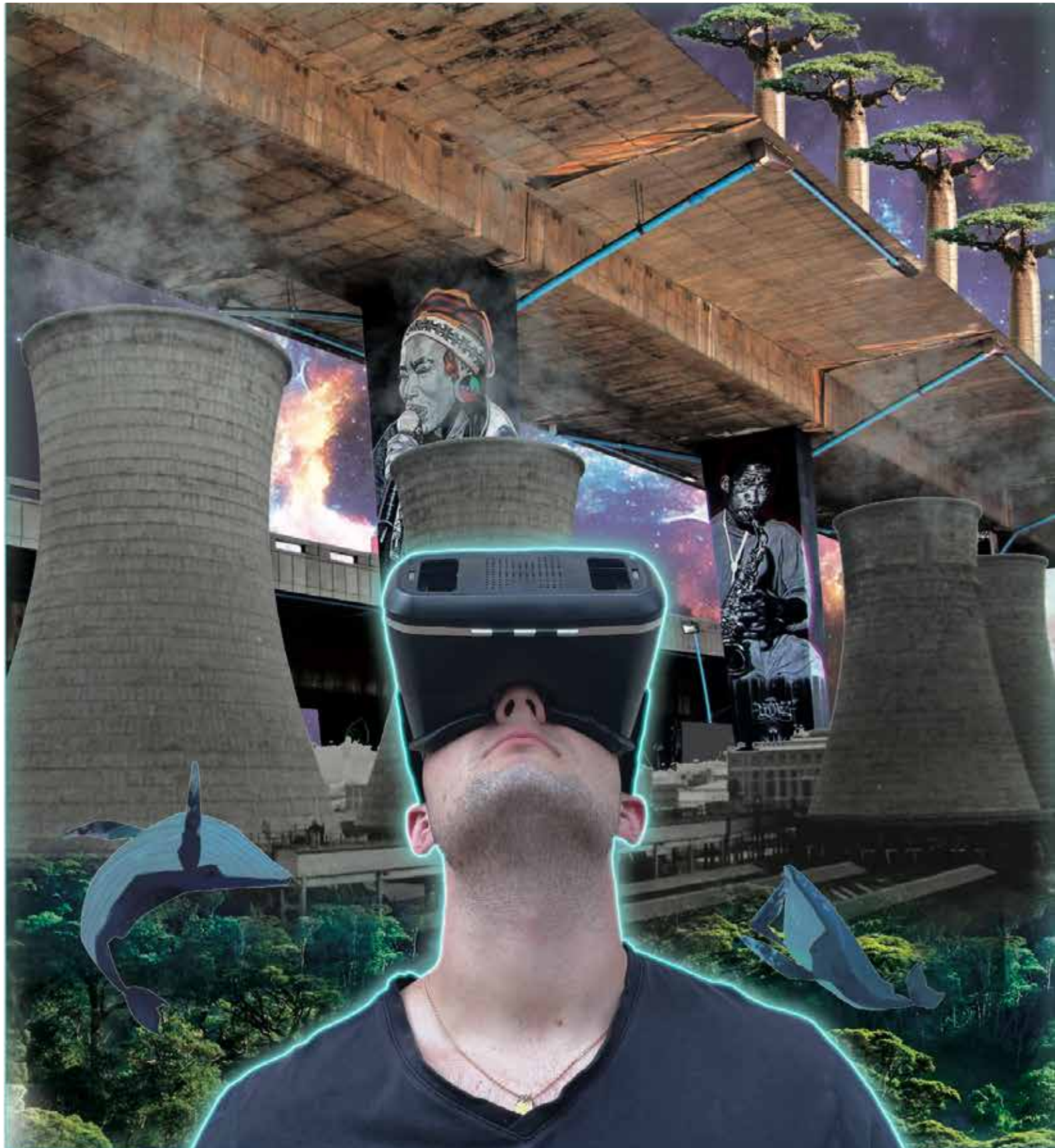


PROJECT REALITY

Imagining the symbiotic relationship between virtual reality and the human narrative.

Michael Peneda
1713035



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A research report proposal submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Architecture (Professional).

08-05-2024

Declaration

I, Michael Peneda am a student registered for the course Masters of Architecture (Professional). I hereby declare:

I am aware that plagiarism is the use of someone else's work without their permission and without acknowledging the original source. I hereby confirm that all work presented for assessment in the course Master of Architecture(Professional) is my own work without aid except where I have clearly indicated otherwise, I have utilised the required conventions for referencing visual materials, ideas and thoughts. I have referred to the Graduate School of Engineering and the Built environment style guide.

Michael Peneda
08 May 2024

Abstract

With virtual reality technology being ever more integrated in our daily lives, through the accessibility to technology such as smartphones, personal computers, the internet, and social media. The potential possibilities for exploration, education, historical preservation, spatial exploration and how we define reality are endless. With the Newtown precinct having historical, educational, and recreational facilities within the heart of Johannesburg yet not functioning as a true representation of a cultural precinct. It provides the perfect catalyst for a virtual reality centre that enables the public to access this technology and explore its vast potential whilst reviving and transforming Newtown into a functional cultural precinct. Whilst being supported by the surrounding public infrastructure as well as creating a new pillar to support the precinct. This virtual reality centre provides the ability for users to explore both the virtual realm and the physical, while being able to easily transition from one to the other. With new ways of engaging with spatial exploration, immersive education, and new representations of historical narratives. With the building functioning as an amalgamation of new representations of classical typologies such as museums, exhibition spaces, galleries, research development and education facilities. By housing the functionalities of these typologies within the centre yet representing them in new ways with unique ways of engaging with them.

Preface

As an avid gamer, technology geek and all-round nerd I have been immersed in the virtual realm and in these virtual realms I have joined communities, made new friends, and learnt about other cultures. Seeing these virtual communities in a similar light to the physical communities I engage with. I have eagerly observed the hardware and software that makes these virtual realms possible to develop and become more immersive and engaging. Virtual reality is the current apex of immersion in gaming as well as engaging with the virtual realm. The potential capabilities of integrating this technology into other spheres of life I believe is the next evolutionary step in the tech world and the way humans engage and perceive the world around them. The current technological landscape is the result of several advancements working in tandem. Utilising AI along with the capabilities of hardware can greatly enhance the benefits of virtual reality (VR) and augmented reality (AR). This next step will utilise the capabilities of the technology to have a smoother and more effective transition into a part of our daily lives. To achieve this there needs to be further integration of this technology into our industries and made accessible and viable for all South Africans. Understanding of how these systems and technology can be incorporated and integrated into the building intervention and how the users will engage with them.

Dedication

I would like to dedicate this thesis to my family, friends, loved ones and the Wits SoAP staff. Without the support of my family and loved ones I would never have pushed myself through my years of study and hard times, they truly enabled me to be my best self and express my character through the work I do. My friends and colleagues who shared the pain throughout our architecture journey, always pushing, supporting and learning from each other. They are the ones who understand the experience of going from first year to masters in a way that family and friends can not, and through this journey we have bonded and grown. This Journey however would not be possible without all the staff in our school, their experience, care, passion to educate and their professionalism all accumulates into a well planned, exciting, and inspiration seires of degrees. Through the carefully planned educational system provided by the school I have changed the way I percieve architecture and the way I wish to play a role in its future.

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Introduction

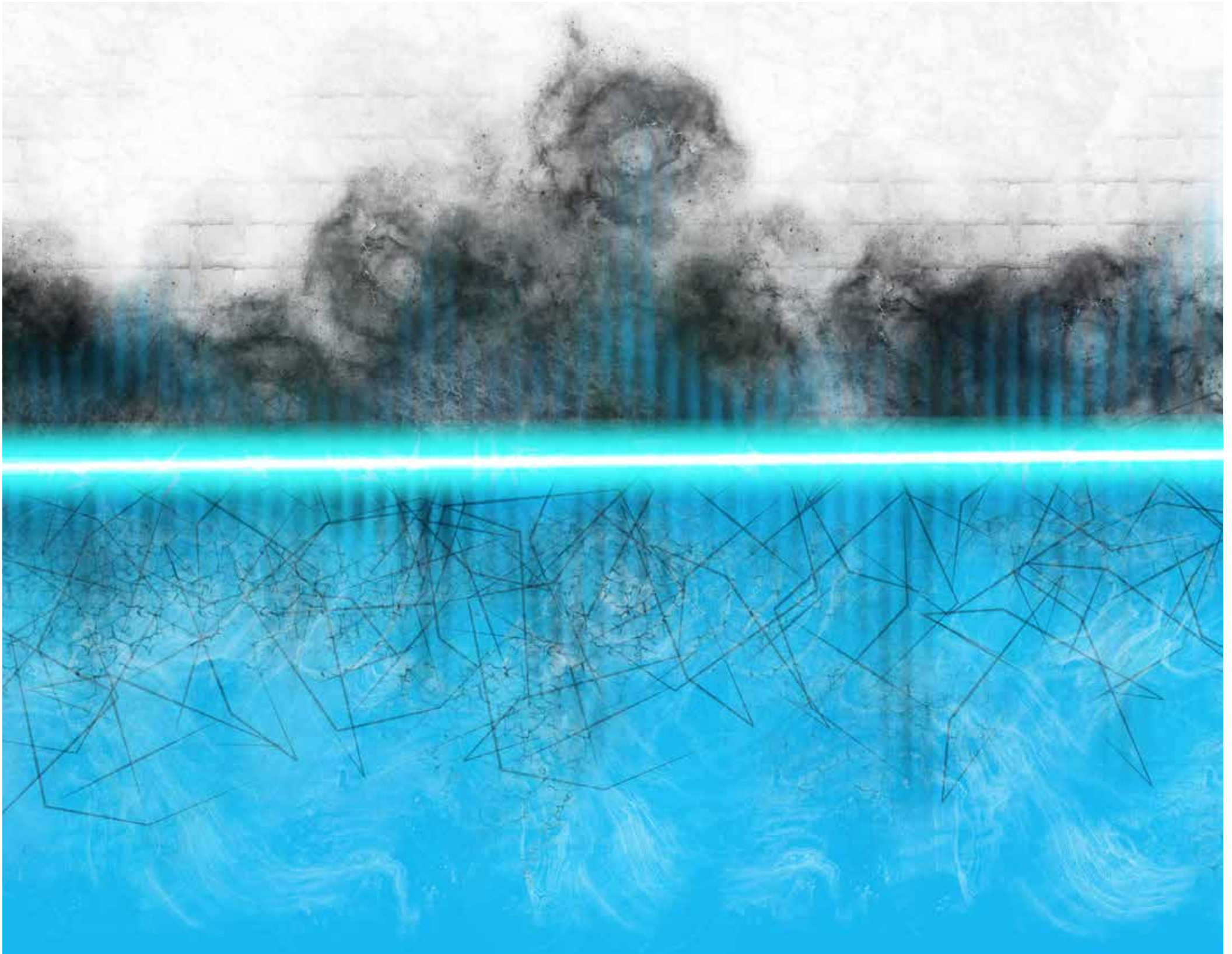
The relationship between the physical and virtual realms has become increasingly intertwined, shaping our lived experiences, and redefining the human narrative through their interdependent relationship that exists between them. This interconnectedness stems from the interactions between physical and virtual realms, as well as their mutual influence on how we perceive, engage with, and construct our understanding of the known world. By unpacking their relationship between the physical and virtual realms, we can unravel the impact they have on the human narrative and the construction of new narratives. This Thesis explores the relationship between the physical and virtual realms, exploring how they can intertwine and shape the human narrative in a dynamic and evolving manner. Through the analysis of their relationship, the transformative power and impact that they will have on how we perceive and engage with our past, present, and future realities has been explored. By utilising the capabilities of virtual reality within a building intervention that can enhance the users experience and engagement with these systems and technologies. Making VR more accessible and integrated into our daily lives.

“Even masterful architects do not invent architectural realities, they rather reveal and articulate what exists and what are the natural potentials of the given conditions, or what the given situation calls for. Alvaro Siza, one of the finest architects in our time in combining a deeply rooted sense of tradition with a unique personal expression, puts it sharply: ‘Architects don’t invent anything, they transform reality’ (in Frampton, 2002: 18).” (Pallasmaa, 2017)

There is a superficial understanding of the term ‘Virtual Reality’ and this had led to the term being misused and misrepresented. This has largely been due to the trend of these systems and technology being represented by the media. The ease of access to information about VR and the limited accessibility has led to users not having the full capability to understand the experience, capabilities, and potential for these systems and technology. This dilemma is one I encountered whilst doing my research. Having accessed and utilised the technology first hand aided in my understanding of how this technology works beyond all the data and research I had already conducted. This experience has led to a clearer understanding of how these systems and technology can be incorporated and integrated into the building intervention and how the users will engage with them.

CHAPTER 01

Deconstructing the Virtual Perception



The Rise of Virtual Reality

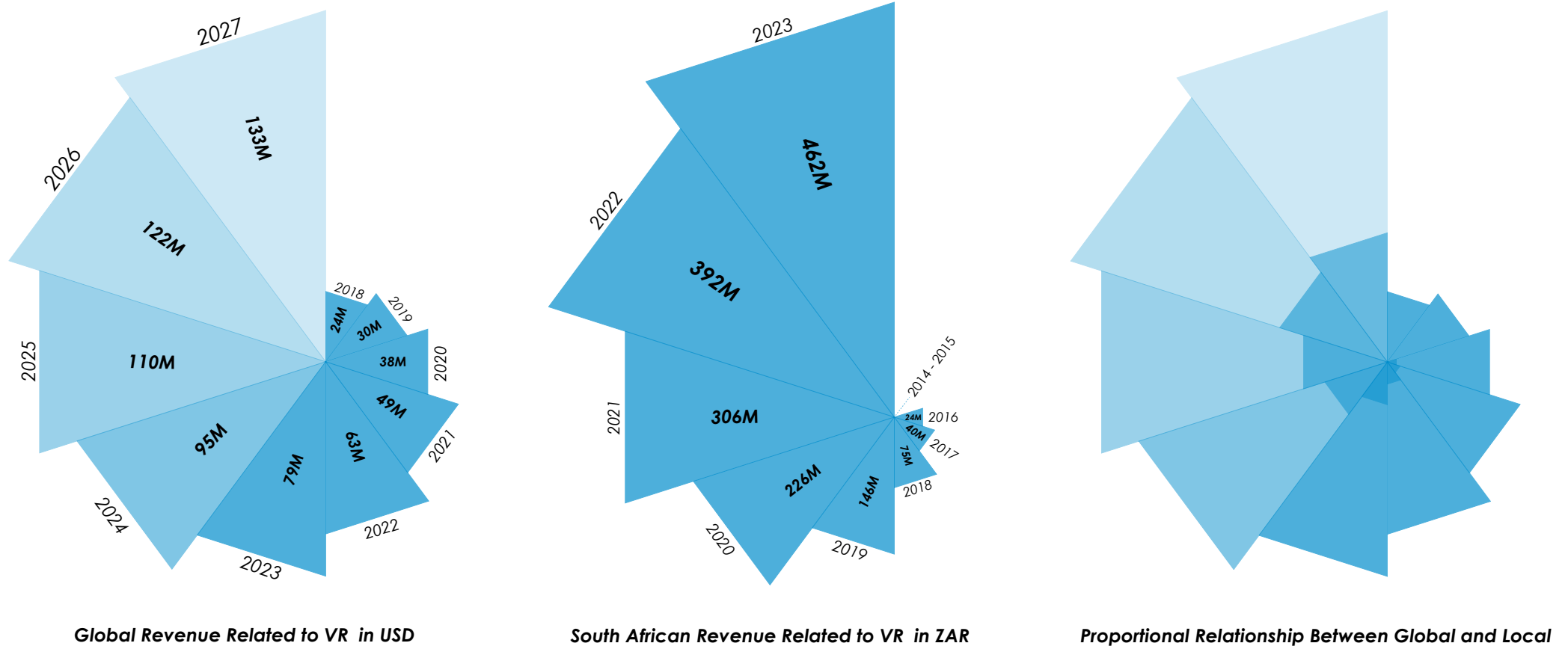


Figure 1.1 Virtual Reality Revenues over a 10-year period - Authors Diagram

The Sword of Damocles invented in 1968 was the first concept for a virtual reality system and hardware that enabled users to engage with the virtual realm. This allowed users to initially explore the digital frontier and served as the catalyst for further development and integration of these systems and technology leading to the advancement we see today. With the advancement of technology over the last couple decades we have seen an exponential growth in the development and accessibility of these systems and technology. As seen in figure 1.1 the global market revenue for virtual reality is a multi-million-dollar market that has seen a jump from 24 million to 133 million over a 10-year period (AR & VR - South Africa | Statista Market Forecast, 2023). The South African revenue is proportionally behind the global development growth yet has seen an exponential growth and indicates the further development and integration of these systems and technology into the South African market (South Africa VR market spending 2023, 2023).

This uptick in development and accessibility of these technological systems has led to them being integrated into a variety of industries such as film, gaming, drone technology, social media, construction, architecture, medical and military. This integration has led to these industries providing more publicly accessible experiences engaging with these technological systems. Utilising more public focuses experiences and engagement within a building intervention allows for a better understanding for the users on the potentials and capabilities of these technological systems, which will prompt further development and integration into our daily lives. The ability to integrate these technological systems has been made possible by two main factors, the development of the physical hardware as well as the software that runs the hardware. These developments run parallel to each other and has led to the development of software such as AI systems, gaming engines, and 3D modeling and scanning software as well as hardware developments such as VR contact lenses, haptic body suits, and head mounted displays Marr(2021). The capabilities and possibilities of virtual reality technological systems can assist in many aspects of how humans engage and experience life such as, skill development, social engagement, human experience of space, global community building, and knowledge transfer.

The Rise of Virtual Reality

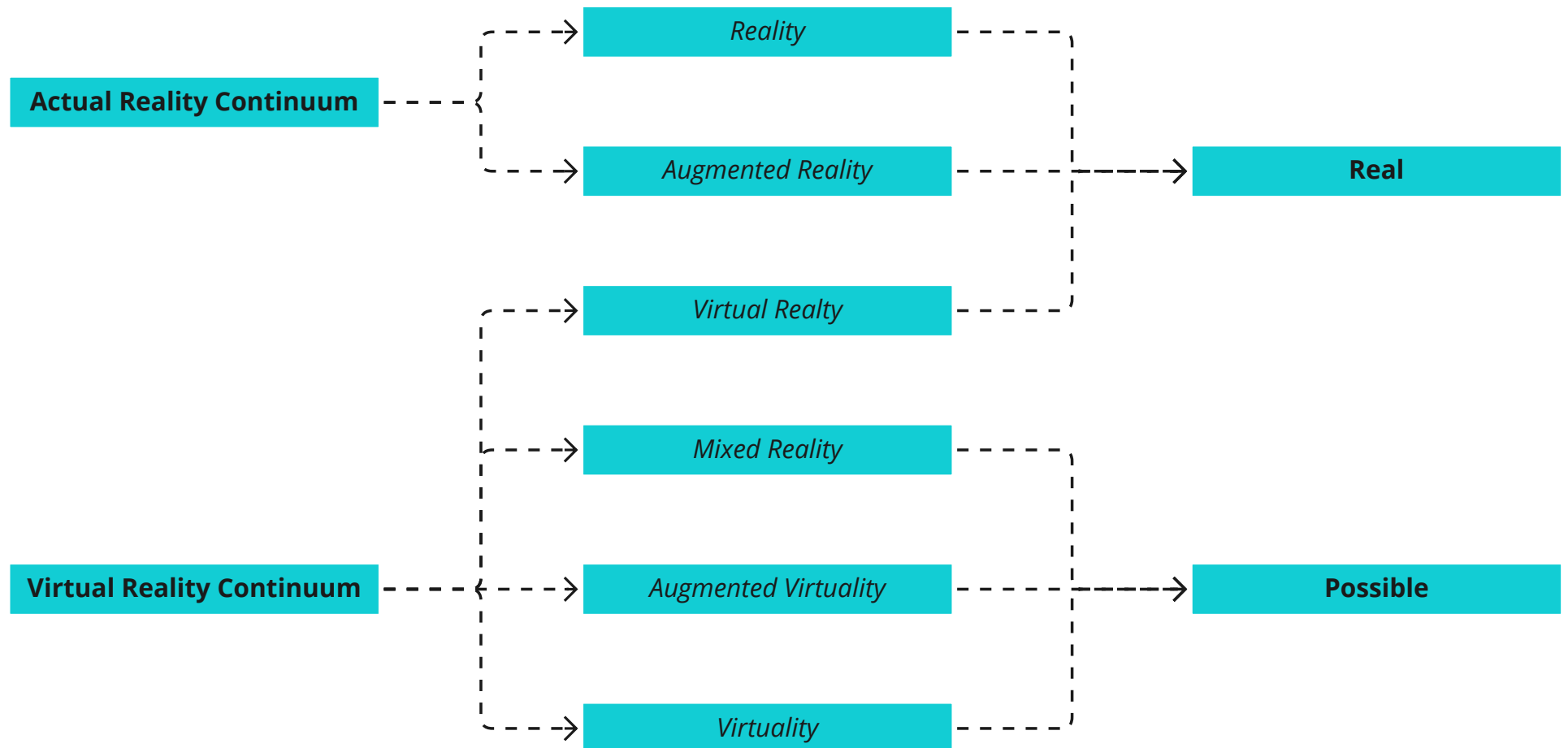


Figure 1.2 Reality Continuum Diagram - Authors Diagram

Virtual reality systems and technology consist of a combination of software systems and the hardware that allows users to engage and be immersed with the virtual realm. To understand and correctly implement virtual reality systems and technology into something accessible and functional for the general user who may engage with it, one must dissect the term 'virtual reality' into its working components. There are two defined reality continuum's, these are the actual reality continuum which refers to the physical realm and the known world that we inhabit, and the virtual reality continuum which refers to the virtual realm which is a completely digital space. Within these two continuum's sit the six defined realities which relate to the extent of which the virtual and physical realms are being represented and altered, these realities are:

The Rise of Virtual Reality



Figure 1.3 Reality Representation - Authors Diagram

Reality – Is the natural and physical world that we experience every day. It is within this reality that we have biologically evolved to experience our surroundings utilising our six sense and natural instincts. This biological evolution allows us to naturally experience the physical realm and refers to the phenomenological experience that is unique to the individual, as I will refer to in more detail within chapter 03.

The Rise of Virtual Reality



Figure 1.4 Augmented Reality Representation - Authors Diagram

Augmented Reality (AR) – Refers to the integration of the physical realm with digital information overlayed on it. This is done by utilising a technological device (smart-phones, tablets and digital displays) to add a digital layer over the physical. These overlays are objects that we recognise from the physical realm and are defined as real and possible for example animals, trees, iconic buildings as the digital layer being placed within the physical realm.

The Rise of Virtual Reality



Figure 1.5 Virtual Reality Representation - Authors Diagram

Virtual reality (VR) – Refers to the replication of real-world environments and simulates a user's physical presence within a space by utilising a head mounted display. This reality is a digital twin of the physical realm and follows the laws of nature that we experience in it, for example a client viewing their new house design before it is built to get a better understanding of what the spaces would feel like if it were to be constructed.

The Rise of Virtual Reality



Figure 1.6 Mixed Reality Representation - Authors Diagram

Mixed Reality (MR) – Refers to experiencing new objects or scenarios that do not actually exist through the utilisation of a head mounted display. Within this reality the representation of the physical realm is twisted and altered to create new experiences, such as a rainforest being placed on the moon with snow. Within this reality users experience natural elements or objects that are familiar from the physical real yet displayed in a way that we do not perceive within the physical realm.

The Rise of Virtual Reality

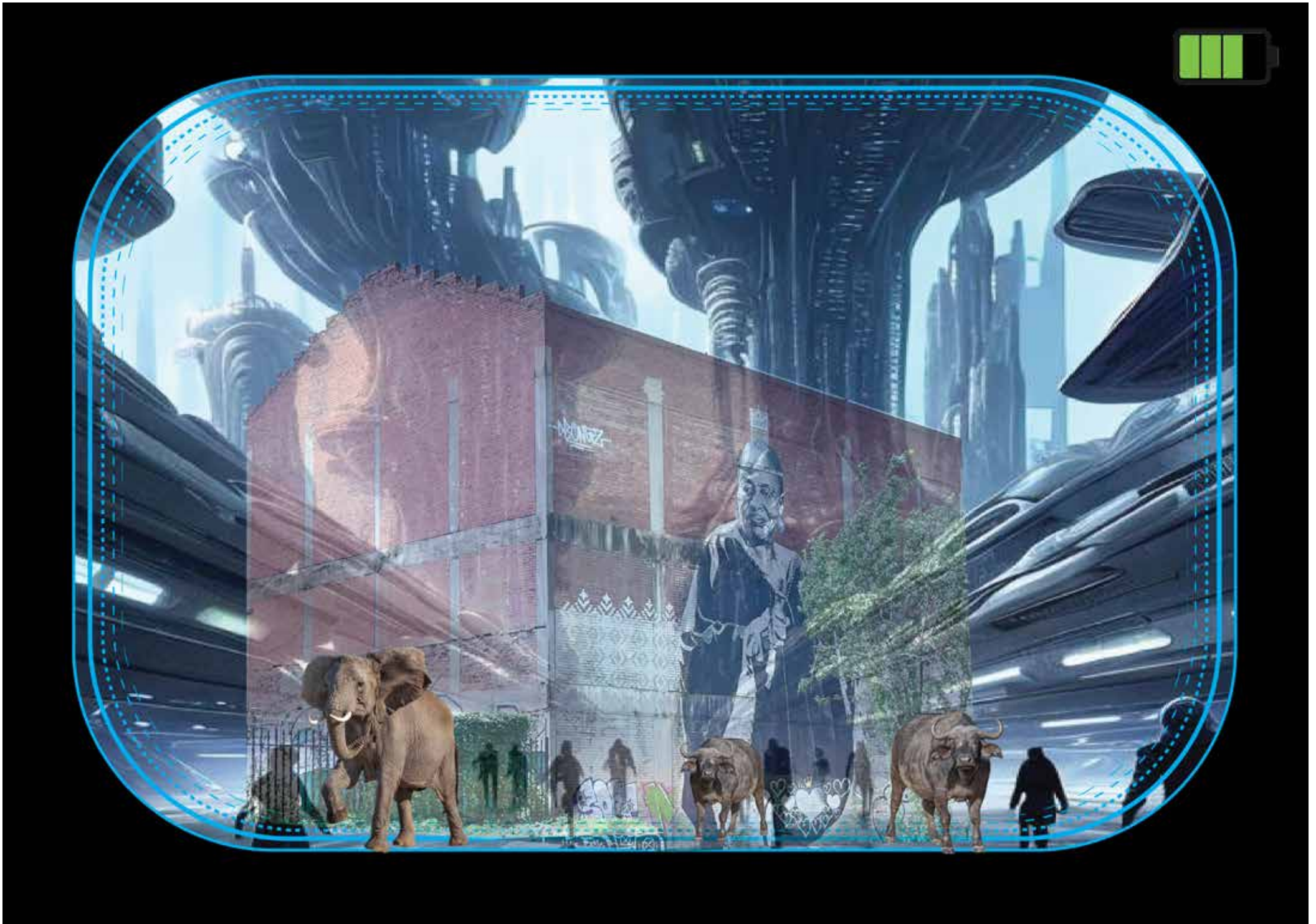


Figure 1.7 Augmented Virtuality Representation - Authors Diagram

Augmented Virtuality (AV) – Refers to computer generated possible world scenarios augmented with real and virtual constructs by utilising head mounted displays. Within this reality users experience spaces and worlds that are impossible yet integrate some elements from the physical realm, for example exploring a science fiction futuristic world with animals from our physical realm roaming around it

The Rise of Virtual Reality



Figure 1.8 Virtuality Representation - Authors Diagram

Virtuality – Refers to virtual representations of a impossible worlds by utilising head mounted displays. Where everything being displayed is completely impossible and fictional, for example a science fiction world with aliens inhabiting it.

The Rise of Virtual Reality

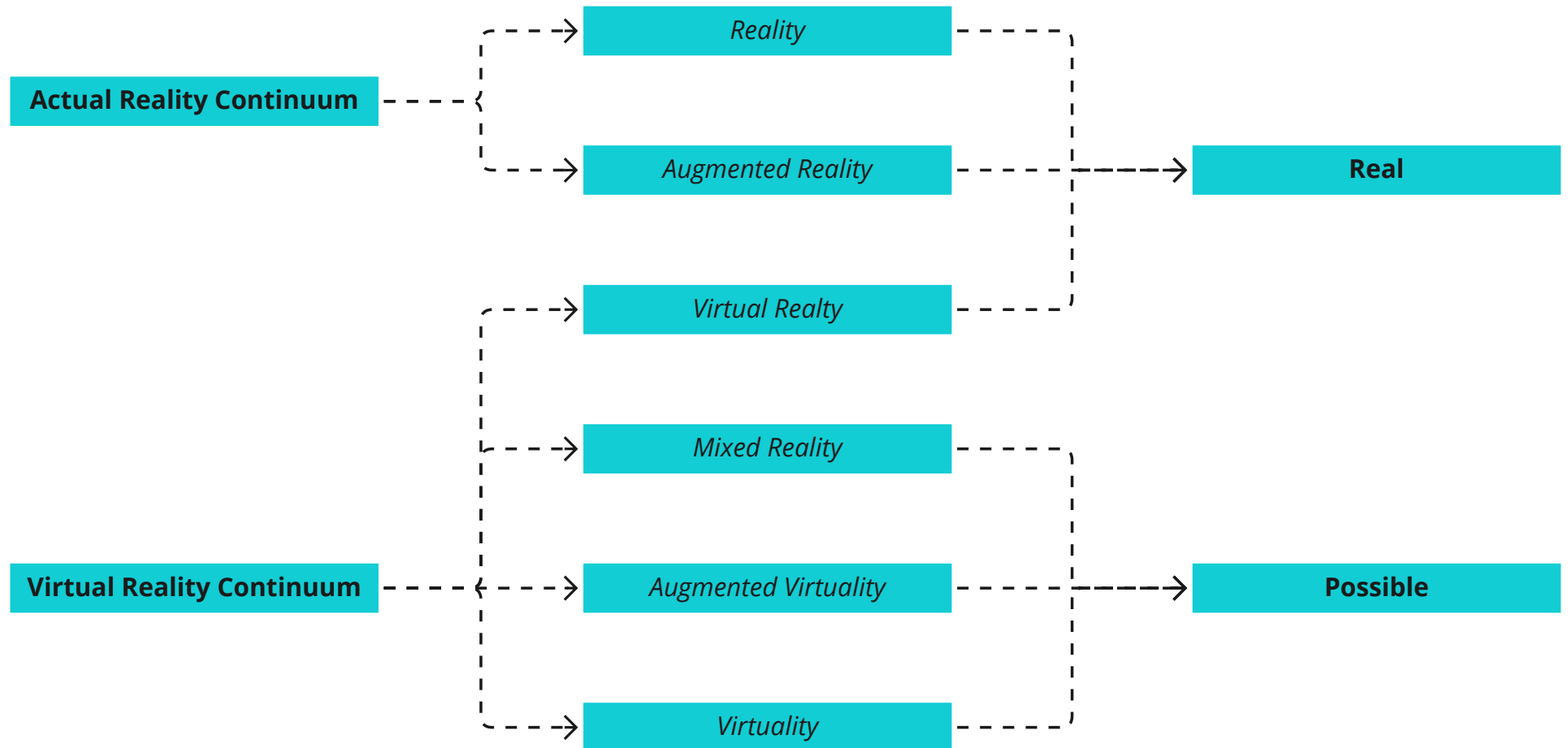


Figure 1.2 Reality Continuum Diagram - Authors Diagram

The six defined realities essentially represent the extent of the virtual and physical realms that the user perceives in the space they occupy. With regards to reality being our natural perception of the space we occupy and virtuality being the potential possibilities to experience and perceive space. With reality and virtuality sitting on opposite side of the spectrum, there is another classification for the six defined realities other than the two continua, and they strongly relate to the distinct differences between the two. These two additional classifications are termed 'real' and 'possible' and relate to the extent of which the virtual and physical realms are represented. Figure 1.2 represents the relationship between the six realities and the two reality continua which they relate to, and then it indicates a separation between what is 'real' and therefore utilises physical or known world representations and what is 'possible' and therefore utilises the capabilities of creating virtual representations of space that may not physically exist (Farshid et al., 2018).

Community Building with Physically Isolating Technology

Although there are many ways to experience the spaces we engage with, there are limiting factors for engaging with the virtual reality continuum, which currently is a result of the need to utilise a head mounted display (HMD). This is due to HMD being the most accessible and immersive way to engage with the virtual realm. The requirement for these HMD to engage with the virtual realm results in an isolating technology where users engage with the virtual realm on a personal level as it is only their perception of space and reality which is being altered. This engagement process leads to most users who utilise VR with HMD to be in physically isolating environments. However, this may be a problem created by using virtual reality technological systems, as there are new possibilities created by its use and integration. This provides the opportunity for users to create communities within the virtual realm as more users engage with it.

Community building within the virtual realm has largely been influenced by the gaming industry and the connections made through online gaming. This gaming culture resulted in large communities being created by people from all over the world with such diversity and cultural differences, yet the virtual realm and its possibilities allowed for these new connections to be made around commonalities between the users and their passion for gaming. The gaming industry has the same dilemma as VR with how the technology is physically isolating yet through the engagement and capabilities of the virtual realm, we were able to create global virtual communities around their commonalities. Although they may be physically isolated, they form part of a large global community.

BIGGIE IS BACK! As his music lives on, so does his presence in Meta Horizon Worlds. We're bringing you a jam-packed, hour-long VR concert experience like no other, with special guests Diddy, Latto, Nardo Wick, and more! (The Notorious B.I.G Sky's the Limit: A VR Concert Experience - Always On.Meta,2023)

Community Building with Physically Isolating Technology

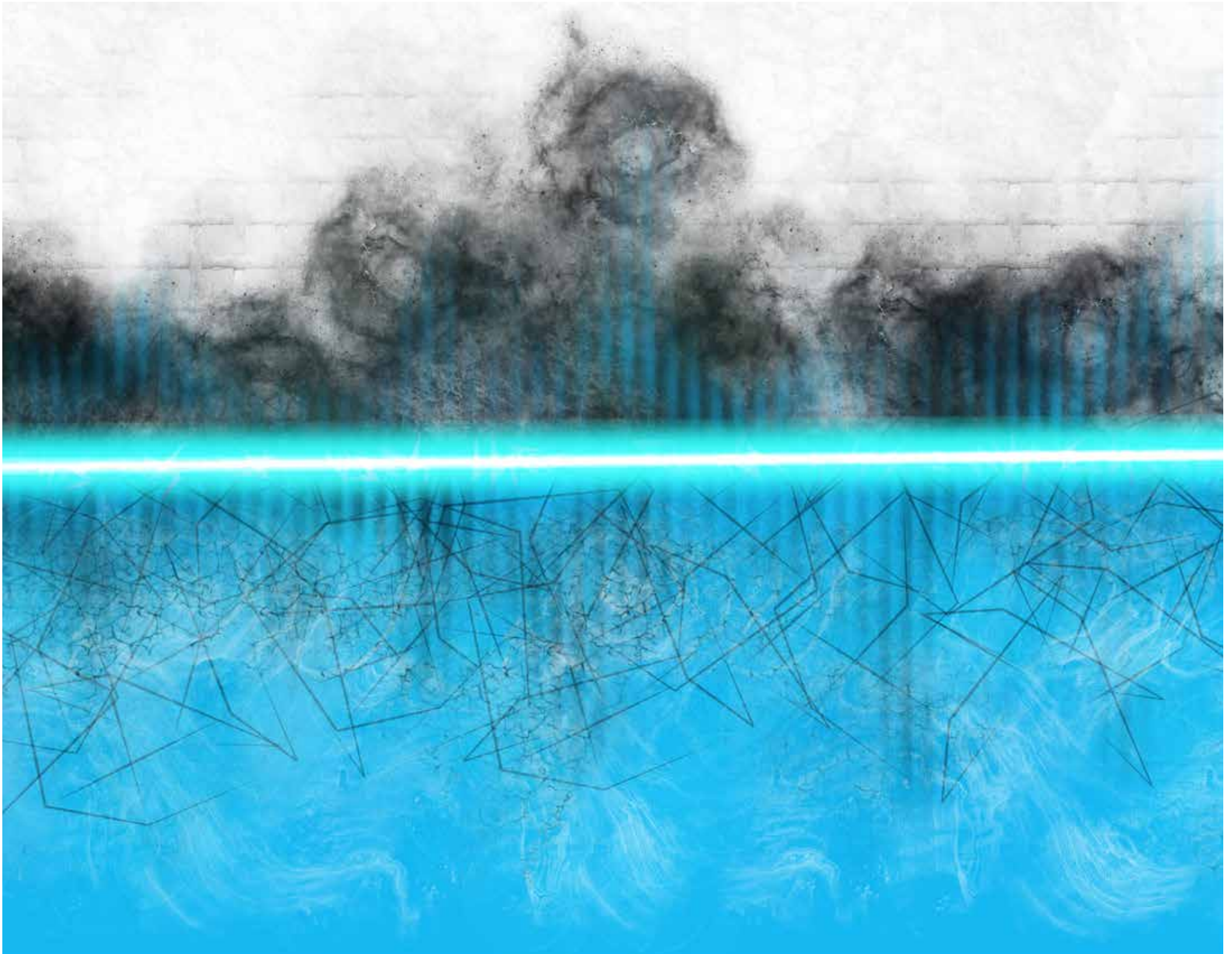
Although the use of VR technological systems can result in users being isolated there are possibilities for physical communities to be built around these systems and technologies. The gaming communities around the world meet at large conventions such as the South African 'Rage' gaming convention that is a yearly event located in Johannesburg. Here gamers meet and engage with like-minded people who share their values and passions in life." rAge has always been defined by crowds of avid gamers, technology enthusiasts and lovers of all geek things, that make the annual pilgrimage to rediscover their passion for the fantastical. Some come for the whole weekend dressed as their favourite characters, while others are in and out in a few hours looking for a hot deal on a new graphics card, or to just wander the halls taking in the sights and sounds of this vibrant community" (Lauren, 2023). The interactions at these gatherings allow for the virtual communities created to become part of physical communities that allow for physical connections and relationships to be formed and support their further growth. With the similarities between the gaming industry and VR being so close we can utilise these gatherings that incorporate isolating technology as precedents for creating similar conditions for physical gatherings geared towards VR integration and utilisation.

With The ability to access the virtual realm from anywhere in the world, there are new ways to share one's representation of space, life, and culture with the global communities. This form of representation and the capability of the virtual realm allows for unique perspectives and representations of space, life, and culture to be shared with the global communities. This empowers marginalised communities through their ability to create their own representations and understanding of their world, communities, beliefs, and culture. The South African pavilion at the 18th Venice Architecture Biennale has utilised AR systems and technology to express traditional African belief systems. Allowing for the international architectural community to experience these new perceptions and representations (The Structure of a People: The South African Pavilion Explores Architectural Representations at the 2023 Venice Architecture Biennale, 2023).

The virtual realm is a new and unexplored frontier that humanity unprecedented has full control over. The human fascination with the exploration has led to advancements within technology to make it a reality. The capabilities of the VR tied with the user's engagement within the immersive environments of the virtual realm allows for this need to be met yet spark engagement within the physical realm. The threshold between the virtual and physical realm is merely a thin veil that users can transition between and allows for new way of perceiving our known reality as well as create opportunities that can enrich our lives and our experiences.

