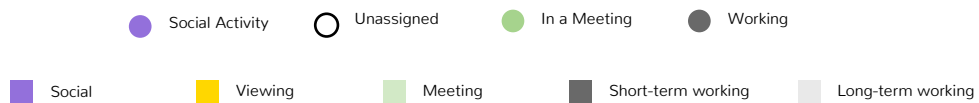


Figure: 2.3.4- Coffee Shop B Spatial Analysis



COFFEE SHOP C



Figure: 2.4- Coffee Shop C

OBSERVATIONS

Coffee Shop C is only divided up into two sections: a general floor area and an outside area. Despite only having two sections people who wanted to work would only sit in the general area. Workers who wanted to work for longer periods of time were located in the back of the room. People who worked for 1 - 2 hours were more comfortable by the window. The area where people conducted meetings were in the centre of the room. Social areas were located along the main axis of entry. People who used the communal work desk at the back would also sit diagonally from each other. What is interesting to note is a single person working would often take up a whole table or booth. Despite not requiring as much space, people would often use the extended space to spread their notes or items across the area. This was done in a sense to proclaim ownership of their work area.

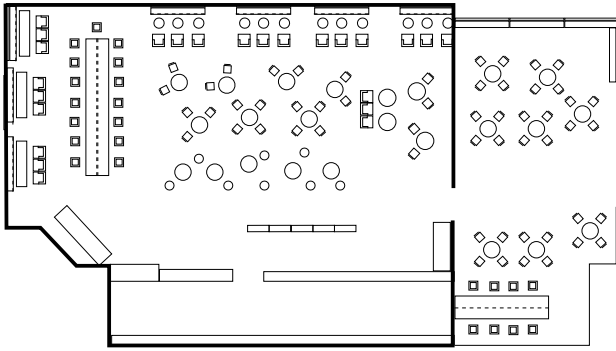


Figure: 2.4.1- Coffee Shop C Physical Layout

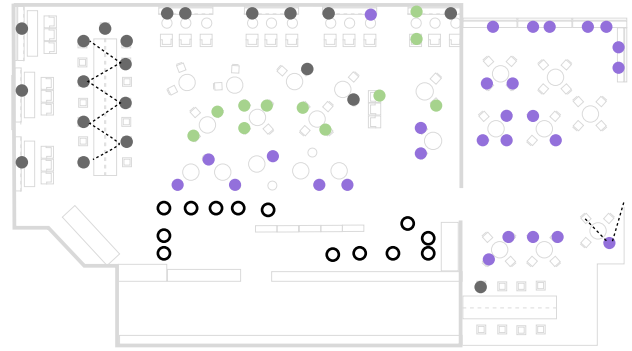


Figure: 2.4.2- Coffee Shop C Use

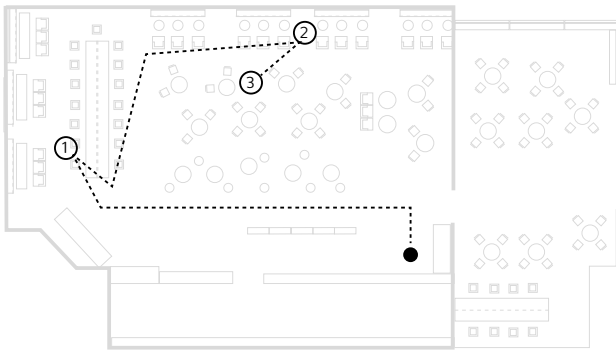


Figure: 2.4.3- Coffee Shop C Prioritized workspaces/ movement

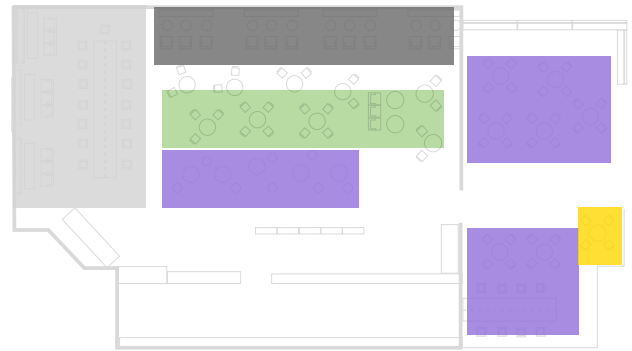
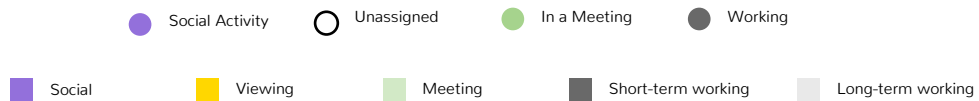


