

EXPLORING "DIGITAL ECOLOGY" AS A TOOL FOR  
ENVIRONMENTAL CONSERVATION THROUGH

**THE DESIGN OF A VIRTUAL ECO-PARK FOR PORT ELIZABETH.**

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Submitted in partial fulfillment of the requirements for the degree Masters in Architecture (Professional).

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Alexandra Charlotte Edmayr

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To my course master, Andrew Palframan, thank you for the guidance and attention you give.

Soft, to your places, animals, Your legendary duty calls - Thomas Kinsella



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## ABSTRACT

This treatise deals with the design of a new Virtual Eco-Park and humankind's relationship to the natural world. The cultural institution of captivity has been positive and negative for the study and conservative approaches of fauna and flora. While this has had benefits, it has resulted in a dominated mindset over the 'other'. This treatise looks at the zoo and aquarium as an outdated educational platform and proposes a new perspective.

This treatise explores 'digital ecology' as a tool of theoretical application. The intention is to provide environmental conservation. The design will use the virtual medium for a new immersive experience instead of the 'live exhibit'.

The 'digital ecology' is also seen as spatial stacking of layers. Using Timothy Lukes theories on the three natures, this thesis applies this theory in a post-anthropocentric way by its role in generating the Virtual Eco-Park. The layers are terrestrial as an ecosystem, the territorial as the built environment and the digital as the immersive experience. These components form the skeleton of the application to the site.

The Port Elizabeth manganese ore and tank farm and the surrounding area has been a dump and polluted landscape for forty years. This treatise, in its entirety, has set up an urban framework that promotes a reconnection to the ecological systems in Port Elizabeth.

The 'digital ecology' and the Virtual Eco Park as a 'building' intends to regenerate/reestablish an old industrial landscape into a new park. The building is designed to become a component of the landscape and not an object on the landscape.

The result of this research will result in a final design that hosts immersive experience—bringing the 'true wild' into the urban landscape by replacing the 'tamed natural'—thereby solving the Anthropocene of the Zoo building type by reframing it as the virtual eco-park of nature.

## PRELUDE

This treatise is preoccupied with the current hierarchy of humankind ruling over the world and promotes a new perspective. A perspective that encourages one to give more than is taken, addressing the repercussion of our actions and looks to history as principles guidelines for what not to do.

*The conclusion I draw is optimistic: to the degree that we come to understand other organisms, we will place a greater value on them, and on ourselves. - Edward O Wilson.*

There is an ethos that is not an immediate revelation to be adopted. Seeking to understand the hierarchical culture we live in now, this treatise strives toward the post-Anthropocene by emphasising on education as an essential role in adopting this mindset. By looking at how we educate society about the natural world, we can hope to encourage better paths.

*We took ownership, it is ours, we own it...nature once determined how we survive, now we determine how nature survives – Sir David Attenborough*

## INTRODUCTION 0

*Animals trapped in a human world- Jo-Anne McArthur*

One could argue that an underlying problem in the world is that it is becoming less wild. As an everlasting enthusiast of ECO over EGO, this treatise into my Master's research began with an environmental lens - *often asking why and as a species can we not be better?* We move, create and destroy at an ever-increasing speed that the natural world surely cannot understand. We carve both into and create barriers onto landscapes -stopping flows, migrations and ecosystems. We create as if our ideas and opinions are the dominant overall; as if we are the sole inhabitant of this planet. As an intelligent species, we take for granted our perceived inferiors.

The psychology behind how we perceive animals and how we understand their habitats, specifically through the lens of captivity, has arguably created a disconnection to the natural - and, in turn, teaches us a lesson: that of what the 'natural' looks like. This (tamed) 'natural' is not limited to the animal, but the non sentient as well. We distinguish ourselves from the natural world.

Therefore, this line of thought leads me to the question at the core of my paper: How do we represent the 'true wild' in architecture, and what exactly does that look like? This request runs alongside our societies increase in compassion - where there is more care and consideration taken into how we consume, specifically looking at sustainable resources, methods, foods, and lifestyles. In contemporary society, perhaps the closest experience of the 'natural' in the city is through a wildlife documentary - providing insight into animal lives via rare shots of nature untamed. Documentaries are a potent form of education, with the potential to educate more so than a museum, zoo, or oceanarium.

Do we continue the fictional representation of the natural in this outdated teaching platform or do we look to digital solutions to teach us the true importance of preservation and conservation?

This thesis develops with intentions of exploring 'digital ecology' as both a tool for environmental conservation and for the design of a Virtual Eco-Park. Exploring the idea of the hologram, and virtual and augmented reality as a measure to bring us closer to nature - this Virtual Eco-Park seeks to become a better tool for 'nature' education, dispelling any current necessity for captivity. In exploring the natural in terms of 'True Wild' vs 'Tamed Natural' and its place in the urban landscape, the 'digital ecology' of the Virtual Eco-Park then takes form as a set of layering principles, by becoming interconnected into the city layer.



Figure 002: Animals Trapped in a human world.

Source: Announcing our new book 'HIDDEN: Animals in the Anthropocene', (2020)

The nature of the building-type thesis intends to establish done through an analysis of the existing zoo/aquarium types - where an understanding of captivity is ingrained within these institutions. An understanding of what the 'zoo' is, as well as its generational development, assist in the building-type establishment of the Virtual Eco-Park. Once I've outlined the role of the zoo/aquarium model, I'll apply what the virtual revolution is capable of for the building-type, essentially re-adjusting the building-type as a post-anthropocentric example of the zoo/aquarium.

The nature of the physical context is aligned with the concepts driving the post-anthropocentric ideals: city as a digital ecology's tool to environmental conservation. Searching for the 'tamed natural' leads the search to brown-field landscapes as places of contaminated post-industrial instability, leading to remediation, and rehabilitation. Therefore, the Port Elizabeth harbour area can be considered a 'tamed landscape'. The Manganese Ore Terminal and Storage Facility along with the Oil Tank farm is an area of exploration for this treatise as a contaminated state.

The principles gained from each research component for the purpose of 'Digital Ecology' is then the tool for the environmental conservation that the zoo/aquarium becomes the Virtual Eco-Park in Port Elizabeth.

## RESEARCH METHODOLOGY:

The research methodology for this paper comes as a systematic way to solve a problem. It is the means of gaining knowledge through the study of methods which result in a strategic framework of paradigms that leads to research conclusions relevant to the subject matter (Rajasekar, Philominathan, & Chinnathambi, 2013).

This document explores an inductive process of research. An initial interest in theory and categories of the site provides the departure point from which I make later decisions.

Two types of research are important to differentiate: pure research and applied research. Pure research is driven by an interest or an inquisitive nature into a scientific question, the main motivation behind this version is the expansion of knowledge and not to create or invent something. Applied research is intended for knowing more of real-world problems, and the application of natural science principles on practical difficulties and enhancing innovations (Balinggan, 2018). This document follows pure research as a platform for pursuing an interest, and then pursues an arguable discourse of study. The application of information and understanding gained through pure research is used to focus this treatise.

Exploratory research further identifies and defines the investigation design tasks, informing the engagement with relevant topics and notions on the treatise. As the argument develops, a dialogue between exploratory research will produce informed understandings of the fundamental issues to be addressed. Empirical research is conducted through practical observation, theoretical exploration and empirical sources. The qualitative research gathered through the application of empirical methods will contribute to a collection of information directly informing the primary and secondary resources of this investigation. The articulation of relevant findings and the inference of information, graphics, photographs and maps all contribute to the production of design narrative and a possible design solution.

My methods of empirical research include books, journals, published articles, governmental reports, websites, past treatise documents, interviews, precedent studies, interviews and any insights from professionals in the fields of research.