CHAPTER 02

The Phenomenology of the Virtual Realm



The human lived experience within the physical space it resides

Phenomenology is a form of qualitative research that focuses on the study of an individual's sensory experience within the world. We perceive and engage with physical spaces through our physical body and ability to cognitively process what has been presented through the senses of the human body, the one cannot exist without the other. "All our sensory systems 'think' in the sense of structuring our relationships with the world." (Pallasmaa, 2017) The relationship between our physical body and the way we engage with spaces is deeply organic and moulded by centuries of evolution. Utilising our body and six sense to organically collect data about the spaces we inhabit and process how this data makes us feel within the space. This collection of data happens throughout our life process and enables the individual to have an organic archive of their lived experience which further informs how one feels within a spaces based on ones unique lived experience. This enables us to a subconsciously dissect space and instinctually process and understand it. This instinctual perception and dissection of space informs how we feel within these spaces and triggers the chemical body processes that make us feel a certain way when experiencing space *"We are connected with the world through our senses. However, the senses are not merely passive receptors of stimuli, and the body is not only a point of viewing the world from a central perspective. Neither is the head the sole locus of cognitive thinking, as our senses and entire bodily being directly structure, produce and store silent existential knowledge."* (Pallasmaa, 2017)

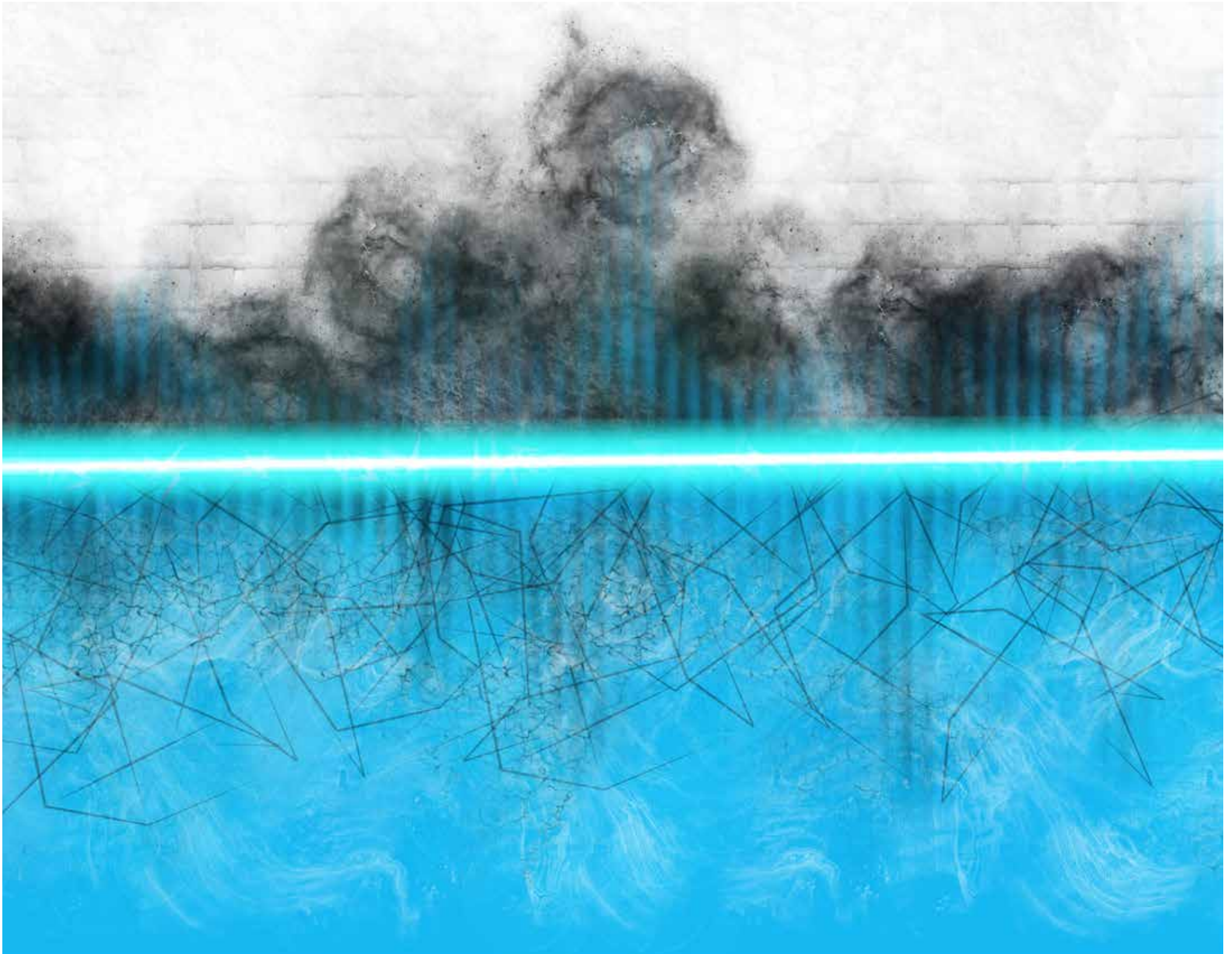
"In our age of massive industrial production, surreal consumption, euphoric communication and fictitious digital environments, we continue to live in our bodies in the same way that we inhabit our houses, because we have sadly forgotten that we do not live in our bodies but we are ourselves fundamentally embodied constitutions." (Pallasmaa, 2017) Pallasmaa indicates that technology and the advancements within the technological realm as well as the further integration of virtual interactions have been utilised against the users who engage with them, as we consume, idolise, and engage with information and societal structures that remove our presence and agency with the physical spaces it reside within. This is due to societal structures and norms being constantly pushed on us as consumers and seen as a way of distracting users from their lived embodied experience. This Pallasmaa believes is threatening and further removing users from being physically connected the spaces our body inhabits, this removes the users sense of presence and agency within the spaces it resides which results in a less connected presence within a space. This disconnection from the physical realm created by the further utilisation of these technological systems led to less physical presence in the spaces we inhabit with our physical bodies. This lack of embodied consciousness in space is seen as one of the key grievances with the utilisation and integration of virtual technological systems within our daily activities *"yet at the same time these very same senses continue to be undervalued as prerequisites of our existential condition"* (Pallasmaa, 2017). Presence in terms of the phenomenological experience can be defined as ones conscious existence within a space, where the user is fully aware of their surroundings without being distracted by external factors. This allows the user to gather biological data about the space they inhabit and process it accordingly. While agency can be define as ones ability to control how they navigate and experience space, giving them control and choice over their action and how they collect biological data.

Transcending the Physical Realm and Engaging in the Virtual

I understand the perspective and points of view that Pallasmaa utilises to formulate his argument. Yet I believe that the capabilities and opportunities made possible by utilising the virtual realm can transcend how we experience space. The ability for users to create and develop spaces which they can engage with and be immersed by whilst utilising the advancement of virtual reality and the technological systems that makes these spatial experiences possible, I believe is truly revolutionary. The possibilities and opportunities presented in the virtual realm draws similarities to how the human body experiences spaces within the physical and this is due to one of the core drivers behind engaging with the virtual realm being immersion. The more immersive the experience the more presence and agency the user experiences whilst engaging with the virtual realm, as I will allude to in more detail within chapter 05. They achieve more immersion when engaging with the technological systems by harnessing the human senses similarly to the way our body engages and experiences the physical realm. Harnessing the human senses to create immersive spaces that defined and created by the users of the spaces, with the laws of nature and physics being a non-factor it allows for the re-imaging and redefining of our perceived reality. Yet its important to note that we inhabit the physical realm and I believe that engagement within the virtual should inspire the users to go out and explore the physical with all their senses. As engagement within the physical is still the most natural and organic way we perceive the world we live in , with VR being a option for users to engage with and explore instead of overtaking users engagement within the physical realm. This provides users with the agency to choose what realm they engage with based on their needs and wants, as the physical and virtual realm coexist.

CHAPTER 03

Navigating the South African Context



The Historical context of Controlled Access and Rights

South Africa has been reconstructing the fragments and remnants left behind from the apartheid era, to create the vision that was fought for during the struggle. To achieve and create the vision for the new South Africa, it falls upon all its citizens to take agency in creation. Any design intervention must address the historical narratives of the country.

Racial segregation during apartheid divided communities and this segregation was implemented into every aspect of the country's fabric, from controlled access to public spaces, key infrastructure, education, and transportation to mention just a few. The remnants left behind from this historical segregation still plagues the country and many South Africans still do not have access to infrastructure, education, and are living in communities that are still divided. Any design intervention located within South Africa will need to consider and address these problems and consider the interventions impact on the communities it will inhabit. The aim of the virtual reality centre is to be a piece of infrastructure that will address and express the historical narratives and problems of the countries past whilst being publicly accessible and inclusive.

The Viability of VR technology in South Africa

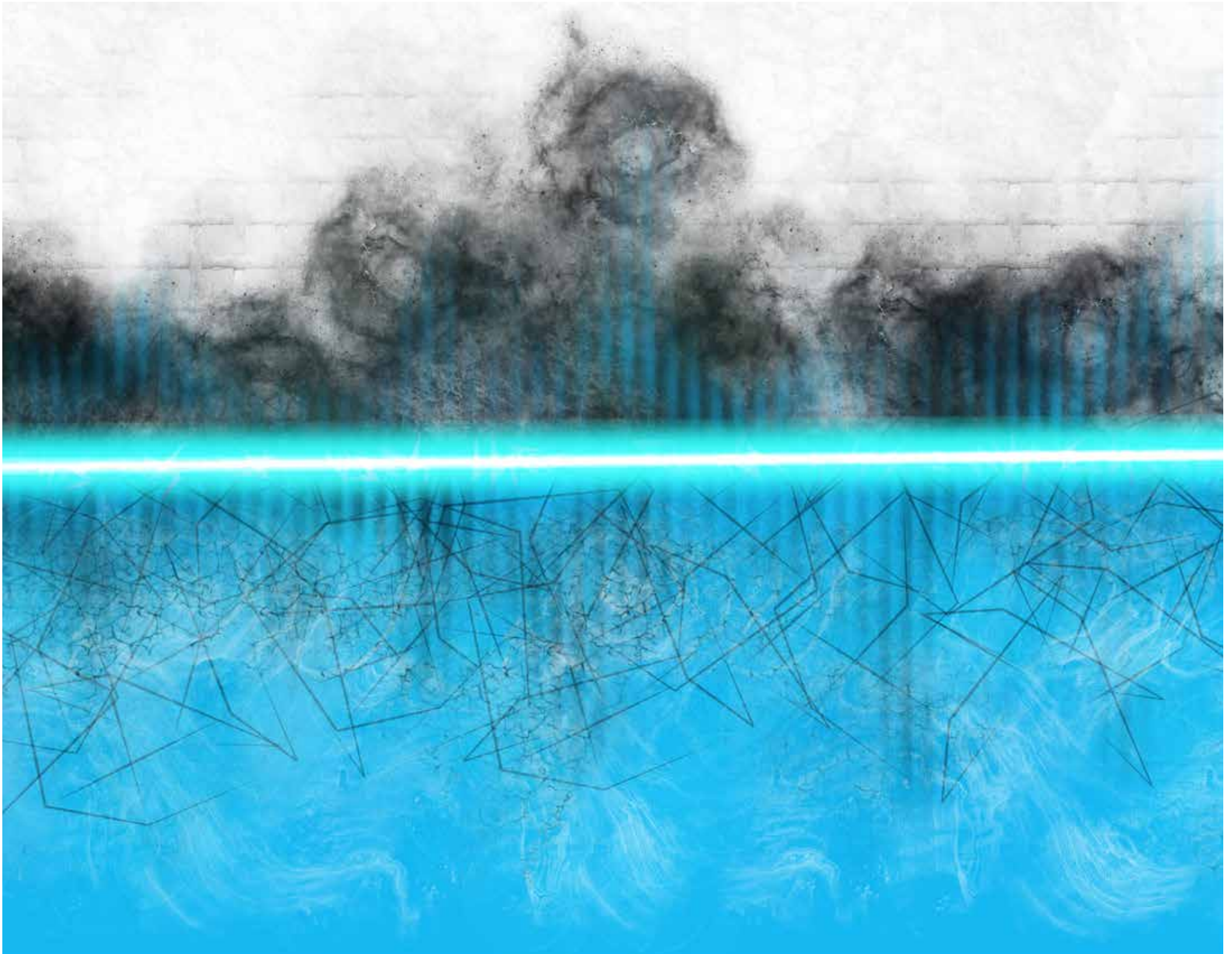
There are a variety of ways to engage with VR technological systems, some are at a lower price point than and more viable such as being able to utilise smart phones and tablets with cardboard HMD, while others are quite expensive and less affordable such as high tech HMD with powerful computers. It is important to note that the most capable and immersive engagement with the virtual realm sits on the higher end of the scale. In the South African market, the viability to own and access the hardware and software required is limited to the upper middle class. This means that a large portion of the population will not be able to access and utilise the capabilities and possibilities of these VR systems and technology. Ideally the government would be providing opportunities and infrastructure for the public to access these systems and technology yet unfortunately the likelihood of a government intervention that incorporates these technologies is very unlikely as investment in infrastructure has been directed to core infrastructural projects like housing, basic services, and public infrastructure works. Its due to this unlikelihood that I believe the intended design intervention of a virtual reality centre is a sorely needed piece of public infrastructure that can provide accessibility to these technological systems. By providing accessibility to a piece of infrastructure that can benefit the public we can start to break down the remnants that remain from our past and start to build a strong foundation for our country to develop in the future. Allowing for marginalised groups to start being considered in the conversation when regarding accessibility, infrastructure, and knowledge transfer. The virtual reality centre should be adaptable for further development to cater to the needs of the technology and its further integration into users' daily activities. This adaptability will allow for long term utilisation of the centre.

Power and Difference in Site Selection

I have identified two points within the design process that site considerations can be considered for the development of the design intervention with regards to the implementation of virtual reality technological systems. These two points happen at two ends of the spectrum and have specific goals for the design intervention. With the first point being an in-depth analysis of the site at the beginning of the project, this allows for the context and communities who the intervention will become part of to inform the design and provide insights into what is valued and needed by the community. It is important to note that selecting site considerations at this point would be geared towards projects that wish to incorporate the community and consider how the project may affect the community, these types of projects would generally be public based or commercial projects that have the community as a target market. The second point being site considerations towards the end of the design process, where there is a clear vision for the intended intervention and site considerations may not be priority of the design. Projects that wish to choose this point within the design process are most likely commercial projects who have stipulated intentions and goals. With the potential for a virtual reality centre to influence and support the local context, there needs to be a clear understanding of the site and surrounding communities. This is why I have chosen to consider site considerations at the bringing of the design process. This will allow for the centre to be informed by the contextual analysis. This will allow it to root itself within the existing community and context and ensure its utilised by the community, ensuring a long-lasting relationship with the community.

CHAPTER 04

Locating the Threshold – Site Analysis



That Which Comprises the Inner-City

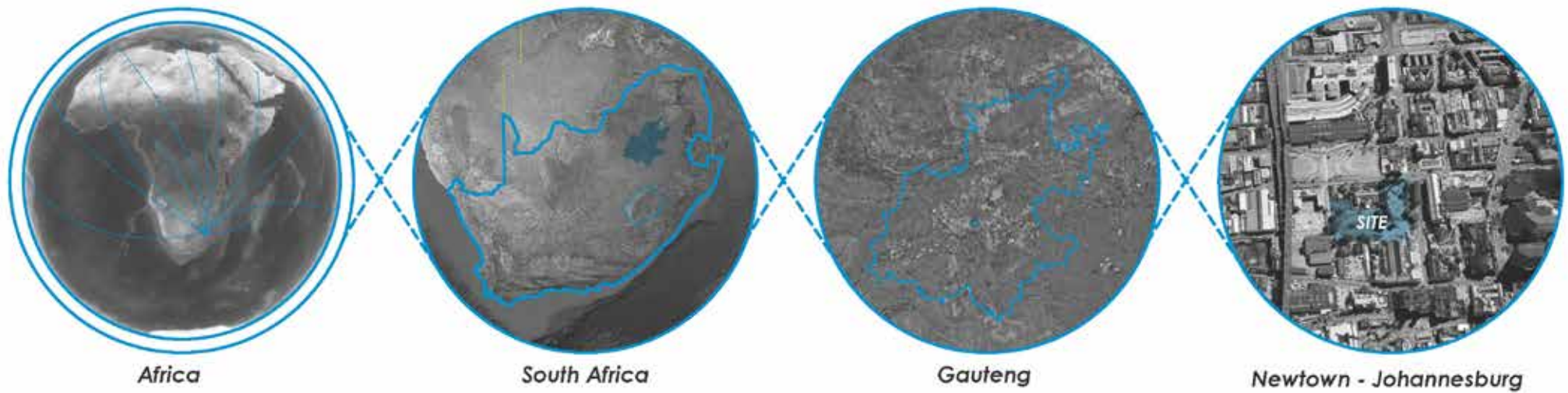


Figure 4.1 Locating the Site - Authors Diagram

The site is located within the Newtown precinct of Johannesburg and closely situated to the city's central business district. Johannesburg is the financial capital of South Africa and is the most populated city within the country *"Four hundred thousand people reside in the area, and about 1,000,000 people pass through the Inner City everyday. It also hosts many small businesses and local retailers, owned mainly by the lower income segment."* (Johannesburg | Urban Regeneration, 2023). The potential to earn a better living by working within the city draws people from all over the country as well as neighbouring countries, with the hopes of improving their lives and their family's lives. This has resulted in a densely populated city with the central business district being a cultural melting pot of diversity, culture, and ethnicity. Newtown was selected as a site location due to a couple of contributing factors which are:

- Its location within the inner city, to prompt the users who interact with the city to come and explore VR systems and technology. This will bring more users to the precinct, sparking further interest within the other available facilities within the precinct.
- The strong ties between the activities and infrastructure located within Newtown and the current utilisation of virtual reality within industries that indicate positive results for the integration and utilisation of these systems and technology.
- The strong historical narratives of Newtown's past that have played a crucial role in Johannesburg development, as well as its strong political presence.
- Its proximity to the two universities located in Johannesburg, these being the University of the Witwatersrand and the University of Johannesburg. Allowing for the universities to have easy access to the facility for their own research as well as giving the students the ability to access the centre and utilise the technology available.

That Which Comprises the Inner-City

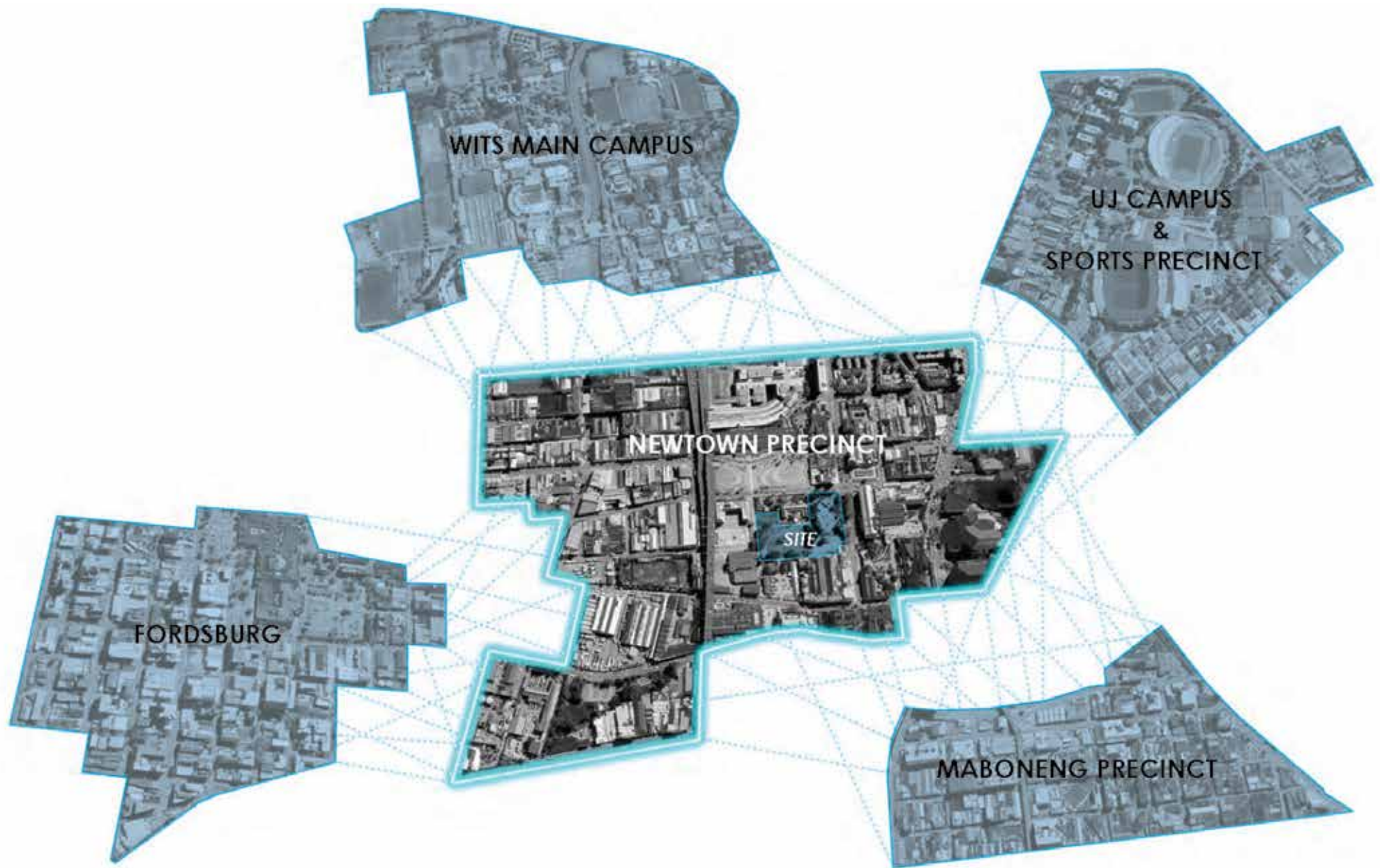


Figure 4.2 Supporting Districts - Authors Diagram

That Which Comprises the Inner-City

Newtown is intended to be the cultural precinct of Johannesburg and is just one element that links to surrounding inner city districts to form the greater boundaries of the inner city as seen in figure 4.2. I have identified key districts that can support the implantation and integration of a virtual reality centre, these districts can directly benefit from the implementation and integration virtual reality systems and technology.

The University of the Witwatersrand main campus is located on the other side of the train tracks and is within walking distance of Newtown. This proximity provides the ability for both students and researchers from the university to engage with the virtual reality centre and be a tool for them to utilise. Providing the potential for data to be collect within the centre and utilised by the students and university, as I will allude to in more detail within chapter 05.

The University of Johannesburg's campuses is located within the sports precinct of Johannesburg. The duality of the precinct provides opportunities within two spheres that can support the integration of a virtual reality centre, one of these being students engaging with the centre as a tool. The other being the ability for the sports district to utilise the centre for training, skill development, marketing, and community engagement. The sports precinct draws large crowds of people from all over the world for the various fixtures and events that the district hosts, these visitors could potentially navigate their way to Newtown and engage with the centre. This trip would take them through the heart of the inner city and reveal the inner works of the city.

Fordsburg is a neighbouring district of Newtown and has a strong cultural presence within the city as well as strong historical narratives which can be represented within the virtual reality centre as I will allude to in more detail within chapter 05. With the Oriental Plaza being located within Fordsburg and within proximity to the site users who engage with the centre may be drawn to engaging with the virtual reality centre as the histories of Fordsburg will be represented, this along with the high volume of residential area surrounding Fordsburg may encourage users to explore the centre beyond the historical representation exhibited.

The Maboneng Precinct is a result of new development being implemented within the inner city of Johannesburg, with the city prompting for urban renewal projects and developments. The precinct has seen the refurbishment and redevelopment of existing buildings to provide more housing within the inner city as well as create a safer inner-city environment. *'Town planning decisions made in the 1970's resulted in more business orientated CBD with minimal housing, this may have worked then but has now resulted in the problems of living within the inner-city today'* Heather Trumbel, *Town planner with The City of Johannesburg (COJ)*. The revitalisation of the Maboneng precinct has been the catalyst for further developments and has drawn users back to the inner-city. Although this inner city development is still in progress and has flaws that need to be works out before it functions as intended.

That Which Comprises the Inner-City



Figure 4.3 The Regenerative Development of the inner-city - Authors Diagram

Figure 4.3 represents the regenerative line of development within the inner-city. This creates a spine that runs east to west and forms the basis for inner city development. *The first major plan for the Inner City was the “Inner City Regeneration Business Plan”, developed by the Economic Development Unit of the City of Johannesburg in 2004. The Plan was based on five pillars: Addressing sinkholes, undertaking intensive urban management, maintaining and upgrading infrastructure, promoting ripple pond investments, and supporting economic sectors.” (Johannesburg | Urban Regeneration, 2023).* Considering that the city plans to further develop the inner-city and with Newtown being a key precinct within the city, the further development of Newtown needs to be considered now to align with the developments. This spine created serves as the base line for extended developments through the city and its surrounding areas. Although the current state of development for the line has halted and what remains is non-functional, the concept and intention behind it remains strong. Due to the non-functional state of the line the virtual reality centre will need to function and operate as its own entity without assistance of surrounding infrastructure yet be able to support inner-city lifestyles and infrastructure, with it being a single point within the greater context that can aid in strengthening the development throughout Johannesburg. The need for the centre to function as its own entity is based on the inherent reality that many facilities, infrastructure and services within the city are not well maintained and often fail. If the centre were to rely fully on these external factors it would be liable to failure or poor functionality. Yet in the future if the development of the line recommences the centre will play a key role in supporting the functionality and development of the city.

The Historical Narratives of Newtown

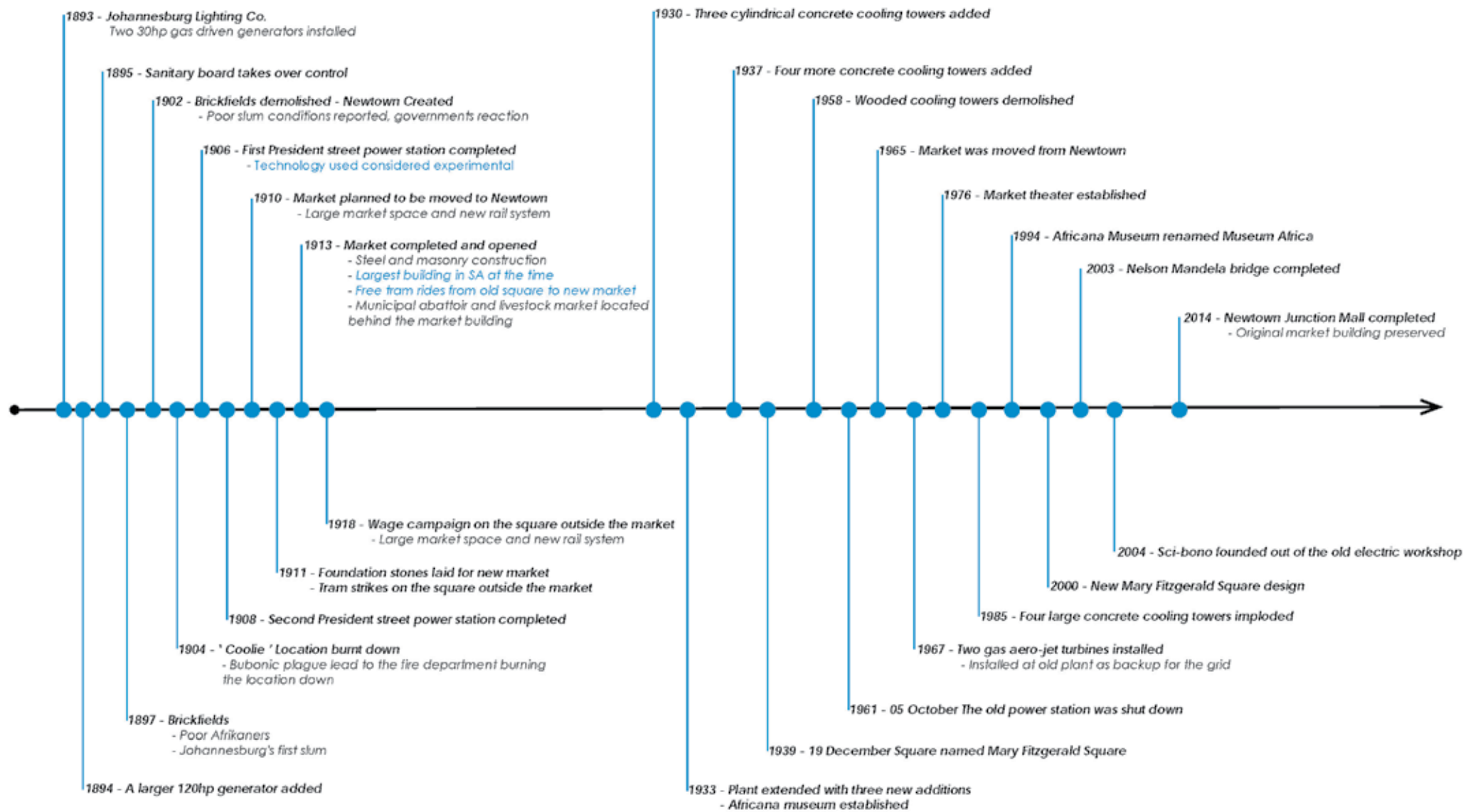


Figure 4.4 Historical Timeline of Newtown - Authors Diagram

The Historical Narratives of Newtown

Newtown has a rich historical past with a variety of historical events that occurred, some of which shaped and influenced the development of Johannesburg. The development of Newtown is closely aligned with that of Johannesburg as the city grew over the century, with the founding of Newtown being shortly after the gold was found in Johannesburg. There was a period in which Newtown had a high level of public infrastructure, facilities, services being provided, and economic boom. With trams and the rail lines allowing for ease of transportation of good as well as people to and from Newtown, this being the peak of the technology for the period. Along the lines of technological capabilities, the local power station was situated within Newtown and the buildings that remain from this period have been repurposed to meet the needs of the local community as well as utilised for cultural activities and initiatives. The power station which powered several suburbs within the area throughout its lifespan saw a multitude of technological advancements and utilised revolutionary technology over the period of the station's utilisation. The market which drew people from all over Johannesburg allowed for an economic boom within Newtown that later degraded into a forgotten landscape yet being revitalised into its current cultural precinct('History of Newtown Pt.1', 2021). It is important to note that through the period of Newtown history before 1994 racial segregation and the exploitation of working class and lower income workers. This resulted in the community members within Newtown that were being excluded or exploited to protest and fight for what they rightly deserved "In 1918 an unprecedented wave of strikes by black and white workers engulfed the Witwatersrand. Inspired by the strikes by other municipal workers, night soil workers went out to strike demanding an increase in their wages".('History of Newtown Pt.1', 2021) The action of one individual has forever been memorialised in the naming of a public square after this individual. This individual being Mary Fitzgerald who fought for workers' rights as well as women's right and was the first female councillor of the Witwatersrand. The square to this day is still utilised for protesting and large public gathering, utilising the memory of Mary Fitzgerald and her fighting spirit.

Contextual Site Analysis

Highlighting Important Buildings and Infrastructure, Movement Routes and Vehicle Routes

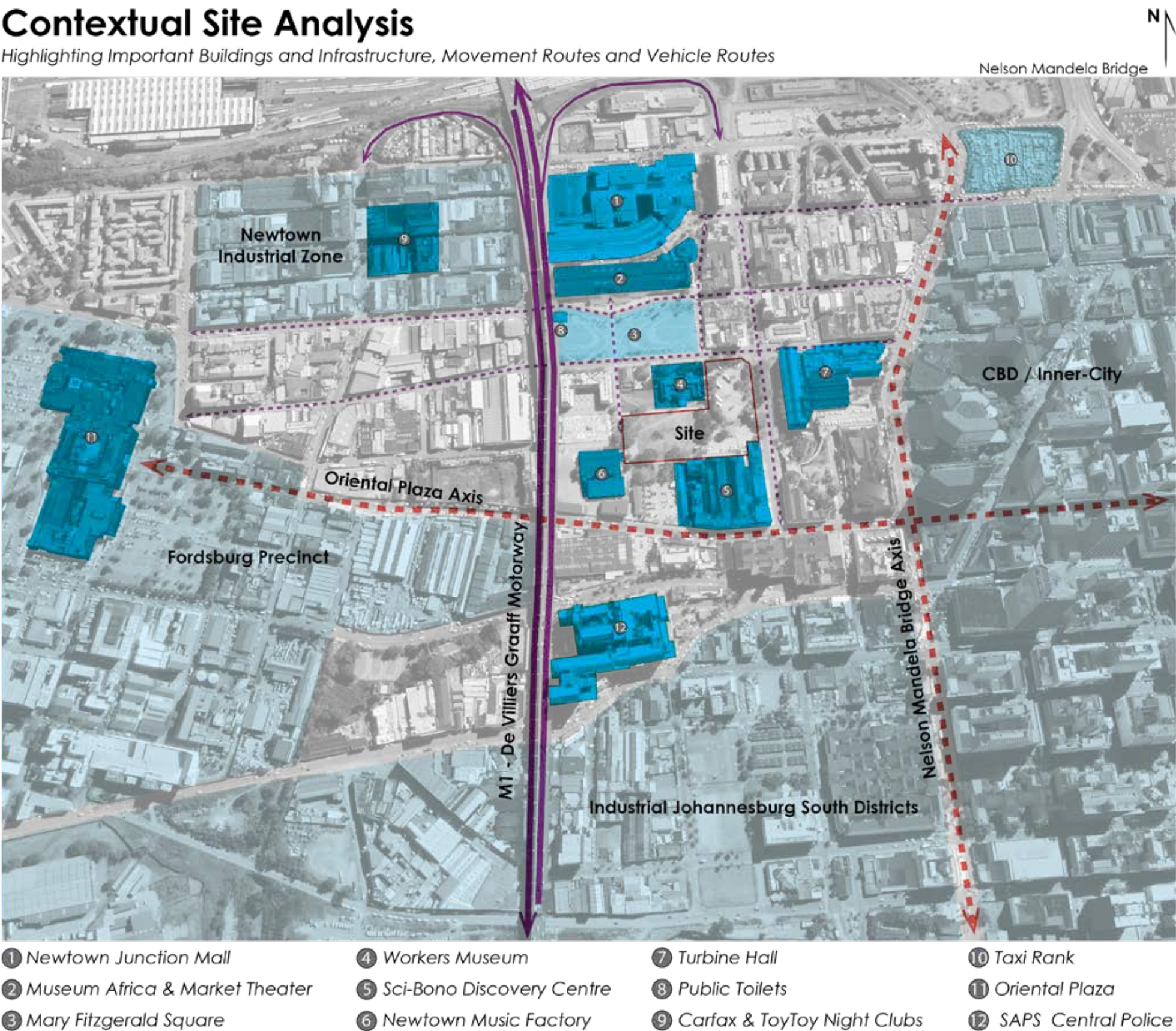


Figure 4.5 Contextual Site Analysis - Authors Diagram

Dissecting the Newtown Precinct

As seen in figure 4.5 the intended function of the cultural precinct of Newtown represents a variety of narratives simultaneously. There are various knowledge transfer facilities located within the proximity of the site, these being Sci-Bono Science Discovery Centre, Museum Africa, Workers Museum, Mary Fitzgerald Square and a variety of dance studios.

Sci-Bono is an NPC (Nonprofit Company) with a focus of education, skill development and knowledge transfer for all ages, and this draws a wide range of users to the site to engage with the various exhibits that allow users to understand science and technology in a fun and interesting way. The centre is located within the old electric workshop of the power station and borders with Newtown Park. This serves as a catalyst for both the park and Sci-Bono to have joint activities and shared users.

Museum Africa follows the traditional typology of a museum with several exhibits that allows the users to gain more knowledge based on what exhibits are being presented to the public. One of these exhibits being based on the apartheid era, this having ties to a strong historical narrative of the countries past. The museum utilises a portion of the fruit and vegetable market building that played a key role in Johannesburg's and Newtown's development. The building is adjacent to Mary Fitzgerald Square with the jazz walk aligning with the entrance to Museum Africa.

Mary Fitzgerald Square is a large public square utilised by the city for various events as well as the citizen for protests and rally due to its historical narratives. This combination activities results in the square being highly populated and utilised during these activities whilst being relatively quite and empty outside of these activities. The square has public toilets located near the highway and results in a high volume of users utilising it throughout the day. The resulting site conditions have led to an inform taxi pickup and drop-off on the west side of the square under the freeway. This informal taxi point has a high volume of users utilising it throughout the day.

The Workers Museum is housed within the old workers compound that was utilised by the power-station during its lifespan as serves as a historical museum representing the poor living and working conditions for black African workers of the station. The main entrance to the museum is located on the boundary of Newtown Park instead of the main road. I believe this decision was made to try draw users that engage we the park to engage with the museum as well as serve a practical function that the main road is used for deliveries and staff

Dissecting the Newtown Precinct

Carfax and ToyToy are night clubs houses within the industrial zone of Newtown and sees very little public activity during the day yet sees a high volume of users during the evenings of the weekend. This clubbing night-life draws a variety of users to Newtown from across Johannesburg. These users however hardly engage with the rest of the Newtown precinct and provides an opportunity to try and entice these users to further explore and engage with the rest of the precinct.

Dance and music play a strong role within Newtown, historical musicians are illustrated all throughout the precinct as a reminder of their influence. These musicians paved the way for the existing dance and music culture within the precinct, the ability to bond, share narratives, and express oneself through dance and music has a strong cultural role with the precinct and the communities that reside within it.

As seen throughout the context of Newtown there is a variety of educational facilities yet many of them have strong ties to historical narratives, whether they are housed within re-purposed historical buildings located within the precinct or through historical events and narratives being represented. This link indicates that the intended virtual reality centre should incorporate and utilise educational components as well as integrate historical narratives. It is important to note that all the education and historical facilities present within the precinct utilise recreational activities as drivers for engagement with the local community. This is another component which should be considered with the intended virtual reality centre, as recreational activities may entice users to engage with the centre as well as draw users from outside the city centre to come and experience its possibilities and capabilities.

Based on my analysis of the site, context, and community I believe that there are three key components that need to be incorporated within the design for the intended virtual reality centre to serve the community as well as support the surrounding facilities. These elements are education facilities for skill development and knowledge transfer. Historical representations of Newtons and the surrounding districts, Johannesburg, and South Africa's historical narratives. Recreational activities that draw users to the precinct as well as promoting the inner-city lifestyle and its further development. With the selected site being Newtown Park and the Sci-Bono parking lot, as there are numerous opportunities for community engagement, precinct revitalisation and park expansion through the implementation of a virtual reality centre on the selected site.

Urban Green Space Analysis

Identifying Green Spaces and Natural Elements



Figure 4.6 Urban Green Space Analysis - Authors Diagram

Figure 4.6 represents natural vegetation located throughout the Newtown precinct and the surrounding districts. With a high volume of residents and users engaging with the precinct and surrounding districts it is important to identify what natural elements are present for the community to use and engage with. There is a variety of urban street scape planting scattered throughout the area yet very little open green spaces that are accessible by the public. Newtown Park is the largest of these available spaces and is surrounded by various public facilities and infrastructure. With the second and third largest spaces being located near the taxi rank and Nelson Mandela Bridge. An interview with a town-planner from the City of Johannesburg revealed that there is 'approximately 3% of park space present within the city of Johannesburg yet the ideal amount being 6%'. This means that there should be double the amount of land that is currently allocated to parks within the city, this indicates that there is not enough natural vegetation and recreation spaces for the users of the city of Johannesburg to engage with.