Figure: 2.4.4- Coffee Shop C Spatial Analysis



COFFEE SHOP D



Figure: 2.5- Coffee Shop D

OBSERVATIONS

Coffee Shop D is contained by a steel structure. Two areas are created by a level change. Thus, the shop comprises of a general area and an area looking out onto the street - the viewing area. People who wanted to work for longer periods were located towards the entrance of the structure - furthest point from natural daylight. People who worked for 1 - 2 hours preferred working in the centre of the shop. The long-term work space was hardly utilized, often only occupied by one person. Meaning that more people were using this coffee shop as a place for short-term work. This might be due to the compact size of the coffee shop. The other reason is unlike previous coffee shops that create a sense of isolation for the long-term work spaces, this space is open and positioned close to the main axis of entry making it harder for people to concentrate.

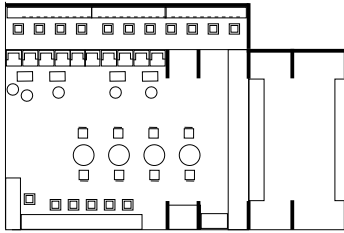


Figure: 2.5.1- Coffee Shop D Physical Layout

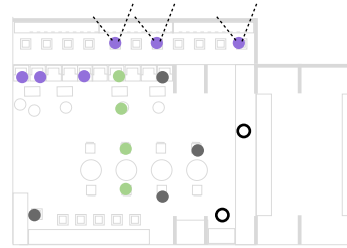


Figure: 2.5.2- Coffee Shop D Use

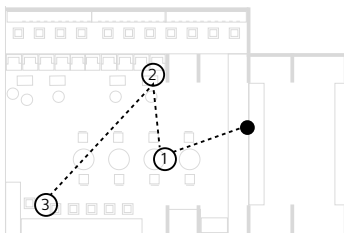


Figure: 2.5.3- Coffee Shop D Prioritized workspaces/
movement

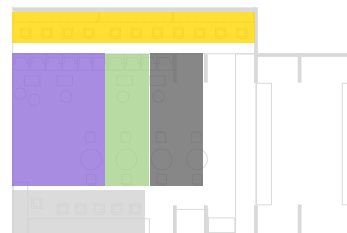
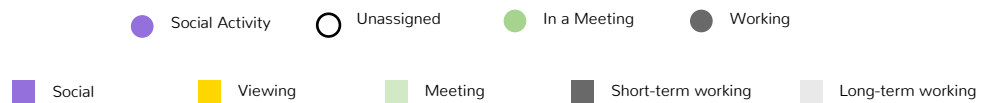


Figure: 2.5.4- Coffee Shop D Spatial Analysis



COFFEE SHOP E



Figure: 2.6- Coffee Shop E

OBSERVATIONS

Coffee Shop E is also divided up into two sections: a general floor area and back area. These areas are divided by an island where condiments are placed. People who wanted to work would tend to sit towards the back area. Unlike the previous examples where the social activity would occur in the centre of the shop instead of the perimeter. This resulted in meetings occurring by the entrance of the shop. This seemed to happen due to the furniture in the shop. In the centre they placed communal booths and ottomans. This allows for no sense of privacy making it applicable for social interaction but not meetings. The furniture on the perimeter not only offers a sense of privacy but also more comfort experience through the application of single couch seats and coffee tables.