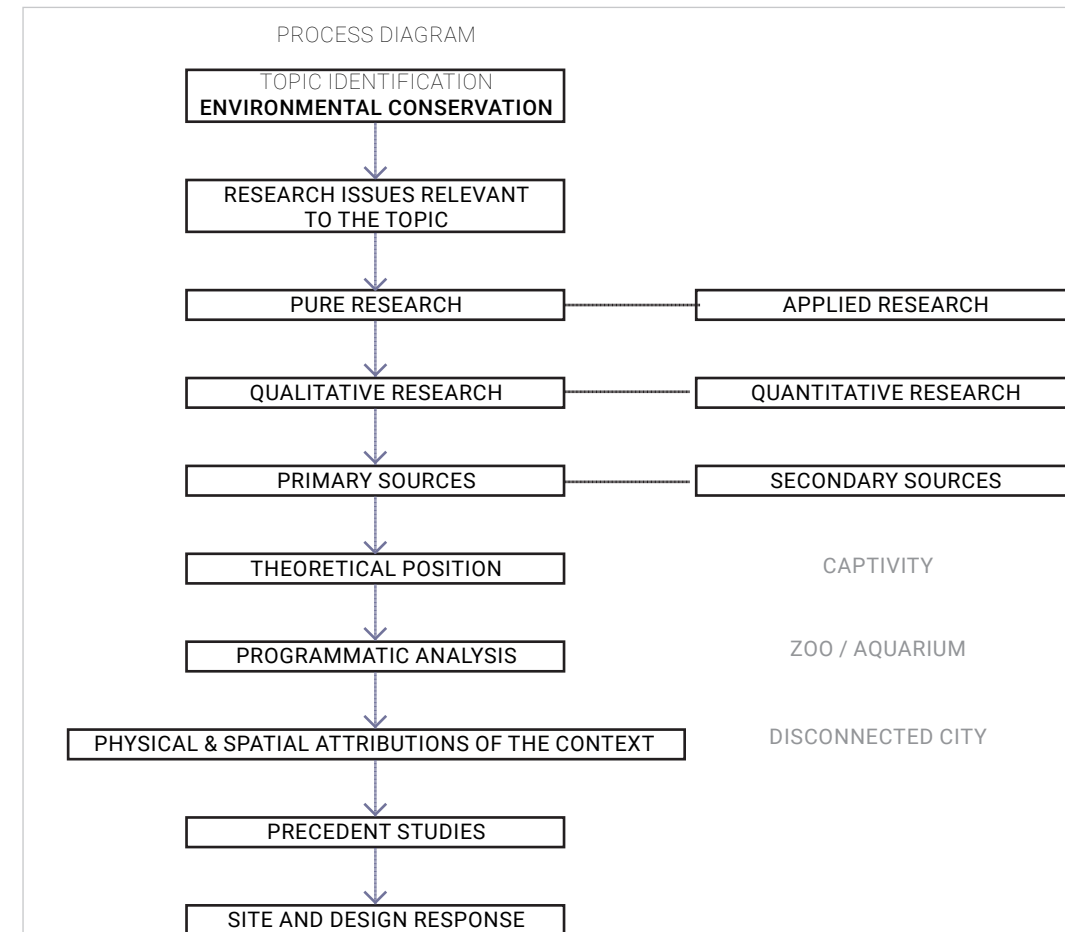


Figure 003: Research methodology.  
Source: Author (2020).

# SOLVING THE ANTHROPOCENE 1

The Problem of Priority

Technology's Impact as Educator

Tamed Nature versus a Wild Nature

Nature in a Digital Age

Defining 'digital ecology'

The Anthropocene is the new geological age in which human activity has been the dominant influence over our climate and the environment. This chapter will introduce the human condition as the dominant. Followed by the impact advancing technology has as a tool educating for change. This chapter intends to outline theoretical drivers that establish a layered spatial framework that explores 'Digital Ecology'.

### THE PROBLEM OF PRIORITY:

*Animals trapped in a human world – Jo-anne Mc Arthur*

One could imagine if the news headlines were mashed together, it could create the intro to a rather terrifying 'What has the world come to' movie montage. Following the logic of the quote above, the human world is a dominated one, where a single species constructs the validity of everything else.

It is conditioning towards this state of being that majority of the human race is unaware. It takes a repetitive telling, subconscious suggestions and as of late, a compelling documentary to open a mind to the condition of the world we know today.

What is nature, what do you think is natural? What is our experience of the natural? Is it a venture into a mountain landscape? Is it taking a boat ride tour to see marine life? Is it a shark cage experience. Is it seeing a dolphin in an oceanarium? We experience nature as a form of entertainment, in those moments, the experiences become educators.

In collaboration between the WWF and Silverback Films, Netflix created a documentary titled *Our Planet*. The documentary is a rich display of the worlds wonders, species and wildlife and how its fragile state is becoming clearer. It is an example of the latest plea to address the change we have caused. The following quote is by David Attenborough introduction to the film series.

*The Anthropocene is the new geological age which human activity has been the dominant influence over our climate and the environment. The habitats that make up our planet are connected and reliant on each other. The diversity, variety of life on our earth depends on these connections. This new geological age is brought on by us changing so much. The critical moment for our planet is for us to wake up, act quickly (Our Planet, 2019).*

The scientific prediction shows this new age is 'destined to be a short one' as it is unsustainable to continue in such away. The imbalance with our planet is devastating, as seen in the figures, the loss of biodiversity is our biggest problem. Without maintaining a balance we cannot sustain our needs and our impact won't be absorbed by our planet.

EGO



ECO



Figure 004: Diagram of the Anthropocene World-view of Today & the Desired Ecological World-view  
Source: Author (2020)



Human beings built their first settlements, some ten thousand years ago. The world around them, on the land and in the sea, **was full of life**. For generations, this stable Eden nurtured our civilisations. But now in the space of **1 human lifetime, all that has changed**. In the last 50 years, Wildlife populations on average have declined by 60%. For the first time in human history, the **stability of human nature can no longer be taken for granted**. But the natural world is resilient, great riches remain. And with our help, the planet can recover. Never has it been more important to understand how the natural world works and how to help it.

- (David Attenborough, 2019).

When referring to 'impact', I am referring primarily to the ever-growing human population, as well as the way in which we consume. Regaining balance means that we will need to slow our population growth considerably (Our Planet,2019). Amongst the solutions to solving the impact humans are having on the earth, arguably the key to the most drastic improvement within our planet is in education – and it is therefore one of the most important areas to invest in development. It is not a surprise that education is the key to regaining the balance within nature, where the most important concept is to live sustainably.

The concern for change is a result. The encouraging factor behind the thesis is that in studying the Anthropocene, we realise that we are losing touch with the natural world. Through education, we can speculate that there will be an increase in compassion as we learn more about nature's habitats and variety, as well as sustainability.

Compassion, as defined by the Encyclopedia of Psychology, motivates people to go out of their way to help the physical, mental, or emotional pains of another and themselves. (Lopez, 2009). It is human instinct to respond to another's misfortune. The increase in our compassion and empathy toward the natural world is rising every day. Education is the guide to gaining momentum, raising awareness and most importantly gaining compassion. The mechanism that got us there is technology.

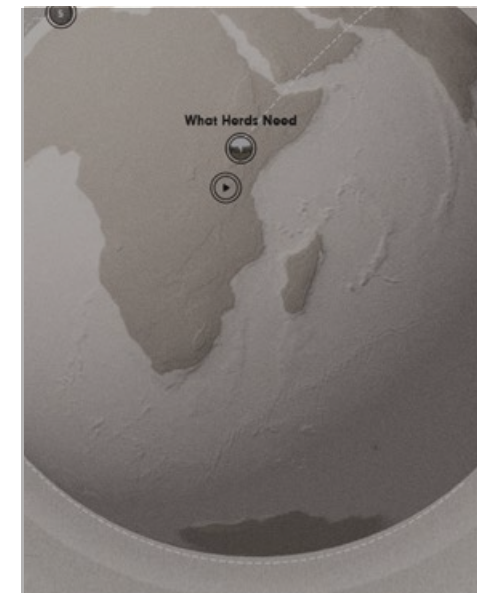


Figure 005: Our Wild Grasslands  
Source: Our Planet (2020).

### OUR WILD GRASSLANDS

Grasslands are home to huge herds of big grazing beasts and the majestic predators that feed on them. Now many natural grasslands have been converted into a cropland or pasture.

However, if we revolutionize what we eat and how we grow, this could change us and our world for the better (Our Planet, 2020).



Figure 006: Our Jungles  
Source: Our Planet (2020).

### OUR JUNGLES

Amazon. Congo. Borneo. Jungles are home to half of all species on land, despite covering only 7% of the lands surface. Jungles produce oxygen, simultaneously soaking up a third of all CO2 that we are the cause of. These precious resources are cut down to grow crops (Our Planet, 2020).

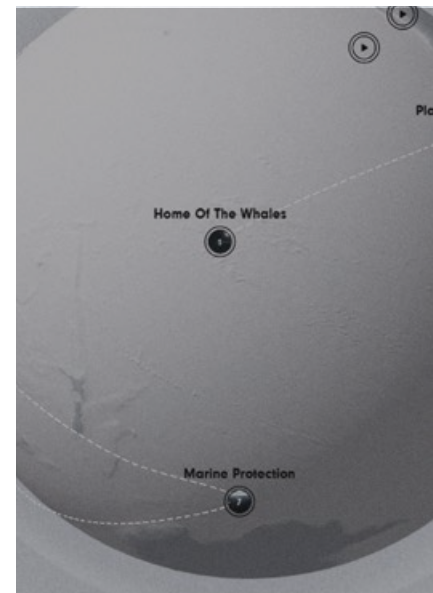


Figure 007: The High Seas  
Source: Our Planet (2020).

### THE HIGH SEAS

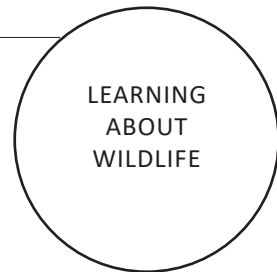
The high seas cover half our planet. No one owns the high seas and therefore, there are no laws in place. Delicate seabed habitats are being destroyed by deep sea fishing and a sea mining. Fishing activities are culling populations of turtles, albatross, sharks and fish stocks (Our Planet, 2020).

**TECHNOLOGIES IMPACT AS EDUCATOR:**

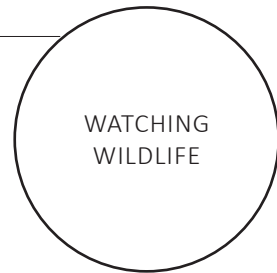
Technologies impact has been at the expense of nature. A large part of the advancement in technology has brought us to travel further, move faster, create and optimise electricity, and manufacture merchandise – where in the process it has become integral to human life. The more we advance the more we infringe on natural systems and wildlife. With the significance of our impact, how technology has improved our emotional connection towards wildlife and the planet has also developed(Heimbuch, 2012). It has given us a clearer understanding of climate change, and amazing advances in alternative energies along with the hope of greener futures. A common thread throughout this all are the developments that help us to interact with nature like never before (Faires, 2017).