Site Images

Land Marks and Notable Elements Observed on Site Inspections



Figure 4.7 Street Art - Graffiti



Figure 4.8 Street Art - Mosaic



Figure 4.9 Street Art - Sculptures



Figure 4.10 Street Art - Sculptures



Figure 4.11 Sculpture / Optical Illusion



Figure 4.12 Sculpture - Historical Figure



Figure 4.13 Jazz Walk



Figure 4.14 NW Corner Perspective of Site

Site Images

Land Marks and Notable Elements Observed on Site Inspections



Figure 4.15 Sci-Bono Perspective



Figure 4.16 Existing Building on site



Figure 4.17 Existing Building on site



Figure 4.18 Existing Building on site



Figure 4.19 Workers Museum Entrance



Figure 4.20 Museum Africa Entrance



Figure 4.21 Jazz Walk to Museum Africa Entrance



Figure 4.22 The Market Square

Site Inspection Observations

Precinct analysis indicating prominent roads, movement routes, gatherings and urban ecology

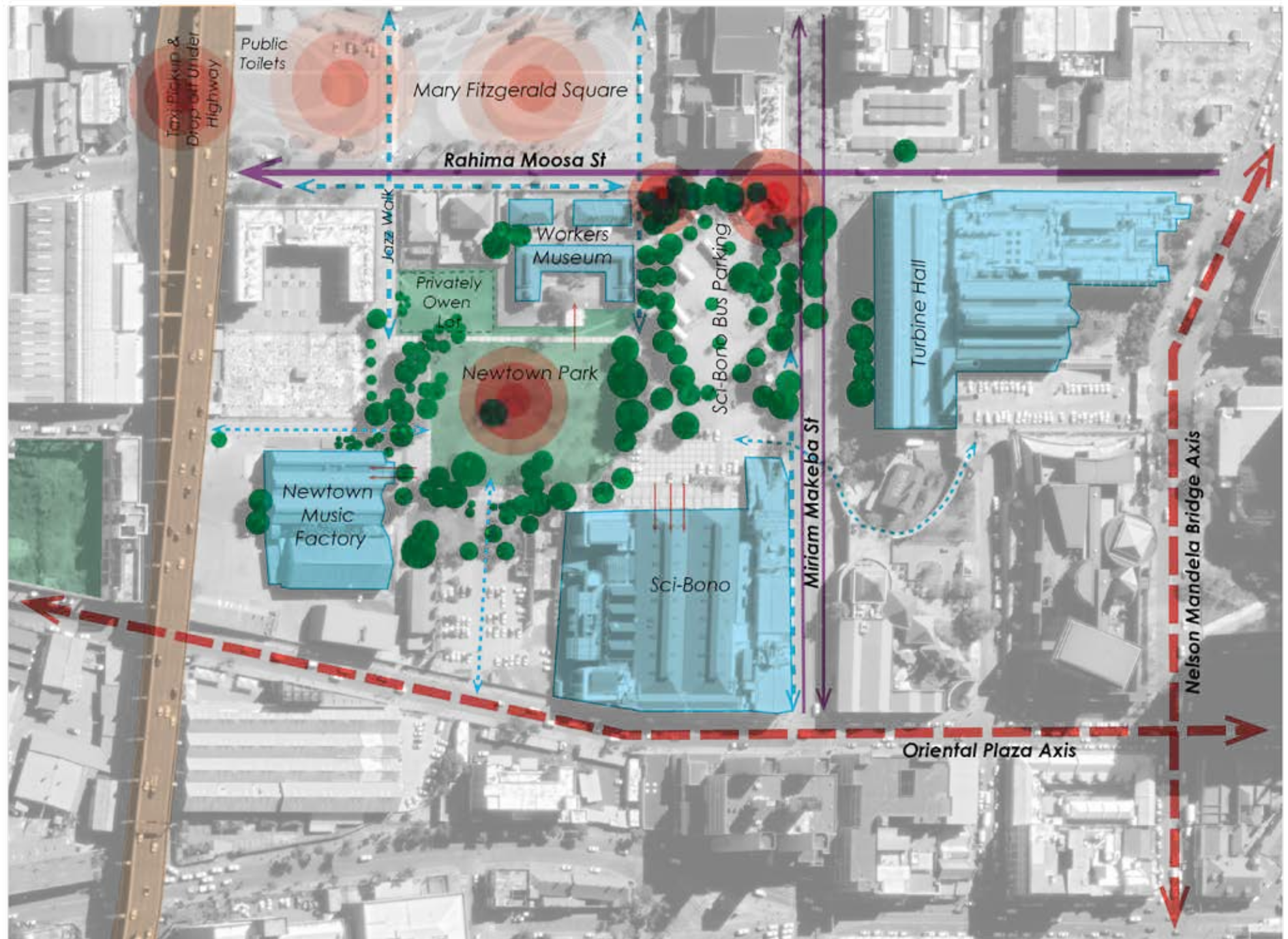


Figure 4.23 Site Inspection Observations - Authors Diagram

Figure 4.23 represents observations made during site visits throughout the year. There are various movement routes that surround the site , with the Jazz walk seeing a high volume of users utilising it as a short cut through the block or for users to engage with the park. The other more prominent movement route runs parallel with the Jazz walk and runs from Junction mall to the Sci-Bono Parking lot. Rahima Moosa St is a one way street with a high volume of users traveling along it with some utilising the informal taxi drop off and pick, Mary Fitzgerald Square, and some navigate to the park. The Corner of Rahima Moosa St and Mariam Makeba sees a high number of users gathering around the corner and can be quite loud. Rahima Moosa St is far less utilised by vehicles yet sees moderate use by pedestrians navigating through the precinct. The highway overlooks the entire precinct with a high amount of traffic and use by people through Johannesburg and provides an opportunity to draw users to the precinct as they see the precinct being used and the facilities available.

Site Inspection Observations

Site analysis indicating prominent movement route, hard boundaries, users engagement, entrances to buildings

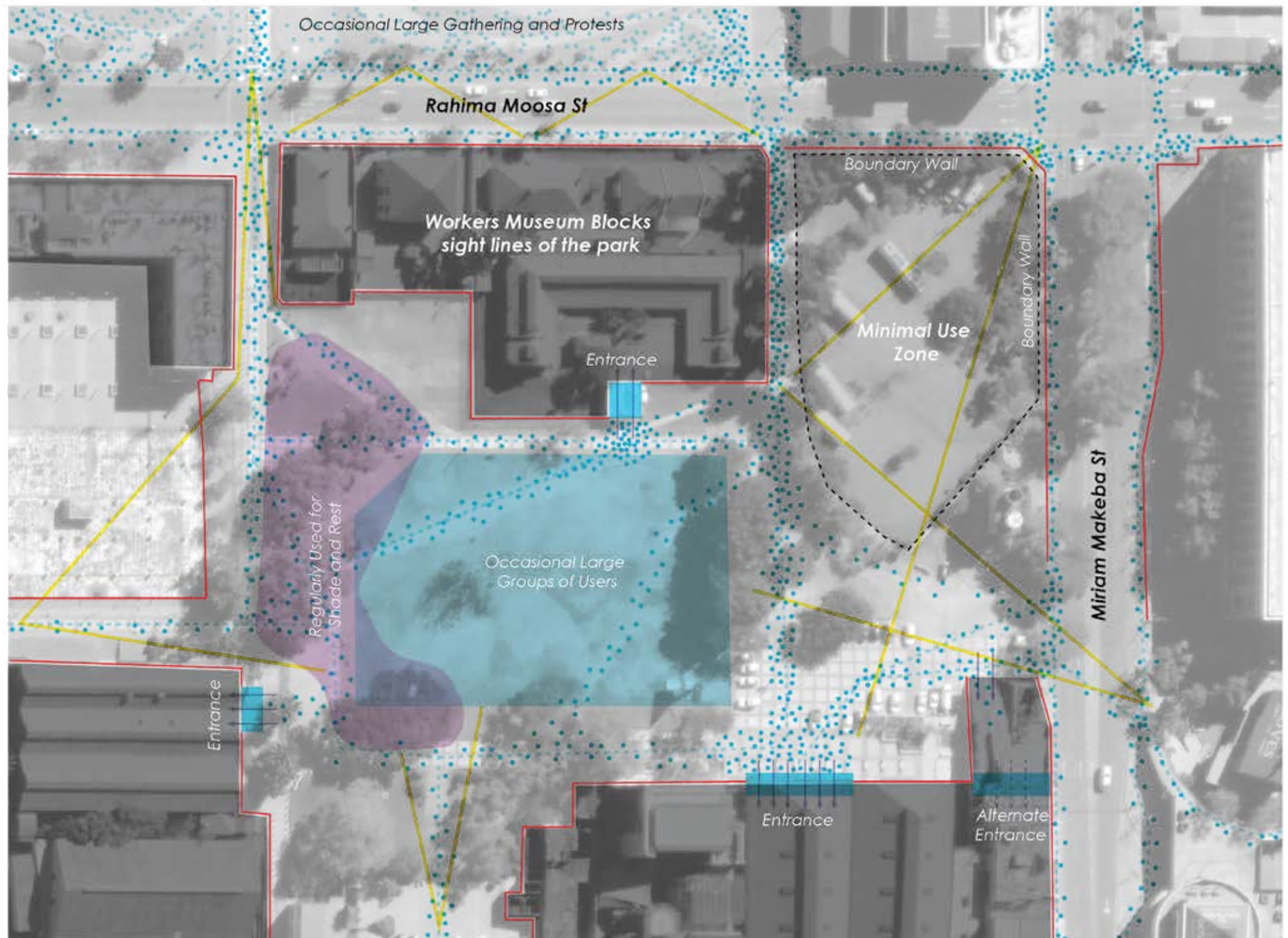
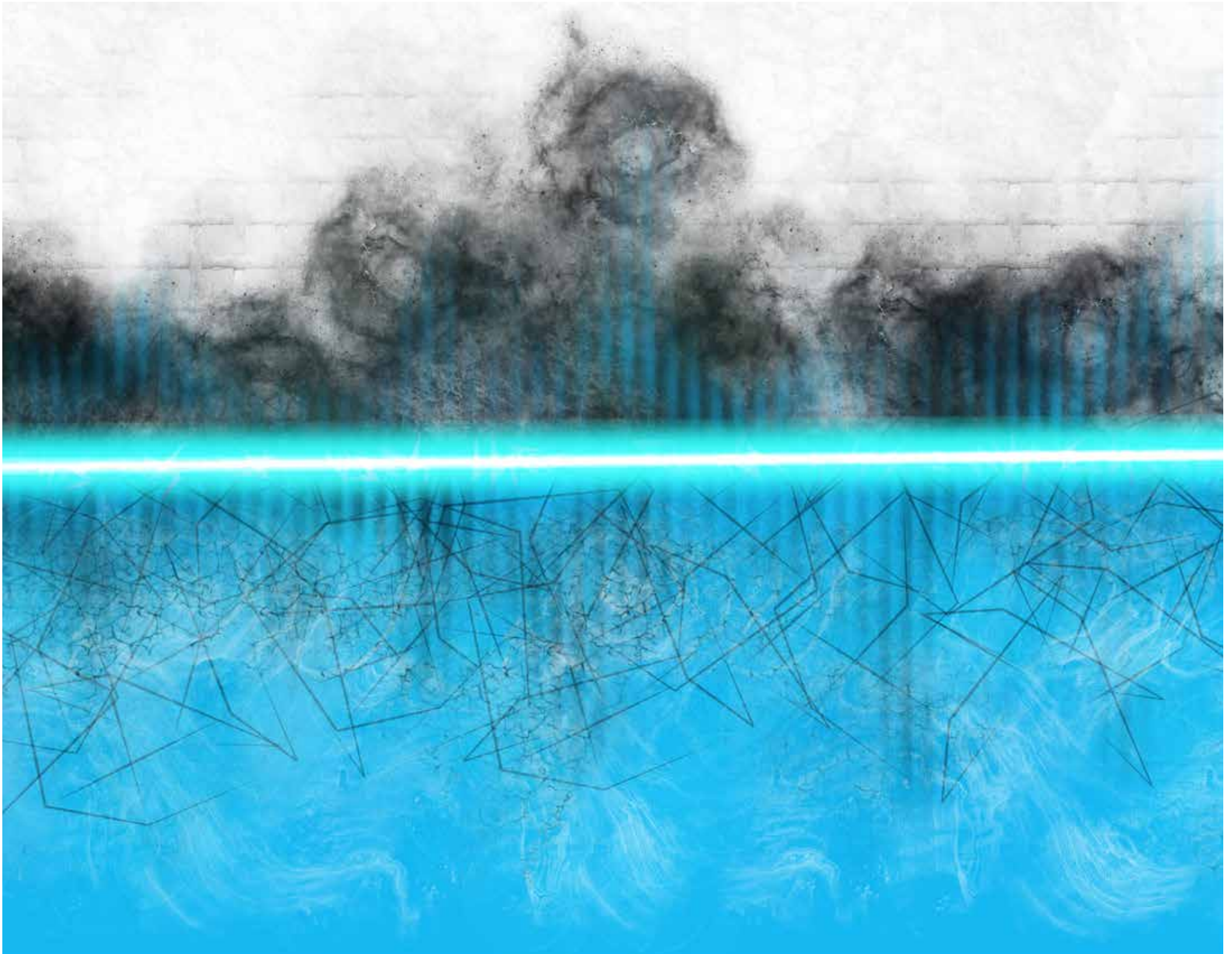


Figure 4.24 Site Inspection Observations - Authors Diagram

Figure 4.24 represents observations made during site visits throughout the year. Newtown park is fairly hidden from the public with few sight-lines where users can clearly see the park. The Worker Museum has hard boundaries surrounding it and blocks views of the park from Rahima Moosa St and Mary Fitzgerald square, with the two main desire lines for access to the park flanking the museum on the east and west. These desire lines are reinforced by the hard boundaries on the corner of Rahima Moosa St and Marium Makeba St and the commercial building locates to the west of the Workers Museum. The park sees various users and activities throughout the week with many users coming to the park to relax or nap during breaks and navigating throughout the city mainly during weekdays, with larger groups utilising the parking in the late afternoons and weekends for recreational activities. The Sci-Bono parking lot is hardly utilised by Sci-Bono due excessive parking design for the facility, as they have basement parking which is more secure for their visitors. The external parking lot is mainly utilised by school buses and tour groups with one or two buses potentially utilizing the lot, yet the lot can easily hold 20 buses. This space seems to be wasted as it is under utilised and forms a no man's land with adjacent busy streets that users navigate around.

CHAPTER 05

The Three Pilers



Education, Knowledge Transfer, and Skill Development Through the Exploration of the Virtual Realm

“Cognitive Affective Model of Immersive Learning (CAMIL) synthesizes existing immersive educational research to describe the process of learning in IVR (Immersive Virtual Reality).” (Makrasky and Petersen, 2021) Immersive virtual reality (IVR) learning is the utilisation of virtual reality systems and technology to create immersive environments within the virtual realm that aid in the ability for knowledge transfer to be more effective and efficient. IVR has been utilised in a variety of situations for educational purposes such as aiding in motor skill development, cognitive behaviour therapy, motivating learners when engaging with task to feel more effortless as well as decrease time need to effectively complete a task. These virtual environments facilitate knowledge transfer and skill development through the activities that have learning outcomes because of engagement with the virtual realm. *“presence and agency as the general psychological affordances of learning in IVR” (Makrasky and Petersen, 2021)* Presence and agency are seen as the two of the most important contributing factors for learning and the retention of information, the utilisation of virtual reality technological systems provides the users with both presence and agency.

“Presence can roughly be translated to a feeling of ‘being there’” (Makrasky and Petersen, 2021) Yet as seen in chapter 02 the human body and its sense allow us to perceive the space we inhabit and this in terms of virtual reality is considered as immersion “immersion can vary based on the number of senses that are activated by the technology and the quality of the hardware,” (Makrasky and Petersen, 2021). Users engaging with virtual reality can be immersed through a variety of systems. Some are physical and relate to sense like taste and smell which have yet to be integrated within the virtual and can only be facilitated within the physical realm, with others being virtual such as sight, hearing and touch which can all be facilitated within the virtual by engaging with hardware in the physical realm that emulates engagements and interactions within the virtual.

“sense of agency (here referred to as agency) can be described as a feeling of generating and controlling actions. The most important predictor of agency in virtual environments is that users have control over their actions and are able to exert that control over parameters in the environment (Johnson-Glenberg 2019).” (Makrasky and Petersen, 2021) Users who engage with the virtual realm are met with a variety of activities that they can choose to engage with, this being the first point of agency provided for them. The various activities that the users can select from can have varied amounts of control given to the users, with some giving the users full control of their movement, actions and can manipulate their environment and other giving less control over the users actions. This is a result of the virtual world being designed by people for specific outcomes and not all of these intended outcomes require the users to have full control of their actions and environment.

Education, Knowledge Transfer, and Skill Development Through the Exploration of the Virtual Realm

There are six key factors to consider when utilising IVR with the intent of knowledge transfer and skill development, to achieve a high level of immersion and retention of information. These factors are:

- **Situational Interest** - Interest is a psychological construct that represents a relationship between an individual and a specific topic or content area and is characterized by both affective and cognitive factors (Krapp 1999).
- **Intrinsic Motivation** - Intrinsic motivation refers to engaging in an activity for the built-in satisfaction associated with the activity itself, rather than for some separate consequence (Deci and Ryan 2000).
- **Embodiment** - The term embodiment can be used to describe the sensations that arise as part of “being inside, having, and controlling a body” (Kiltner et al. 2012, p. 375). Embodiment is a central part of embodied cognition, which suggests that the way we think and make sense of the world depends on our sensorimotor system and bodily interactions with the environment (Wilson 2002).
- **Cognitive load** - Is posited to be caused by the cognitive demands involved in the learning task, and it is a multifaceted construct consisting of intrinsic and extraneous load (Kalyuga 2011; Sweller 2010).
- **Self-regulation** - Is defined as “the ability to manage one’s behavior, so as to withstand impulses, maintain focus, and undertake tasks, even if there are other more enticing alternatives available” (Boyd et al. 2005, p. 3).
- **Transfer** - Transfer of learning refers to situations where learning that has taken place in one context impacts performance in another context, and is considered a key educational concept and goal (Perkins and Salomon 1992).

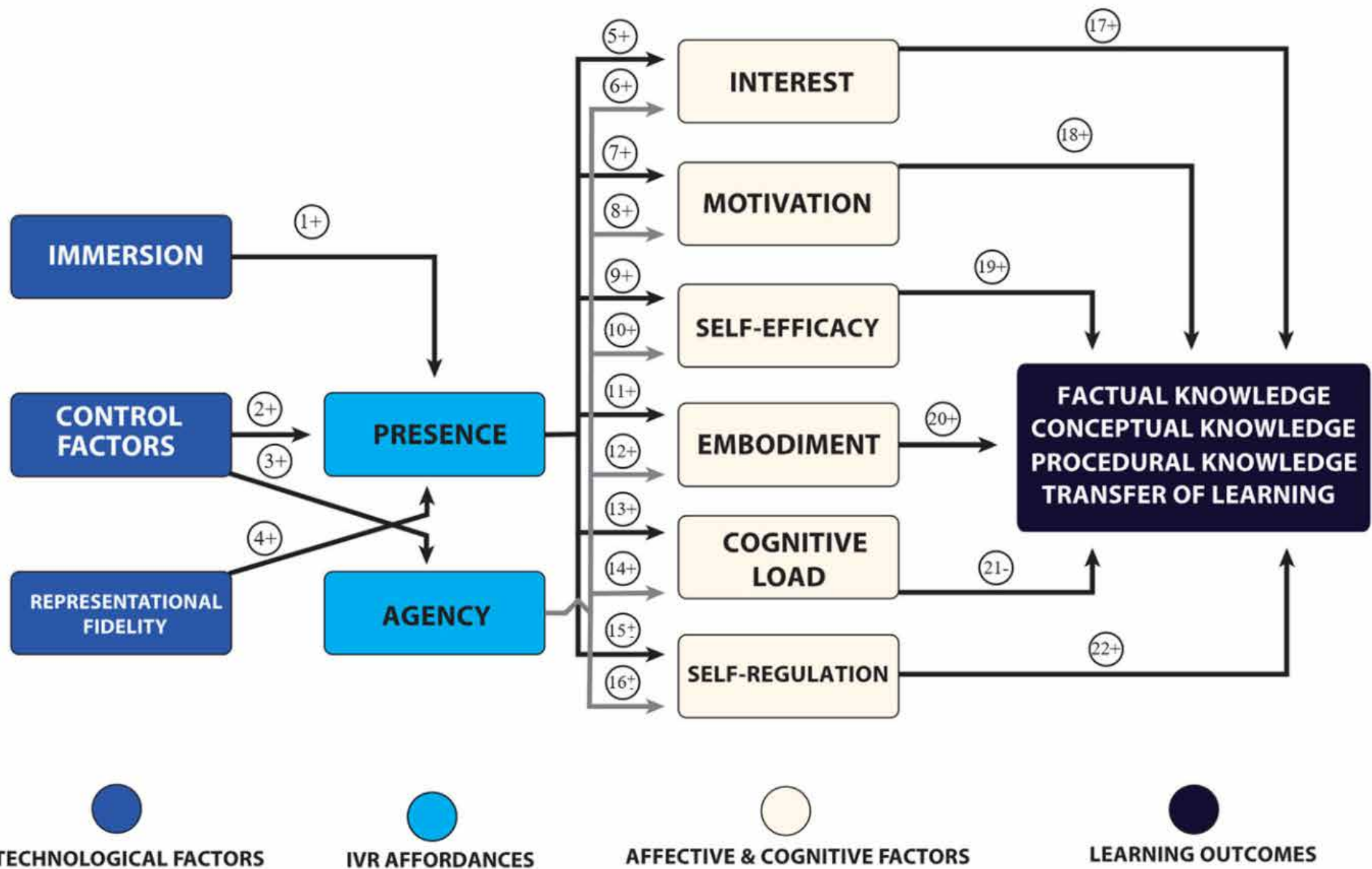


Figure 5.1 CAMIL Overview - (Makransky and Petersen, 2021)

Historical Narratives, Representations and Archive

"The 3D reconstruction of historic buildings and cities offers an opportunity to experience the history of relevant objects and their development over the centuries. - allow for a more natural view of history as well as showing information that is not possible in a real world setting." (Deggim et al., 2017). With the advancement of 3D modelling and scanning technological systems the ability to accurately recreate physical spaces within the virtual realms has become a relatively easy task that can be completed with the utilisation of a variety of hardware and software systems. With the capability to 3D scan real world places and environment that can be transitioned into a digital twin for users to engage with in the virtual realm and serve as a digital archive. This digital archive can be unprecedented as it serves as a way of preserving and engaging with our human history *"virtual museums or in general interactive programs presenting 3D data, game engines offer many necessary concepts with much functionality so that users can interact with the virtual environment."* (Deggim et al., 2017) This ability to forever archive and store this space virtual will allow future generations to view and experience the world as it is during our current period of 2023, also allowing future generations to study our physical world in a far more accurate way. This however is not the only implementation of these systems as we can now recreate historically accurate spaces and engage only possible through the virtual realm or exact physical recreations. However the virtual provides temporality, with users being able to engage and transition between one space to another without bounds of costs and physical restraints. These digital twins tied with the utilisation of VR systems and technology allows for a unique engagement and immersion within the represented historical narratives the users are exploring. *"Cultural heritage monuments or historic environments are ideally suited both for thorough multi-dimensional geometric documentation and for realistic interactive visualisation in immersive VR applications."* (Deggim et al., 2017) along the lines of recreating these spaces we can change the way they are represented and what narratives they tell. This allows for marginalised groups and non-western perception of history, spatial understanding, and belief systems to be represented in ways that could never be achieved before. These new forms of representation are made possible by utilising both 3D modelling as well as 3D scanning with a creative blend to allow for the ideologies and beliefs to be perceived through the eyes of whose beliefs are being portrayed. Virtual reality could be the perfect platform for these spaces and experiences to be engaged with globally by various communities.

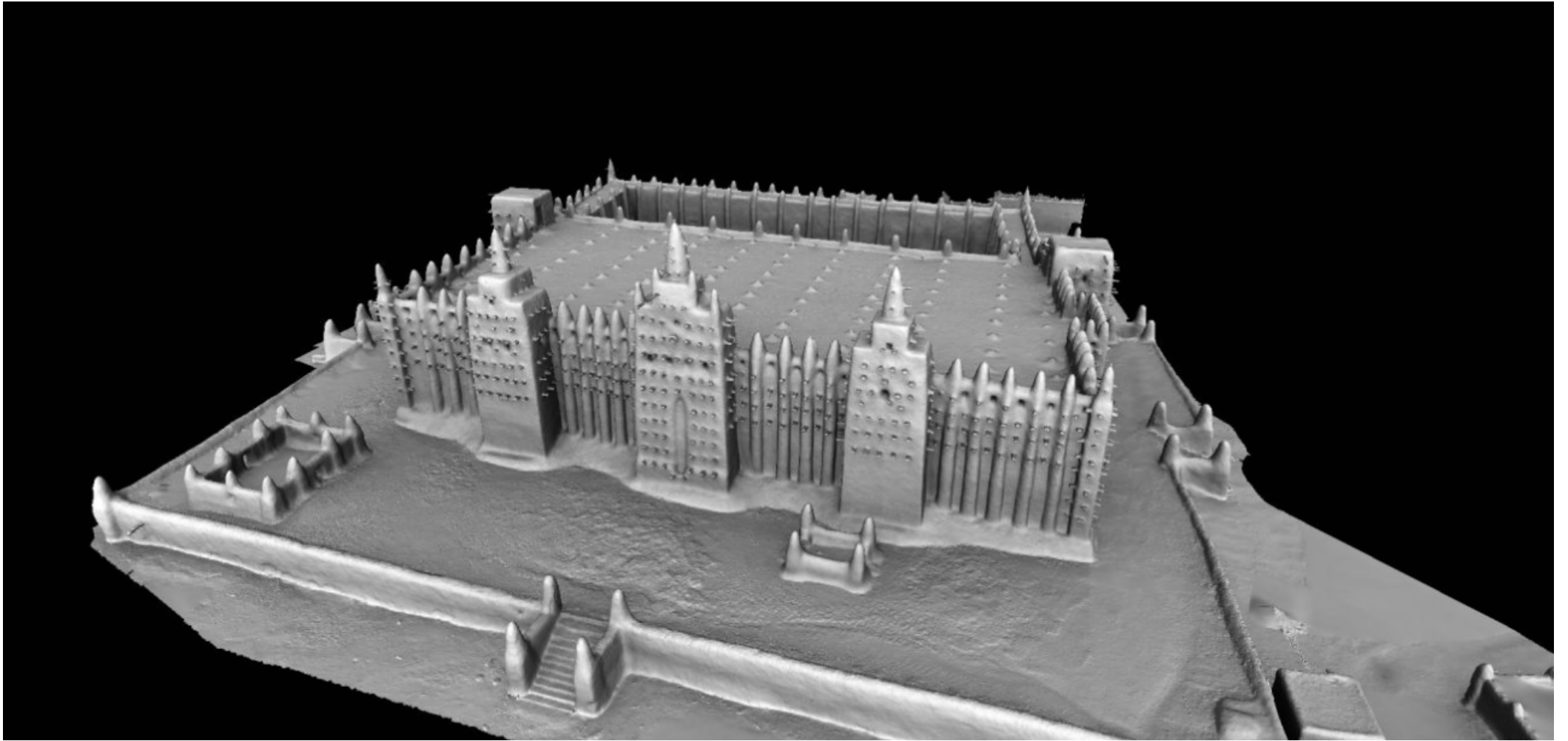


Figure 5.2 Digital Twin of Djenné Mosque - (Giles, 2018)



Figure 5.3 Digital Twin of the Notre-Dame - (Baptiste Veyrieras, 2019)



Figure 5.4 Digital Twin of the Titanic - (Rubin, 2023)

Recreation Through Exploration of the Virtual Realm

The potential for exploring within the virtual realm due to the capabilities to create endless possibilities, realities, and redefining how we perceive and engage with space allows users to explore worlds they have never imagined before as well as explore and engage with the physical world that they may have never been able to see in the physical realm. This form of exploration I believe has not been felt by a human since man has stepped on the moon, human engagement with spaces outside of our reach has not been nearly as accessible as it can be through the use of VR. Utilizing a mixed medium of the six realities to present these possible worlds and scenarios should be the key intention of the reactionary components that are comprised within the virtual reality centre, whilst encouraging social engagement and community building. Due to the heavy influence of gaming on the virtual reality industry and as seen through the CAMIL analysis gaming / the gamification of these immersive spaces will allow for more presence and agency felt by the users allowing for an enhanced experience of the represented virtual realm they are engaging with (Makransky and Petersen, 2021). It is important to note that the educational and historical components of the virtual reality centre can provide recreational activities within them, yet this is not their primary role. Exploring and utilizing the recreational component of the centre should serve as inspiration to explore the physical realm as the phenomenology experience of the physical cannot be match within the virtual.



Figure 5.5 Omni Areana - (2019)

Recreation Through Exploration of the Virtual Realm



Figure 5.6 VR eSports: a look into the future of competitive gaming (Sparshy, 2023)



Figure 5.7 Avatar Meeting and Seminar - (Laufik, 2020)

Recreation Through Exploration of the Virtual Realm

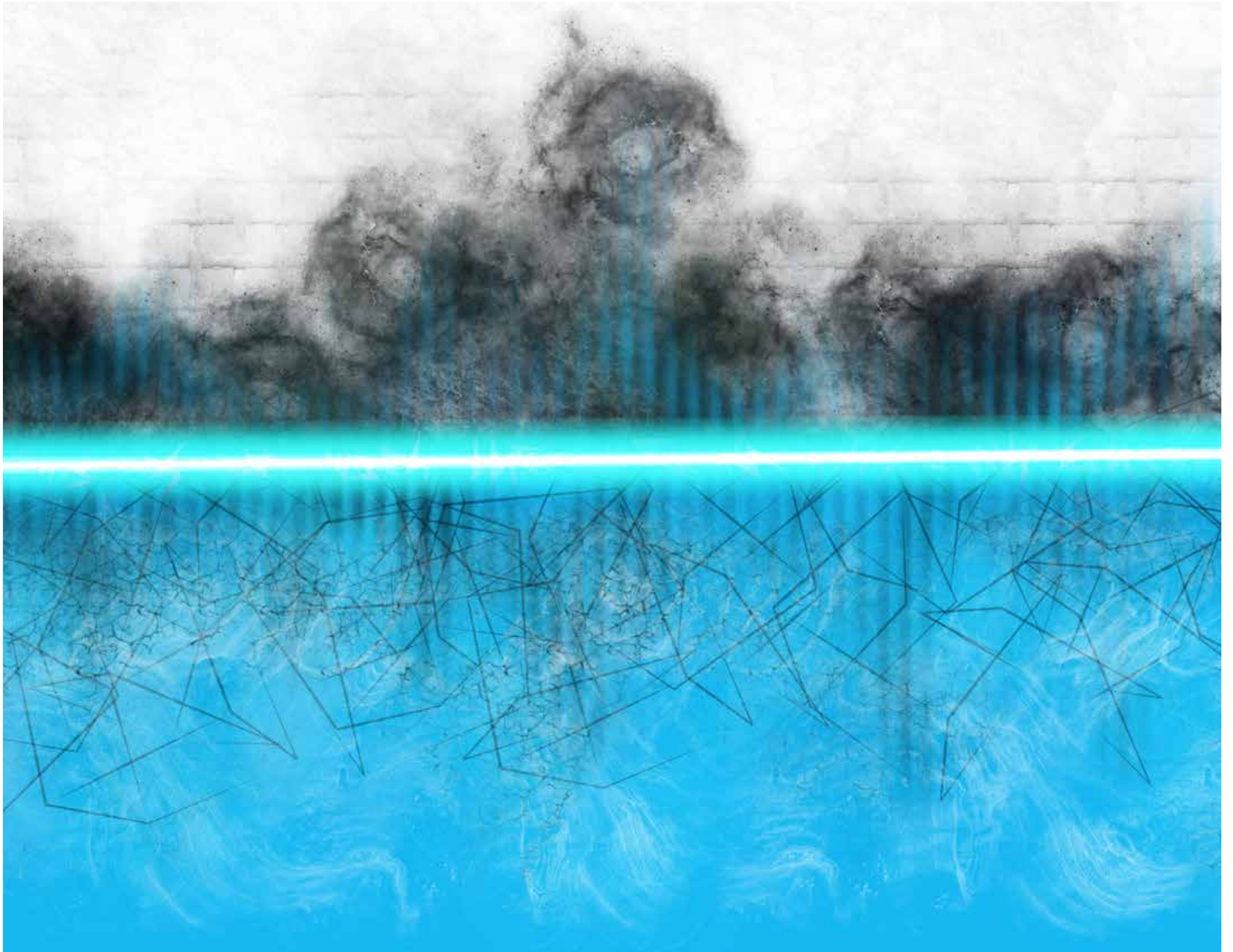


Figure 5.8 Data Science vs Big Data - (Monnappa, 2023)

“fuses virtual reality and non-invasive body area sensor networks (BSNs) to quantify human experience in architectural spaces. Using a set of biometric sensors, several physiological metrics such as skin conductance, brain activity, and heart rate were captured and examined while subjects were navigating and performing tasks in virtual environments (VEs). The integrated platform has been used to quantify the sense of stress and anxiety - configured by varying the related set of architectural design features.”(Ergan et al., 2019) With the ability for the data generated from the users who engage with the virtual realm to be collected, studied and then utilized in the research and development with various industries. It is critical to use the opportunity to collect data with the intended virtual reality centre to inform further development of the facilities, exhibits and experience when engaging with the building in the future. This data can be utilized for research purposes such as how humans experience space as well as the utilized in the further development of the systems and technology that makes virtual reality possible, allowing for enhanced development within the virtual realm and the way we engage with it.

CHAPTER 06

Brief, Program and Precedents



Brief

“First life, then space, then buildings – the other way around never works” Jan Gehl

Based on the theoretical investigations and studies undertaken within this thesis document, the intended interventions are an amalgamation of the various technological, spatial, experiential, immersive and pragmatic elements that create the physical real and space in which users integrate and engage with to transition between the veil and explore the possibilities available within the virtual realm. With the users' experience and journey through the various thresholds being tailored to the narrative being presented. As users explore and engage with the facility, they will slowly start to feel more comfortable with engaging with these new technologies and utilising these systems and technology will become more intuitive. This leads to the users adapting and learning to engage more with VR and feel more comfortable utilising these systems and technology.

The physical and sculptural qualities of the spaces created both internally and externally play with the users' experience and expectation of space within the physical realm. The materiality of these spaces and the emotions evoked within them have been designed for the narratives being presented within the space both virtual and physical. With the threshold between spaces being key point within the users' journey through the building.

The users who engage with the intervention and facilities will find themselves exploring topics which both relate to them as an individual as well as what is seen in the surrounding context. Whilst exploring these topics through the latest technological systems available which all enhance and improve the experience they are engaged with. Encouraging them to return to the facility and engage with these systems as well as exploring the potential use and integration of them within their daily lives.

The facility is situated within a context that has a strong supportive network that the facility can tap into, support as well as uplift and enrich through many different avenues. The contextual analysis is a strong driver for the program and the intended facilities that have been implemented within the intervention and supported by the Integration of VR technological systems.

Program Development

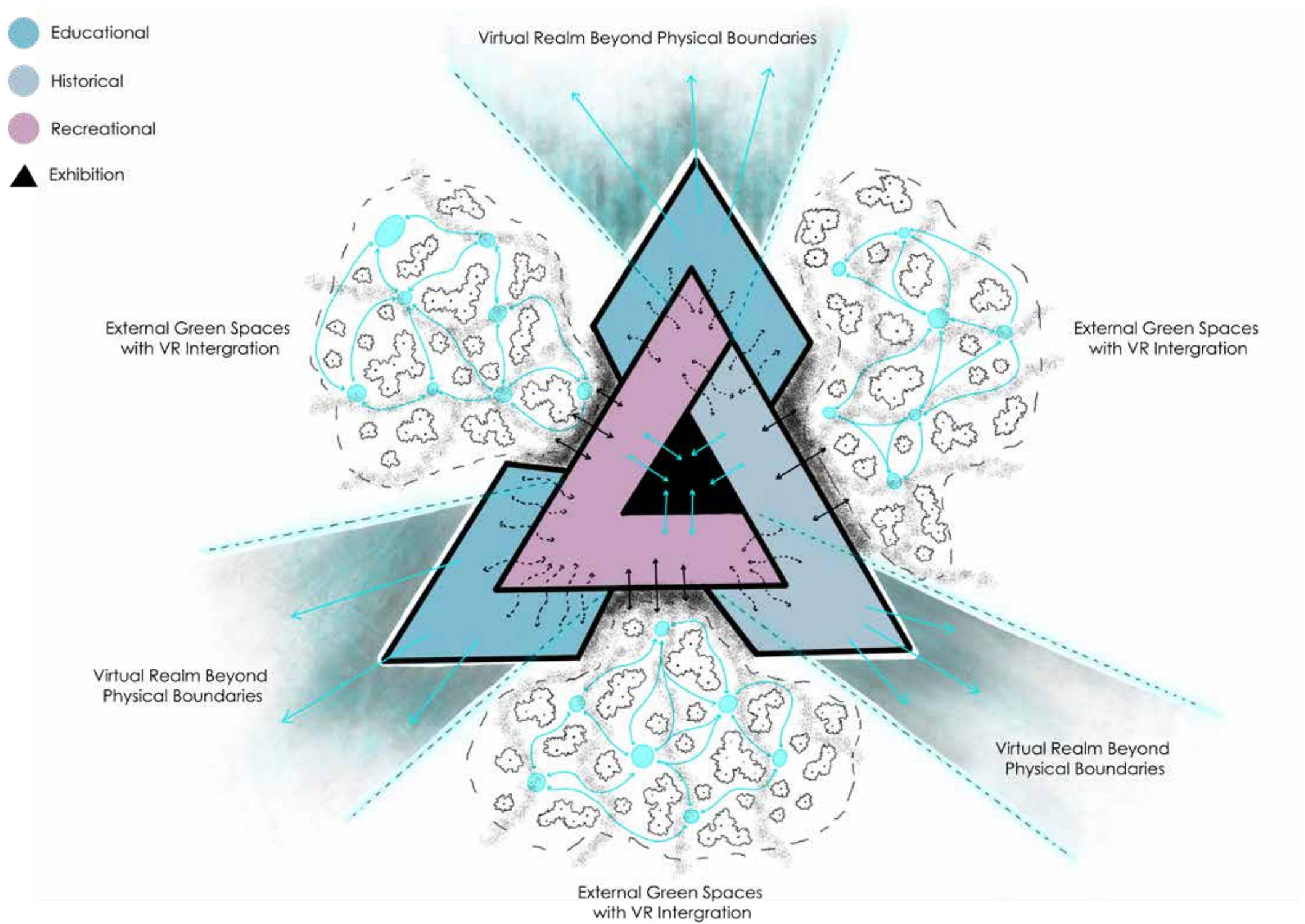


Figure 6.1 Program Diagram -Authors Drawing

Program Development

Figure 6.1 represents the interconnected relationships between the three core programs within the centre as well as their relation to the surrounding context it is embedded within. At the core of this centres programming lies an exhibition space that plays a vital role within the centre's engagement with its users. This space will exhibit works from all over the world and serve as an attractive feature to entice users to come to see the centre for the exhibit as well as utilise the VR facilities available. The works exhibited should relate to the systems and technology that is present within the centre and serve as further insight into the capabilities of technology as well as show the advancements within them being made within Africa and the rest of the world. Users will become more interwoven with VR systems and technology as they navigate from the extents of the site through the various programs of the centre making their way through to the exhibition spaces. This progressive addition of VR and the digital realm intends for the users to become more comfortable with the technology and insight engagement.