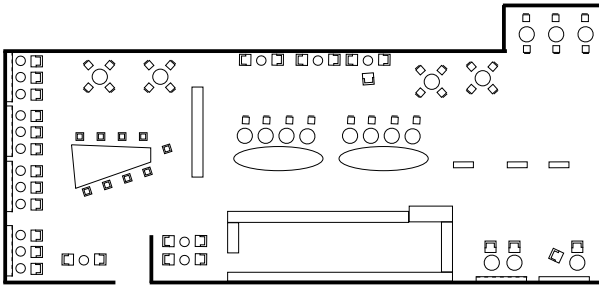


Figure: 2.6.1- Coffee Shop E Physical Layout

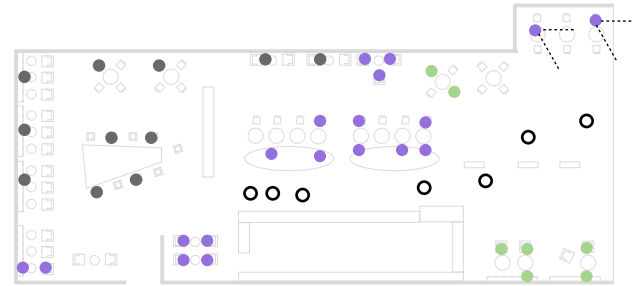


Figure: 2.6.2- Coffee Shop E Use

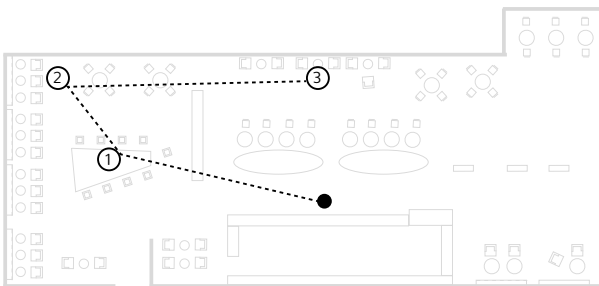
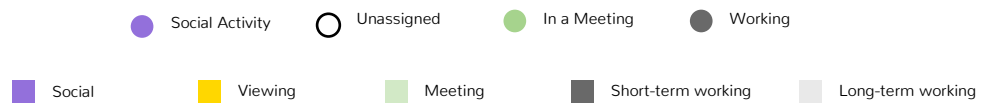