**THE FOLLOWING ARE IMPORTANT WAYS IN WHICH TECHNOLOGY HAS ACCOMPLISHED THIS (HEIMBUCH, 2012).**

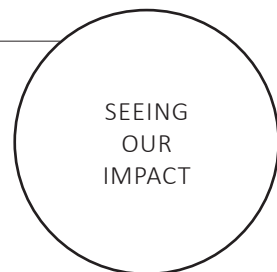
**The everpresent digital devices we surround ourselves with allow for:**  
 Applications to guide you in the wilderness  
 Identifying Species – sounds or imagery



**The online platform and streaming services which allow for:**  
 Nature Documentaries  
 Live-streams and Camera Traps



**Comparative databases showing the effects we are having.**



The looming threats of climate change and the imbalance we have with nature have collected innovative thinkers, bringing creativity and passion into the team. The solutions we need exist, and the plans are in place, so it comes down to science, engineering, marketing, storytelling, business and education in many facets of this revolt to transform and take great steps to rebalance and protect our planet.

We drive change through boosting awareness, understanding the challenges and gaining compassion through powerful storytelling.

**CONTEMPORARY EXAMPLES OF GROWING COMPASSION THROUGH TECHNOLOGY:**

This year has seen our modern society, globally, retreat to the confines of their dwellings with national lockdown regulations to combat the Coronavirus Pandemic. The seas have a low reading of noise pollution, the congested skies over cities have cleared due to shutdown factories, multiple wild species have ventured into the 'privatised' lands of cities and towns. The lockdowns have also inspired compassion to the contained, and, of course, lockdown also came with an increase in screen time. With everyone watching the trends on Netflix, the world's collective obsession with Tiger King, an example of the darker side of the accepted wild animal trade/breeding in America(Vaynshteyn, 2020). In other words, a serious topic was masked by an outlandish story.

Documentaries like the Cove and Black Fish are based on organisations that are working to counter the marine life captivity trade and entertainment. Started by the original trainer and forerunner to the boom of marine-life entertainment industry, Ric O'Barry has dedicated his life to exposing the brutal practices behind this form of entertainment. These documentaries, protests and movements against captivity have created an effect on the industry; bans have been implemented, directly affecting major enterprises like Seaworld. The ban for keeping Orcas in captivity has been successful in fourteen countries (for more information refer to appendices) (The Dolphin Project, 2020).



Figure 008: Blackfish Documentary Cover  
 Source: (Blackfish, 2013)

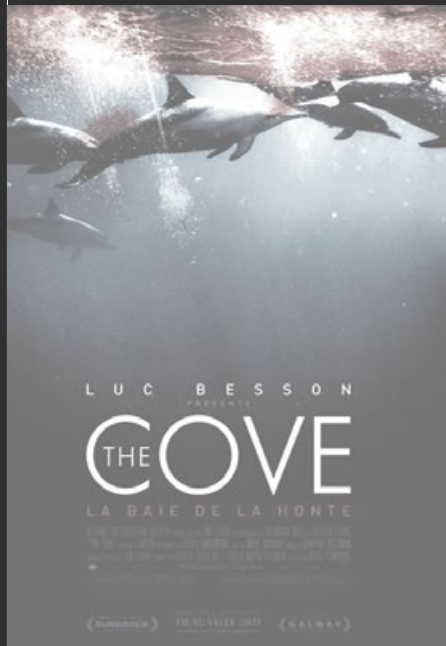


Figure 009: The Cove Documentary Cover  
 Source: (The Cove, 2009)

## TAMED NATURE VS A WILD NATURE

So far, humankind's relationship to the natural world has been established; looking at the display of nature in terms of its level of understanding correlates with the level of urbanisation. The diagram to the right represents the correlation between the natural to the artificial, and from rural to urban. It indicates humankind's affiliations to the animal kingdom.

The scale indicates the correlation that the closer 'nature' gets to the urban setting, the more artificial its representation becomes.

The 'artificial' is a disconnection and superficial form of the natural which contributes to the perception that the ecosystem can be objectified. This is what encourages the problem of priority and anthropocentric habits.

It is important to pair the urban environment to the placements of these building environments. From the true wild to the imported landscapes of a Zoo/Aquarium and their confines of rigid order.



Figure 010: Killer whale Tilikum watches his trainers at SeaWorld in Orlando, Florida.  
Source: Source: (Associate Press, 2020)

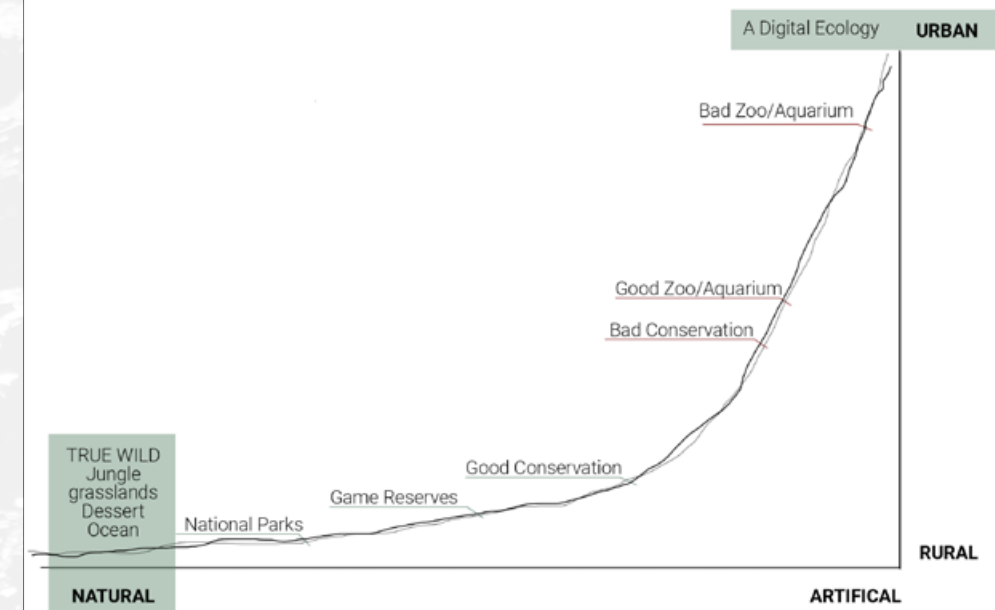


Figure 011: Diagram comparing Urban context to representation of animals  
Source: Author (2020).



Figure 012: Killer whale Tilikum watches his trainers at SeaWorld in Orlando, Florida.  
Source: (Associate Press, 2020)



## NATURE IN A DIGITAL AGE

The revolution is taking place in the science and technology domains. In nanoscale, biology, physics, chemistry and material science – all are converging toward the same principles. There are two major thoughts on the transformative potential of the technological wave that is coming: **either for or against** (Crysler, C., Cairns, S. and Heynen, H., 2013: 467-468).

The NSTC(National Science and Technology Council) and the NBIC(National Board Inspection Code) are forecasting dramatic shifts and a promise of immortality (Gaarfland & Sohn, 2012: 467-468). On the other hand, the European Commission (EC) reports that they are opposed to the American agenda of the NSTC for human improvement. The EC intends to proceed with caution as without it this converging technology could threaten culture, human integrity, autonomy and traditions (Crysler, C., Cairns, S. and Heynen, H., 2013: 467-468).

The new conceptual ideas of these converging technologies are aligned in the common understanding of modernity – which aligns human progress with our domination of nature, and not in our transforming/evolving relationship between humans and nature (Crysler, C., Cairns, S. and Heynen, H., 2013: 467-468).

Gaarfland & Sohn, outline in detail the developments of these converging technologies and the effects they are having. They highlight the characterisation of instability, mobility and flexibility for change. The position of architecture is open for inquiry and acquisition (Crysler, C., Cairns, S. and Heynen, H., 2013: 467-468).

Antoine Picon published Architecture and Sciences, where he addresses the growing interest of the virtual dimension in the architectural field. He questions the predisposition of the architectural discourse as habitual in its lending from the historical developments of biology science and technology. Alternatively, can these developments have a more profound effect? Picon names the notion of structure and illustrates how it was developed from biology through the study of living beings (Crysler, C., Cairns, S. and Heynen, H., 2013: 467-468).

Contemporary architecture as a discourse currently develops a pattern from the postmodern discourse which derived from biosciences (Gaarfland & Sohn, 2012: 467-468). Gaarfland & Sohn bring up the analogy of the immune system for a new architecture. The proposal by Braham and Emmons, in the essay Upright and flexible, that the body is a dynamic and interconnected system opens up the possibility that a building can be envisioned as flexible systems (Crysler, C., Cairns, S. and Heynen, H., 2013: 467-468).

Gaarfland & Sohn discuss the technology, virtuality and materiality as a creation of the hybrid between human and technology proposed by Anthony Picon. They discuss the Virtual Architecture and digital media by Hayles and Gannon and the virtuality as two clusters of thought. Virtual Reality and the philosophical concept of the virtual put forth by Deleuze (Crysler, C., Cairns, S. and Heynen, H., 2013: 467-468).

These illustrate leaps of changes in the meaning of architecture, and the relationship to society. Gaarfland & Sohn highlight Timothy Lakes 'Third Nature' which directly follows the first and second natures (Crysler, C., Cairns, S. and Heynen, H., 2013: 467-468). See figures 013/014/015 for the breakdown of the natures and the relevance they play in the formulation of the ecological spatial layering for the Digital Ecology proposal.