The exhibition space is flanked by the three core programs of the centre with the recreational programming playing a vital role in how users transition from one core program to another. This is due to users having more immersion and presences when engaging with recreation within the virtual realm. This high level of engagement provides an easy transition from one VR experience to another, allowing the users to navigate the centre and the various VR experiences available as they would prefer to. This allows for the recreation programming to have a large and more focused integration with the user's engagement as well as integrate users within other programmes within the centre.

The educational programming serves as the knowledge transfer focused point within the centre, with various spaces, systems, and tools to engage with and allow for knowledge to be transferred to the users. With various age groups and categories being presented. Due to the nature of the technology these facilities need to be adaptable to keep up to date and utilise the best available systems, tools, and technology. These virtual reality systems will utilise immersive education programs, technologies, and systems. Utilising the CAMIL system and VR experienced designed within the guidelines of the system allows for educational experiences to be created that cater to the needs of the educators and parents. Allowing for the centre to serve as a safe and effective facility to aid in knowledge transfer customised to the needs of the users. The educational role is also present within the historical programming of the centre as the user's engagement within the historical VR worlds they will learn further insight within the represented historical narratives being represented. This plays a vital role in how the historical VR worlds are engaged with and their future use within the centre's lifespan.

Program Development

The historical programming serves as a platform for indigenous African belief systems and representations to be explored and represented. The representations will indicate the ideologies in which indigenous Africans understand and perceive their known world. These spaces can be explored in virtual reality and allow for a unique perspective on the historical and theoretical understanding of these spaces. There will be physical artefacts presented throughout this wing, these can range from 3D printed and manufactured objects that explore the physical interpretation of the spaces perceived in VR to actual historical artefacts from South Africa's history. This duality of virtual and physical allows for the users to engage with certain artefacts from history physically whilst simultaneously accessing the virtual realm for the narratives that can not be expressed within the physical.

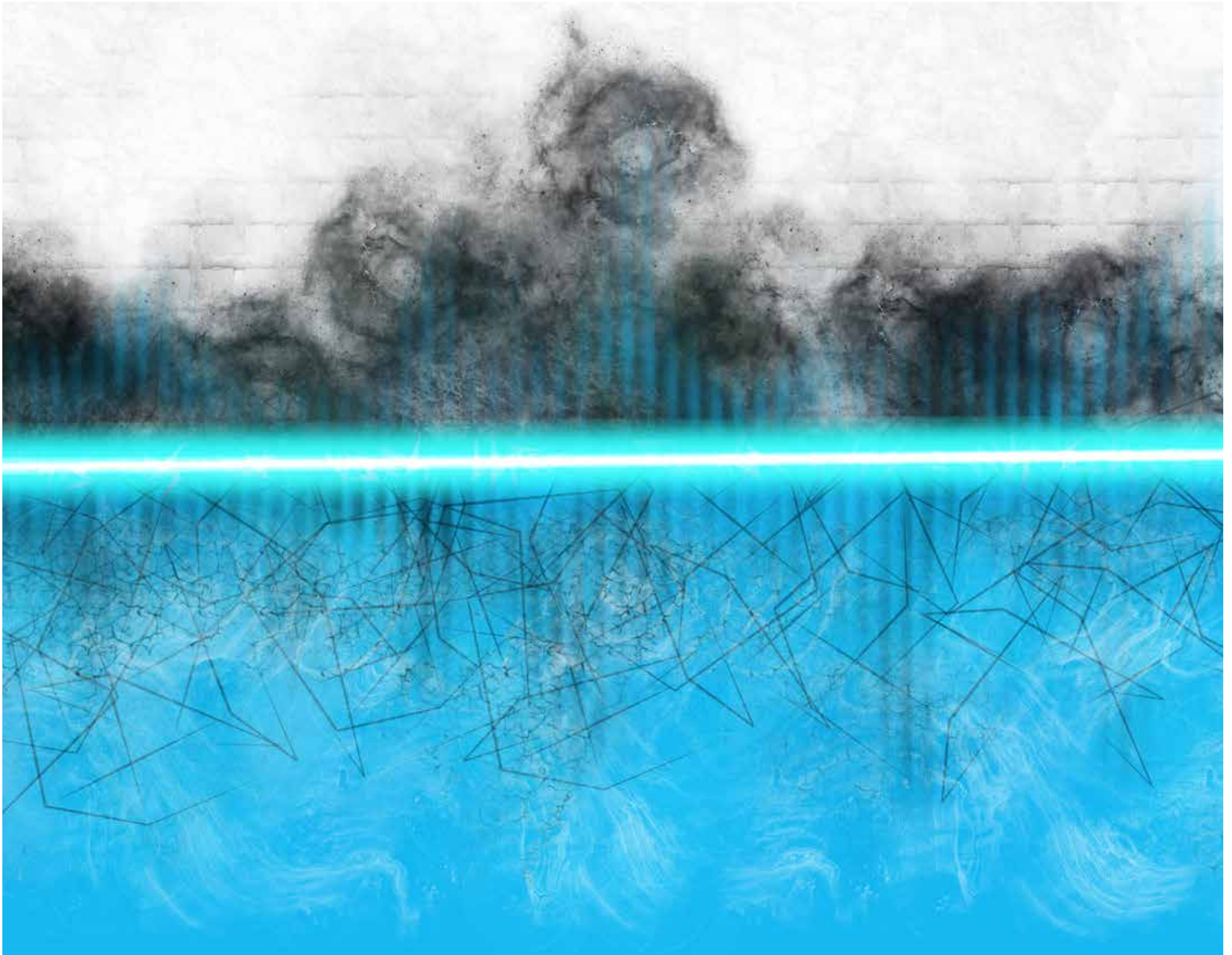
Newtown Park and its natural greenery serve as a key piece of infrastructure for the residents of the community and those who engage with Newtown daily. The centre utilises and enhances of the parks size and functionality as a key tool within their engagement with the centre as well as how the users engage and transition from the virtual to the physical. Utilising the natural spaces of the park with thresholds that integrate the natural elements within the centre. This integration will be utilised as a tool to ground users back in the physical realm after engaging with the virtual realm. This is necessary as some users can find the virtual realm quite disorientating and uncomfortable. Grounding takes places through the tactile elements utilised in the detailing of the architecture and space, the control on natural light wells and utilise of artificial lighting, natural elements that are calming and familiar, natural sounds and the utilisation of the human senses. Utilising a threshold of more natural spaces with very limited VR, AR, or MR systems being located on the peripherals of the site, with the more VR and digital focuses spaces being located within the centre. This threshold allows users to transition from the physical world that is familiar to the more digital and VR core as they navigate further within the centre. This allows for the centre to project its capabilities to the surrounding community and entice further engagement with the centre and the technology.

Site Area	12 235m²
Coverage	100% 12 235m²
F.A.R	2,00 24 470m²

Program				
Program	Amount	Area Per Unit	Total Area	
Administration and Services				
Reception Desk: For device hand out and general information	2	30	60	
Device Storage and cleaning: Secure storage for VR devices and sanitization	2	100	200	
Admin Office: utilised for general admin for building operation	1	100	100	
Managers Office: For management members to run the building operation	1	50	50	
Finance Office: For building finance management	1	50	50	
Admin Reception Office: Utilisd for Admin staff as well as Digital archive Reception	1	100	100	
Admin Reception Waiting Area	1	50	50	
Service and Plant Room: Houses all building operational systems and mechanical Systems	1	500	500	
Male Ablutions	2	100	200	
Female Ablutions	2	100	200	
Disabled Ablitions	4	25	100	
General Storage	2	50	100	
		Total Area m²	1710	
Research Development Unit				
Offices: Utilised by the development unit to design VR spaces and conduct research	1	400	400	
VR Testing Area: Space utilised for testing VR engagment and research development	1	200	200	
Meeting Rooms	2	90	180	
3D Scanning Room: Utilised for 3D scanning physical objects	1	100	100	
Motion Capture Room: For recording physical motions of objects and humans for VR trasion	1	100	100	
Staff Break Area and Kitchenette	1	80	80	
		Total Area m²	1060	
Virtual Reality Systems and Exhibits				
Enhanced VR Engagement Zone: VR with michanical aid for experience - Historical and Recreational	2	500	1000	
VR Pods - Single User: Built in VR stations	10	25	250	
VR Lounge and Café: Utilised for casual VR engagement	1	400	400	
Recreational VR Zone	1	1000	1000	
Educationall and Historical VR Zone	1	1500	1500	
Educational and Recreational VR Zone	1	1000	1000	
Historical Narratives Exhibit: Physical historical artifacts to be displayed	1	300	300	
External VR and AR Interventions	20	5	100	
		Total Area m²	5550	
Fabrication Unit				
3D Fabrication Lab: 3D printers, lasercutting, and CnC machines	1	300	300	
Workshop Space: Mechanical machinary and workspace	1	600	600	
Reception Area	1	30	30	
Managers Office	1	50	50	
Storage Space for Materials	1	150	150	
		Total Area m²	1130	
Security Control				
Security Stations - Public space	5	5	25	
Server Room	2	50	100	
Control Office	1	100	100	
Security Checkpoints Between Thresholds (Amount TBC)	0	5	0	
Private Ablutions / Change Room	1	20	20	
Private Kitechnette	1	5	5	
		Total Area m²	250	
Digital Archive and Archive				
Archive and engament Zone: Displays and engagement zone for archive	1	300	300	
Reading Room	1	300	300	
Single Unit Work Station	8	5	40	
Double Unit Work Station	8	15	120	
		Total Area m²	760	
Public Services and Facilities				
Restaurant	1	300	300	
Kitchen	1	250	250	
Kitchen Storage and Staff	1	80	80	
Exhibition Space	1	2500	2500	
Exhibition Space Storage	1	50	50	
4D Movie Theater	1	700	700	
Optical Illusions	2	1 000	2000	
Internal Naturally Planted Zones	3	1000	3000	
		Total Area m²	8880	
		Total Area m²	19340	

Precedent Studies

Architectural Precedents

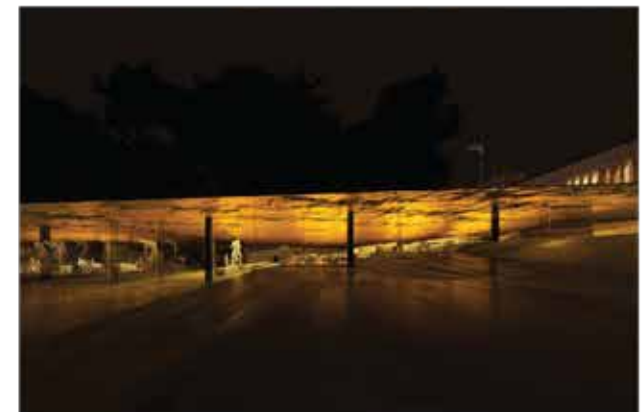


Architectural Precedents

National Archaeological Museum

kengo kuma & k-studio
Athens, Greece
Competition entry 2023

I have selected this competition entry by Kengo Kuma and K-Studio due to a couple key aspects that stood out to me within the design. The ceiling detail mimicking a natural rock face seems to fit perfectly within the context of the building and it's function, whilst it adds a unique spacial and tactile experience for the users. The building seemingly embeds itself within the surrounding land that ramps up the existing museum. This choice adds in the new addition being more discreet and serves a practical function for users to navigate between the existing and new addition. This ease of transition allows for users that utilise the street and side walk to feel part of the building and intense them to engage with it.



National Archaeological Museum additions Competition Entry
kengo kuma & k-studio, 2023.

Architectural Precedents



Figure 6.3 A gradient of light shows the way from outdoors through the subterranean obscurity - (Kafasis, 2023)

Materiality and Finishes

The tectonics explored within the buildings internal and external finishes creates a form that relates strongly to the natural space that flanks the building. The ceiling texture resembling a rock face that catches the light within the space, mimicking the feeling of an open fire within a cave. I believe this grounds the users within the space as well as links them to the artifacts presented within the spaces that relate to history and the archaeological process. The choice of utilising a very slick and dark rock tile as a floor finish provides a contrast to the rough ceiling and I believe this allows the users to feel the clinical process of preserving history, by drawing their attention to the artifacts being displayed and the tactile nature of archaeology.

Architectural Precedents



Figure 6.4 Night Time Atmosphere - (Kafasis, 2023)

Light

The choice of the buildings form and scale creates moments within that truly explore and express the natural of light and how the mood of a space is set with controlled lighting. Natural light has been used selectively with apertures in the roof being used to create an atmosphere within that space, whereas other internal spaces use artificial light with set light value and angles to achieve a specific representation of the artifacts and spaces that the light hits. The utilisation of the control of light is utilising out sense our sight and the way we perceive depth and our spatial relation to our surroundings. This aids in the narratives being represented by the space with strong ties to excavation, subterranean exploration and the preservation of history.

Architectural Precedents



Figure 6.5 The Slit - (Kafasis, 2023)

Scale

The users that engage with the building can experience a number of spatial relations as the volume of the spaces changes as the users navigate through the building. In this case I have selected an experience where the building is lowered from the public street level with a relatively cramped head space as the user enters. This space allows the users to feel the tectonics of the space and get a closer view of them and how they catch light on their surfaces as well as experience the 'opening' of the space as they descend down the steps which act as a threshold from the street level to the building's internal spaces. This threshold serves as a way to disconnect the users from the busy street to spatial experience of the exhibit and the architecture that it houses within. The utilisation of carefully designed thresholds will allow for users' experiences to be transitioned from one space to another through a guided process.

Architectural Precedents

Zeitz Museum of Contemporary Art Africa

Heatherwick Studio
Cape Town, South Africa
2017

I selected the Zeitz Museum as a precedent because it utilises an adaptive reuse model that transformed an existing industrial building into a sculptural architectural space that users can engage with. The choice of selective carving away from what was existing space allowed the designers to explore and express the buildings sculptural qualities it now has. Users engage with various spaces at different volumes and scale with designed thresholds to transition between that allows the users to navigate the building through a personal journey that they create as they choose to explore the sculptural spaces.



Zeitz Museum of Contemporary Art Africa
Iwan Baan, 2017.

Architectural Precedents



Figure 6.6 Sculpted Volume - (Baan, 2017)

Carving

The architects have intentionally approached the refurbishment of the existing structure by carving away at it. This carving approach has allowed for spaces to be designed with the narrative of the users and their experience in mind. This technique allows for thresholds between one space and another. Designing the negative space by carving away at the building in this case can transition directly to the subterranean concept that can be utilised with the design process of my facility. Carving allows for exploration of light as well as the tectonics of a space, which support my design drivers. By exploring the carving process the spaces created can be quite dynamic and utilise various techniques to enhance the experience for users who explore the spaces.

Architectural Precedents



Figure 6.7 Sculpting Space - (Baan, 2017)

Sculpture

The carving approach has allowed for the architects to design sculptural spaces that play with light, scale and volume. This sculpting of space is based on the existing structure and the intended journey that users will experience during their navigation of the space. The sculptural spaces created through this carving serve as further inspiration for the spatial relations and form making that can be created within the spaces I design. As the users engage and explore the sculptural spaces they are presented with various materials, light, and scale as they navigate through these spaces. This creates a unique journey created by the user's choice of exploration and navigation of the building and its facilities.

Architectural Precedents



Figure 6.8 Sculpting Thresholds - (Baan, 2017)

Thresholds

The design and intention of the thresholds created within the building have carefully been considered for the intent from one space to the next. In the case represented above we see a very tight and compact corridor that is dark and utilises artificial light, lead to large sculptural atrium that is flooded with natural light. Human senses allow users to experience these thresholds and be influenced by them. Attributes such as light, scale, temperature, and materiality has been explored with testing of the thresholds attributes. These thresholds allows for the users to navigate between spaces and experience the change between one space to another. This creates a more experiential transition from sculptural spaces to non-sculptural spaces.

Architectural Precedents

Jewish Museum Additions

Studio Libeskind
Berlin, Germany
1999

The narrative of the journey a user experiences through the navigation and exploration this addition is a core design driver for the spaces created throughout my facility. The Jewish struggle story being expressed through the formation of the architecture and the intended journey a users will explore when engaging with the museum. The sculptural, light, and material qualities of the spaces created provide inspiration for space design and how to evoke emotions when exploring space.



AD Classics: Jewish Museum
Denis Esakov, 1999.

Architectural Precedents



Figure 6.9 Experience and Journey - (Esakov, 1999)

Journey - Exploration

The Journey a users experiences when navigating through the building plays a vital role in the design of the addition. It is seen as a design driver that is utilised throughout my design process as a tool to inform decisions throughout the building. This consideration informs all aspects of the building from the selection of materials, the design and scale of a space, the thresholds between spaces, and the historical narratives expressions and interpretation. The journey a user takes when engage with the building must be seen as a design tool to guide the users through an intended narrative. This narrative engages the users with the spaces and content presented by the building. The stronger the design of the journey the user takes the stronger connection they have with the narrative presented.

The Jewish Museum additions provide the prefect insight into the narrative of the journey, as the architectural spaces, thresholds, and the way users navigate through the spaces. The tight corridors and spaces created throughout the building utilises unique spacial, material and lighting qualities to tie the space to the narrative being exhibited. This reinforces the unique narratives and feel from one space to another.

Architectural Precedents



Figure 6.10 Light -Wells - (Esakov, 1999)

Light

The designers have utilised natural light sources to aid in the experience of the journey a users experiences when navigating through the building. The quality of light allows in addition too the form, scale, and materiality of the space to be created in a specific way for the point within the narrative journey that part of the building is situated, allowing for scripted journey and experience of the building being engaged with. *The play of light utilised within the building links to the narrative journey presented and utilises the play on light both in threshold design as well as the design of sculptural volumetric spaces.*

Architectural Precedents



Figure 6.11 External Experience - (Esakov, 1999)

Materiality and Finishes

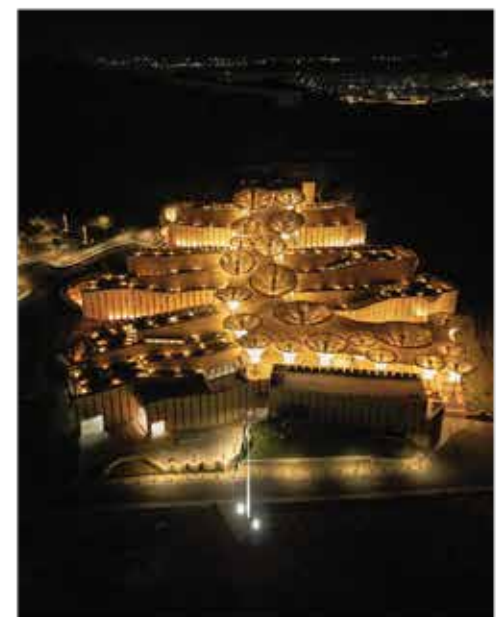
The choice of a monotone colour pallet and a selection of cold materials evokes a natural experience that allows the users to engage with the narrative of the Jewish struggle and allow them to imagine the atrocities experienced by the Jewish people. Utilising the senses in conjunction with carefully considered architectural design choices. By playing with the material used within portions of the building the designers have the ability to shape and control how users feel in selected spaces throughout the building. The choices in material allow for thresholds and sculptural volumetric spaces to be easily understood by the selection of materials and are made in conjunction with the journey, narrative, volumetric design, and control of light.

Architectural Precedents

Smritivan Earthquake Memorial Museum

Vastushilpa Sangath
Bhuj, Gujarat, India
2023

With the conceptualisations of the veil between realities and the ground plane being explored and expressed, this precedent has been selected as inspiration for how the building is situated and interrogated on site. With natural landscapes and materials being integrated and expressed throughout the building. The selection of natural materials and the integration of natural systems and landscapes informed aspects such as the program layout, utilisation of mechanical system, users journey, indoor and outdoor transitions. The users Navigate through a central spine which is flanked by the surrounding programs. The spine serves as a sheltered space that allows users to engage with the natural elements. It ties the users to a journey that guides the users from the lowest part of the site to the highest which is where the main memorial is located.



Smritivan Earthquake Memorial Museum
Vinay Panjwani, Sohaib Ilyas, 2023.

Architectural Precedents



Figure 6.12 Blending into the landscape - (Panjwani, Ilyas, 2023)

Journey - Exploration

The building utilises a central spine for users to easily navigate between the exhibits that flank it. The spine serves as an open air covered promenade that functions and the core circulation route for users to navigate throughout the building and exhibits. With the covered canopy sitting above the enclosed buildings, it allows for light and fresh air to penetrate deep within the building and provides a threshold transition from an enclosed controlled light exhibits to an open and more volumetric spaces. This internal external journey that is expressed by the building ties into the narrative being represented by the exhibits as the building mimics the spacial qualities of the crumbling earth during an earthquake.

Architectural Precedents



Figure 6.13 External Circulation - (Panjwani, Ilyas, 2023)

Thresholds and Spatial Experience

As mentioned before the transition from internal exhibits and external movement routes serves a key role in the narrative and experience of the building. These thresholds serve as design choices that allow the architect to plan and carefully design how a user transitions from one space to the next, utilising a design tool kit of techniques to create each of the thresholds as unique experiences as well as maintain cohesion between all of them throughout the building. The main tool utilised for cohesion throughout these thresholds is that the spaces which house the exhibit will always lead to an open external spaces which has a higher volume than the exhibit spaces. The spine is covered due to the volume of circulation it sees, whereas areas that are secondary lead to uncovered external walkways.

Architectural Precedents



Figure 6.14 Life at Night - (Panjwani, Ilyas, 2023)

Light and Materiality

The building utilises the main and secondary circulation routes as light-wells that serve as a way for users to easily navigate throughout the complex. Whilst utilising carefully considered light-wells and apertures within the spaces which house the exhibits, to ensure that they are experienced by the users in the most optimal way. The building utilises the design choice for natural daylight as a key way for the building to be expressed and engaged with at night. Enticing users to engage with the night activities provided by the museum. The materiality choice, finishes and colour scheme are all carefully considered to enhance the users experience and the narratives represented. With green roofs and natural stone cladding allowing the building to blend in with the surrounding rocky context, which also provide benefits for passive design strategies utilised throughout the design.

Architectural Precedents

Design and Virtual Reality Educational Complex

Olll architecten
Valenciennes, France
2013

This design and virtual reality complex focuses of educational development and the integration between students and the professionals within the industry occupy the same spaces and leads to engagement between the two. This combination and integration of technology provides inspiration from a programing and functionality aspect as well as provide incites on potential problems, areas to be improved on, as well as indicate what systems a building of this natural may utilise. The Technology utilised within this building is similar yet not exactly what will be utilised within my building, therefor the implementation of how systems and spaces are combined has been analysed to inform design decision.



Design and Virtual Reality Educational Complex
Olll architecten, 2013.

Figure 6.15 Learning and Operating - (Olll Architecten, 2011)

Design Drivers

Light - The exploration and expression of light plays a vital role within this design. The colour of light, natural or artificial, the movement and adaptation of light, control of the light source and its intensity, and how light supports the users' journey through the spaces presented narrative.

Landscape & Natural Elements - The integration of vegetation and natural elements throughout the design both internal and external acts as one form of grounding the users within the physical realm as well as supporting passive design systems and support green building design and practices which incorporate vegetation and natural elements. This aids in increasing the amount of greenery within the inner city as well as increasing the amount of water absorbed on site. This reduces the load on public Infrastructure.

Materials - The tactile nature of the materials and the general tectonics of the space has a strong influence on the experience users have when exploring and navigating through the building. This is another way in which users are grounded within the physical realm and allows them to feel the tactile nature of the surfaces around them. This is a change from the potential virtual surfaces and spaces they could engage with yet not feel.

Sculpture & Scale - The way a user's is located within a space plays a vital role in how they perceive the space and experience it. With the volume, light, structure, materiality, and other elements all contributing to the experience of the space. This relates to both sculptural volumes as well as spaces that are sculptural. The more emotions a space can evoke within a user as they navigate the space the more immersed and invested, they are along their navigation of the journey.

Threshold - The Transition between one space to another provides the perfect opportunity for design intervention and the formation of this transition being detailed to express the intended narrative for that transition. These spaces can be dynamic and have many variations, with these variations being designed to directly cater towards the needs of the space and the narrative they are presenting. Some of these spaces can be adaptable and change as users navigate through them or as they engage with the threshold.

Journey / Narrative - The journey that a user starts and ends when engaging with the site and building interface is a key point for architects to design and sculpt to best describe the intention for a space and program. The building will have many points along a user's journey that influence the overall experience they have. These points can be design and form as a script that guides the users through the spaces and allows them to experience the spaces as intended.

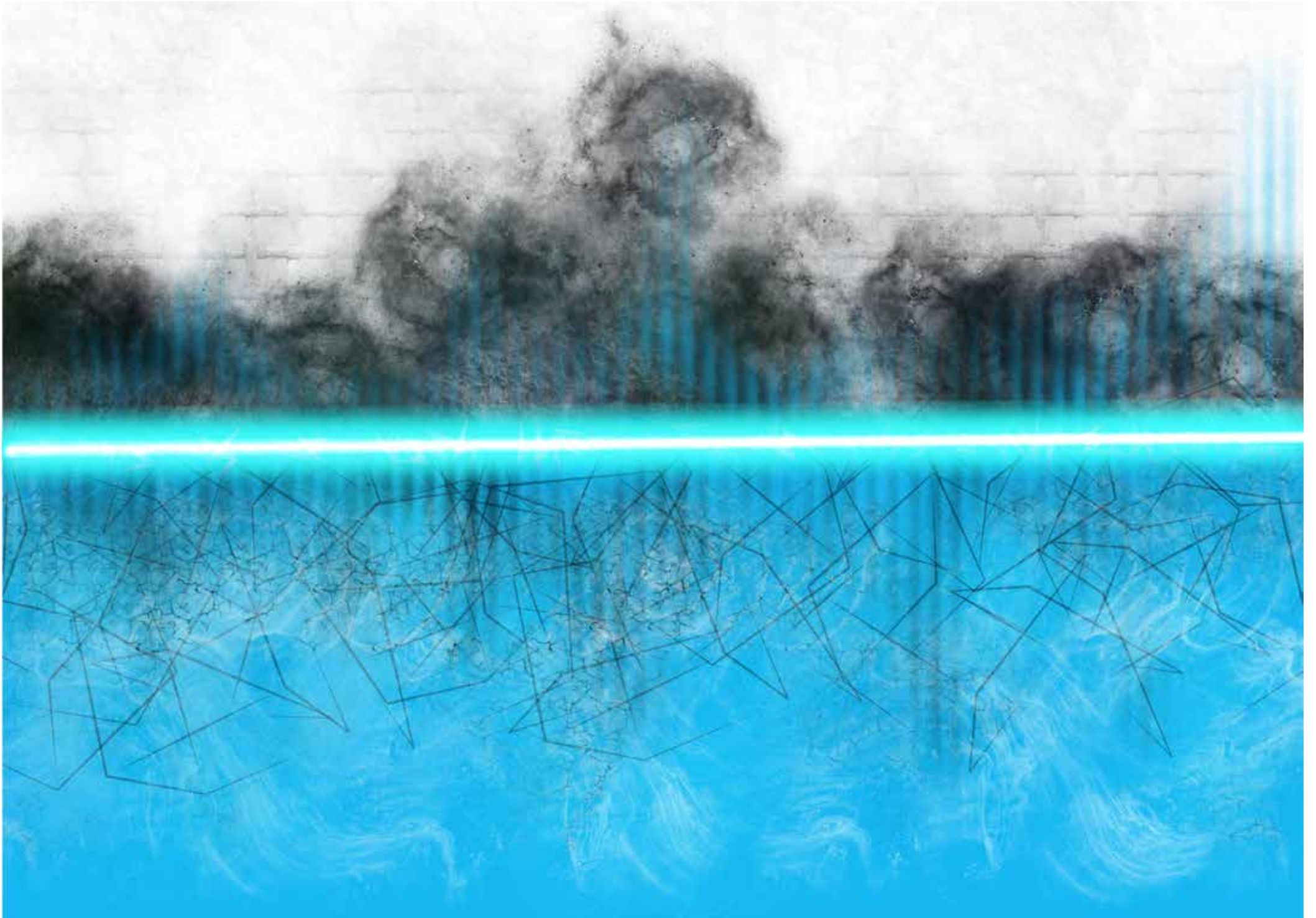
Virtual Reality and Digital Overlays - This is a clear design driver as it is the main pillar on which this thesis is based on. The physical spaces that house the VR engagements need to enhance the users experience and engagement within the virtual realm, these spaces need to be adaptable and dynamic. Another key aspect within the spaces is how users experience these spaces before and after engaging within the virtual realm. This links strongly to the phenomenology experience of the physical spaces.

Chapter 07 Design Development

Design Charrette

Ground Plane - The Thin veil between realities

Exploring the ground plane in which we navigate the physical boundaries of our realities, as a thin veil that acts as the threshold between the physical and virtual realms. What lies below the threshold between realities is uncapped potential for imagination, inspiration and hope. The ability to explore worlds, places and spaces that could only before be engaged with in our dreams yet unlike the fading dreams the virtual realm has only begun to grow and is only limited by the imagination of the users who explore this new frontier and rupture through the threshold between realities.



Ground Plane

Exploring the qualities of the ground plane

The ground plane is seen as a thin malleable threshold between the physical and virtual realm. The users that intend to explore this new frontier will slip between the realities as the explore the threshold, with the transition between the realms being a blurred amalgamation of their experiences and engagements.

Paper provided a perfect medium to explore the ground plane as a thin threshold that is easily manipulated, cut, folded, split and rolled. The explorations represented below intended to mimic the ground plane that could be found within the physical realm. Crumpled paper mimicking natural landscapes, resembling mountain ranges or hilly outcrops. Folded paper mimicking the geometric organised landscapes of a urban environment, resembling a circuit board and its components.



Exploration 1 - Folded Paper



Exploration 2 - Lightly Crumpled Paper

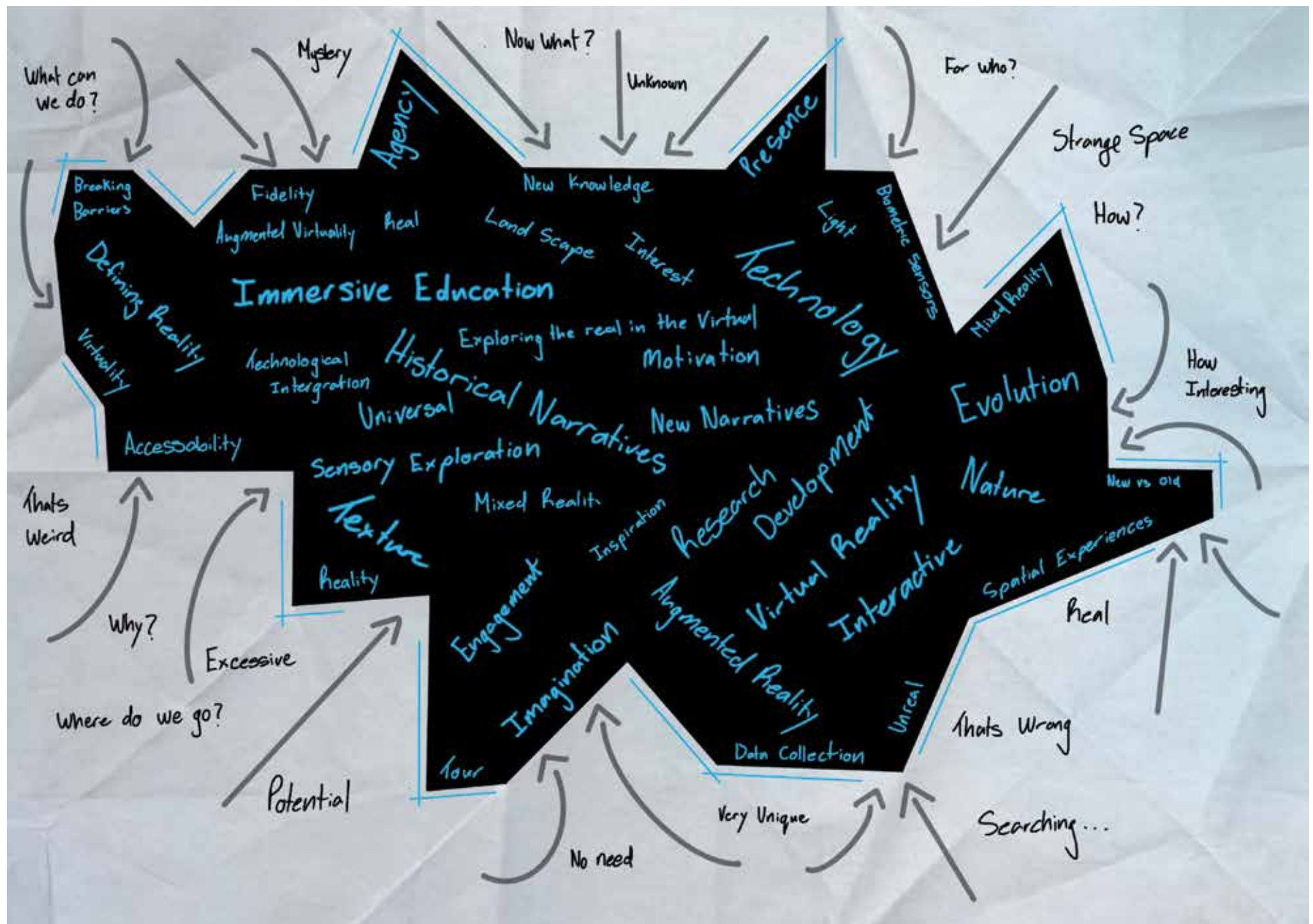


Exploration 3 - Heavily Crumpled Paper

Collage Explorations

Expectation VS Reality Collage - 01

I have posed a series of questions as to how i wished to explore the collage and engage with the thin veil being the paper. The black shapes represented in the three collages represents the space where users transition back and forth between the virtual and physical realms. While those on the peripherals try digests and navigate what lies before them, some willing to explore the threshold while others choose not too.



Exploration 1 - Folded Paper

Expectation VS Reality Collage - 02

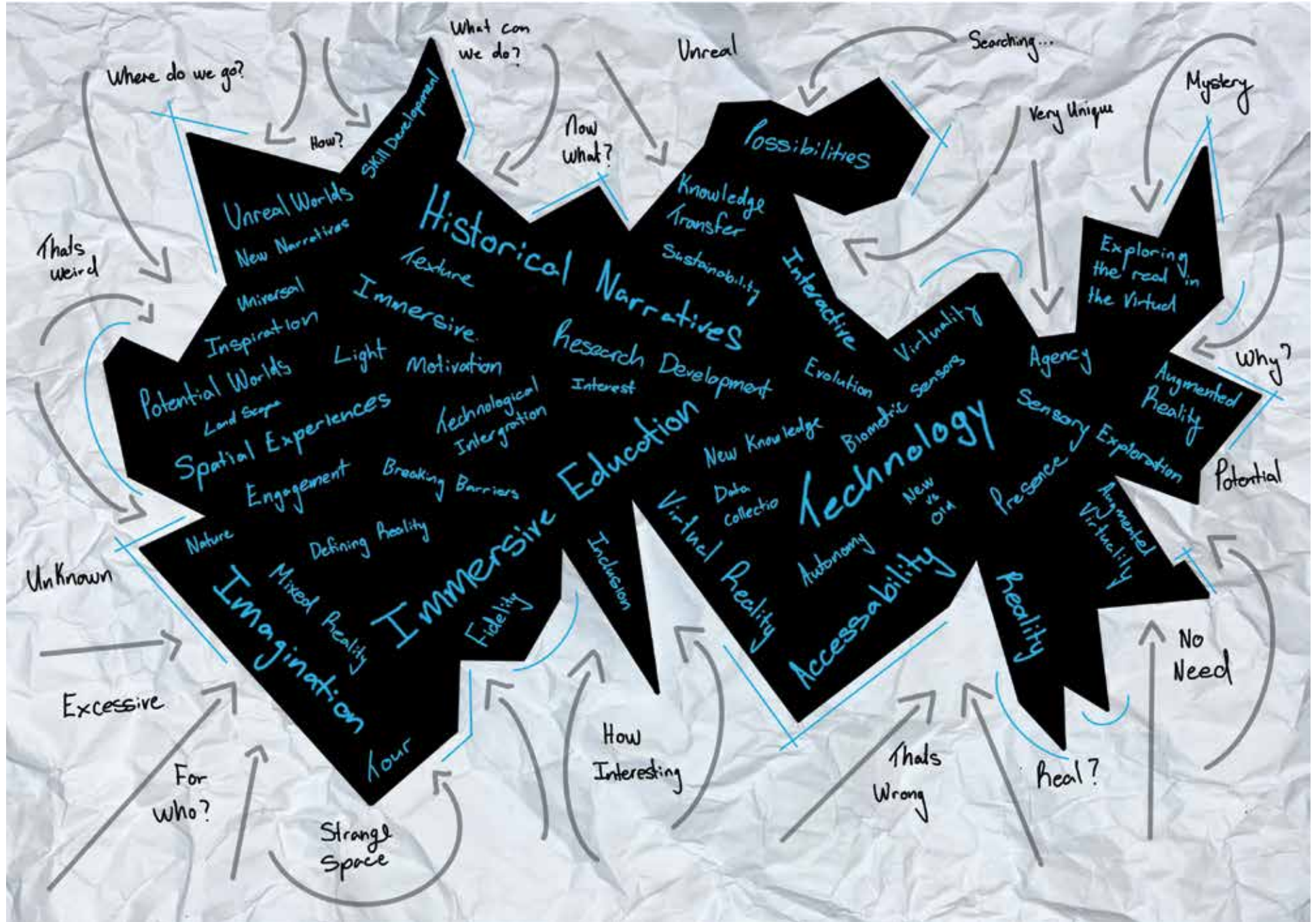
What is the relationship between those who are exploring the thin veil between the realities and those who are witnessing it from the peripherals of the threshold? What do they seeing and feel as they navigate and explore around the threshold? Does the space presented entice those on the peripherals to engage with it those exploring the threshold? What opportunities lie beyond the threshold? Are they Enough to entice those on the peripherals to engage with the space? Do they provide agency and presence to the user?



Exploration 2 - Lightly Crumpled Paper

Expectation VS Reality Collage - 03

Providing opportunities beyond the threshold that realistically relate and entice users to engage with the facility and all the possibilities that lie below the veil. Linking the programming and the functionality to cater towards providing infrastructure and possibilities to those who experience and engage with the local context, as I have selected a space which exists within their physical context and which will be directly effected by exploration of the thin veil and the opportunities which lie below.