Figure: 2.6.3- Coffee Shop E Prioritized workspaces/ movement



Figure: 2.6.4- Coffee Shop E Spatial Analysis



LIBRARY A

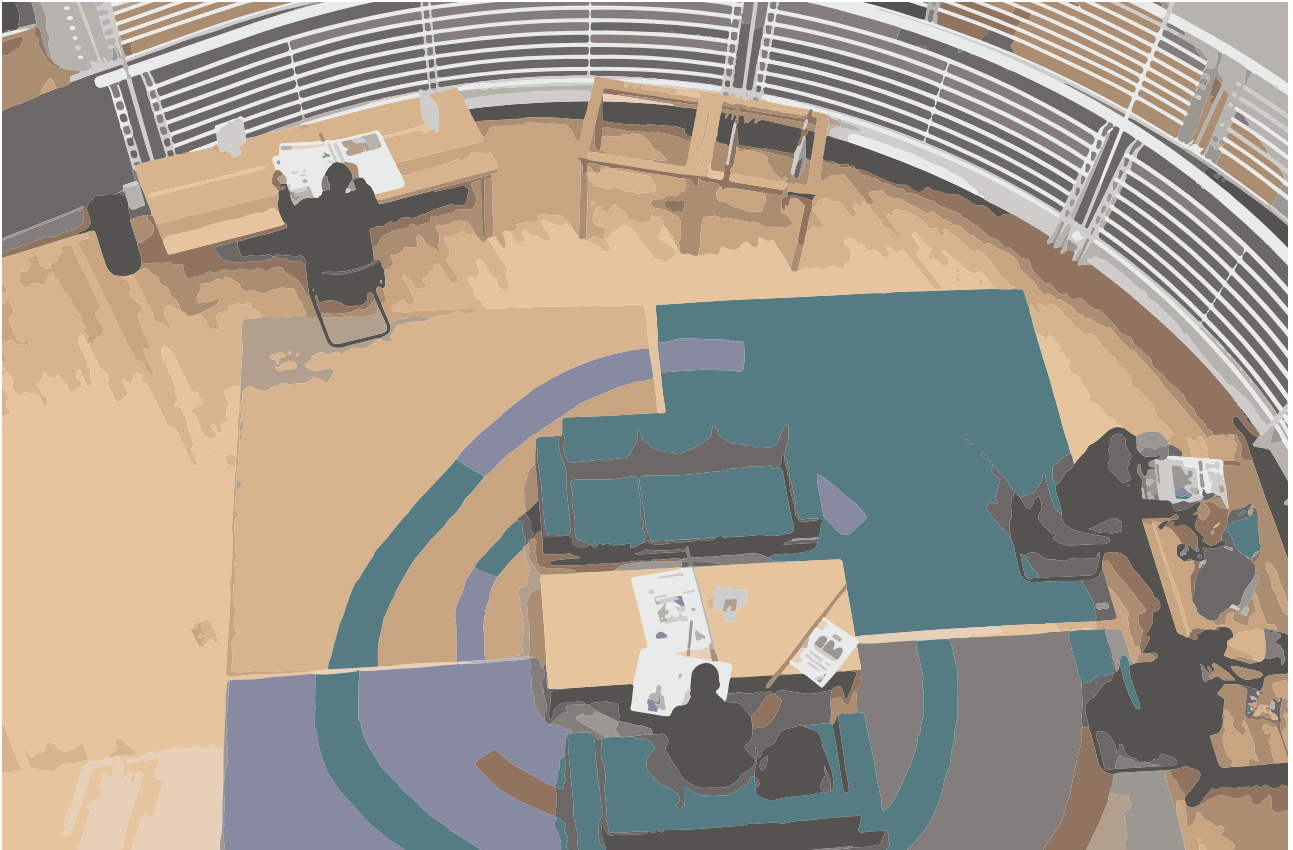


Figure: 2.7- Library A

OBSERVATIONS

Library A was divided into multiple levels through the implementation of a central ramp system, that fed into different library areas. This work space was taken from the third floor. The layout has a central social area denoted by the large couches and coffee table. Green pot plants were used as a mechanism to identify the social areas across the different levels as well as creating a sense of vibrancy. The social areas were hardly used as most of the activities were passive in nature. Workstations containing computers are placed on either side of the social area. This is where people wanting to work for longer periods of time would be located. People wanting to work for 1-2 hours and had their own devices, were found towards the back of this space.

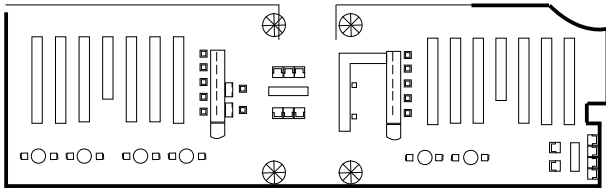


Figure: 2.7.1- Library A Physical Layout

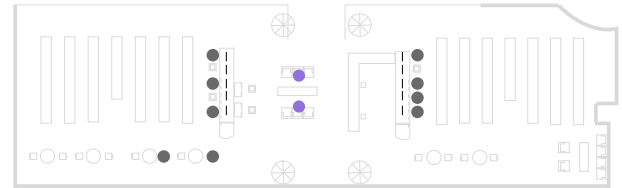


Figure: 2.7.2- Library A Use

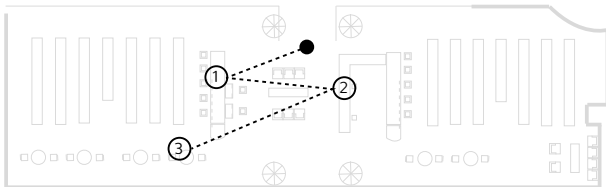


Figure: 2.7.3- Library A Prioritized workspaces/ movement

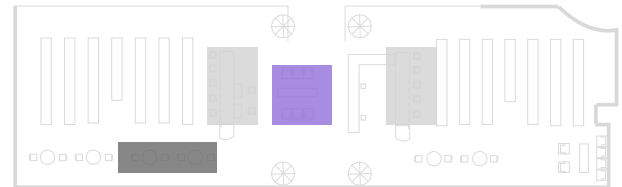
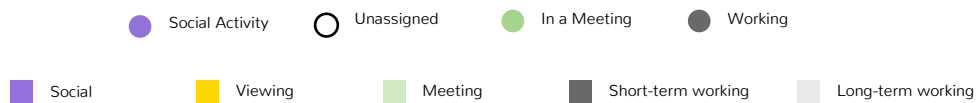


Figure: 2.7.4- Library A Spatial Analysis



LIBRARY B



Figure: 2.8- Library B

OBSERVATIONS

Library B differed from the previous example in that the book shelves were placed in the centre forcing the working and social areas to occur around the perimeter. Long-term work spaces were often located within the front corners, while the short-term work area was located closer to the library's reception area. Thus depicting privacy is in relation to the reception area, thus, people felt more comfortable to work as they got farther away from this area.