Borrowing from the idea of 'three natures' by Timothy Lake (1999), my thesis finds itself in the stacking of the spatial information to reflect on the vertical notions of space being reliant on the other. Here, I reiterate the notion of the ecocentric, rather than the ego-centric or anthropocentric. Assuring the balance of order, influences and nature's balance as an important structure to which we need to locate ourselves.

Figure 013: Photograph of the Terrestrial.

Source: Author (2020).

Figure 014: Photograph of the Territorial.

Source: Author (2020).

Figure 015: Screenshot using the application 'White Spots' to see digital interface.

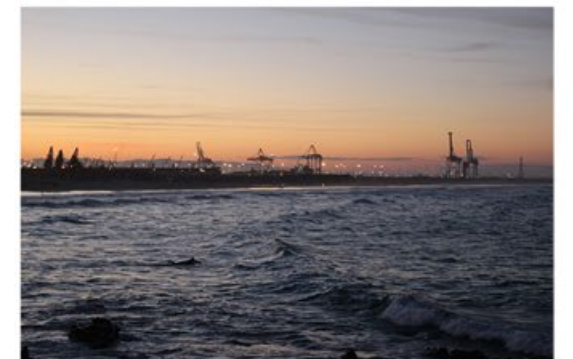
Source: Author (2020).

### TIMOTHY LUKE 3 NATURES



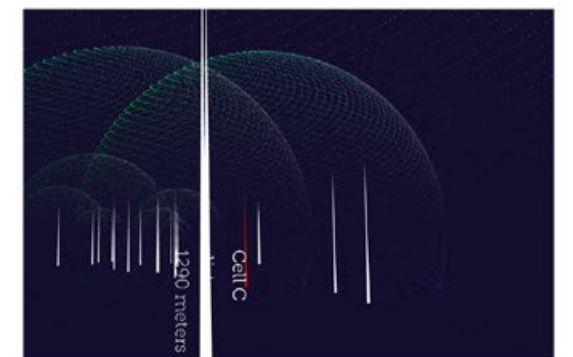
#### THE FIRST NATURE: - TERRESTRIAL

earth/wind/water/sky



#### THE SECOND NATURE - TERRITORIAL

expression of technoscape  
actions of people, cities, economies



#### THE THIRD NATURE - THE VIRTUAL RELATION OF

technology and society

## DEFINING 'DIGITAL ECOLOGY'

### Timothy Lukes 3 natures:

The components that create the three natures are understood as the terrestrial, the territorial and the imaginary. The following will break down what the layers are, then explain what the application means for 'the digital ecology', as well as the architectural response for each layer.

**1** The first of Luke's 'three natures' is defined as on, or relating to, the earth. This is identified as the bioscope, the ecoscope, and the geoscape that fall under the terrestrial. The earth, the sky, and the water are what establish the physical parameters which control human life with natural forces and notion to its effect on the mind and body (Luke, 1999).

**2** The second of Luke's 'three natures' is defined as relating to the ownership of an area of land or sea. This is identified as the expression of the technoscape and socioscapas. The territoriality of the space is created by the action of people, economies and cities, where societal and cultural influence essentially negotiates the second nature's habits and presence (Luke, 1999)

**3** Defined as the hybrid creation of the perceived/conceived space, the third nature identifies as the informational cybersphere of the digital landscape. The shift from the previous nature to the third is the change of the manufactured to the information bits(code). This nature does not submit itself for human presence. It is beyond our consciousness and is found in spheres of the temporal scope. It does not generate and behave the same way that the first two do. An important note for the third nature is that ontology is not possible without the grounding (Luke, 1999).

### These natures, in terms of a landscape, can supply the parameters for a digital ecology.

**1** Firstly, the ecosystem as the first nature exists because it's an interconnected flow of energies and diversity of an ecosystem's biological community of interfacing organisms and their physical environment.

**2** The second is the built environment. The territorial nature of the human presence is dominance, as mentioned in the previous passage, where human progress is based on our dominion over nature. Yet, in order to create a balanced interconnected system, openness and connectivity is imperative.

**3** The third (nature) becomes a digital tool to create the voided layer of the cybersphere. For this thesis, the third nature takes on the role of the educator as a reliable narrator bound by the first two natures. Therefore, the relation of these three natures become exact models of the balance of the eco-centric system this 'world-view' generates: the ability of embodiment of a new space that opens a 'door' for volume; the creation of a temporal scape that does not admit to the same systematic rules as the two natures it is bonded to.

These three can be understood as the major layers of the spatial stacking system proposed for the success of a post Anthropocene integrated system. Together, this spatial stacking allows for a theoretical **application for the architectural response**.

**1** The Architectural response to the three natures develops into Biophilia, and landscape architecture. Biophilia as it rests on the suggestion of the innate connection to nature and its archetypal experience.

**2** The second for the building to be appropriate to the building environment in terms of function, expression and technical resolution should be strictly guided by context (socio-economic, cultural, physical and theoretical), program, materiality (aesthetic expression and technical constitution) and resources/energy efficiency and sustainability.

**3** Then the next becomes a created space of eternal manipulation of the cybersphere. This creation of a temporal scape that does not admit to the same systematic rules as the two natures it is bonded to. Radical modification and limitless potential allow the recreated space to be interpretable.

**The 'digital ecology'** now becomes more defined as these layers are understood as reflections of the three natures, with the intention of giving credibility to the Ecocentric vs Ego-centric societal issues. The use of the digital platform of the third nature as a pliable creation of bound space can be proposed as a design of the new nature park.

The intention behind this would be to educate the focus on humans' fall from dominance and our alignment into an interconnected system that we are urged to re-engage with – essentially creating a digital park of nature that can be categorised as the next generation of the Zoo/ Aquarium.

## THE NATURE OF A VIRTUAL ECO-PARK 2

Captivity as a Cultural Institution

Evolution of the Zoo & Aquarium Type

Modern Zoo Precedent Study

The Virtual Revolution of the Zoo & Aquarium Type

Conservatory Type

Museum / Public Education Facility Type

Exploratorium Type

Conclusions

This chapter seeks to understand the nature of the virtual eco-park. The Zoo/Aquarium is the true form of an anthropocentric building type. This chapter breaks down the captivity of animals and the evolution of the zoo/aquarium type. By understanding the zoo as a building type, and then applying 'digital ecology' to this typology for the hope to provide environmental conservation. Thus defining what the nature of a virtual eco-park might be.



## CAPTIVITY AS A CULTURAL INSTITUTION

**Cultural Institutions evolve & develop over an extended period. It develops in a parallel through the diversity of the culture that nurtures it.**

### ANCIENT TIMES

10 000 - 8 000 B.C. Keeping of wild animals

Ancient collections began as more than just gatherings of these parts; animals were kept within a natural setting.

Small social groups.  
Environmental Knowledge (integrating science, religion and magic)  
Folk systematics, ecology and medicine.

### MENAGERIES AND ZOOLOGICAL GARDENS

3 000 B.C. - 1 500 A.D. Collections of wild animals began

Nature is seen as an integrated whole even while attempting to categorize its many parts.

Urbanization and city-states  
Gardens, parks, game reserves, fishponds, animal collections  
Comprehensive exploitation of natural resources  
Knowledge of environmental change, but not its effects  
Scientific knowledge beyond observation

### MODERN ZOO & AQUARIUM

1 500 - 2 000 A.D. Collections of wild animals began

Nature is public entertainment, 'education' and a tourism factor

Nation-states  
Menageries, zoological gardens, and aquariums  
Cabinets and natural history museums, botanical gardens  
Conservation awareness and environmental ethics  
Human-caused extinctions and extensive natural resources depletion.  
Scientific specialization (natural sciences from natural history)

### THE DIGITAL ECOLOGY

Now & the future  
Releases the notion of captivity from the display

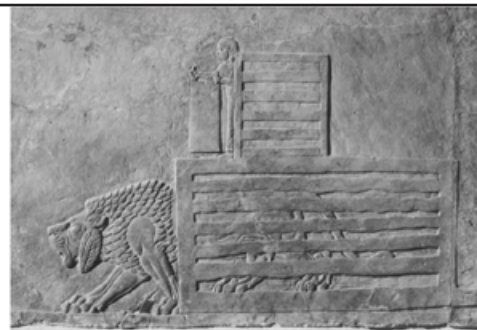


Figure 016: Lion Released From Its Transport Crate Into The Animal Park Of Ashurbanipal, King Of Assyria.  
Source: (The British Museum, 2020).



Figure 017: Versailles Menagerie, Paris.  
Source: (Kisling, 2001).



Figure 018: Zoo Opens to Spectators and Entertainers  
Source: (Zoo Opens to Spectators and Entertainers, 2020).

Cultural institutions evolved and developed over an extended period - developing parallel to the diversity of the cultures that nurture them. The case of keeping wild or exotic animals dates back to 10 000 B.C., right through to the development of collections and finally into what we know as the modern zoo.

The zoo is defined, according to the EAZA (European Association of Zoos and Aquaria), as a permanent establishment where living wild animals are kept for display and exhibition to the public for seven or more days of a year (with or without charge) (Evolution of Zoos, 2017). This includes marine wildlife, safari animals, birds, reptiles, amphibians, bugs and animal sanctuaries (Evolution of Zoos, 2017).

As can be understood in the diagrams to the left. 10 000 B.C. - 8 000 B.C saw the keeping of animals for small social groups. From 3 000 B.C. B.C to 1 500 A.D this developed into wild animals being kept in 'collections'. This is essentially the start of the zoo although this terminology was only introduced in the 18/19th century (Vernon N & Kisling, Jr, 2001).