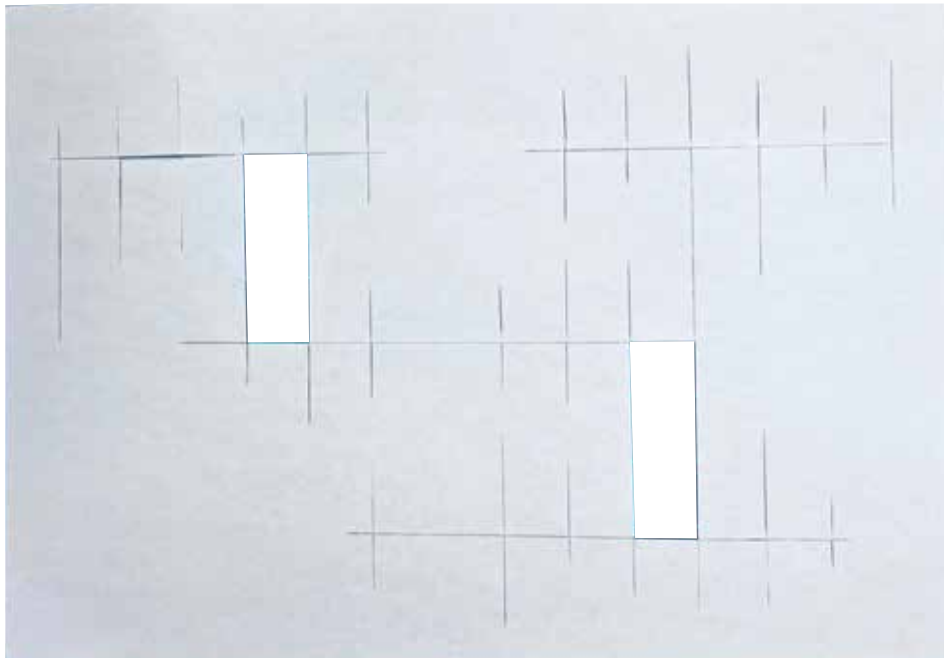


Exploration 3 - Heavily Crumpled Paper

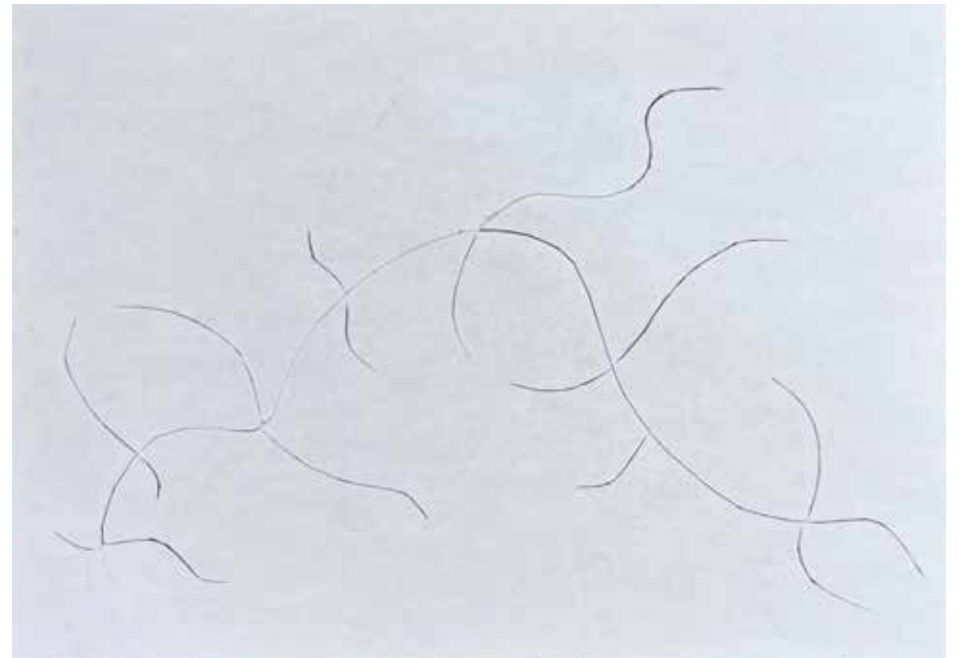
Paper Cutout Exploration

Navigating the threshold

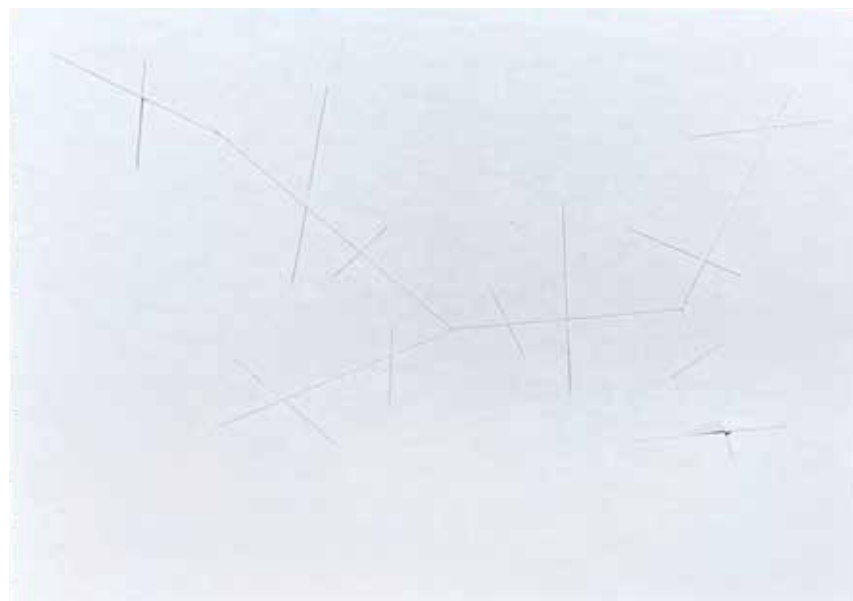
Three explorations derived from the three collage explored. Each serving as a base of 2D lines and points which can be mapped onto the ground plane based on forms seen in the paper exploration. The points located on the plane can now elevate and descend to create specific spaces and glimpses that tear through the thin veil of the ground plane.



Exploration 1 - Geometric Grid



Exploration 2 - Flowing Organic Form



Exploration 3 - Natural Landscapes

Navigating the threshold - Geometric Grid

Mapping for a structured grid that provides for more precise control of the ground plane, with light and scale being easily manipulated and integrated with the virtual realms programming below. This exploration tested multiple perforations which dissected the ground plane allowing for a large variety of adaptations of the form created by the pushing or pulling of the ground plane.

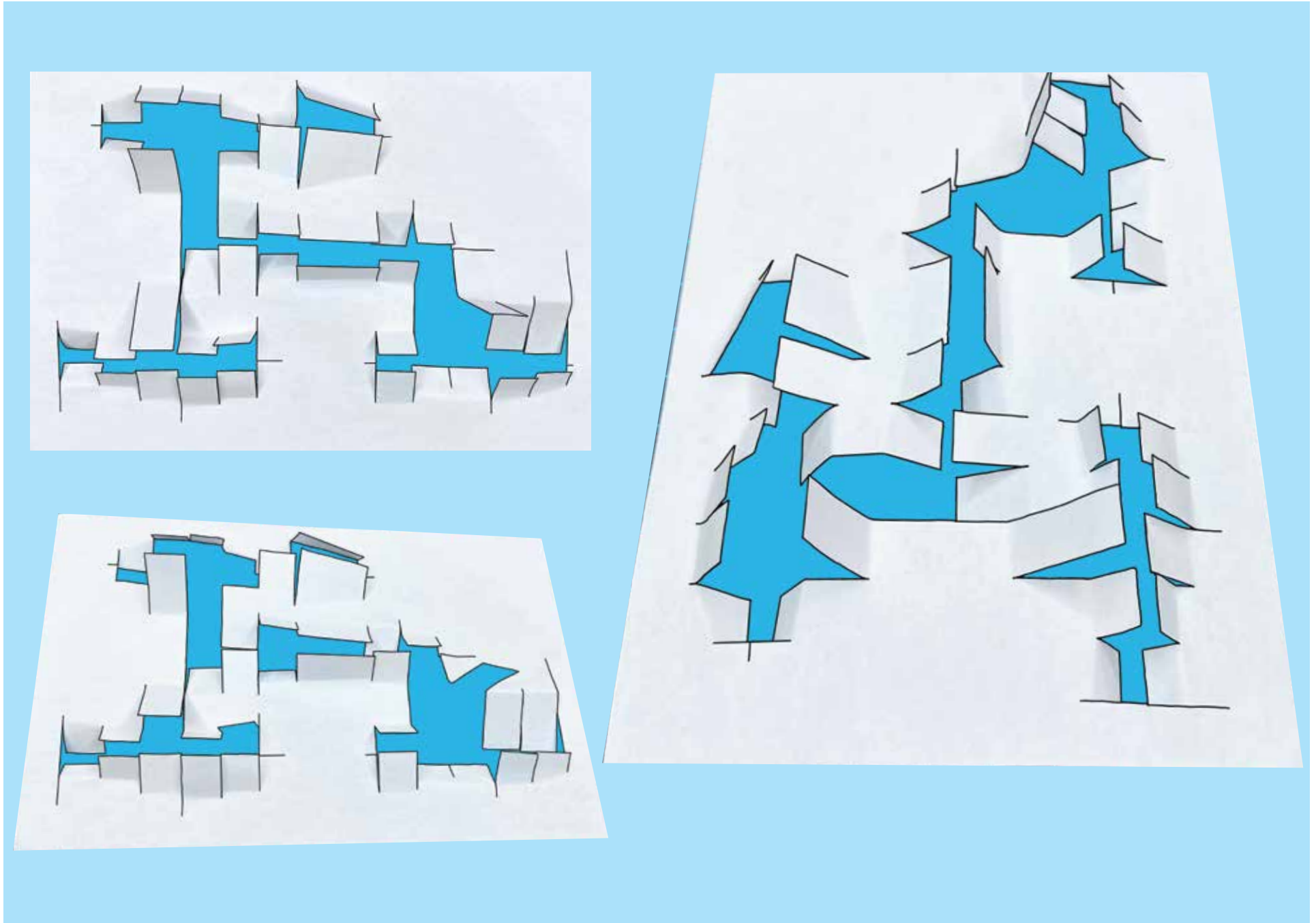


Figure 7.6 Geometric Grid Exploration Charrette - (Author)

Navigating the threshold - Flowing Organic Form

The flow of a natural organic form is one that can be quite random at first glance yet structure becomes a mesh of pieces that create a sturdy functional system. The organic flowing form presents the natural way a threshold between the physical and virtual realms may be interperated from the paper explorations, mimicking flower petals laying on the ground plane with the negative spaces acting a the tear between the realms.

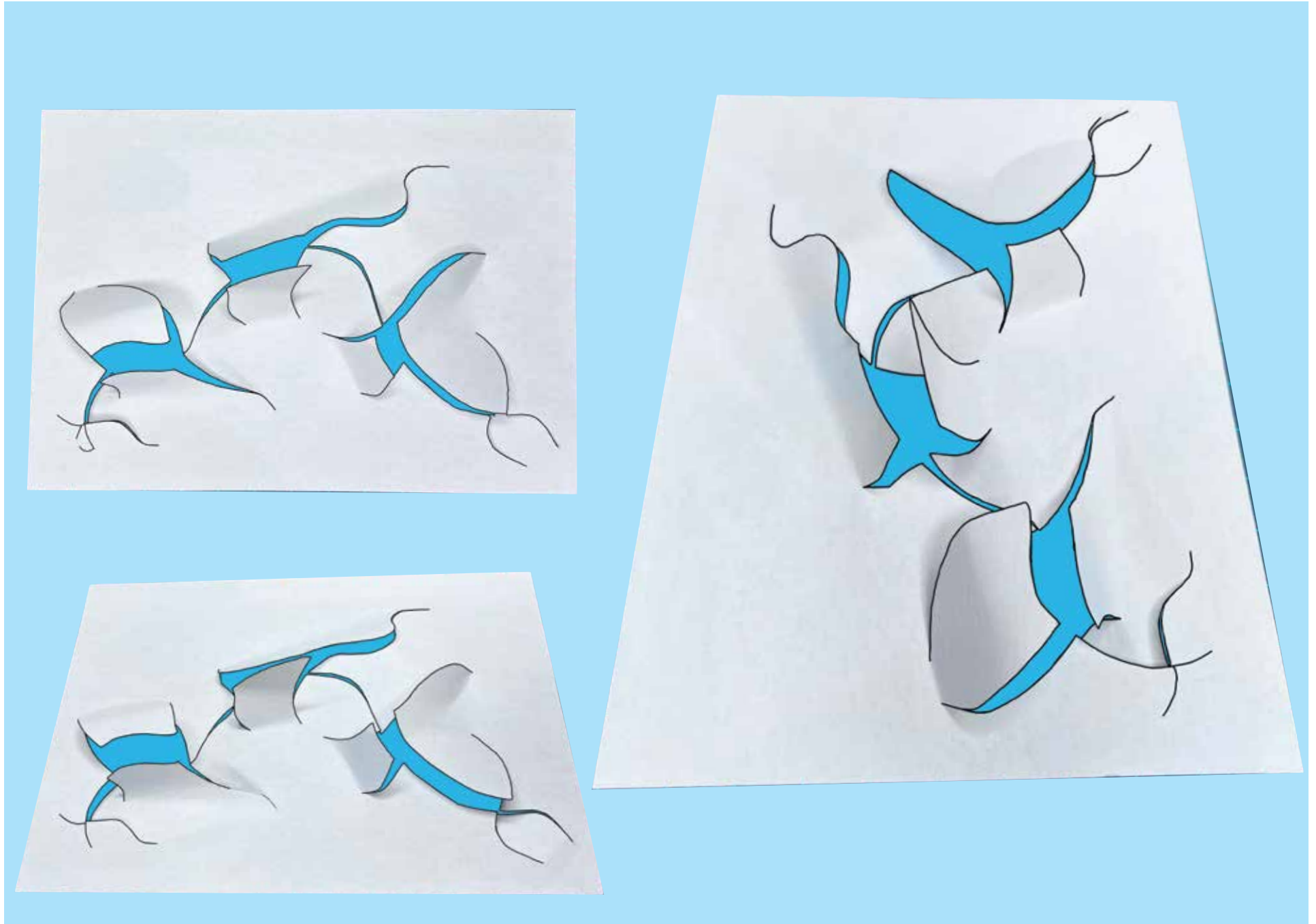


Figure 7.7 Organic Form Exploration Charrette - (Author)

Navigating the threshold - Natural Landscapes

The mimicking of a mountain range being represented within the paper explorations of the heavily crumpled paper lead to the exploration that blends both the geometrical and organic forms presented in the previous explorations into a natural landscape that reassembles both a mountain range and fractal design elements, which has a natural order and structure to it.

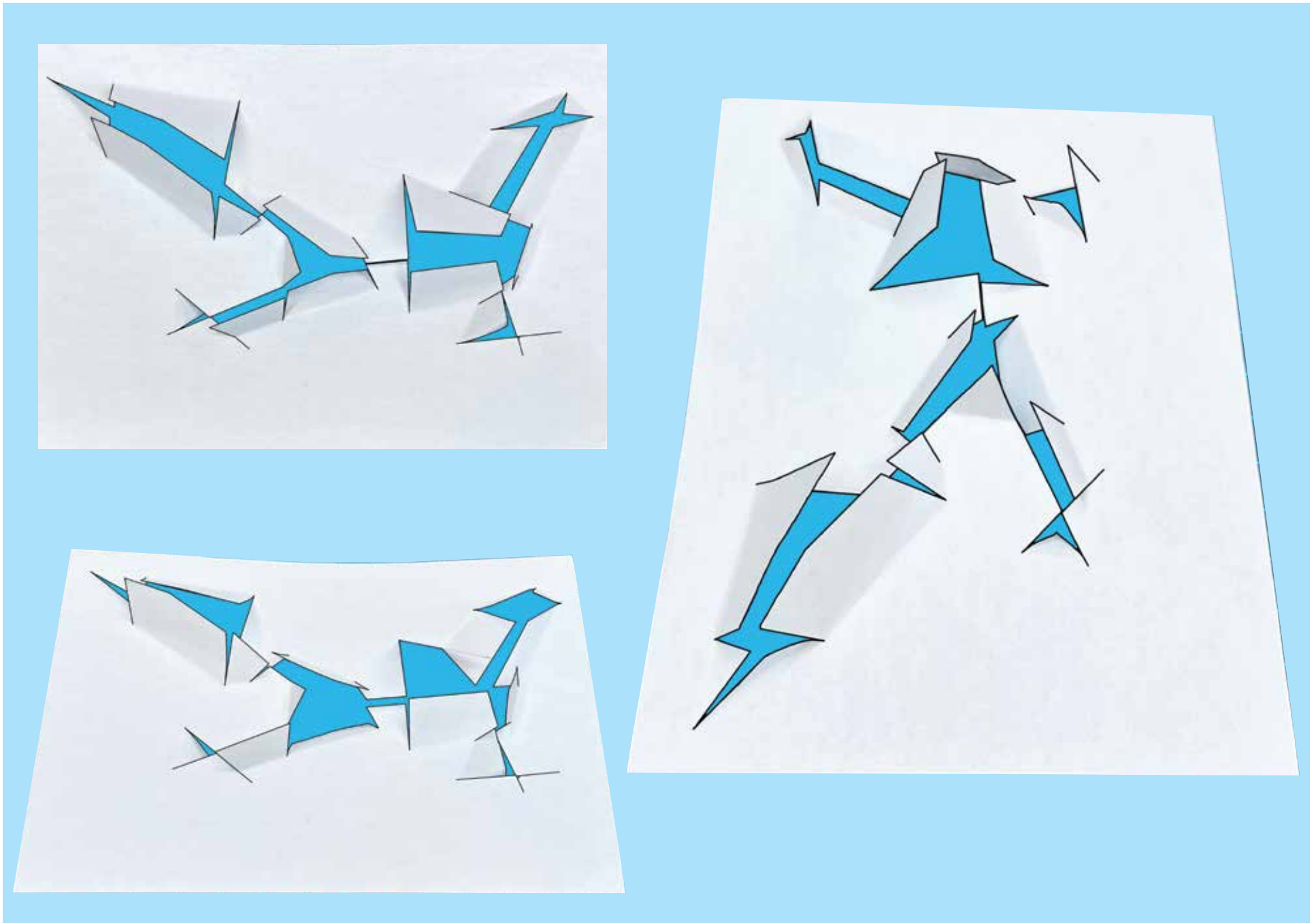


Figure 7.8 Natural Landscape Exploration Charrette - (Author)

Model Explorations

Exploring the Thresholds Created

Further exploration of the paper cutouts was undertaken, with the geometric grid and natural landscape continuing in this exploration. The flowing organic form has been left out of the further explorations. This had been done as the spaces and forms created from the other explorations are more dynamic and best fit within the local context. The further exploration of these two versions intended on understanding and testing how the forms created by elevating or descending points effected the transition between the threshold as well as the spaces created above and below the threshold.

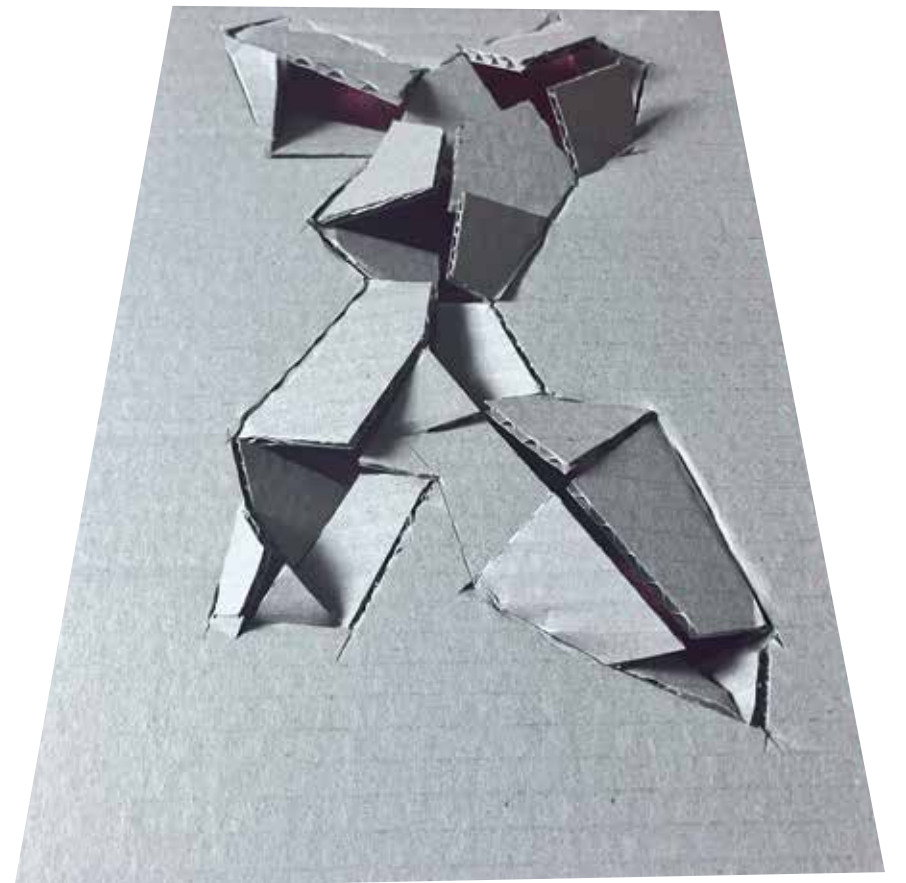
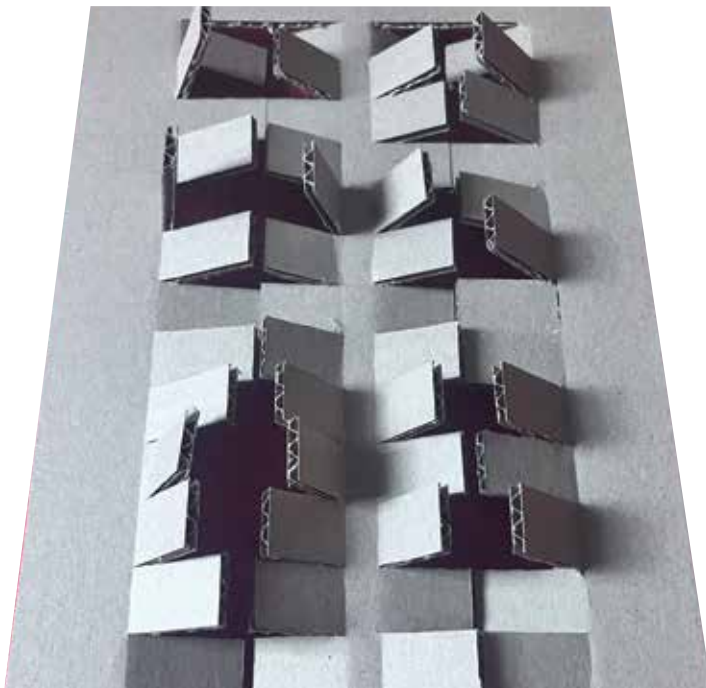
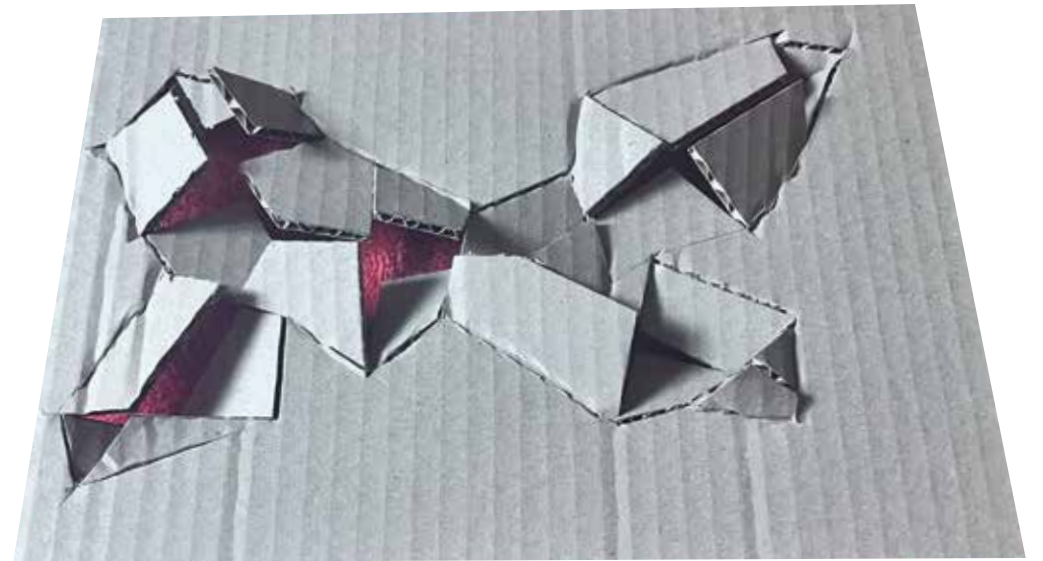
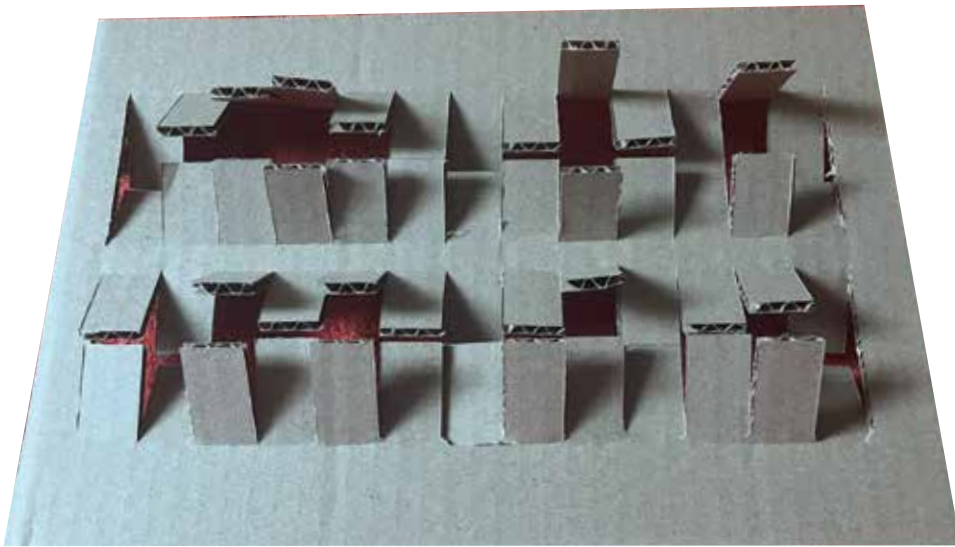


Figure 7.9 Model Exploration Charrette - (Author)

Spaces - Ideas - Experiences

This exploration was intended to mimic teleporting through a virtual tunnel to a new world, with the user starting at the narrow end of the tunnel feeling cramped and claustrophobic. As they travel further down the tunnel the floor descends and the tunnels widens up, exposing more light and giving a glimpse into the space they are navigating too. This transitions is seen as another threshold between the thin veil between realities.

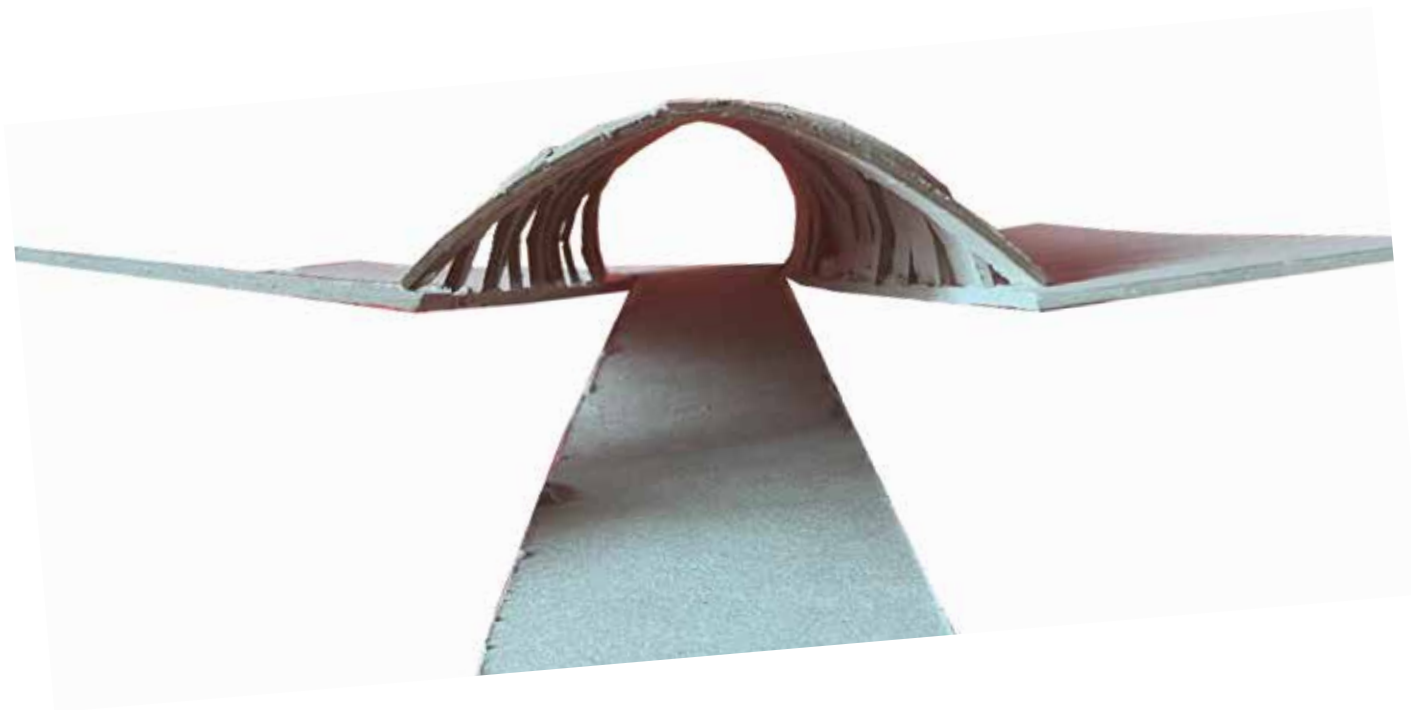
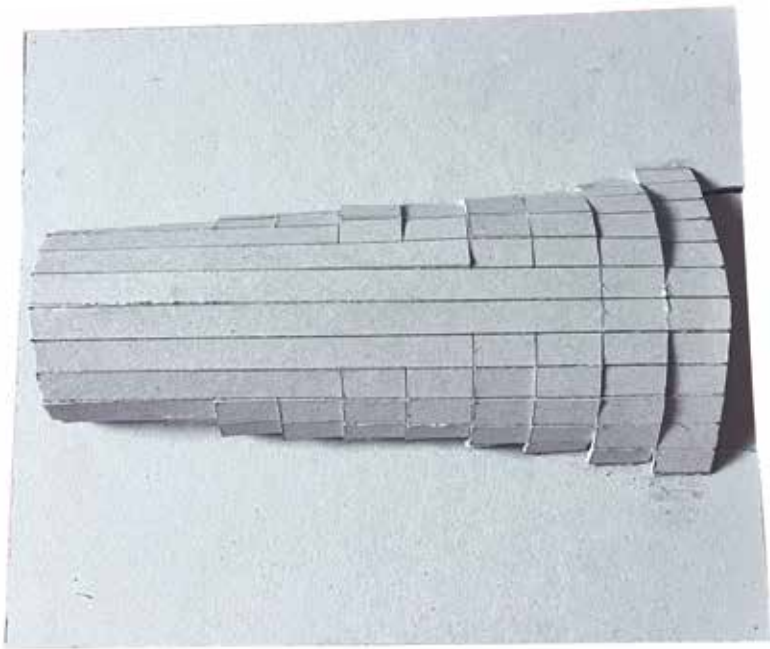


Figure 7.10 Model Spacial Exploration Charrette - (Author)

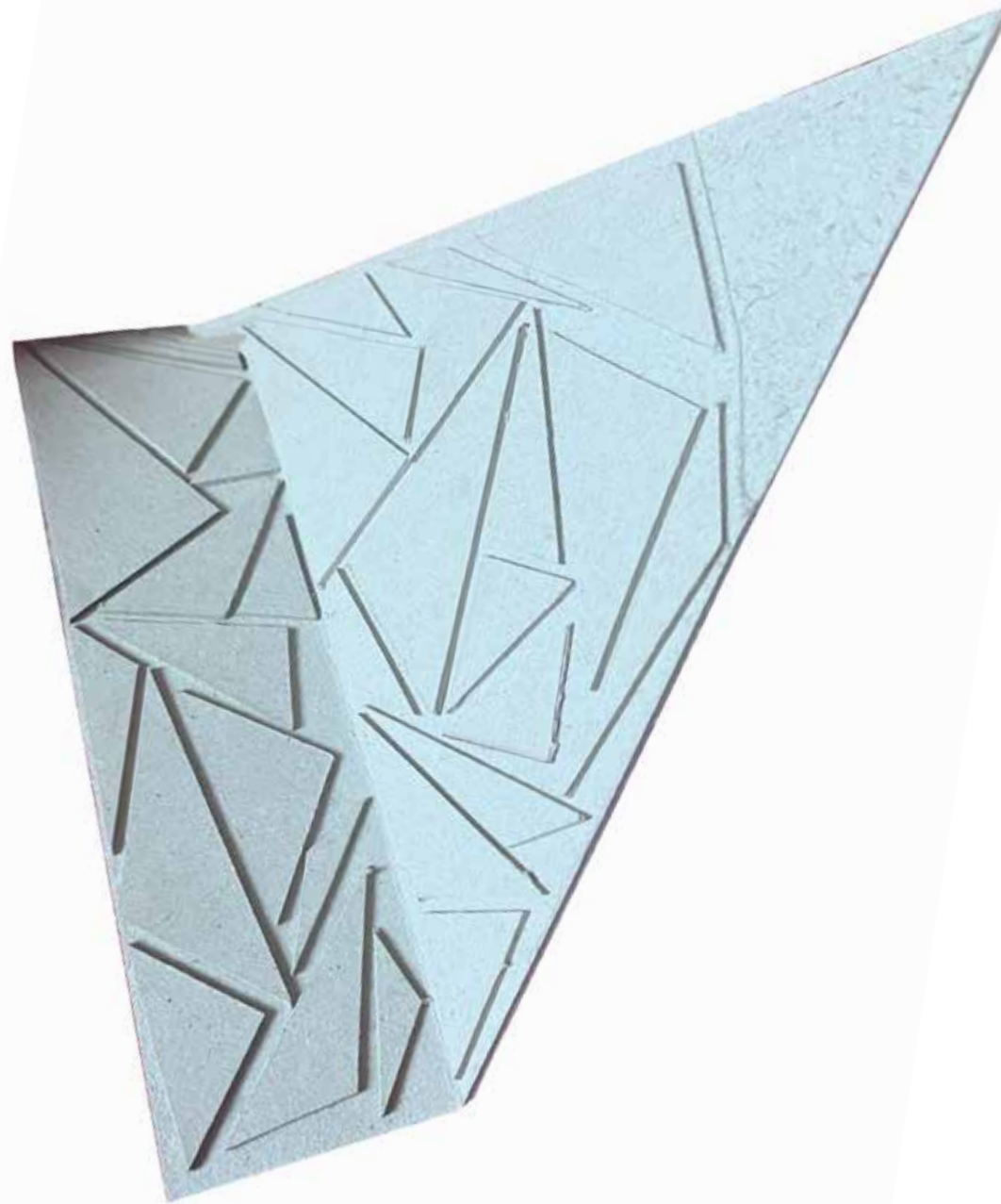
Textures & Materials

Physical Nature of Space

Living in a physical world, we sense the natural presence of materials as they exist in space and it grounds us in the physical realm.

With users engaging with virtual space that currently has no physical attributes, materials and the tactile nature of the physical spaces they occupy whilst engaging with VR is important for transitioning between the two and building up and maintain immersion.

This exploration represents the physical forms that create the ground plane that has been manipulated, with the ground texture peeling up with the rising ground plane. Creating a dynamic transition for the users as they navigate from the ground plane into the areas that engage with virtual reality.



Tactile Textures

Tactile texture will allow for the users to engage with the physical space they exist in, with the ability to transition between various different textures and materials as they navigate through various spaces in the virtual. Textures and materiality can be used throughout the building and its peripherals, This can be used to entice users to engage with the threshold and transition.

These explorations were undertaken by casting tiles of plaster of Paris with materials and textures being placed within the molds. The selected materials placed within the molds intended to create the most tactile surfaces that can be felt by touch. These materials are mimicking rougher textures.