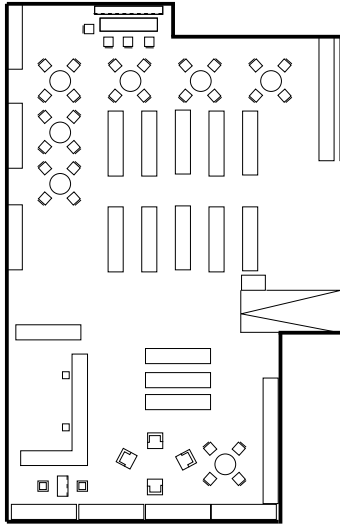


Figure: 2.8.1- Library B Physical Layout

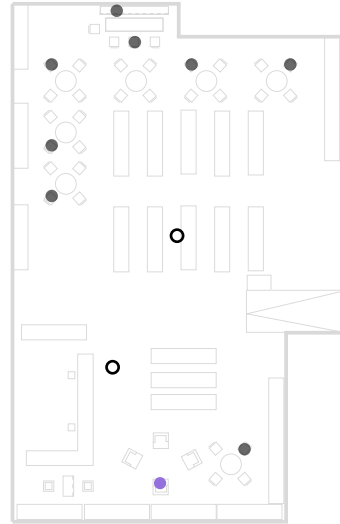


Figure: 2.8.2- Library B Use

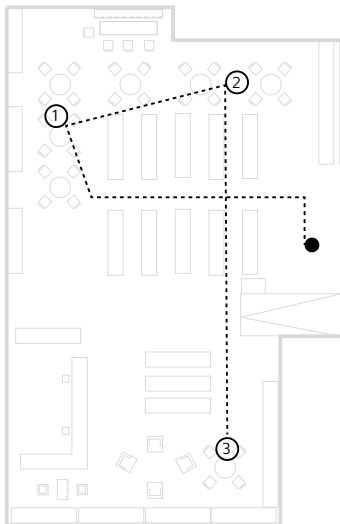


Figure: 2.8.3- Library B Prioritized workspaces/ movement

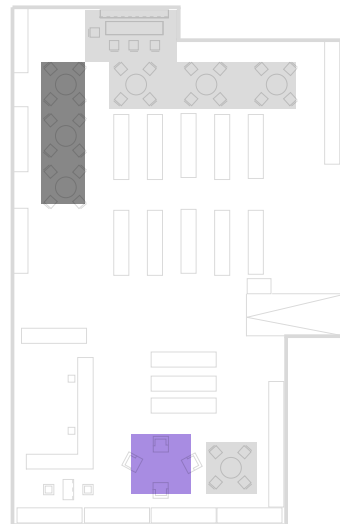
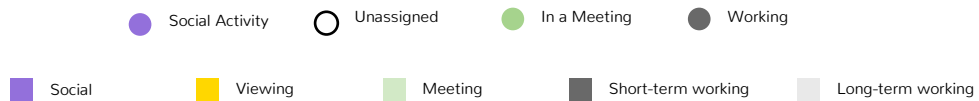


Figure: 2.8.4- Library B Spatial Analysis



APPENDIX B- ETHICS CLEARANCE



SCHOOL OF ARCHITECTURE AND PLANNING
HUMAN RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE
PROTOCOL NUMBER: SOAP09/04/2018

PROJECT TITLE: Tech [no] logical Space: 'Disruptive Technology' and Space
INVESTIGATOR/S: Stephanie Greenberg (Student No: 601795)
SCHOOL: Architecture and Planning
DEGREE PROGRAMME: Masters of Architecture Professional (MArch Prof)
DATE CONSIDERED: 16 July 2018
EXPIRY DATE: 16 July 2019
DECISION OF THE COMMITTEE: Approved

CHAIRPERSON 
(Professor Daniel Irurah)

DATE: 20-07-2018

cc: Supervisor/s: Diaan Van der Westhuizen

DECLARATION OF INVESTIGATORS

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to endure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

Signature 

Date 26/07/2018

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