From ancient times through to the early modern era, there was a perspective of nature as an integrated whole, and a certain respect for the environment. The ancient gatherings included the natural habitats of the animals as, during the import of the exotic animals, plants were also a keen interest (among others). These were coveted extravagances and it was mostly the wealthy that would include the combination (Vernon N & Kisling, Jr, 2001).

Max Oelschlaeger, a historian, states the following as the current way of thinking,

*The world becomes merely a stage upon which the human drama is enacted. The wild plants and animals, the web of life with which our humanity is bound, and without which the human drama could not be enacted, become bit players. The modern viewpoint thus impels us to relentlessly subjugate the wilderness, since things wild and free are alien to Ancient animal collections developed sensibilities nurtured so carefully in the garden of civilization.*

Pre-literate humans were part of the natural order. They had a dependency on uncontrollable and pervasive wilderness. Only when humans became self-sufficient through the mechanism of domestication and agriculture, and as they developed into socially and intellectually unique species of the time, did the dominion over other species begin (Vernon N & Kisling, Jr, 2001).

Urbanised order and socio-economic development (3 000 to 1500 B.C) increased interest in the collection of wild species for the reasons of aesthetics and non-utilitarian reasons. This stretched across Mesopotamian, Ancient Egyptian, Ancient Asia, Greek and Roman, Persian and Arab, Medieval and Aztec and Inca civilisations (Vernon N & Kisling, Jr, 2001).

The renaissance period saw Europe evolve into nation-states, with increasing power, wealth and influence. The existing collections at the time grew in size and numbers. These collections were called menageries (the term was coined in 1712). The menageries of Europe and the colonial collections would eventually establish the zoo and aquarium terminology and industry.

This cultural institution of captivity has led to our anthropocentric global view, of which this treatise seeks to disband.



## EVOLUTION OF THE ZOO & AQUARIUM TYPE

Menageries were popular throughout the world by the 18th - 19th centuries. Between the 1700s and 1800s, there was a shift of menageries being exclusive to royalty and the wealthy to it being a public amenity. This was a progressional cultural shift as before it was only the privileged that had the interest, leisure and financial means to support animal collections, in the 1800s the privileged class grew and the support for menageries came through societies with membership fees, government taxes and funds. Then it shifted to the general public (Vernon N & Kisling, Jr, 2001: 37-42).

Prof. Dr Natascha Meuser has done extensive research into mapping out zoo architecture in a systematic manner of the typology of zoo typology. Her research begins post-renaissance, as it documents explicitly the zoo as a public entity (Meuser, 2018). Her work intended to fill a gap in the research of animal enclosure, setting out to produce a comprehensive manual for large-scale construction zoological gardens. Her research heavily criticizes the 'man and beast' relationship through time.

She addresses the significant influences of humanity's relationship with animals that it is a western civilizations reflection, with key factors of Christian values, political power and intellectual emancipation.

Zoological gardens are subject to change by what society accepts, expects and therefore says is appropriate. This is true for most architectures, our relationship changes with Architecture just as it is for our relationship with animals (Meuser, 2018). As stated before in 'captivity as a cultural institution' the zoo we know today developed from living trophies, living exhibits in museums into the amusement parks with moral duties.

There are five generations of buildings (figure 020). These are generated by our perspective of humans relationship with wild-life and welfare. Prof. Dr Natascha Meuser also writes that the zoo design draws from architectural typologies of the prison, theatre and museum.

Zoos rely on an audience, which meant the location of the zoo would be located in the Urban. The animals are modelled to the habitat of the human. The animals, therefore, have no territorial habitat as it is artificial. Artificial habitats are created to constrain and restrict. Prof Dr Meuser, defines the essential factors of this context are confinement, presentation and dissemination of knowledge (Meuser, 2018).

The zoo and aquarium type has evolved over time. The diagrams on the left are the five generations of zoo/aquarium from its beginning until present. The generations of the zoo all subscribe to the relationship between the captor and the captive. In previous passages, I have used the term 'tamed' as a definition of the control we have over the natural form. I argue that this contributes to our anthropocentric society and culture. This lens finds humankind, and our cultural institutions, as the captors.

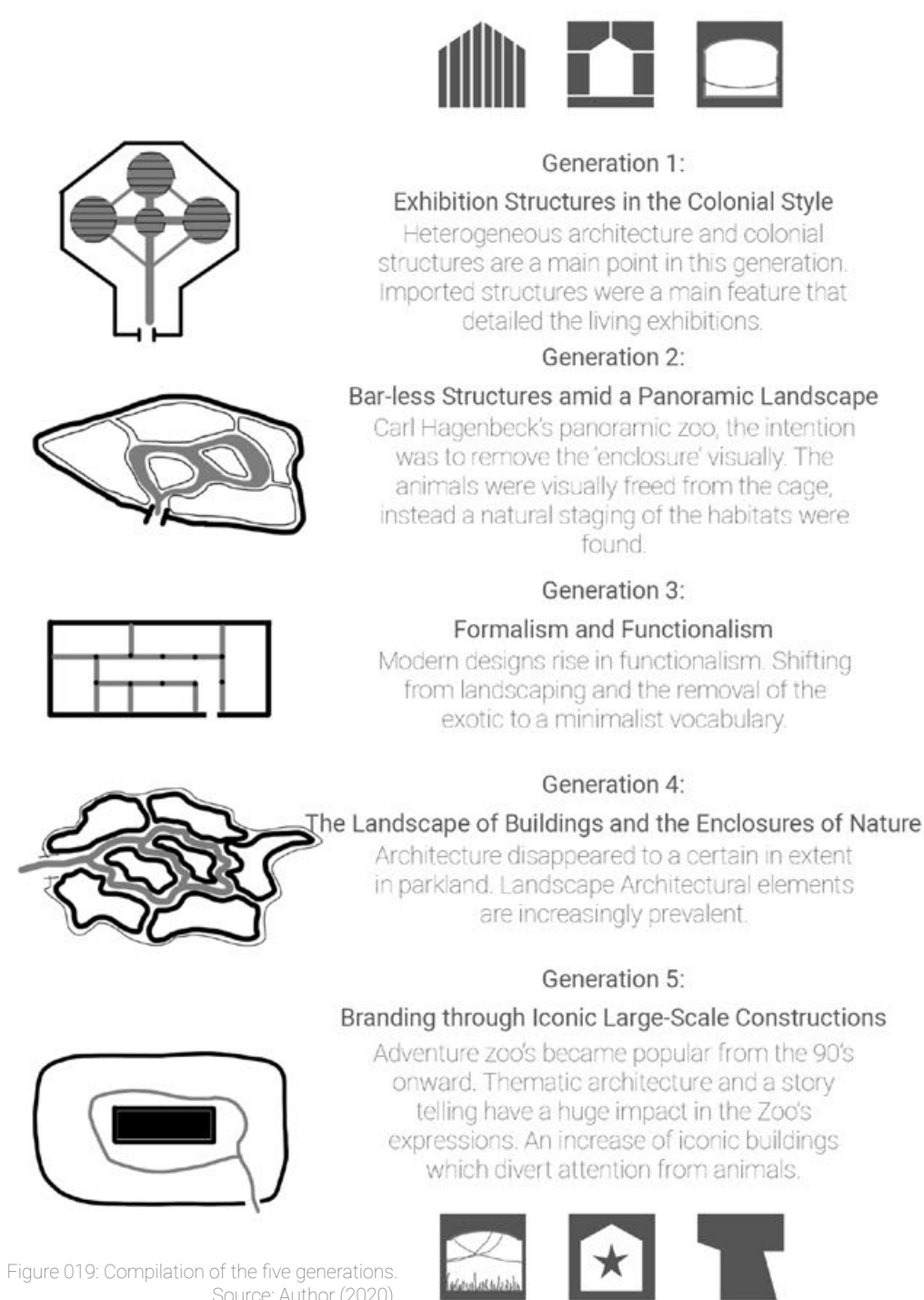


Figure 019: Compilation of the five generations. Source: Author (2020).

As captors of the captive, we need to seek-out and establish a solution to 'release' the captive. Therefore, the nature of the zoo/aquarium building-type is what is necessary to understand as a building type. This is the shifting concept between the generations. This relationship is configured through the relationships between the typologies of building types which the zoo is generated from.

The zoo/aquarium building-type draws from architectural typologies of the prison, the theatre and the museum.

Building-type has masked the museum with architectural innovation as an icon of consumerism. The initial draw of the museum had the intention of education behind it. This is, however, the crux of the thesis. The education received from captive animals is a dangerous lesson. The emphasis on objectifying further encourages the hierarchical belief of anthropocentric normality. Nevertheless, the notion of the museum is somewhat forgotten and the architectural innovation replaces it.

The generations of the zoos/aquariums have been established by these typologies' prompts. Zoological gardens are subject to change by what society accepts, expects and therefore says is appropriate. This is true for most architectures; our relationship changes with architecture just as it does for our relationship with animals (Meuser, 2018). As stated in the previous sub-chapter, the zoo we know developed from living trophies and living exhibits in museums into the amusement parks of today with moral duties (Meuser, 2018).

This statement of moral duties manifests as the staging of the 'natural' for the animal. The argument at this stage is that this 'staging' of the animal and the experience of the animal is set out as a means to educate about the wild – therefore contributing to our objectification of the natural world as a consumerist ideal.