Exploration 1 - Bandage



Exploration 2 - Crumpled Tinfoil



Exploration 3 - Sponge Bandage



Exploration 4 - Chop Sticks

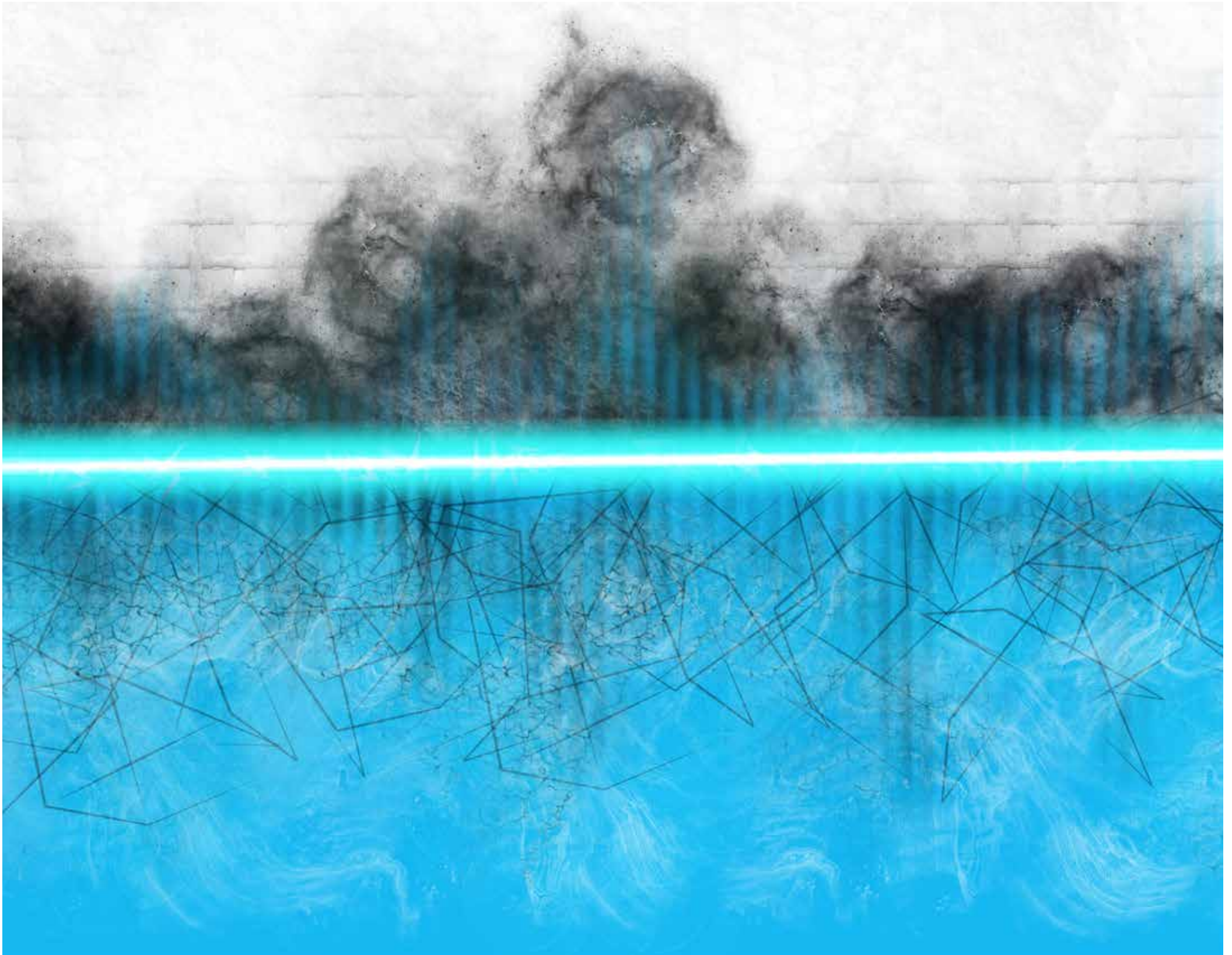


Exploration 5 - Timber Boards

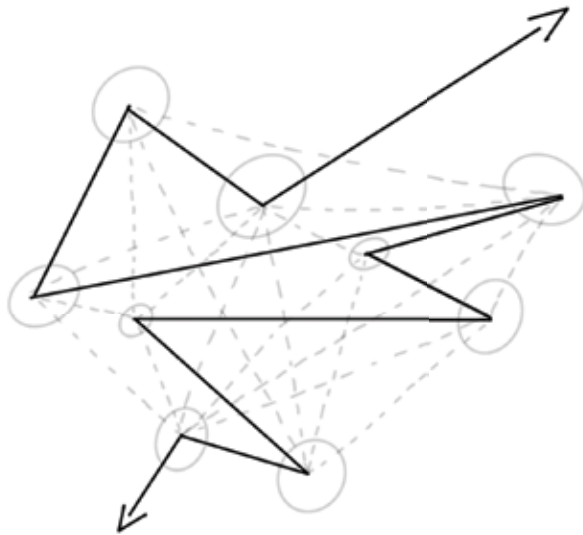
Design Drawings

The Process

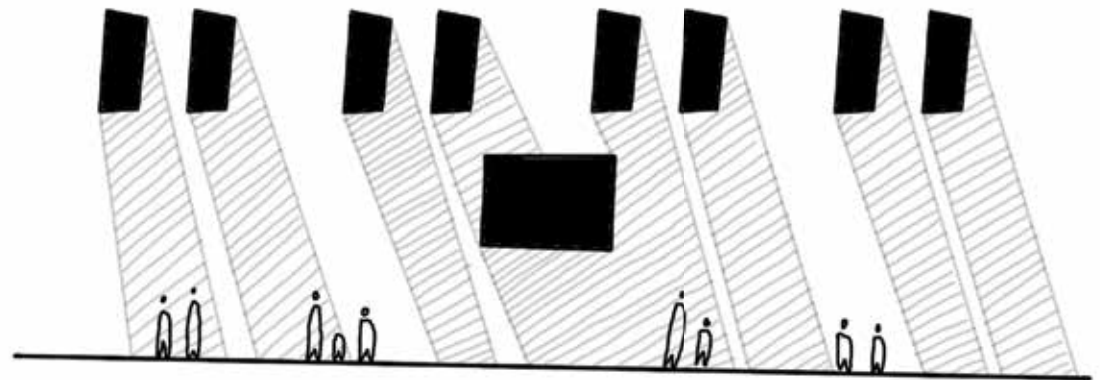
Plans, Sections, Elevations, and Perspectives



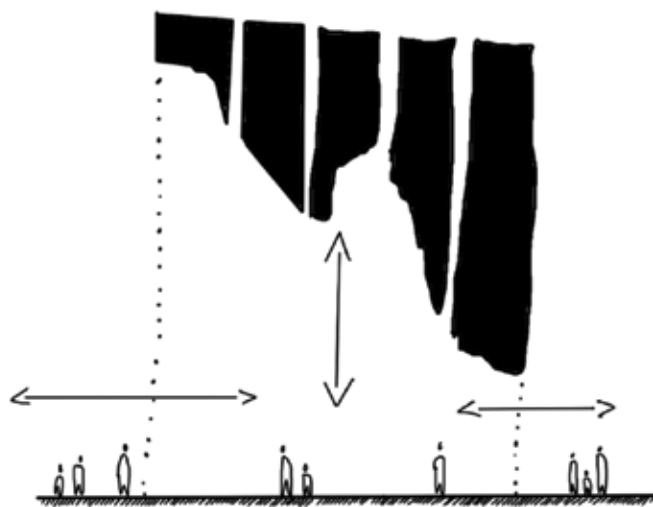
Experiential Sketches



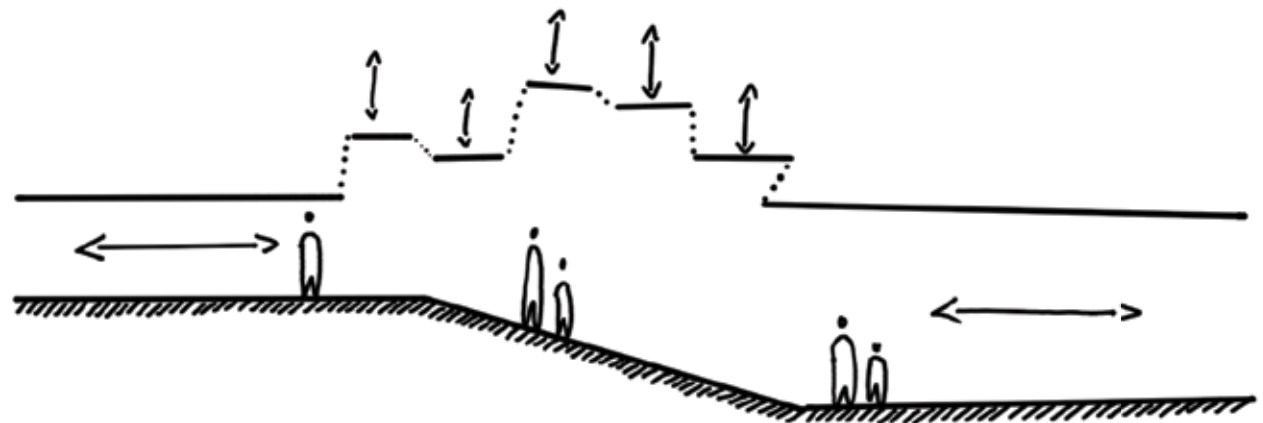
Movement



Light



Scale

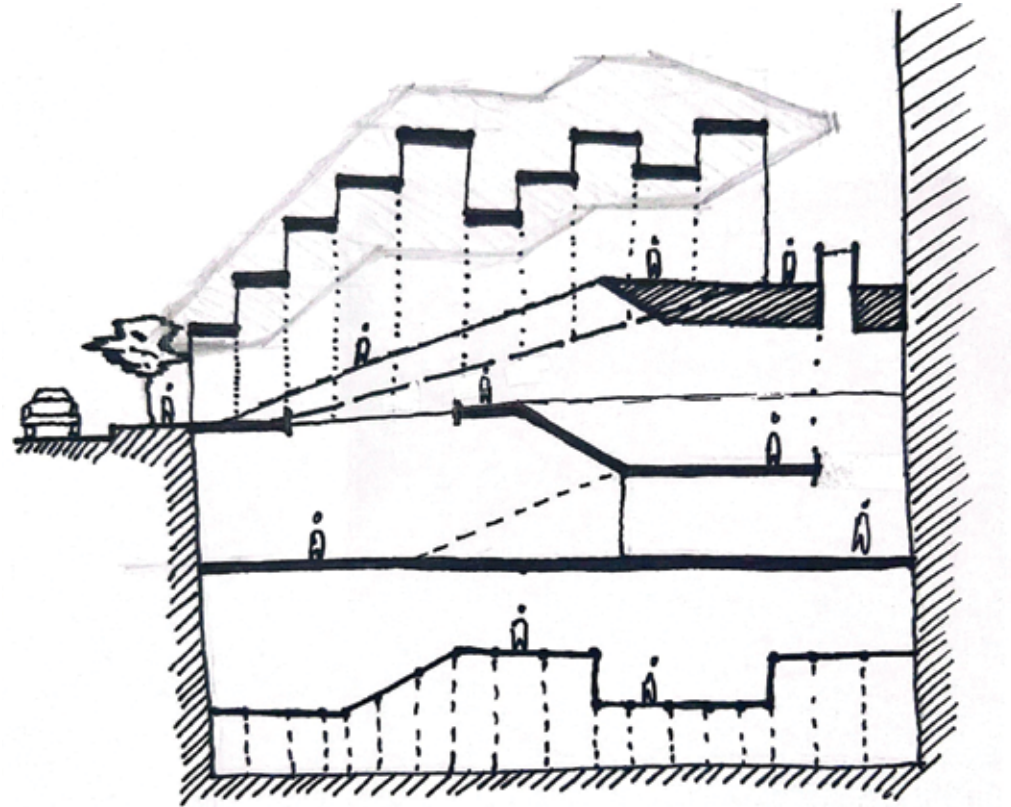
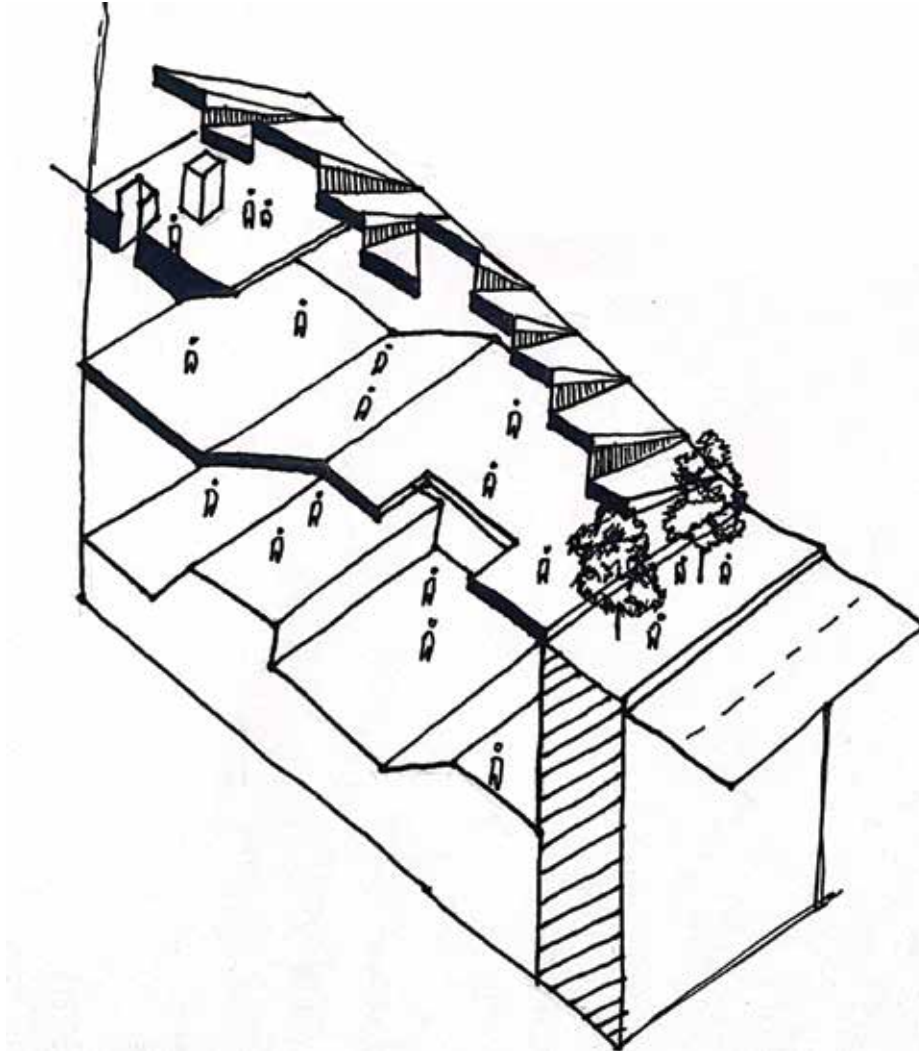


Dynamic Spatial Experience

Early conceptual sketches based on intended key design drivers. With movement relating to users' navigation of the building and the narrative being portrayed. Light utilized as a design tool for spatial experience and the functionality of the building, aiding with passive design strategies as well as ground uses after engaging with VR technological systems. Scale aids in the narrative of the space being portrayed and serves as a way of immersing users within physical space. Utilizing physical spaces that are adaptable and tectonic for further immersion and flexibility within the building and the spaces created.

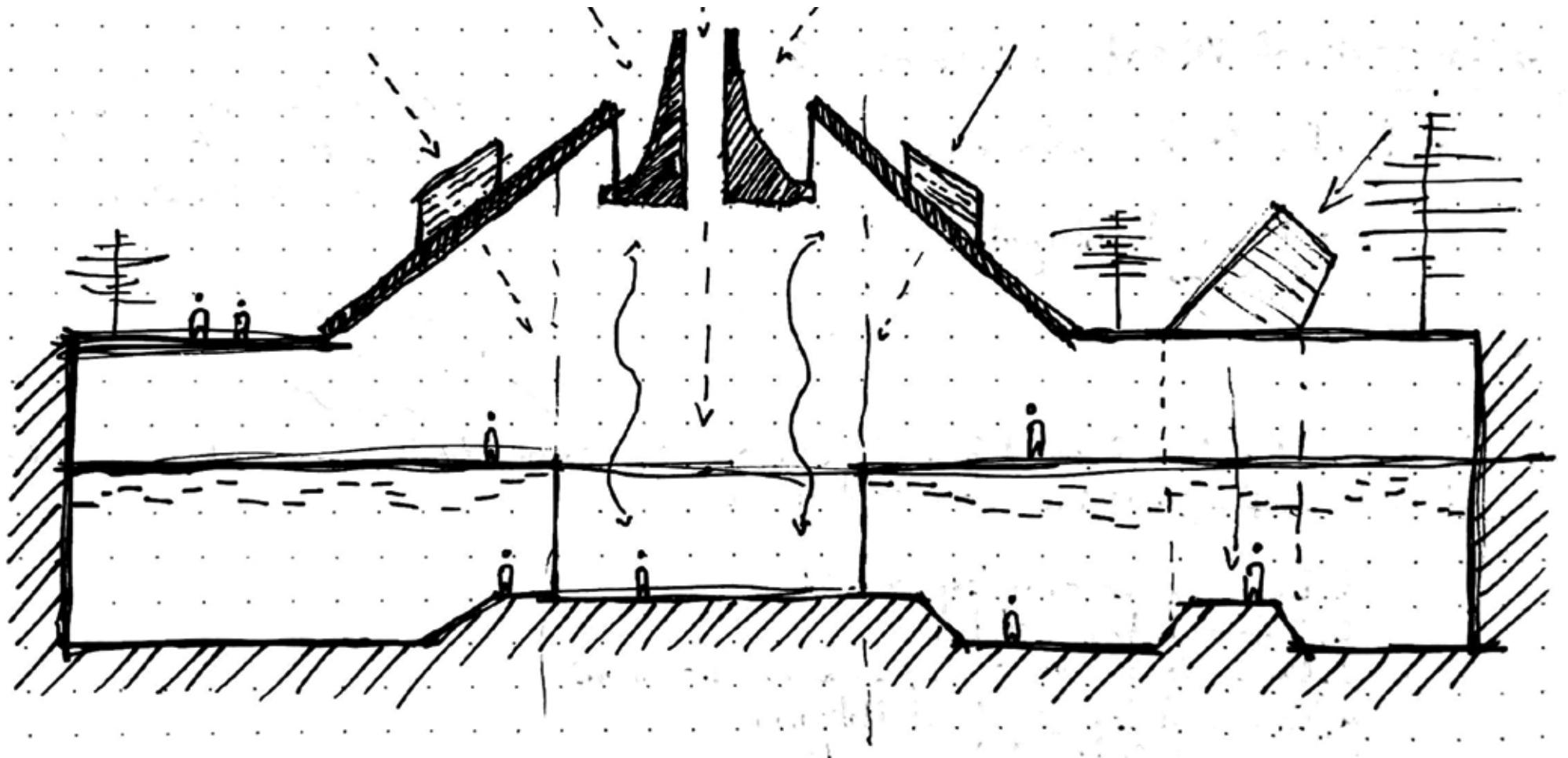
Figure 7.14 Experiential Sketches - (Author)

Concept Sketches



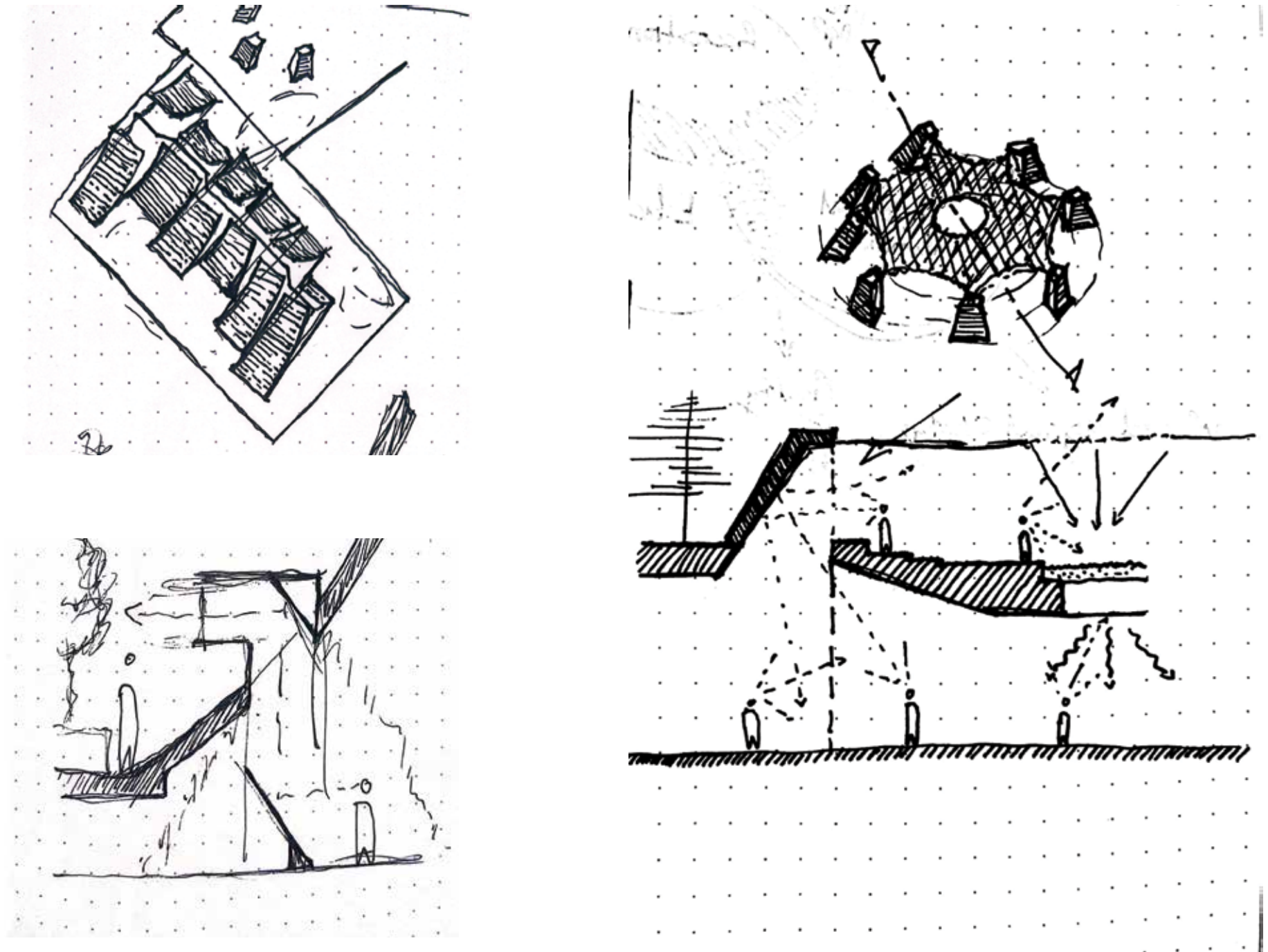
Initial concept sketches derived for the building indicating its subterranean design and undulating roof system. With a focus on level changes, voids and the sculpting of internal spaces. These sketches also indicate the first iteration for the lowest level of the building to be more dynamic, flexible as well as adaptable for the utilization of VR.

Concept Sketches



A key early stage conceptual sketch that helped inform the first integration the buildings form, core and spacial relation. At this point the decision for the building to have 2 levels below the ground plane of the park was made. The sketch looked at exploring natural light and how it enters the building, as well as how light-wells puncture through the park to bring light deep into the building. Utilizing the openings for light as opportunities to passively ventilate the building through stake ventilation.

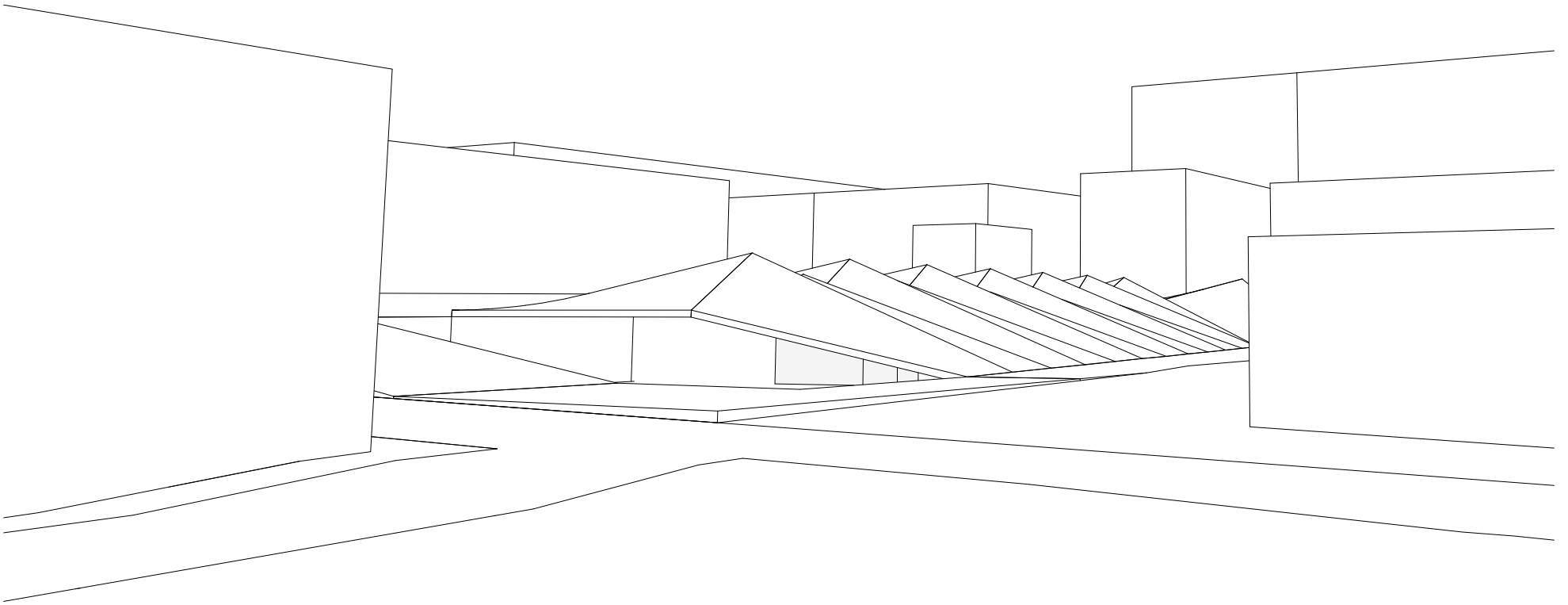
Concept Sketches



A series of sketches done for early conceptualisation of how the ground plan of the park could be sculpted out and how light-wells and para-scope systems can be included within the parks sculpting for a more dynamic and engage interaction for the users. With the buildings opening flaps being trafficable for users and a source of light, as well as how para-scopes could be utilised in a fun and interesting way for users on the park level to engage with users below and visa versa. This engagement can spark curiosity within the users to navigate below and engage with the virtual reality technological systems available.

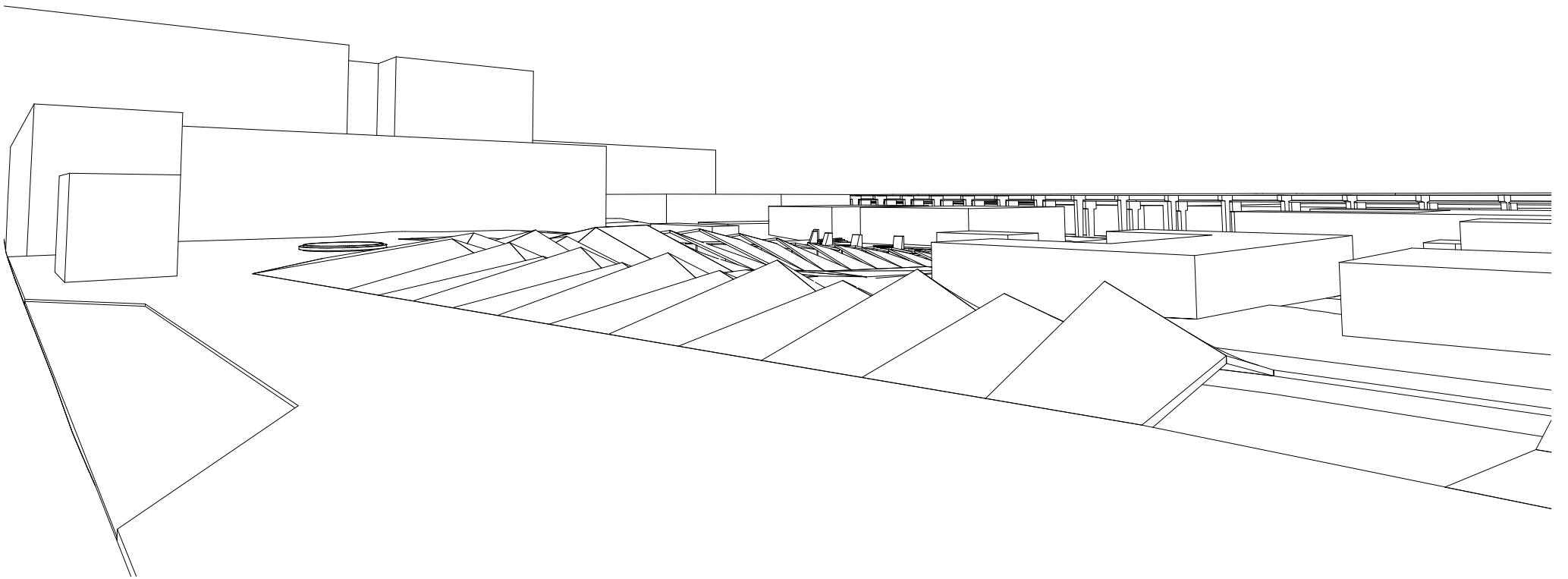
Figure 7.17 Concept Sketches - (Author)

Sketch Design Development



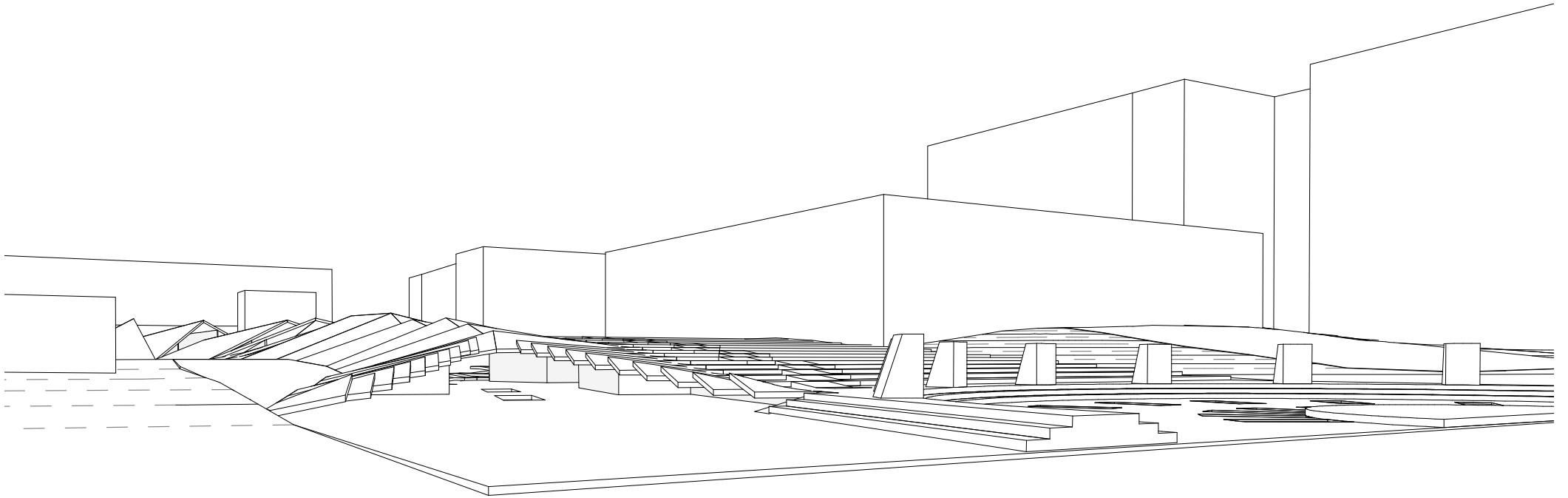
7.18 Mary Fitzgeralds Sqaure Perspective Review3 - (Author)

Sketch Design Development



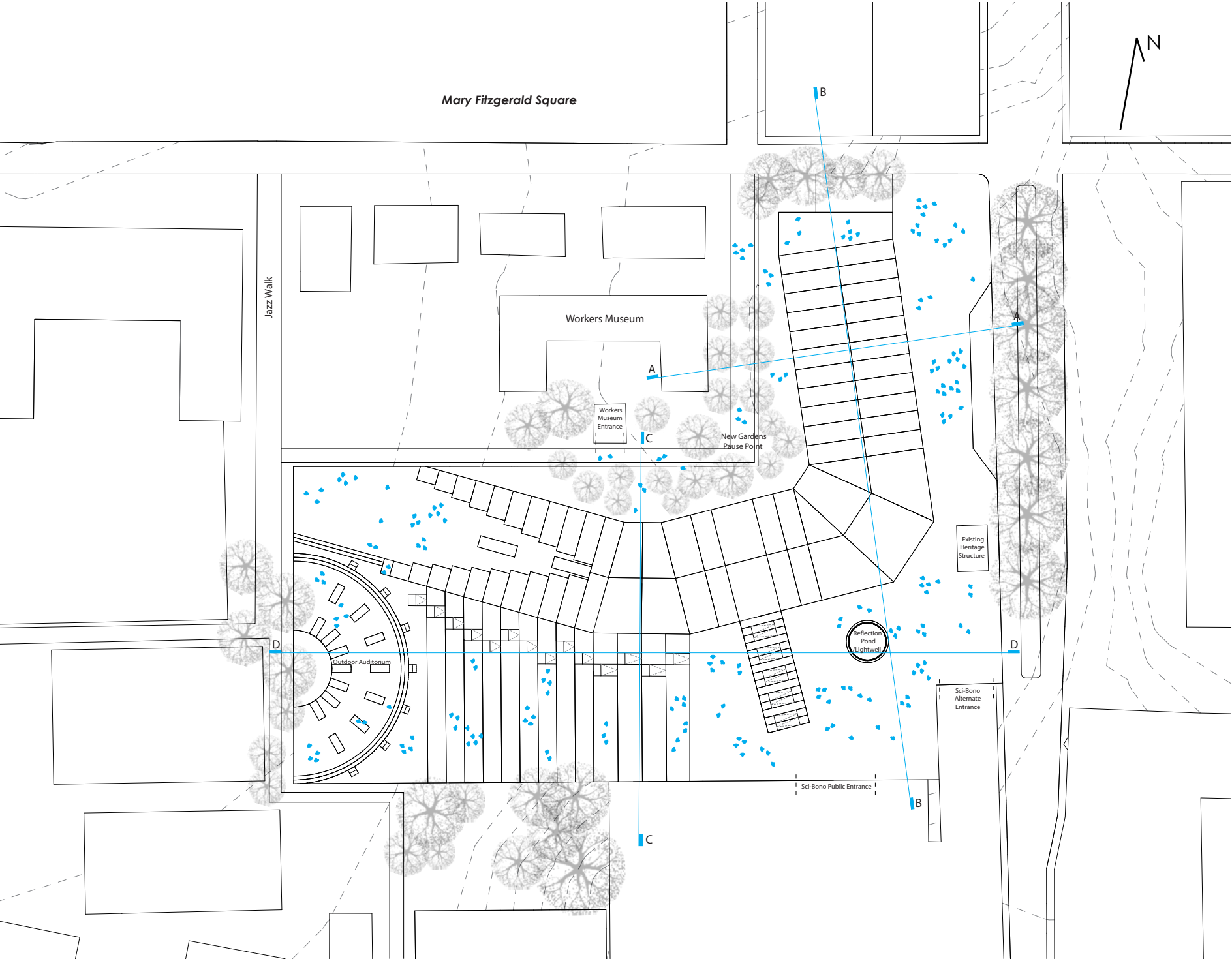
7.19 Corner of Rahima Moosa St and Mariam Makeba St Perspective Review3 - (Author)

Sketch Design Development



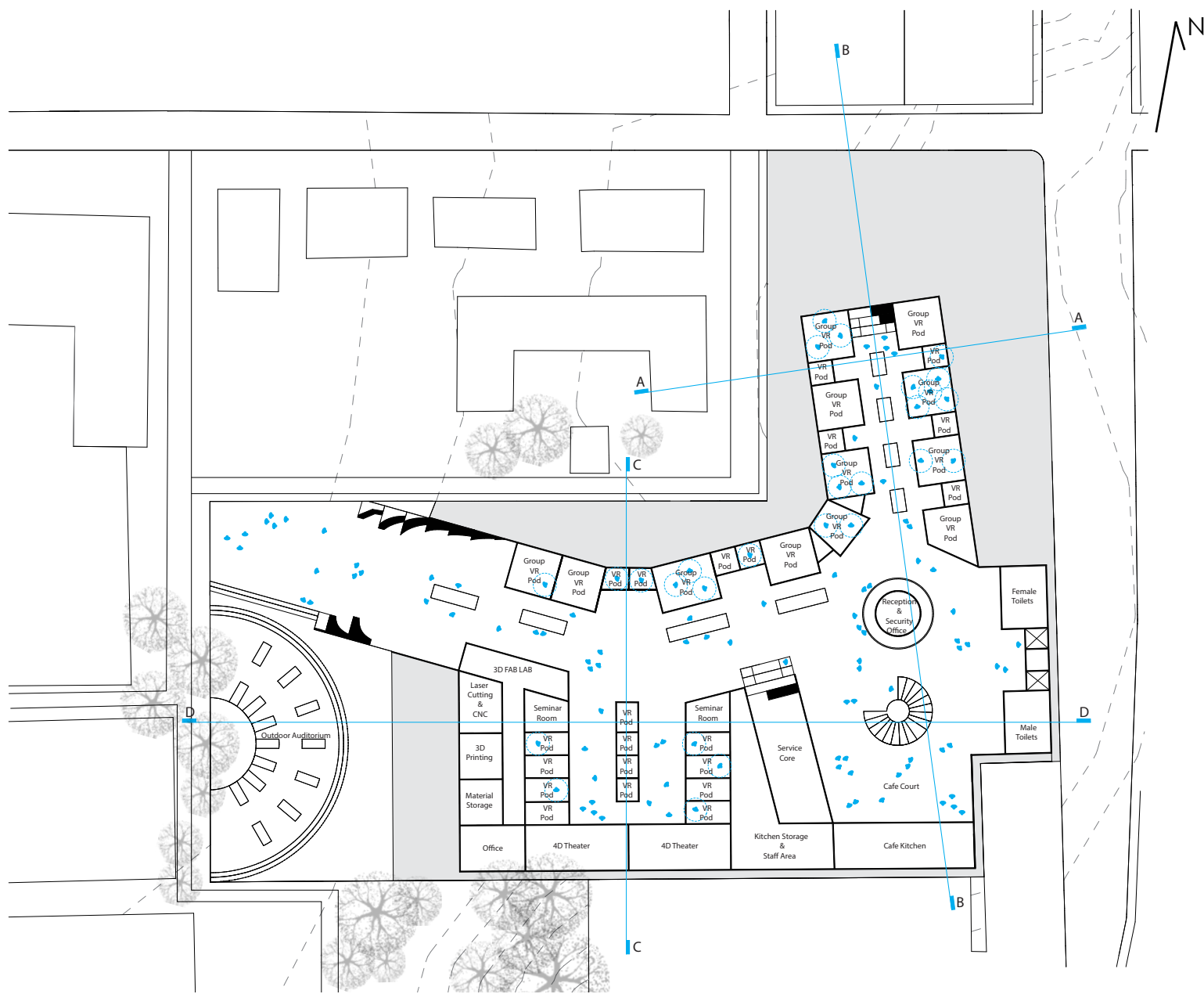
7.20 Jazz Walk Park Perspective Review3 - (Author)

Sketch Design Development



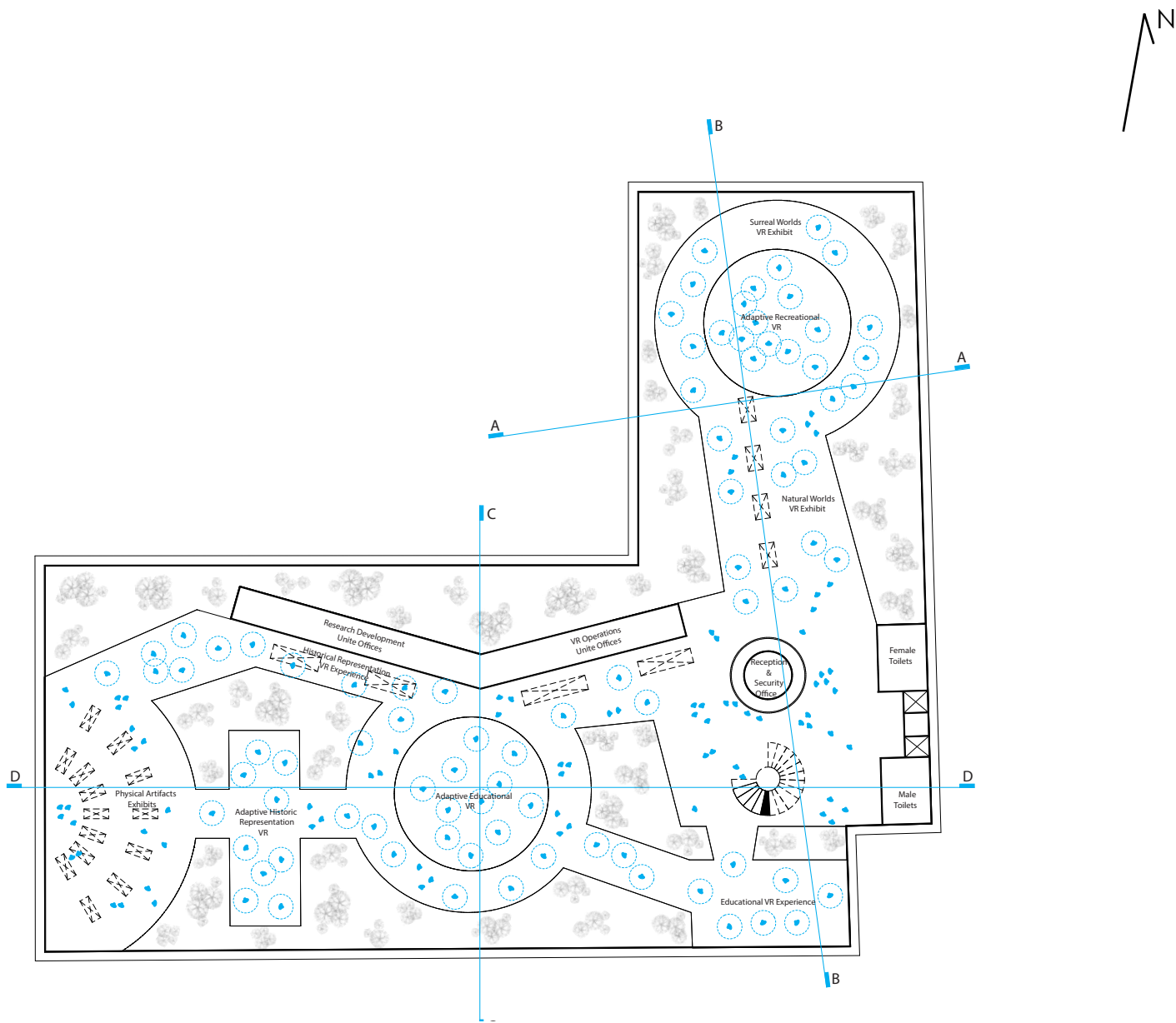
7.21 Site Plan Review3 - (Author)

Sketch Design Development



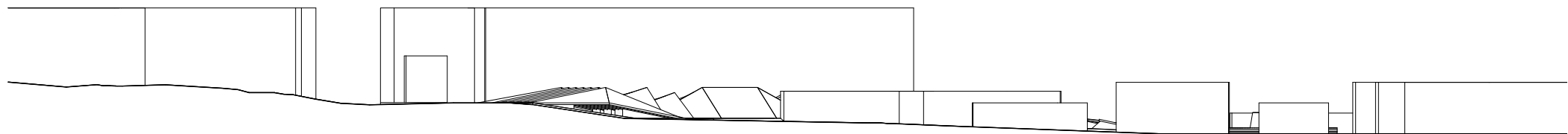
7.22 Ground Floor Plan Review3 - (Author)

Sketch Design Development

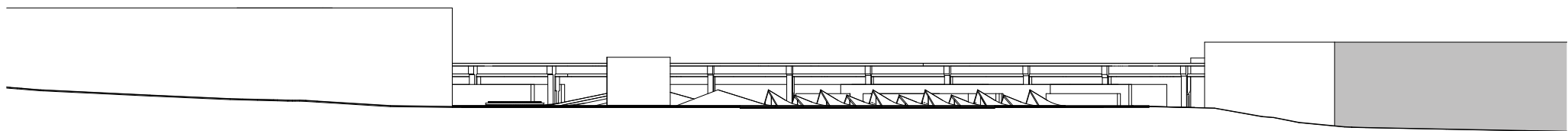


7.23 Lower Ground Floor Plan Review3 - (Author)

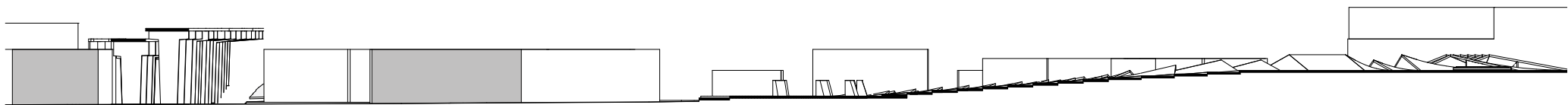
Sketch Design Development



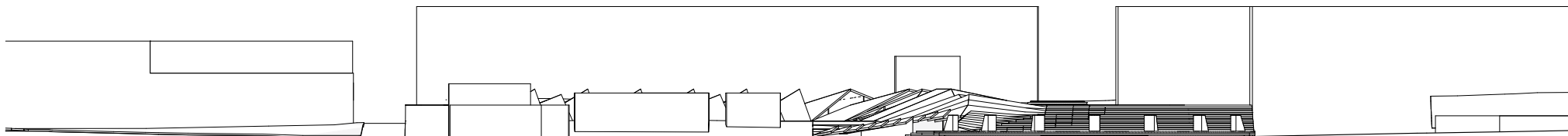
7.24 North Elevation Review3 - (Author)



7.25 East Elevation Review3 - (Author)

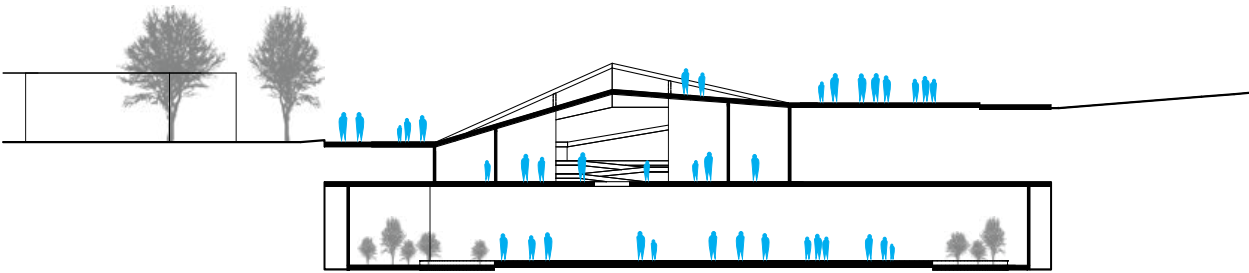


7.26 South Elevation Review3 - (Author)

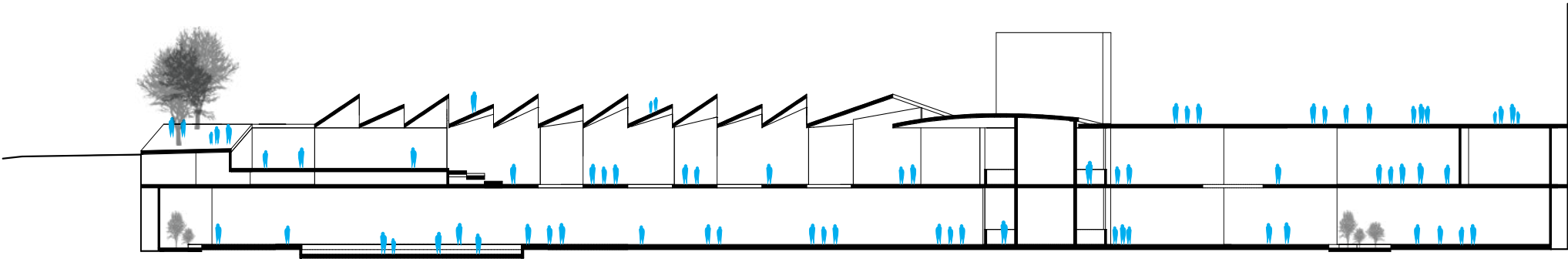


7.27 West Elevation Review3 - (Author)

Sketch Design Development

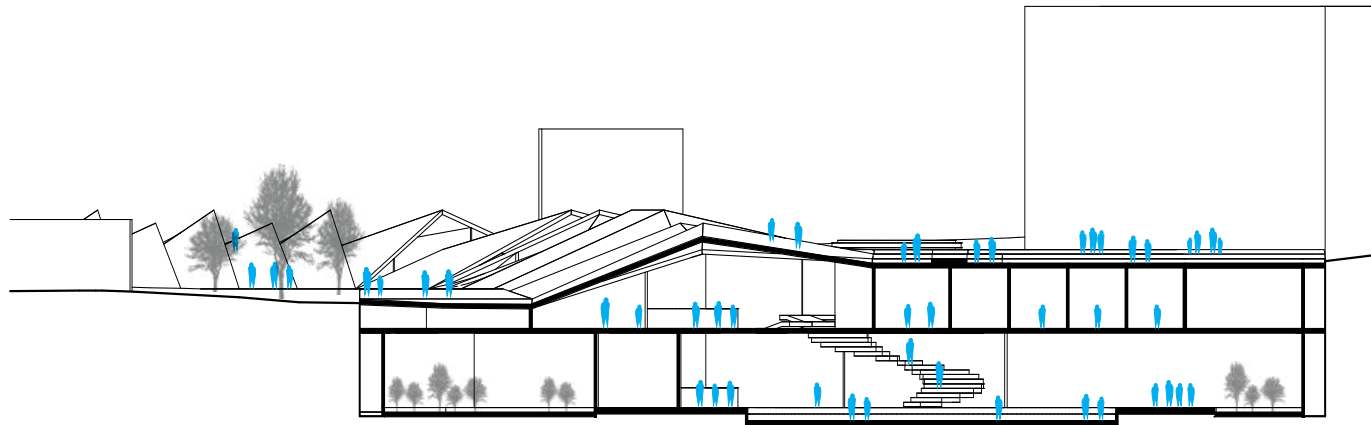


7.28 Section AA Review3 - (Author)

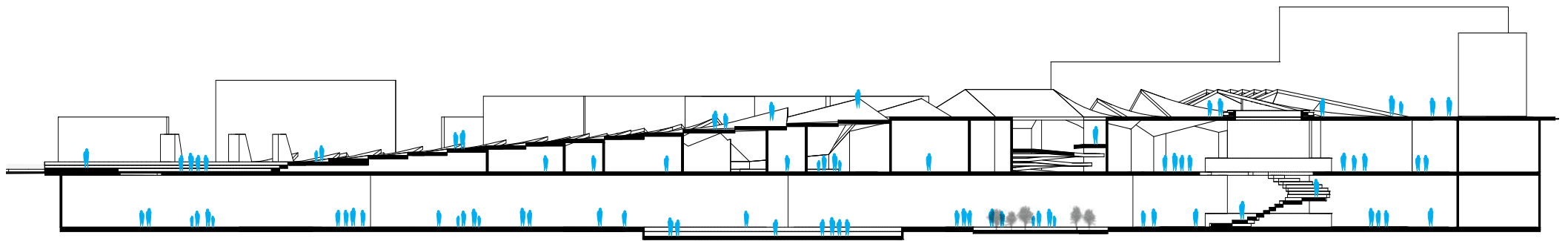


7.29 Section BB Review3 - (Author)

Sketch Design Development



7.30 Section CC Review3 - (Author)

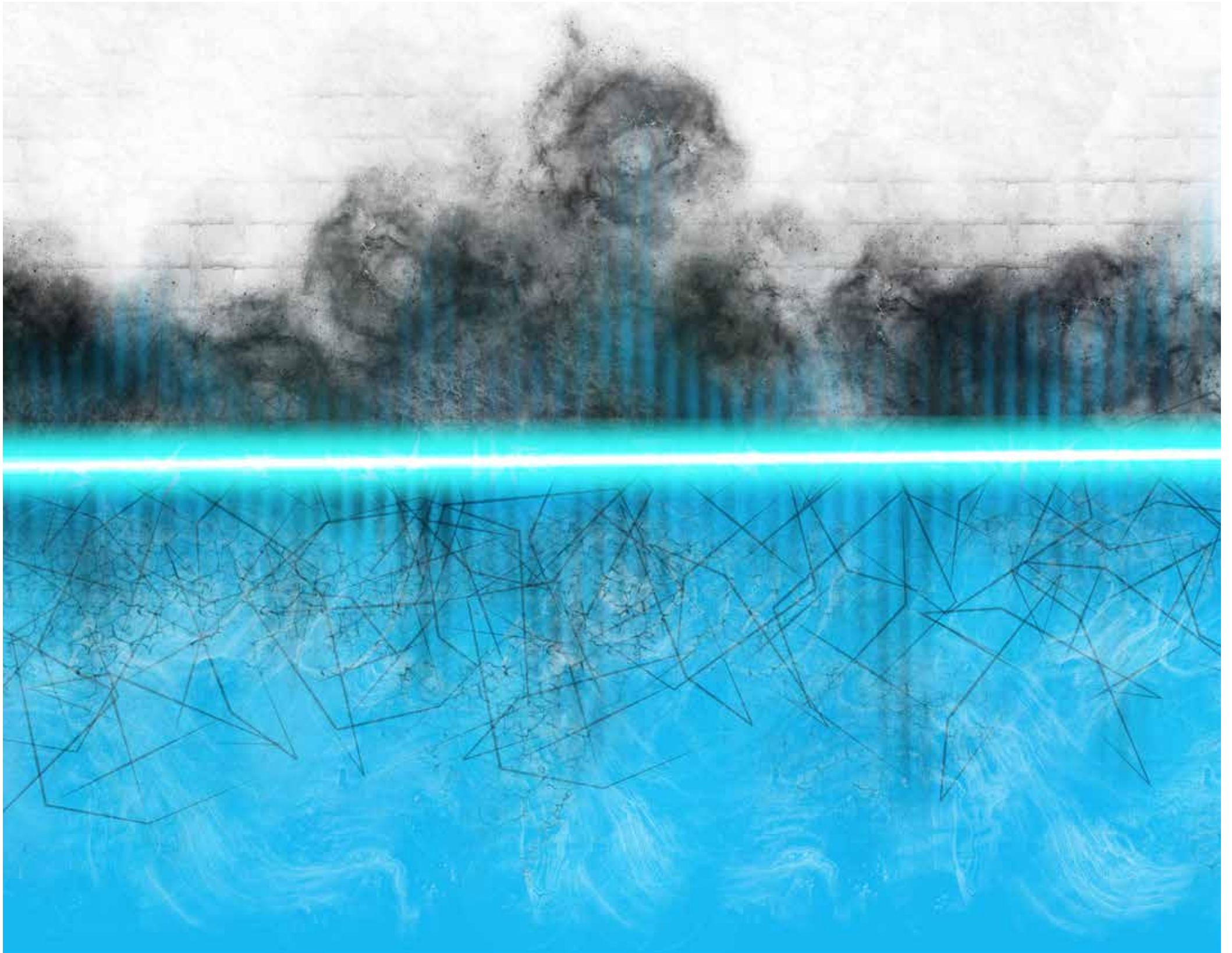


7.31 Section DD Review3 - (Author)

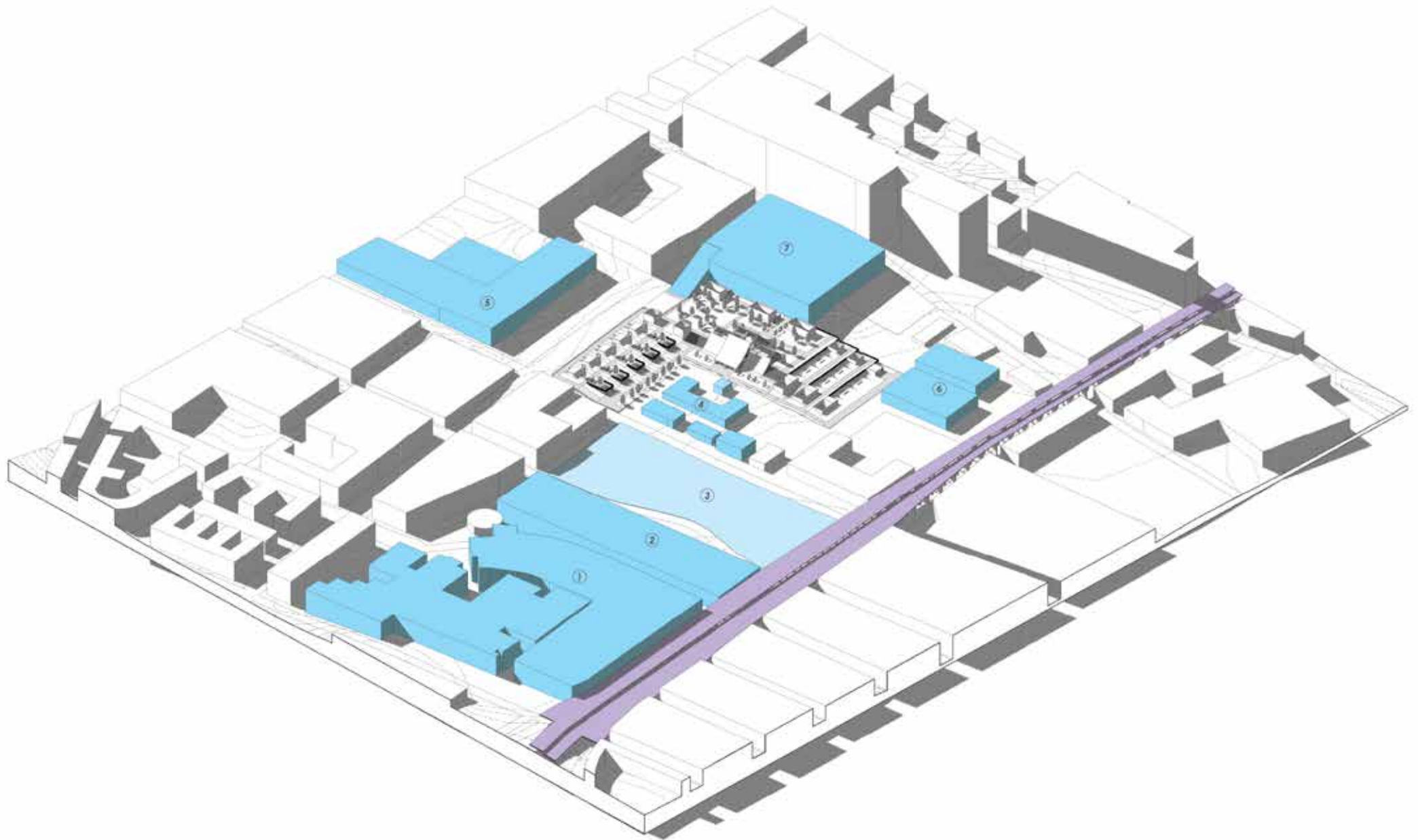
Chapter 08 Final Design

Design Implementation

Plans, Sections, Elevations, and Perspectives



Contextual Axo



Axo Key
1 - Newtown Junction Mall
2 - Museum Africa & Market Theater
3 - Mary Fitzgerald Square
4 - Workers Museum
5 - Turbine Hall
6 - Music Factory
7 Sci - Bono

8.1 Contextual Axo - (Author)

The Newtown park serves as the perfect location to embed the virtual reality centre. By maintaining the parks functionality and placing all VR components of the design below the parks surface, it allows for the residents and users of Newtown to enjoy a more functional park space with alternative means of engagement below. This renewed sense of space aids in the over all precinct functionality and allows for a pleasant space for users to either pause or engage with.

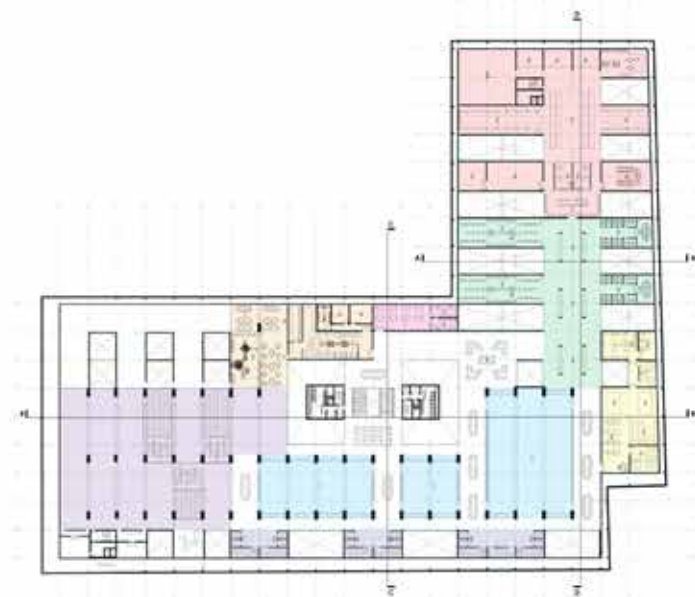
Site Plan



8.2 Site Plan - (Author)

Users can circulate between the park and lower VR levels by navigating to the centre of the site, utilising the large protruding roofs that breach through the ground plane as a navigational marker. As users navigate from the peripherals of the site they will be met with indigenous landscaped gardens, Interactive digital display panels, periscope mirrors that allow you to see other users engaging with VR below them. From the central circulation point users can also navigate to the two big neighbours of the site, one being Sci-Bono which has a main access point aligned centrally with the entrance axis to the centre and the other being the workers museum which has an off centre axis point. This allows for users to navigate easily between all three sites and engage with the various activities.

Basement Plan 01



Program Plan

Research Development Unit

- 1 - Reception
- 2 - Management Offices
- 3 - 3D scanning Room
- 4 - Green Screen Room
- 5 - Office Space
- 6 - Meeting Room
- 7 - Kitchenette
- 8 - VR Testing Zones

Digital Archive

- 1 - PC Work stations
- 2 - Digital Displays
- 3 - Portal Walls
- 4 - Device storage
- 5 - Seminar Rooms
- 6 - Work Spaces

Fabrication Lab

- 1 - 3D Printers
- 2 - Laser Cutting
- 3 - CNC Machines
- 4 - Mechanical Workshop
- 5 - Work Space
- 6 - Material Storage
- 7 - Managers Office
- 8 - Reception
- 9 - PC Stations

Restaurant

- 1 - Restaurant Seating
- 2 - Kids Play Area
- 3 - Bar
- 4 - Kitchen
- 5 - Staff Area
- 6 - Cold & Dry Storage

Augmented Reality Zones

- 1 - Adaptable Engagement
- Educational
- Historical
- Recreational

VR POD Zones

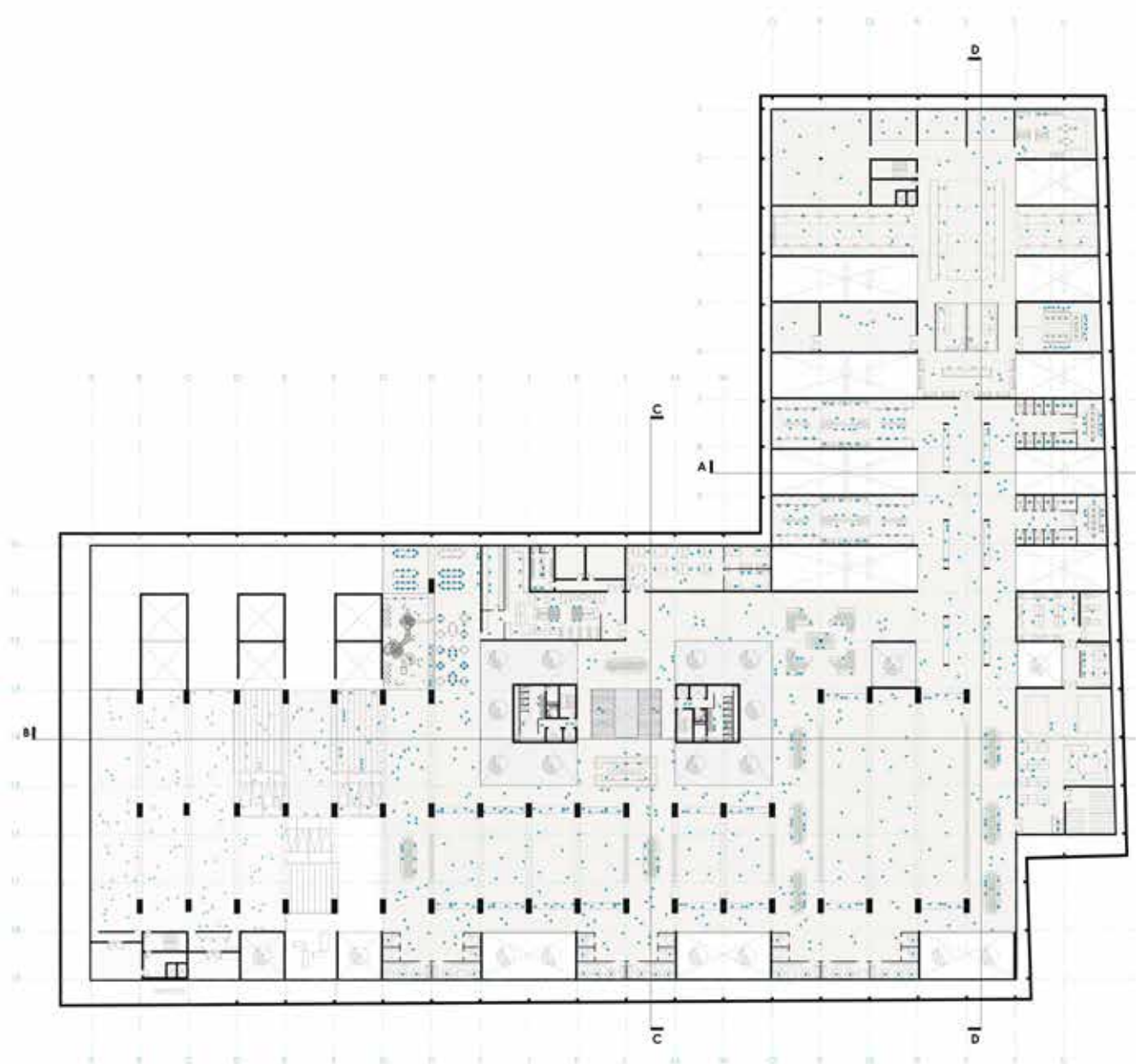
- 1 - Group
- 2 - Single User
- Homebased VR PODs
- Educational, Historical, Reception

Exhibition Space

- VR Exhibition - Digital and Physical
- Physical Exhibition Space
- Local
- Foreign

Admin Offices

- 1 - General Office
- 2 - Management Office
- 3 - Financial Office



8.3 Basement Plan 01 - (Author)

This is the first floor level that users can navigate and engage with VR technology. The need for a physical space that is publicly accessible and can facilitate the use of VR is vital to the users engagement and ability to be immersed within the virtual realm. This is due to the tailored spaces, themes, equipment, opportunities, and experiences the centre has to offer. On this level users can engage with large augmented reality space with various themes and experiences available to the users. They can alternatively visit the digital archive, workshop and makers space, restaurant, or get an individual VR pod. Users will notice throughout the basement level that there are various light wells throughout with natural vegetation or lower level VR activities within their voids. This serves as a way for users to engage with each other between the two basement levels as well as allow for light to penetrate into the building where needed. Users can utilise the same circulation point they entered from to access the level below or alternatively they can navigate through the exhibition space which allows them to access a the level below as they slowly descend through the exhibits and emerge with a familiar large VR engagement zone as previously seen above.

Basement Plan 02



Program Plan

Plant and Servicing Area

- 1 - Geothermal Power Turbines
- 2 - Geothermal Heat Pumps - HVAC
- 3 - VR / IT Room - DB
- 4 - Battery Storage
- 5 - Pump House

Dynamic VR Engagement Zones

- 1 - Harness Dynamic VR System
- 2 - VR Lounge
- 3 - Covered VR Display & Device storage

Historical VR Zone

- 1 - Physical Artifacts Exhibition
- 2 - Covered Display Panels
- 3 - Historical VR Engagement Zone

Virtual Reality Zones

- 1 - Adaptable Engagement
- 2 - Portal Walls

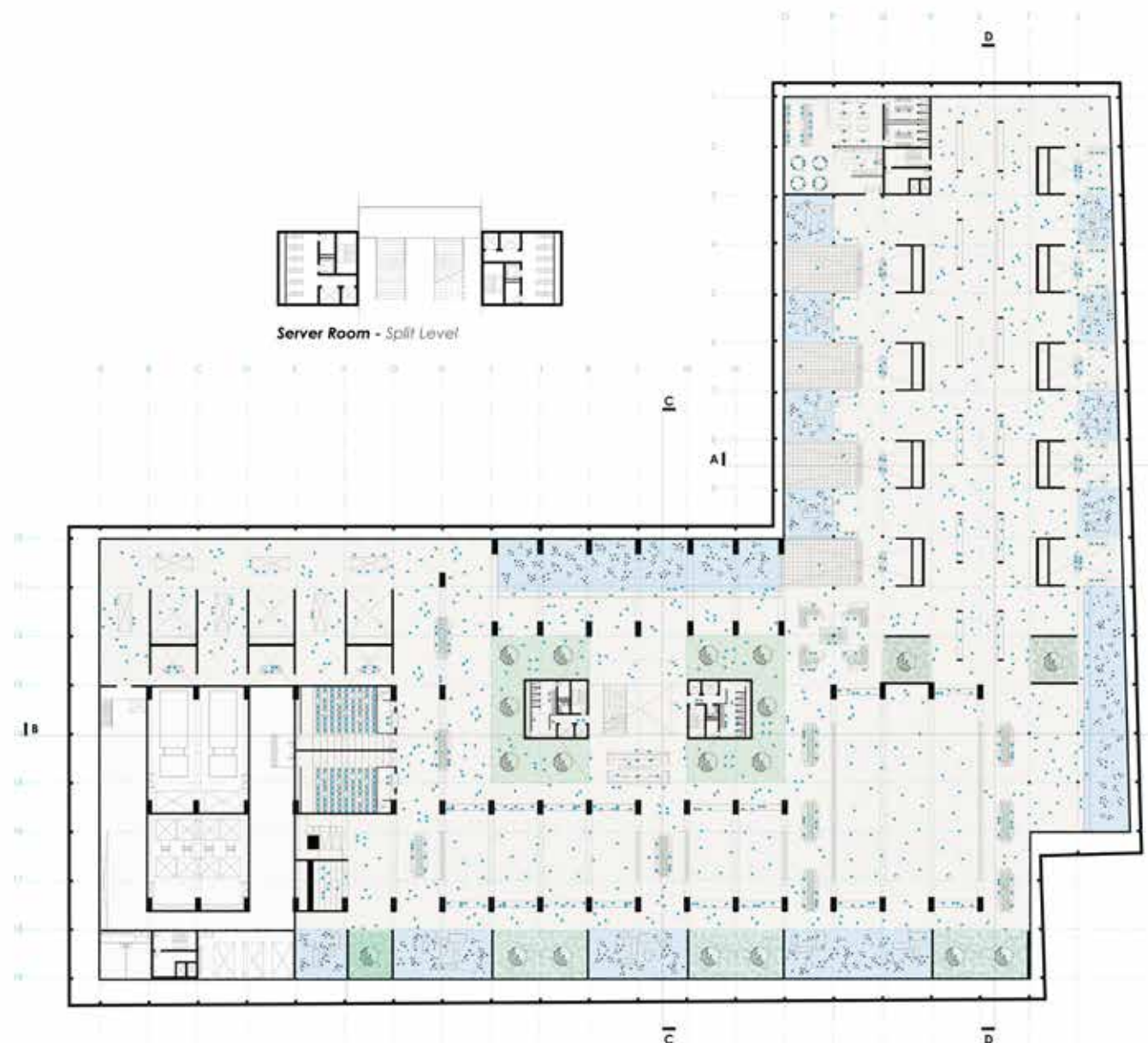
Planting & Ponds

- 1 - Low Light Evergreen
- 2 - Natural Filtration Ponds with Fish

Staff Area

- 1 - Change Room
- 2 - Kitchenette
- 3 - Office Space
- 4 - Break zone

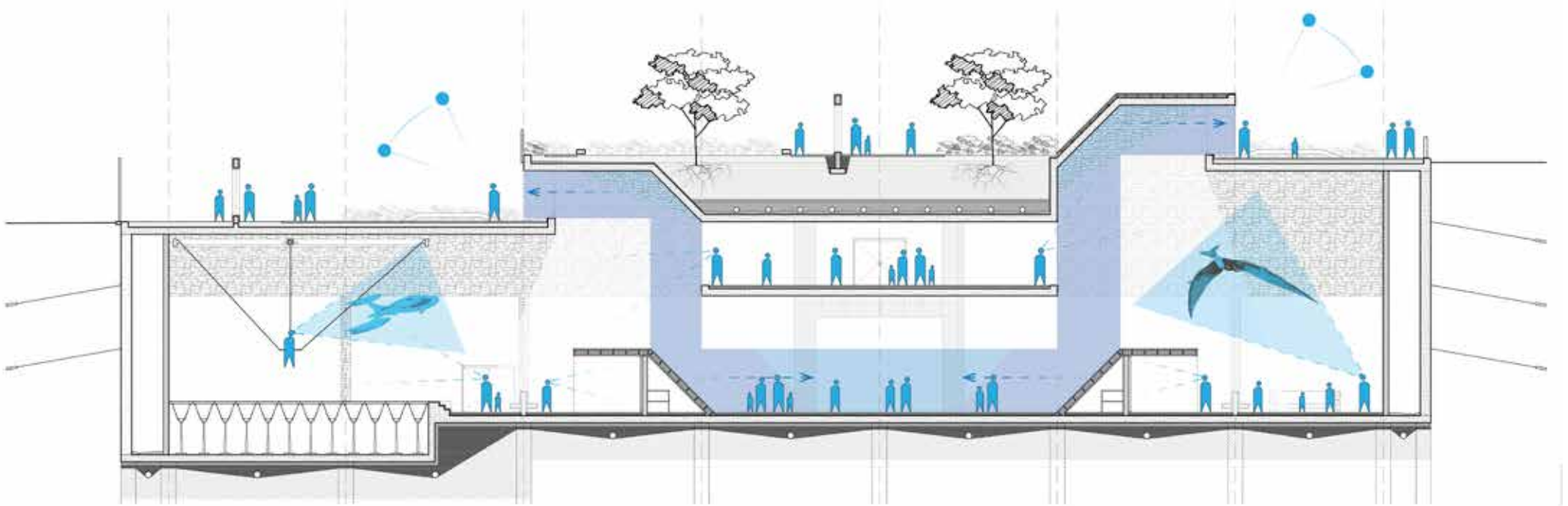
4D Cinemas



8.4 Basement Plan 02 - (Author)

The second basement level features far more natural elements such as water and planting situated between various VR activity zones. The use of natural elements surrounding the VR activities is to allow users to feel more grounded within the space after engaging with VR. This allows the users to engage with all of their physical senses in a calm and natural environment for as long as they need. This is necessary for those users who may feel disorientated after engaging with highly immersive VR activities. The activities they can find on this level are a 4D cinema, large scale VR activity zones, A historical exhibit, group and individual VR activities with adaptable harness system and dynamic flooring. All the VR activities available on this level are highly immersive and provide the ability for users to choose the level of immersion, subject matter, and how many people they wish to join them if any. The apertures in the above floor plate allow for sculpted light to enter this level allowing for controlled lighting and the ability for VR activity zones to dynamically change and adapt to the needs of the facility. The open nature of the plan with the variety of openings and light penetrating deep within the building allows for the structure to have a long lifespan in the cities future, as the park can maintain its functionality whilst the function below adapts to the needs of the city.

Technical Section

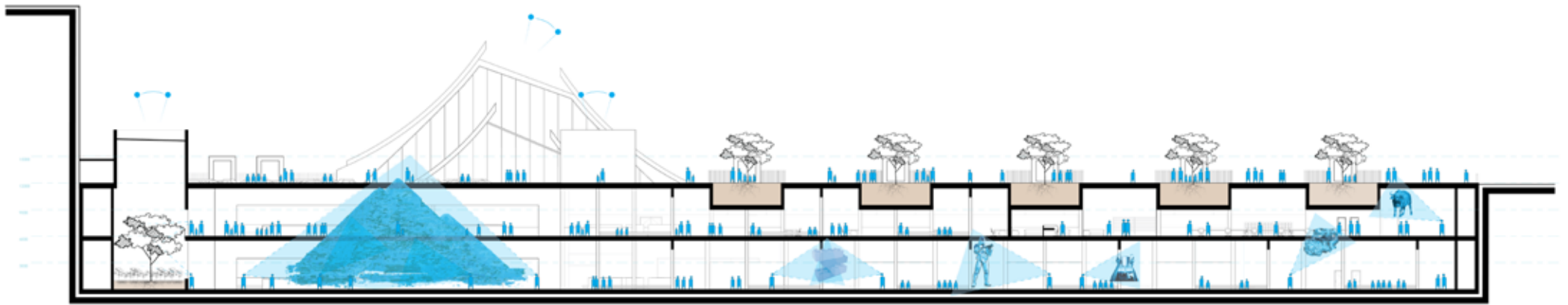


8.5 Technical Section AA - (Author)

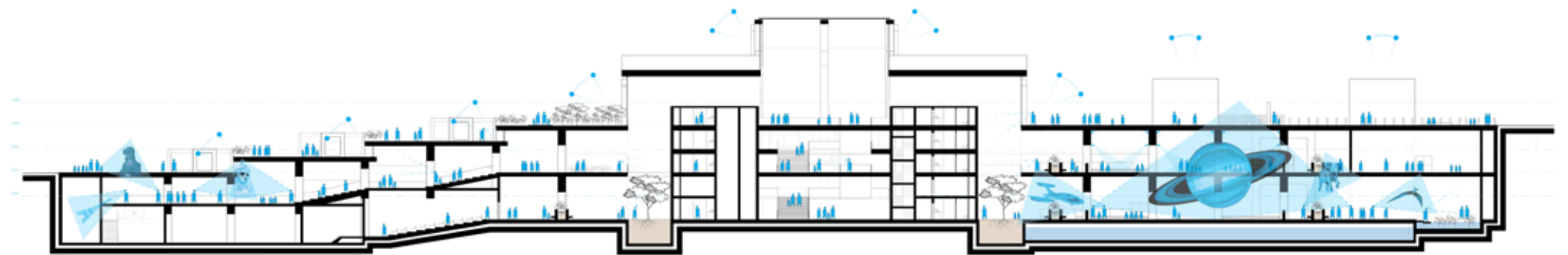
We see in this technical section a number of key elements that relate to how users engage with the facility as well as how the virtual and physical realms overlap each other within the centre. With a majority of the centres facilities being below ground there is a need for natural light to penetrate deep within the basement levels as well as a need to adequately ventilate the spaces. With the upper level serving as a park with some VR,AR,MR interaction for the users to engage with, an opportunity is created by utilising light wells at the park level that help with light and ventilation but also integrate a way for users across all levels to engage with each other and get glimpses of what is happening on a another level. This has been achieved by integrate a periscope system within selected light wells. By adding reflective surfaces at 45° to each other a user in the park can see a users engaging with VR technology and the user engage with VR can see the user in the park as well as the natural park elements (Represented in the blue band). With the multi level interaction happening between the park and the lower basement level the upper basement level too serves as a way for users to seeing into the park and view the sky as well as look down and see what other VR types of engagement is available below.

The VR engagement on both basement levels vary from the type of virtual engagement as well as the intensity of immersion within the virtual realms. The lower level serves as the more immersive and engaging level for virtual interaction, with users being able to engage with a harnessed VR system that has a dynamic floor system, this allows users to physically experience the virtual world they have chosen. This form of VR interaction surpasses what is capable for a user if they purchased a VR headset. The lower level VR lounges provide another unique way of engaging with VR as this allows users to engage with worlds of their choosing in a group setting and allows other users who may not want to utilise the headset to see what their friends are doing within the virtual realm. The upper level serves as a more casual way of engaging with the virtual realm, with users utilising tables, phones, projectors and digital displays to view thee virtual realm. This form of interaction is less taxing on users and allows them to slowly get used the virtual realm and encourages users to further explore what the facility has to offer.