With these five generations (refer to figure 019) as borrowers of the three building-types and never shifting far from this, the question for the next step can be asked: *What will the next generation of zoo/aquarium be?* Essentially, using the three building-types that represent the zoo, and giving the museum's role of a didactic institution its accurate portrayal through the use of 'true-wild' nature and not a tamed version would be the key to a post-Anthropocentric zoo.

Therefore if the education platform of the museum and the entertaining experience of the theatre are used in the post anthropocentric way, what does the prison become? The notion of the prison's constraint and security are employed as navigational guides, no longer the cage of the animal. The prison typology, no longer the prison of captivity as animal pens, is imbued by the constraint and security of physical and spatial spaces of the design.

The mechanism that allows for this is the introduction of the digital. The digital replaces the need for the living exhibition of the animal and dissolves the idea of constraint and security of the animal into the constraint and containment of space. Placing the exhibition of the digital animal in the shifting fields as the public (Meuser, 2018).

The intention for stabilising this anthropocentric approach to the zoo typology can result in a shift in this cultural institution we have as captors of a living product. Restoring a subconscious shift to the understanding of nature in its true form of the 'True Wild' as opposed to the tamed.

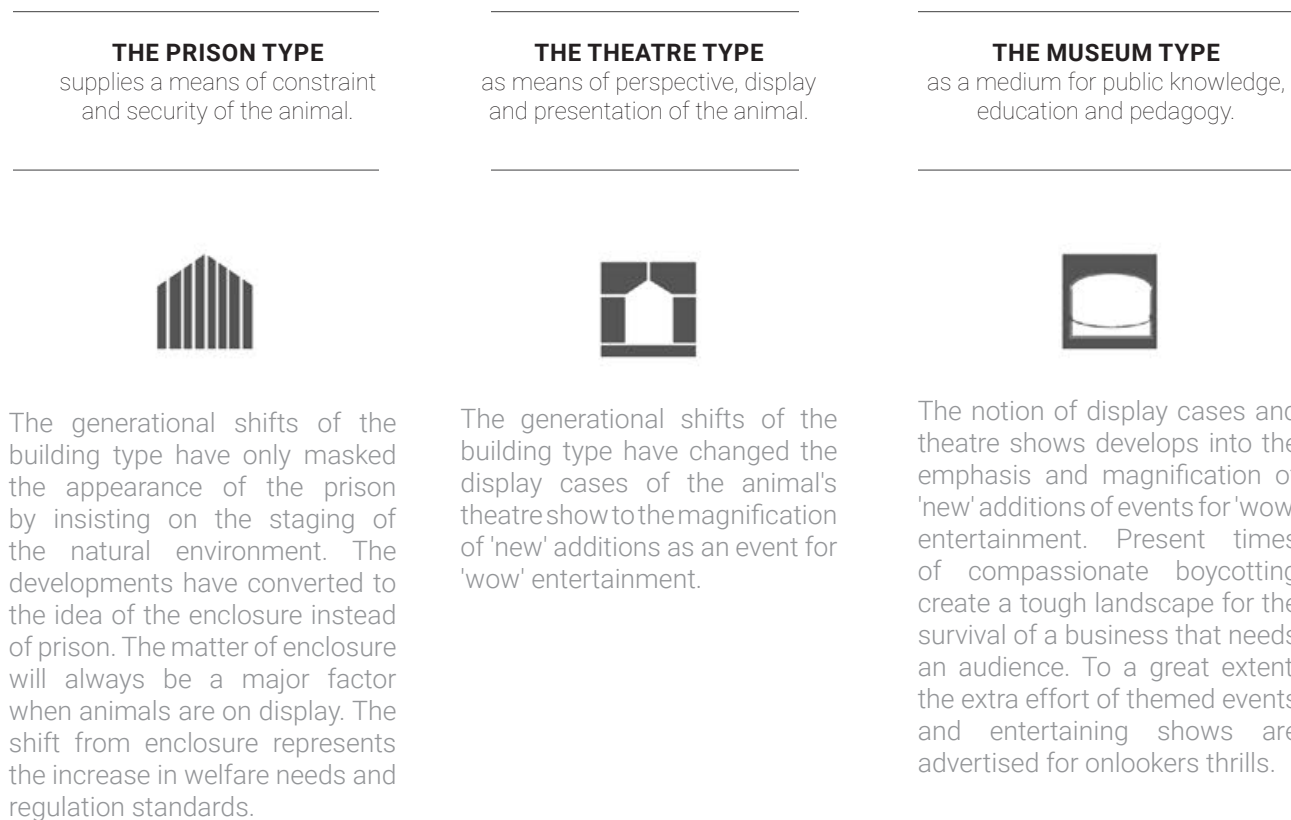


Figure 020: Diagrams of the 3 types.  
Source: Author (2020).



**MODERN ZOO**  
AND THE THREE TYPES

The Zoo is the arrangement of enclosures that stage natural environments to immerse an audience into artificial compounds. The components of the Zoo across scales is the public access and audience. Assuring the location in the city in a public sphere, for natural advertisement, public attention. Similarly to the location in the city and public domain, a Zoo is generally cited near a public park allowing for a 'visual' continuity to the surroundings. The diagram below is a default zoo layout according to the above statement.



Figure 021: Diagram of the default Zoo  
Source: Author (2020).

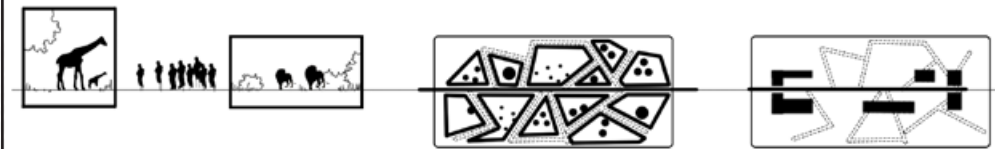


Figure 022: Diagrams of the Prison Type.  
Source: Author (2020).

Levels of enclosure in terms of the **prison type** and staging of natural environments are rooted in the following ways. Its levels of enclosures, pockets of spaces arranged via imported landscapes to nurture specific animals and their needs according to strict guideline regulations. Each enclosure is interconnected by movement paths for the audience. A zoo has a thorough landscaping component to which the park has pathways, and ordering themes. The variety in which Zoos are located in a city are dependent on historical influence, surrounding developments, public access, land cost, land size, green belts or parks. Most are located as close to the public area and near a green belt/park or environment as possible.



Figure 023: Author edited Images of Bayworld Theatre.  
Source: Author (2020).

The **theatre type** in the zoo is parallel to that of circus viewings. The idea of the exhibition of the fauna and flora in pockets of space along the pathways for the audience. In Zoo's taunting, baiting with food and encouraging actions for entertainment is not uncommon. Aquariums, especially those holding seals, dolphins and whales train animals for circus-like entertainment value. These actions are becoming out of date as regulations to improve animal welfare. For example, the closure of Bayworld Oceanarium in Port Elizabeth emphasizes the loss of appeal to the public to see animals kept or treated this way (figures above are the images from Bayworld's website page). In a global example, the fall in Seaworld attendance since the release of movies such as The Cove & Blackfish or public protest movements like "empty the tanks". The increase of animal welfare regulations & breeding in captivity bans, have all made these industries struggle for survival. The theatrical event of interaction in the Zoo encourages the objectification of the Anthropocene.

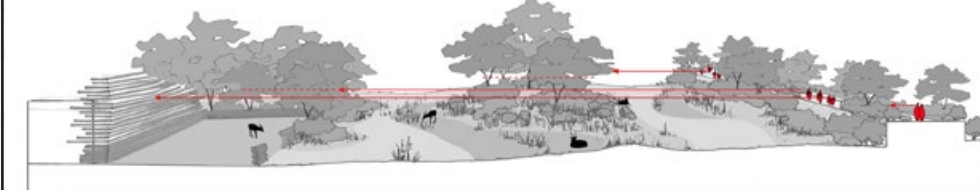


Figure 024: Diagram of the immersive intentions behind Paris Zoological Park  
Source: (Mugnier, Argyroglo and Cieutat, 2014).

The **Museum type**, as discussed before, has been manipulated as 'false conservation efforts' by the portrayal of 'happy' animals. Politics and the greed of consumerism encourage falsifying truth to make a company. For example, Seaworld guided tours educate the audience on captive animals often following scripted information that is simply not based on facts (Black Fish, 2013). The health issues and habits that animals pick up from being in a zoo or aquarium all their life are filtered into the public through careful wording and false information. A local example in Port Elizabeth's Bayworld Sealion pools, one of the sea lions continuously 'barks'. On the exhibit placards, each seal is named and personalities are defined. For this particular seal, it says he likes to talk and communicate. To the naive, this is cute; to the 'woke' participant this is a sign of manipulation, a tragic mask of boredom, restlessness and anxiety.

A PRECEDENT STUDY

**MODERN ZOO**  
**PARIS ZOOLOGICAL PARK / BERNARD**  
**TSCHUMI URBANISTS ARCHITECTS +**  
**VERONIQUE DESCHARRIERES**

ZooParis, 2009-2014  
SCHEDULE  
Commission, 2009  
Inauguration 2014  
SITE  
14 hectares  
BUDGET  
N/A  
CLIENT  
Chrysalis / Museum of Natural History

The Paris Zoological Park was originally constructed in 1934. Found on the fringe of the urban park, the Paris Zoological Park. The Urban utopia envisioned the immersion into the artificial world. The artificial mountain of the Paris Zoo (figure 025/026) draws on dramatic effect to create emotive responsiveness of natural environments. The staging of 'Great rock' architecture to place the presence of animals in otherwise banal landscapes.