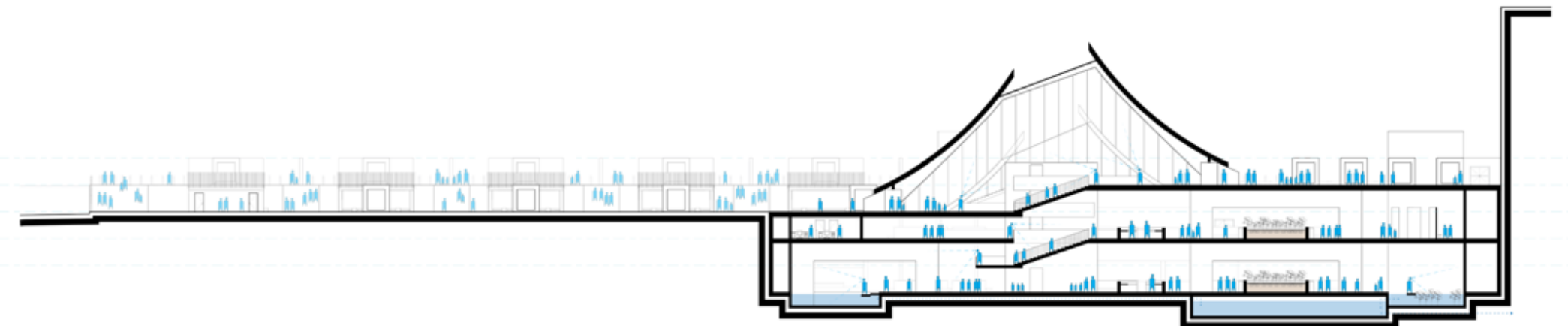
Sections



8.6 Section DD - (Author)

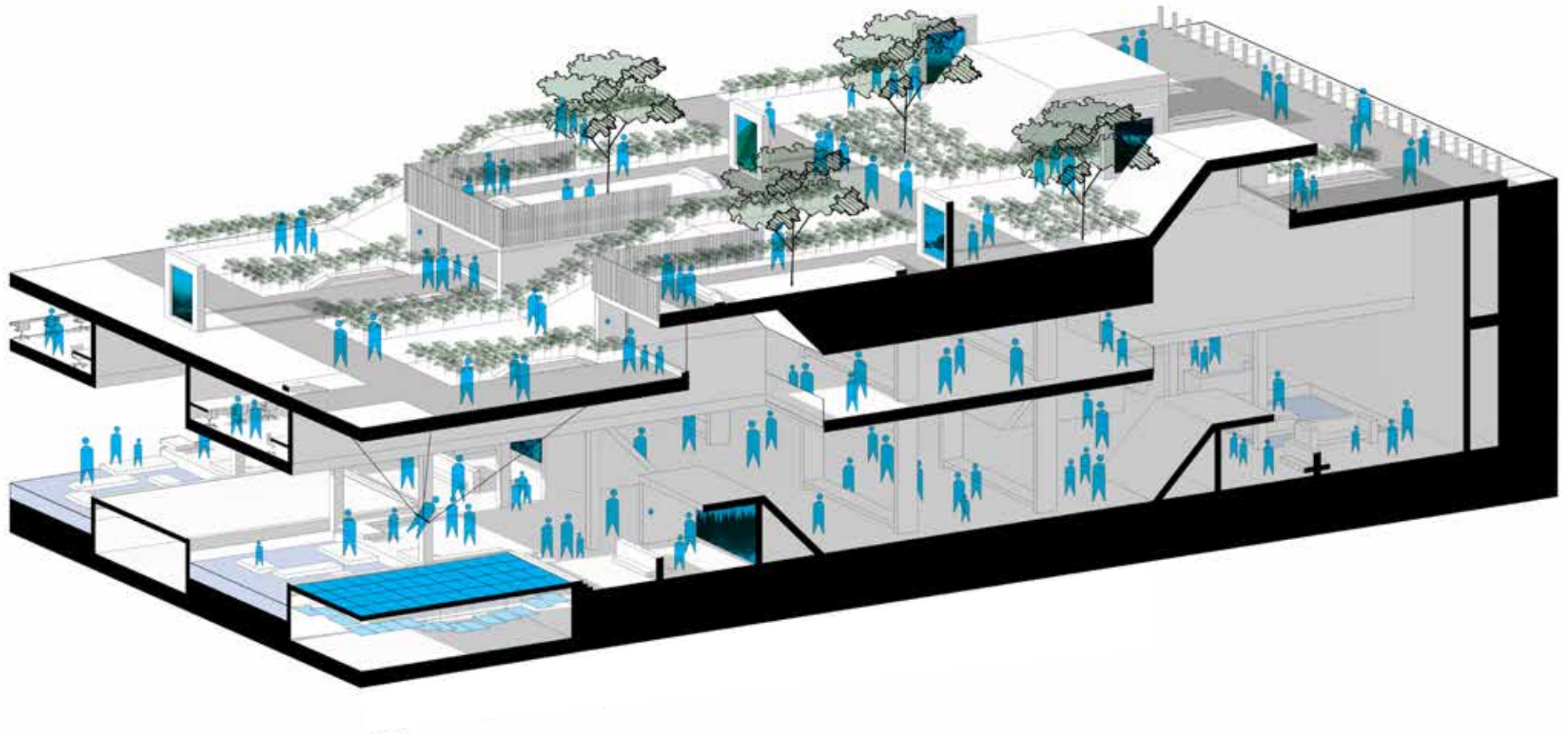


8.7 Section BB - (Author)



8.8 Section CC - (Author)

Sectional Axo

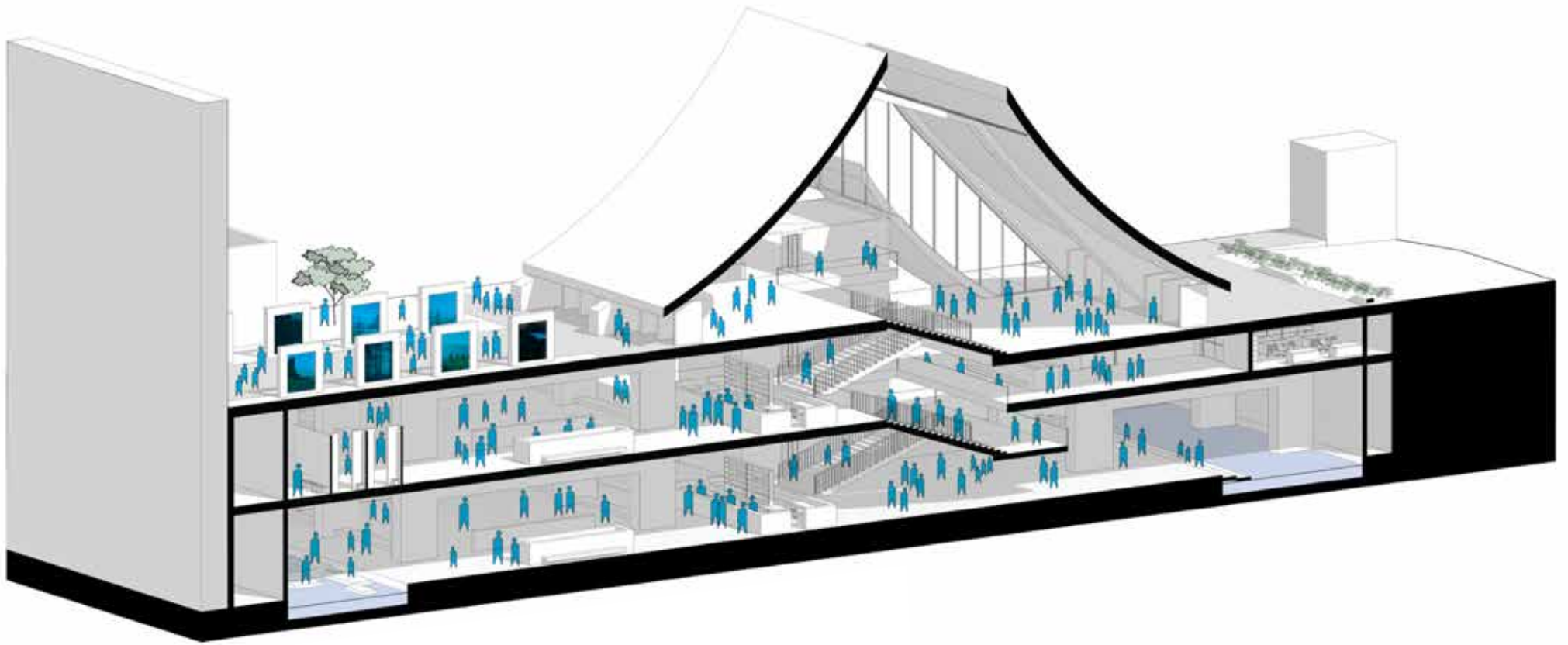


8.9 Sectional Axo 01 - (Author)

In this sectional axo we see that users on the park level are met with a lush natural landscape which they can navigate through at their leisure. There are opportunities for users to engage with digital display panels, which allows users to engage with AR and MR whilst being in a natural open air environment. These users can also utilise the periscope light wells that are integrated within the landscape of the park. Here they can view users on the lower level of the park as well as communicate with them through an audio tube embedded within the light well structure. This form of interaction between the various users across the levels of the centre is a key part of its functionality as well as how it operates within the precinct of Newtown. This allows users who pass by or inhabit the spaces of the park during breaks or free time to still feel part of the centre and what it has to offer.

In the basement levels we can see how spaces have been separated to cater for the needs of the VR system and types of interaction they require yet also see that they are integrated in a way that allows users to have personal connections with VR in spaces that are comfortable and relate to the users needs whilst also still being part of the rest of the centre and VR opportunities available to the users. This concept is similar to an arcade or mall where users can engage with facilities at their chose and be immersed within the experience yet still be in a space with other users engaging with other facilities.

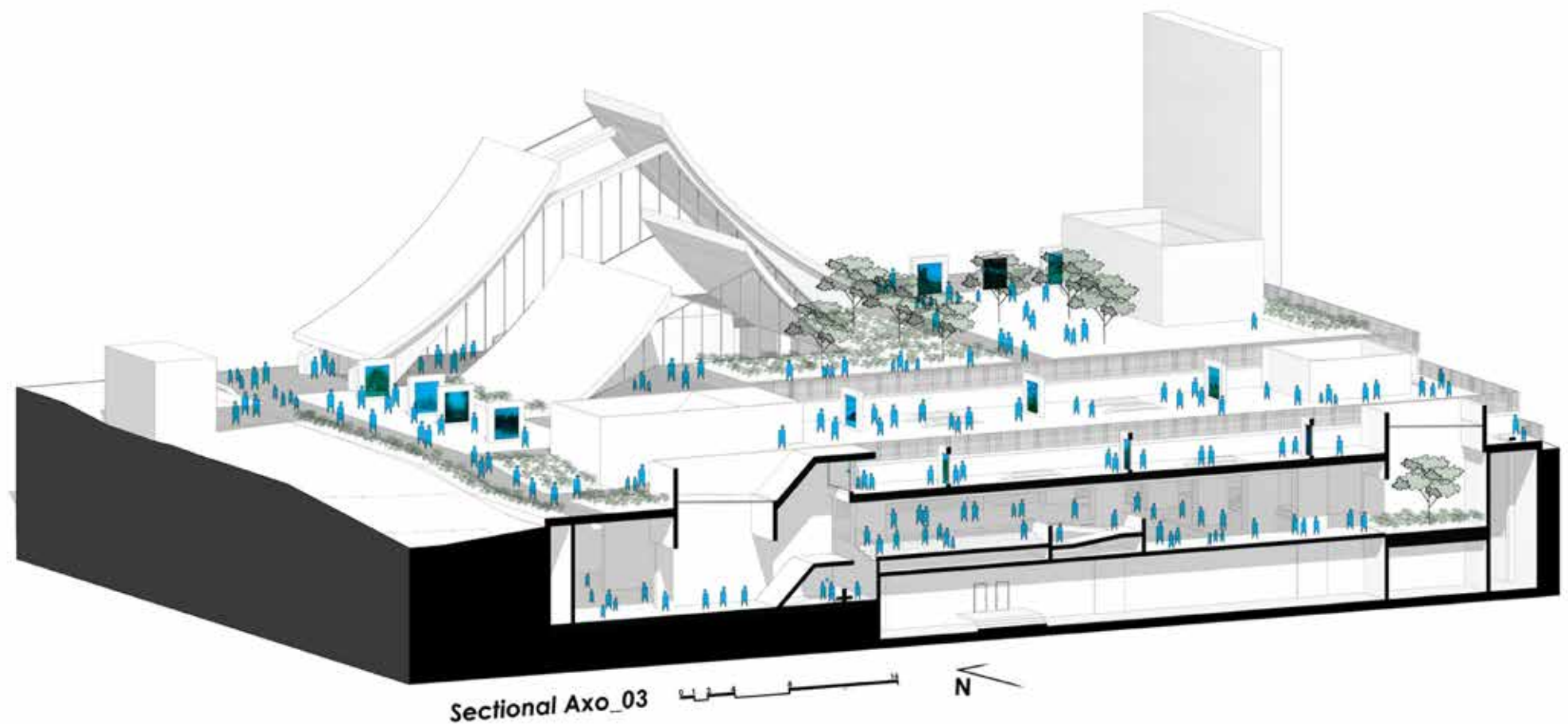
Sectional Axo



8.10 Sectional Axo 02 - (Author)

In this sectional axo we see two key elements that relate to circulation. The Two elements that relate to circulation are the protruding roofs that marks the central circulation point throughout the building and a connection axis between the central circulation point and the Sci-Bono centre. The protruding roofs are a visual marker within the park to indicate the entrance point to access the lower levels of the centre as well as to serve as a beacon to make users who pass by or are navigating through Newtown aware of the centres presence and location. The roofs also serve a more practical function, they allow a large amount of natural light to penetrate deep into the basement level. This light does not only help with the health of the natural vegetation in the basement level but also serve as an internal beacon for users to identify and aid their navigation between the levels. The large void created allows for heat build-up to sit within this space which is ventilated at the roof level. This serves as a large scape stack ventilation system that is replicated throughout the light wells present in the centre. The Sci-Bono circulation access is central with that of the beacon for the ease of circulation for users between the two centres, as they have a strong cohesion in what they offer to the public as well as how they operate. This axis will be utilised by a high volume of users throughout the week and therefore the physical connection between the two needed to provide the easiest form of circulation but served as a threshold between the two centres and what they have to offer.

Sectional Axo



8.11 Sectional Axo 03 - (Author)

In this sectional axo we see the connection between the centre and the Workers Museum. This connection is off axis to the centre to accommodate the connection axis between the centre and Sci-Bono. Although the connection may be of axis the two entrance points are close to each other and this allows for users to navigate between the two easily. This connection is vital as the Workers Museum has one entrance that the public can utilise and it is located on the park side of the building and not the street side. The formation of circulation routes throughout the park allows users to easily navigate the site as well as access the adjacent facilities that surround the park.

We can also see how light wells are used within the park landscape to cater for the needs of the building below. The light wells in the sectional axo show two types, one which functions as a periscope and the other as a traditional light well. The periscope type allows light in and for users to see each other across levels as well as allow for controlled lighting within the building. The traditional light well allows for large amount of light to enter spaces and this has been utilised with natural planting to survive and be healthy within the building.

With the park level serving as a large water catchment roof for water storage to be utilised throughout the building. The water collected from the roof is stored within the basement levels and is filtered where needed to be utilised in all wet services through the centre. This water irrigates the planting and keeps the natural pods topped up as well as utilised in the bathroom and services areas. This reduces the building reliance on the municipality as well as serve as an emergency water source during drought.

External Renders



8.12 Render 01 - (Author)

External Renders



8.13 Render 02 - (Author)

External Renders



8.14 Render 03 - (Author)

External Renders



8.15 Render 04 - (Author)

External Renders



8.16 Render 05 - (Author)

External Renders



8.17 Render 06 - (Author)

External Renders



8.18 Render 07 - (Author)

Internal Renders



8.19 Render 08 - (Author)

Internal Renders



8.20 Render 09 - (Author)

Internal Renders



8.21 Render 10 - (Author)

Internal Renders



8.22 Render 11 - (Author)

Internal Renders



8.23 Render 12 - (Author)

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8.24 Render 13 - (Author)

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Figure 5.2 Giles, C. 2018. Digital Twin of Djenne Mosque, CNN. Available at: <https://www.cnn.com/2018/01/05/africa/preserving-heritage-african-sites-3-d/index.html> (Accessed: 6 September 2023).

Figure 5.3 Digital Twin of the Notre-Dame, CNRS News. Available at: <https://news.cnrs.fr/articles/a-digital-twin-for-notre-dame> (Accessed: 6 September 2023).

Figure 5.4 Rubin, A. 2023 Digital Twin of the Titanic, The New York Times, 17 May. Available at: <https://www.nytimes.com/2023/05/17/science/titanic-shipwreck-3d-images.html> (Accessed: 6 September 2023).

Figure 5.5 Omni Areana, Star Lanes Polaris. Available at: <https://starlanespolaris.com/omni-arena/> (Accessed: 6 September 2023).

Figure 5.6 VR eSports: a look into the future of competitive gaming, Media and Digital Transformation in Sport. Available at: <https://sport-digitaltransformation.media/2023/01/16/vr-esports-a-look-into-the-future-of-competitive-gaming/> (Accessed: 6 September 2023).

Figure 5.7 2020 Avatar Meeting and seminar, The Vendry Memo, 9 June. Available at: <https://memo.thevendry.com/your-avatar-is-cordially-invited-how-to-use-virtual-reality-platforms-for-events/> (Accessed: 6 September 2023).

Figure 5.8 Data Science vs Big Data, Simplilearn.com. Available at: <https://www.simplilearn.com/data-science-vs-big-data-vs-data-analytics-article> (Accessed: 6 September 2023).

Figure 6.1 Author, 2023 Program Diagram

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Figure 6.3 Kafasis,M. A garden of light shows the way from outdoors through subterranean obscurity, Available at: <https://www.arch-daily.com/998955/kengo-kuma-proposes-a-sensory-journey-for-the-national-archaeological-museum-in-athens-greece/642d2a38cfc-130017c0d25f0-kengo-kuma-proposes-a-sensory-journey-for-the-national-archaeological-museum-in-athens-greece-image> (Accessed: 7 May 2023).

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Figure 6.4 Kafasis,M. Night Time Atmosphere, Available at: <https://www.archdaily.com/998955/kengo-kuma-proposes-a-sensory-journey-for-the-national-archaeological-museum-in-athens-greece/642d2a38cfc130017c0d25f0-kengo-kuma-proposes-a-sensory-journey-for-the-national-archaeological-museum-in-athens-greece-image> (Accessed: 7 May 2023).

Figure 6.5 Kafasis,M. The Slit, Available at: <https://www.archdaily.com/998955/kengo-kuma-proposes-a-sensory-journey-for-the-national-archaeological-museum-in-athens-greece/642d2a38cfc130017c0d25f0-kengo-kuma-proposes-a-sensory-journey-for-the-national-archaeological-museum-in-athens-greece-image> (Accessed: 7 May 2023).

Figure 6.6 Baan, 2017. Sculpted Volume, Heatherwick Studio (2017) ArchDaily. Available at: <https://www.archdaily.com/879763/zeitz-museum-of-contemporary-art-africa-heatherwick-studio> (Accessed: 7 May 2023).

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Figure 6.8 Baan, 2017. Sculpting Thresholds, Heatherwick Studio (2017) ArchDaily. Available at: <https://www.archdaily.com/879763/zeitz-museum-of-contemporary-art-africa-heatherwick-studio> (Accessed: 7 May 2023).

Figure 6.9 Esakov, 1999. Experience and Journey, Studio Libeskind (2010) ArchDaily. Available at: <https://www.archdaily.com/91273/ad-classics-jewish-museum-berlin-daniel-libeskind> (Accessed: 7 May 2023).

Figure 6.10 Esakov, 1999. Light-wells, Studio Libeskind (2010) ArchDaily. Available at: <https://www.archdaily.com/91273/ad-classics-jewish-museum-berlin-daniel-libeskind> (Accessed: 7 May 2023).

Figure 6.11 Esakov, 1999. External Experience, Studio Libeskind (2010) ArchDaily. Available at: <https://www.archdaily.com/91273/ad-classics-jewish-museum-berlin-daniel-libeskind> (Accessed: 7 May 2023).

Figure 6.12 Panjwani, Ilyas, 2023. Blending into the Landscape, Vastushilpa Sangath (2023b) ArchDaily. Available at: <https://www.archdaily.com/999425/smritivan-earthquake-memorial-museum-vastushilpa-sangath> (Accessed: 7 May 2023).

Figure 6.13 Panjwani, Ilyas, 2023. External Circulation, Vastushilpa Sangath (2023b) ArchDaily. Available at: <https://www.archdaily.com/999425/smritivan-earthquake-memorial-museum-vastushilpa-sangath> (Accessed: 7 May 2023).

Figure 6.14 Panjwani, Ilyas, 2023. Life at Night, Vastushilpa Sangath (2023b) ArchDaily. Available at: <https://www.archdaily.com/999425/smritivan-earthquake-memorial-museum-vastushilpa-sangath> (Accessed: 7 May 2023).

Figure 6.15 Olll Architecten, 2011. Learning and Operating, Olll architecten (2011) ArchDaily. Available at: <https://www.archdaily.com/115134/design-and-virtual-reality-educational-complex-oiii-architecten> (Accessed: 7 May 2023).

Figure 7.1 Author, 2023. Paper Exploration - Charrette

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Reference List

- AR & VR - South Africa | Statista Market Forecast (no date) Statista. Available at: <https://www.statista.com/outlook/amo/ar-vr/south-africa> (Accessed: 21 May 2023).
- Deggim, S. et al. (2017) 'SEGERBERG 1600 – RECONSTRUCTING A HISTORIC TOWN FOR VIRTUAL REALITY VISUALISATION AS AN IMMERSIVE EXPERIENCE', The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, XLII-2-W8, pp. 87–94. Available at: <https://doi.org/10.5194/isprs-archives-XLII-2-W8-87-2017>.
- Ergan, S. et al. (2019) 'Quantifying Human Experience in Architectural Spaces with Integrated Virtual Reality and Body Sensor Networks', Journal of Computing in Civil Engineering, 33(2), p. 04018062. Available at: [https://doi.org/10.1061/\(ASCE\)CP.1943-5487.0000812](https://doi.org/10.1061/(ASCE)CP.1943-5487.0000812).
- Farshid, M. et al. (2018) 'Go boldly!: Explore augmented reality (AR), virtual reality (VR), and mixed reality (MR) for business', Business Horizons, 61(5), pp. 657–663. Available at: <https://doi.org/10.1016/j.bushor.2018.05.009>.
- 'History of Newtown Pt.1' (2021) Johannesburg 1912 - suburb by suburb research, 26 September. Available at: <https://johannesburg1912.com/2021/09/26/history-of-newtown-pt-1/> (Accessed: 22 March 2023).
- Johannesburg | Urban Regeneration (no date). Available at: <https://urban-regeneration.worldbank.org/Johannesburg> (Accessed: 25 May 2023).
- Lauren (2023) rAge 2022: A Reawakening, rAge Expo. Available at: <https://www.rageexpo.co.za/2023/02/rage-2022-a-reawakening/> (Accessed: 24 May 2023).
- Marr, B., 2021. Forbes. [Online] Available at: <https://www.forbes.com/sites/bernardmarr/2021/06/04/future-predictions-of-how-virtual-reality-and-augmented-reality-will-reshape-our-lives/?sh=6534bf5e68b4> (Accessed 15 April 2023).
- Makransky, G. and Petersen, G.B. (2021) 'The Cognitive Affective Model of Immersive Learning (CAMIL): a Theoretical Research-Based Model of Learning in Immersive Virtual Reality', Educational Psychology Review, 33(3), pp. 937–958. Available at: <https://doi.org/10.1007/s10648-020-09586-2>.
- Pallasmaa, J. (2017) 'Embodied and Existential Wisdom in Architecture: The Thinking Hand', Body & Society, 23(1), pp. 96–111. Available at: <https://doi.org/10.1177/1357034X16681443>.
- South Africa VR market spending 2023 (2023) Statista. Available at: <https://www.statista.com/statistics/1067742/south-africa-value-vr-market/> (Accessed: 20 May 2023).
- The Notorious B.I.G Sky's the Limit: A VR Concert Experience - Always On (no date) The Notorious B.I.G Sky's the Limit: A VR Concert Experience - Always On | Oculus. Available at: <https://www.oculus.com/experiences/event/885669532609892/> (Accessed: 21 July 2023).
- Structure of a People: The South African Pavilion Explores Architectural Representations at the 2023 Venice Architecture Biennale (2023) ArchDaily. Available at: <https://www.archdaily.com/1001115/the-structure-of-a-people-the-south-african-pavilion-explores-social-structures-at-the-2023-venice-architecture-biennale> (Accessed: 23 May 2023).

Bibliography

133_011_06099.jpg (2244×2292) (no date). Available at: http://cdngiportal.co.za/photocentres/OTHER_SCALES_PAN/133/133_011_06099.jpg (Accessed: 12 June 2023).

133_011_06100.jpg (2244×2284) (no date). Available at: http://cdngiportal.co.za/photocentres/OTHER_SCALES_PAN/133/133_011_06100.jpg (Accessed: 12 June 2023).

162_012_57691.jpg (2338×2220) (no date). Available at: http://cdngiportal.co.za/photocentres/OTHER_SCALES_PAN/162/162_012_57691.jpg (Accessed: 12 June 2023).

A Digital Twin for Notre-Dame (no date) CNRS News. Available at: <https://news.cnrs.fr/articles/a-digital-twin-for-notre-dame> (Accessed: 6 September 2023).

AD Classics: Jewish Museum, Berlin / Studio Libeskind (2010) ArchDaily. Available at: <https://www.archdaily.com/91273/ad-classics-jewish-museum-berlin-daniel-libeskind> (Accessed: 7 May 2023).

AR & VR - South Africa | Statista Market Forecast (no date a) Statista. Available at: <https://www.statista.com/outlook/amo/ar-vr/south-africa> (Accessed: 19 May 2023).

Banfi, F. et al. (2023) 'Narrating Ancient Roman Heritage through Drawings and Digital Architectural Representation: From Historical Archives, UAV and LIDAR to Virtual-Visual Storytelling and HBIM Projects', Drones, 7(51), p. 51. Available at: <https://doi.org/10.3390/drones7010051>.

Biocca, F. and Delaney, B. (1995) Immersive virtual reality technology.

Cavazza, M. et al. (2005) 'Intelligent virtual environments for virtual reality art', Computers & Graphics, 29(6), pp. 852–861. Available at: <https://doi.org/10.1016/j.cag.2005.09.002>.

Colombino, L. (2012) 'The House As SKIN: J. G. Ballard, Existentialism and Archigram's mini-environments', European Journal of English Studies, 16(1), pp. 21–31. Available at: <https://doi.org/10.1080/13825577.2012.655407>.

Data Science vs. Big Data vs. Data Analytics (2016) Simplilearn.com. Available at: <https://www.simplilearn.com/data-science-vs-big-data-vs-data-analytics-article> (Accessed: 6 September 2023).

Deggim, S. et al. (2017) 'SEGERBERG 1600 – RECONSTRUCTING A HISTORIC TOWN FOR VIRTUAL REALITY VISUALISATION AS AN IMMERSIVE EXPERIENCE', The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, XLII-2-W8, pp. 87–94. Available at: <https://doi.org/10.5194/isprs-archives-XLII-2-W8-87-2017>.

Design and Virtual Reality Educational Complex / OIII architecten (2011) ArchDaily. Available at: <https://www.archdaily.com/115134/design-and-virtual-reality-educational-complex-oiii-architecten> (Accessed: 7 May 2023).

Donker, T. et al. (2019) 'Effectiveness of Self-guided App-Based Virtual Reality Cognitive Behavior Therapy for Acrophobia: A Randomized Clinical Trial', JAMA Psychiatry, 76(7), pp. 682–690. Available at: <https://doi.org/10.1001/jamapsychiatry.2019.0219>.

Bibliography

Ergan, S. et al. (2019) 'Quantifying Human Experience in Architectural Spaces with Integrated Virtual Reality and Body Sensor Networks', *Journal of Computing in Civil Engineering*, 33(2), p. 04018062. Available at: [https://doi.org/10.1061/\(ASCE\)CP.1943-5487.0000812](https://doi.org/10.1061/(ASCE)CP.1943-5487.0000812).

Farshid, M. et al. (2018) 'Go boldly!: Explore augmented reality (AR), virtual reality (VR), and mixed reality (MR) for business', *Business Horizons*, 61(5), pp. 657–663. Available at: <https://doi.org/10.1016/j.bushor.2018.05.009>.

Freitas, S. de and Neumann, T. (2009) 'The use of "exploratory learning" for supporting immersive learning in virtual environments', *Computers & Education*, 52(2), pp. 343–352. Available at: <https://doi.org/10.1016/j.compedu.2008.09.010>.

Gallery of Kengo Kuma Proposes a Sensory Journey for The National Archaeological Museum in Athens, Greece - 5 (no date a) ArchDaily. Available at: <https://www.archdaily.com/998955/kengo-kuma-proposes-a-sensory-journey-for-the-national-archaeological-museum-in-athens-greece/642d2a38cfc130017c0d25f0-kengo-kuma-proposes-a-sensory-journey-for-the-national-archaeological-museum-in-athens-greece-image> (Accessed: 7 May 2023).

Giles, C. (2018) Meet the scientists immortalizing African heritage in virtual reality, CNN. Available at: <https://www.cnn.com/2018/01/05/africa/preserving-heritage-african-sites-3-d/index.html> (Accessed: 6 September 2023).

Grahame, S. (2004) 'Labour, Work and Architecture: Collected Essays on Architecture and Design', *Architectural Record*, 192(4), pp. 89–90.

'History of Newtown Pt.1' (2021) Johannesburg 1912 - suburb by suburb research, 26 September. Available at: <https://johannesburg1912.com/2021/09/26/history-of-newtown-pt-1/> (Accessed: 22 March 2023).

History of Newtown Pt.2 | Johannesburg 1912 - suburb by suburb research (no date). Available at: <https://johannesburg1912.com/2022/09/24/history-of-newtown-pt-2/> (Accessed: 25 May 2023).

History of VR - Timeline of Events and Tech Development (no date). Available at: <https://virtualspeech.com/blog/history-of-vr> (Accessed: 23 May 2023).

Hokowhitu, B. (1970) 'Indigenous Existentialism and the Body', *Cultural Studies Review*, 15(2). Available at: <https://doi.org/10.5130/csr.v15i2.2040>.

Hook, M. (2015) 'The Affirmative Qualities of a Temporal Architecture', *Architectural Design*, 85(3), pp. 118–123. Available at: <https://doi.org/10.1002/ad.1910>.

iLead (2021) 'This is How Urban Renewal Can Create a Sustainable Future', Practice Group, 7 December. Available at: <https://practice-group.co.za/this-is-how-urban-renewal-can-create-a-sustainable-future/> (Accessed: 17 March 2023).

Johannesburg | Urban Regeneration (no date). Available at: <https://urban-regeneration.worldbank.org/Johannesburg> (Accessed: 25 May 2023).

KEIM Mineral Paint in the Zeitz Museum of Contemporary African Art from KEIM (no date). Available at: https://www.archdaily.com/catalog/us/products/16421/keim-mineral-paint-in-the-zeitz-museum-of-contemporary-african-art-keim?ad_source=search&ad_medium=projects_tab?ad_source=myad_bookmarks&ad_medium=bookmark-open (Accessed: 7 May 2023).

Bibliography

- Kuliga, S.F. et al. (2015) 'Virtual reality as an empirical research tool — Exploring user experience in a real building and a corresponding virtual model', *Computers, Environment and Urban Systems*, 54, pp. 363–375. Available at: <https://doi.org/10.1016/j.compenvurb-sys.2015.09.006>.
- Latham, W. et al. (2021) 'Exhibiting Mutator VR: Procedural Art Evolves to Virtual Reality', *Leonardo*, 54(3), pp. 274–281. Available at: https://doi.org/10.1162/leon_a_01857.
- Lauren (2023) rAge 2022: A Reawakening, rAge Expo. Available at: <https://www.rageexpo.co.za/2023/02/rage-2022-a-reawakening/> (Accessed: 24 May 2023).
- Makransky, G. and Petersen, G.B. (2021) 'The Cognitive Affective Model of Immersive Learning (CAMIL): a Theoretical Research-Based Model of Learning in Immersive Virtual Reality', *Educational Psychology Review*, 33(3), pp. 937–958. Available at: <https://doi.org/10.1007/s10648-020-09586-2>.
- Melo, M. et al. (2022) 'Immersive multisensory virtual reality technologies for virtual tourism', *Multimedia Systems*, 28(3), pp. 1027–1037. Available at: <https://doi.org/10.1007/s00530-022-00898-7>.
- Omni Areana Columbus OH (no date) Star Lanes Polaris. Available at: <https://starlanespolaris.com/omni-arena/> (Accessed: 6 September 2023).
- Pallasmaa, J. (2017) 'Embodied and Existential Wisdom in Architecture: The Thinking Hand', *Body & Society*, 23(1), pp. 96–111. Available at: <https://doi.org/10.1177/1357034X16681443>.
- Riva, G., Wiederhold, B.K. and Mantovani, F. (2019) 'Neuroscience of Virtual Reality: From Virtual Exposure to Embodied Medicine', *Cyberpsychology, Behavior, and Social Networking*, 22(1), pp. 82–96. Available at: <https://doi.org/10.1089/cyber.2017.29099.gri>.
- Rubin, A. (2023) "'Digital Twin" of the Titanic Shows the Shipwreck in Stunning Detail', *The New York Times*, 17 May. Available at: <https://www.nytimes.com/2023/05/17/science/titanic-shipwreck-3d-images.html> (Accessed: 6 September 2023).
- Shamri Zeevi, L. (2021) 'Making Art Therapy Virtual: Integrating Virtual Reality Into Art Therapy With Adolescents', *Frontiers in Psychology*, 12, p. 584943. Available at: <https://doi.org/10.3389/fpsyg.2021.584943>.
- Smritivan Earthquake Memorial Museum / Vastushilpa Sangath (2023b) ArchDaily. Available at: <https://www.archdaily.com/999425/smritivan-earthquake-memorial-museum-vastushilpa-sangath> (Accessed: 7 May 2023).
- South Africa VR market spending 2023 (no date) Statista. Available at: <https://www.statista.com/statistics/1067742/south-africa-value-vr-market/> (Accessed: 20 May 2023).
- The Economist (no date) 'The world's most valuable resource is no longer oil, but data'. Available at: <https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data> (Accessed: 28 May 2023).
- The Notorious B.I.G Sky's the Limit: A VR Concert Experience - Always On (no date) The Notorious B.I.G Sky's the Limit: A VR Concert Experience - Always On | Oculus. Available at: <https://www.oculus.com/experiences/event/885669532609892/> (Accessed: 21 July 2023).

Bibliography

The Structure of a People: The South African Pavilion Explores Architectural Representations at the 2023 Venice Architecture Biennale (2023) ArchDaily. Available at: <https://www.archdaily.com/1001115/the-structure-of-a-people-the-south-african-pavilion-explores-social-structures-at-the-2023-venice-architecture-biennale> (Accessed: 23 May 2023).

Tussyadiah, I.P. et al. (2018) 'Virtual reality, presence, and attitude change: Empirical evidence from tourism', *Tourism Management*, 66, pp. 140–154. Available at: <https://doi.org/10.1016/j.tourman.2017.12.003>.

VILLAGE—Virtual Immersive Language Learning and Gaming Environment: Immersion and presence - Wang - 2017 - *British Journal of Educational Technology* - Wiley Online Library (no date). Available at: <https://onlinelibrary.wiley.com/doi/full/10.1111/bjet.12388> (Accessed: 17 March 2023).

Virtual Reality Opens Up New Possibilities for Historic Preservation (2018) ArchDaily. Available at: <https://www.archdaily.com/892885/virtual-reality-opens-up-new-possibilities-for-historic-preservation> (Accessed: 7 May 2023).

VR eSports: a look into the future of competitive gaming – *Media and Digital Transformation in Sport* (no date). Available at: <https://sport-digitaltransformation.media/2023/01/16/vr-esports-a-look-into-the-future-of-competitive-gaming/> (Accessed: 6 September 2023).

Writer, S. (no date) 'Joburg's R2 billion Jewel City redevelopment set to launch next week'. Available at: <https://businesstech.co.za/news/property/433877/joburgs-r2-billion-jewel-city-redevelopment-set-to-launch-next-week/> (Accessed: 28 April 2023).

'Your Avatar Is Cordially Invited: How to Use Virtual Reality Platforms for Events' (2020) The Vendry Memo, 9 June. Available at: <https://memo.thevendry.com/your-avatar-is-cordially-invited-how-to-use-virtual-reality-platforms-for-events/> (Accessed: 6 September 2023).

Zeitz Museum of Contemporary Art Africa / Heatherwick Studio (2017) ArchDaily. Available at: <https://www.archdaily.com/879763/zeitz-museum-of-contemporary-art-africa-heatherwick-studio> (Accessed: 7 May 2023).

Appendices

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG



SCHOOL
OF ARCHITECTURE
PLANNING

01 August 2023

Faculty of Engineering and the Built Environment:

Ethics clearance letter:

Dear Michael Peneda

Student number (1713035), this letter confirms that your ethics application has been cleared. Your clearance/protocol number: SOAP022/04/2023.


Yours sincerely

Lerato Nkosi

Appendices

SUBDIVISIONAL DIAGRAM

SIDES metres		ANGLES OF DIRECTION		CO-ORDINATES Y System: Lo29 X	
		Constants		+90 000, 00	+2 890 000, 00
A B	105, 10	262.21.20	A	+6 675, 08	+9 369, 09
B C	116, 58	352.21.20	B	+6 570, 91	+9 355, 11
C D	105, 10	82.32.10	C	+6 555, 41	+9 470, 65
D A	116, 25	172.21.20	D	+6 659, 62	+9 484, 31

SG No. A
2143/1992

Approved
J.H. Mouton
for
SURVEYOR-
GENERAL
1992-04-22

SERVITUDE DATA

a b	7, 07	37.21.20	a	+6 577, 85	+9 356, 04
b c	56, 34	352.21.20	b	+6 582, 14	+9 361, 66
c d	12, 00	262.21.20	c	+6 574, 65	+9 417, 50
d e	10, 00	352.21.20	d	+6 562, 75	+9 415, 90
e f	12, 00	82.21.20	e	+6 561, 42	+9 425, 81
f g	22, 20	352.21.20	f	+6 573, 32	+9 427, 41
g h	7, 07	307.27.00	g	+6 570, 36	+9 449, 41
h j	7, 00	262.32.10	h	+6 564, 74	+9 453, 72
j c	18, 00	352.21.20	j	+6 557, 80	+9 452, 81
C D	105, 10	82.32.10	C	+6 555, 41	+9 470, 65
D k	7, 00	172.21.20	D	+6 659, 62	+9 484, 31
k l	60, 10	262.32.10	k	+6 660, 55	+9 477, 37
l m	7, 06	217.26.30	l	+6 600, 96	+9 469, 56
m n	99, 45	172.21.20	m	+6 596, 66	+9 463, 96
n p	7, 07	127.21.20	n	+6 609, 89	+9 365, 38
p a	38, 00	262.21.20	p	+6 615, 51	+9 361, 09

INDICATORY DATA

p q	1, 50	172.21.20	q	+6 615, 71	+9 359, 61
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TOWN SURVEY MARKS

533D1	⊙	+6 679, 07	+9 353, 14
534D1	⊙	+6 523, 86	+9 332, 08

SHEET 1 OF 2 SHEETS

Descriptions of Beacons

A, C, D, a, b, c, d, e
f, g, h, j, k, l, n ----- 12mm Iron peg
B ----- Hole in pavement
m ----- Hole in concrete
p ----- Not beaconed
q ----- Hole in pavement

SERVITUDE NOTE

The figure a b c d e f g h j C D k l m n p a
represents 4104 square metres being a servitude area

The figure A B C D A
represents 1,2235 hectares of land being
Portion 3 of Lot 599
of the Township of NEWTOWN
Province of Transvaal
Surveyed in July 1991 - February 1992 by me
H.N. Thorniley
Land Surveyor

**ORD. No. 15/1986
ART./SECT. 92**

This diagram is annexed to No. T 3683/1994 d.d. i.f.o. Registrar of deeds	The original diagram is No. A 806/1990 Transfer Grant C.C.T.	File S.R. No. 887/1992 G.P. Comp. IR1C-16/B1 TP 706
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EXAMINATION FEES PAID
J.H. Mouton
for SURVEYOR-GENERAL

Appendices