The upgrade of 21st Century regulations led to the closure of the zoo from 2008 to 2014. Its dilapidation, loss of audience & the cramped animal compounds led to the renovation into the Paris Zoological Park today. Bernard Tschumi Urban Architects & Veronique Descharrieres were conscripted to rethink the concepts of the park. The vision for new landscaping and architectural strategies dreamt up a building that incorporates 5 major natural environments called Biozones. These zones meet the modern standards for animal welfare, public safety and museology and include respect to the environment.

To understand the park as a Zoo type, the building can be separated into the three building types that Zoos are created.



Figure 025: Modern Zoo example, Paris Zoological Park.  
Source: (Mugnier, Argyroglo and Cieutat, 2014).

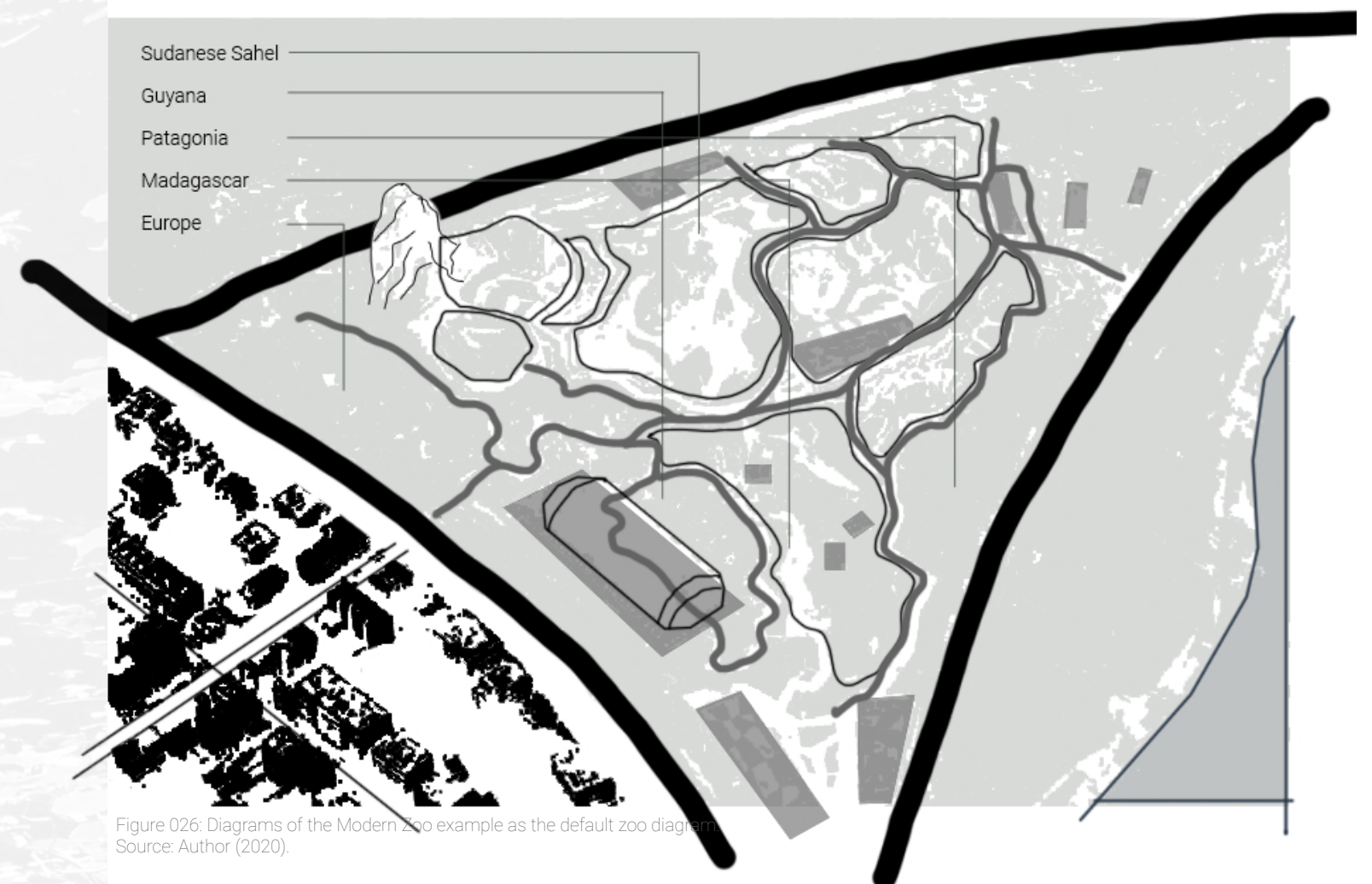


Figure 026: Diagrams of the Modern Zoo example as the default zoo diagram.  
Source: Author (2020).





Figure 027: Author edited photo of the prison types of Zoological Park.  
Source: Author (2020).

### PRISON TYPE

This building is the modernisation of an old zoo. The concept, according to Tschumi, is that human architecture and animal architecture are very similar, and therefore this building-type intends to blend the barrier of the contained space. The animal compounds embrace systems that act as common denominators throughout the zoo (Betsky, A., 2014).

The giraffe wood filtering and aviary mesh structures are present throughout the project. The building is designed for background, not foreground. The zoo landscaping and planting were specifically designed to re-create an ecosphere and the architecture becomes the background (Betsky, A., 2014).

Mechanisms to transport the audience into an artificial landscape. The timber is a theme that runs throughout the zoo/park, it is intended to age over time to match the historical rock which the zoo is designed around (Betsky, A., 2014).

Tschumi's ideas of the 'follies' in la Villette are elements of a constructional game. The follies are the markers, and articulate the space around them. Since the zoo is the opposite of that, each of the 'wood filters' intend to define a background, not to activate a space (Betsky, A., 2014). Tschumi describes this project as a sort of anti-La Villette with similar conceptual points. The aviary structures act similarly to the follies, as the complex geometry create the variety of geometries for various uses, eg. the entrance, the aviary, and the children's play areas (Betsky, A., 2014).

The design strategies intend for the architecture of animals and humans to blend together. Still exhibiting captive animals, this project exhibits the prison building type. The captive as the observed and contained. Otherwise, the building's ethos, intentions, and the design of background not foreground are otherwise a precedent for the final creation of the design of a Virtual Eco-park that is using 'digital ecology' as a tool for environmental conservation.

### MUSEUM TYPE

Zoos function as didactic educational institutions. Tschumi agrees that it is more about education than with event making. He questions the point of captivity. He then reassures that the intent to show the animals in closest proximity to the native environment is the way to make people aware of how fragile our environments are.

Adding a museum type to the captivity of animals [prison] is a superficial level that promotes anthropocentric ideals. The building is designing background, not foreground, for the zoo as landscape. The landscaping and planting is specifically designed to re-create an ecosphere and the architecture becomes the background. The artificial recreation makes for an immersive experience that attempts to educate on natural habitats of real environments.

As described that the Architecture for animals and people are identical, the visual language is the tool to create that. The architectural components are used for both animals and visitors[humans]. Today the Zoo incorporates 5 major natural environments called Biozones. These zones meet the modern standards for animal welfare, public safety and museology and include respect to the environment.

The park uses educational stimuli throughout the park using signs, audio and visual guidance. Educating on these biozones, the animals, the history, conditions, climate change etc. The zoo takes on a responsibility of the ecocentric aesthetic, but the underlying anthropocentric stimuli still sits at the base.



Figure 028: Paris Zoological Park plan as containment.  
Source: Author (2020).

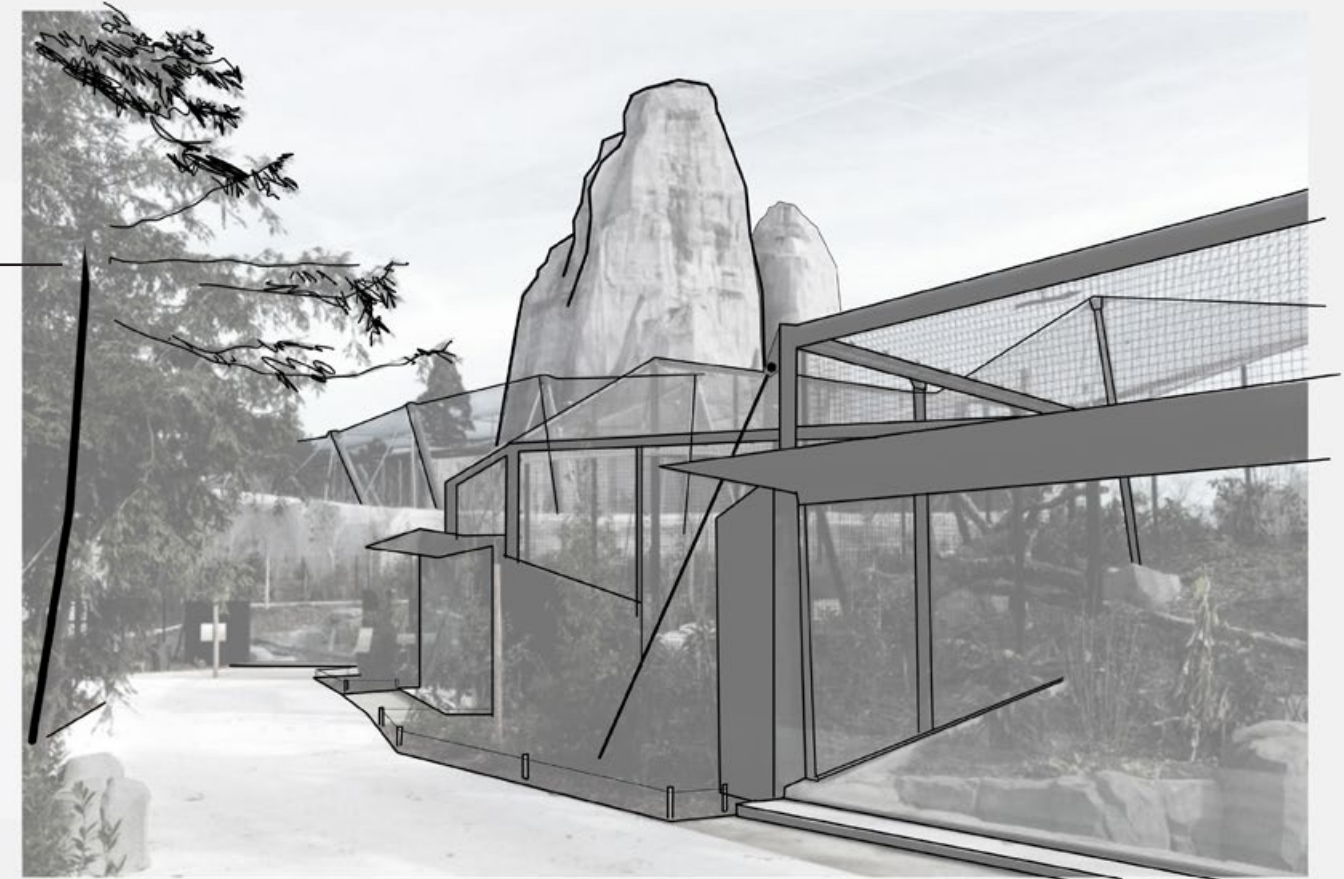


Figure 029: Paris Zoological Park as a museum.  
Source: Author (2020).



## THEATRE TYPE

The theatre has come a long way in its development of entertainment mechanisms. At the Paris Zoo, panoramic experiences have been implemented, allowing for immersion into the fauna and flora. The feeling of the free barrier comes across by the use of glass viewing panels (figure 030/background image) and the vastness of enclosures. These all form part of the architectural strategies used in the Paris Zoological Park.

Paris' Zoological Park embraces the intention to create a natural environment of the species. The design lends from the Generations 2, 4 and 5, as it became the desire to 'release' the animal from the cage and into a landscape. While still embarking on the generation of 5 as an iconic example, the building does intend to meet all of the needs of the current regulations of a contemporary enclosure.

Binding back to what was said about the idea of tamed nature, instead of wild nature. Especially as the Tschumi accepts the zoo as a didactic education institution. The intention to teach, particularly in having moral instruction as an ulterior motive. The Paris Zoological Park is potentially the best that the Urban Zoological park could become in the establishment of a captive nature.

The design of a zoological park that strips the need of the captivity or containment, could be conceived as the next idea. The next institutional shift of the zoo building type. This thesis' interest is in the translation of the virtual/digital revolution and what it contributes to the moral instruction as an ulterior motive of a zoo or aquarium. The rest of this chapter is dedicated to the transformation that the virtual/digital revolutions can have, and currently are having, on the zoo/aquarium typology. Followed by what the zoo/aquarium is informed by after applying 'digital ecology' as a tool for environmental conservation.

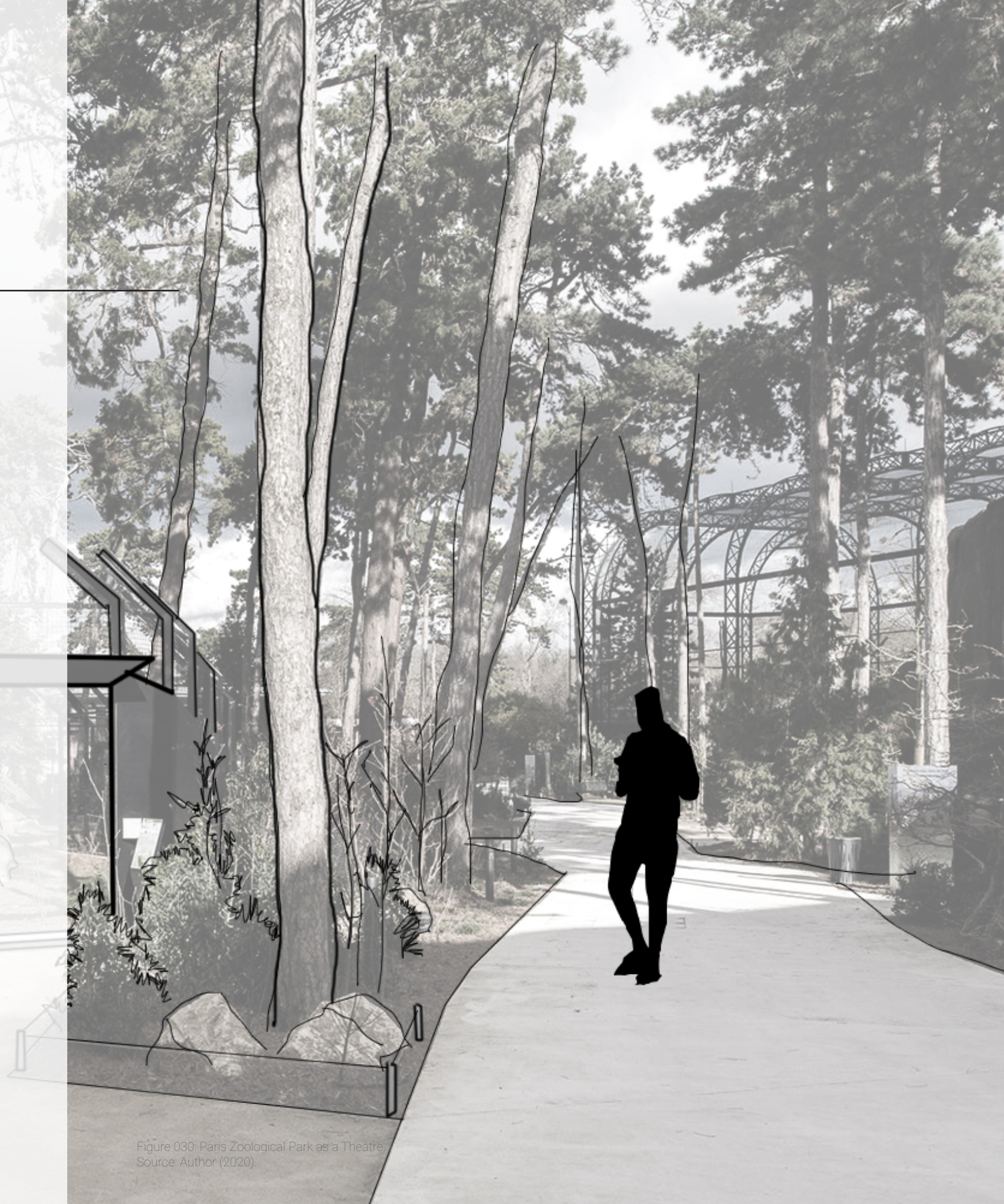


Figure 030: Paris Zoological Park as a Theatre.  
Source: Author (2020).



## THE VIRTUAL REVOLUTION OF THE ZOO TYPOLOGY

"In the end, we will conserve only what we love; we will love only what we understand and we will understand only what we are taught." - Baba Dioum

As previously discussed Zoo Typology developed out of the prison typology for containment and security; the theatre for notions of perspective and visual/staging entertainment and the Museum typology for the notions of education. The generational shifts are motivated by animal's welfare, and building 'popularity'.

The developments have converted to the idea of the **enclosure** instead of **prison**. The matter of enclosure will always be a major factor when animals are on display. The shift from enclosure represents the increase in welfare needs and regulation standards.

The notion of **display cases and theatre shows** develops into the emphasis and magnification of **'new' additions** of events for **'wow' entertainment**. Present times of compassionate boycotting create a tough landscape for the survival of a business that needs an audience. To a great extent, the extra effort of themed events and entertaining shows are advertised for onlooker's thrills.

Building-type has masked **the museum** with an architectural innovation as an Icon of consumerism. The initial draw of the museum had the intention of education behind it. This is, however, the crux of the thesis. The education received from captive animals is a dangerous lesson. This emphasis on objectifying further encourages the hierarchical belief of anthropocentric normality. Nevertheless, the notion of the museum is somewhat forgotten and the Architectural Innovation replaces it.

As iterated before, the intention is to **design for a virtual eco-park as environmental conservation to represent nature as its 'true wild'**. By the application of **'digital ecology'** and inspired by the three natures of Timothy Luke (mentioned in Chapter 1). The first layer as the **terrestrial**, the second as the **territorial** and the third as the **digital tool**. I define this layered level of complimenting dimensions as the **'digital ecology'**.

The typology will then gain creation through three perspectives, the botanical garden, the museum and the exploratorium.

A zoo/aquarium's essential purpose is to educate, entertain and provide conservation. The first chapter has shown the contradiction of these objectives, as it promotes the **anthropocene**. It also highlighted the potential that revolutions in technology have provided solutions to the issue of captivity.

The diagram below shows the building types that have provided the zoo/aquarium typology's generational development, the current status of the zoo remains the same. An enclosure, a place of entertainment and a 'tamed' version of education with added consideration of the animal's welfare. In cases of the aquarium, nothing has been done in terms of animal welfare except for restrictions on the act of breeding.

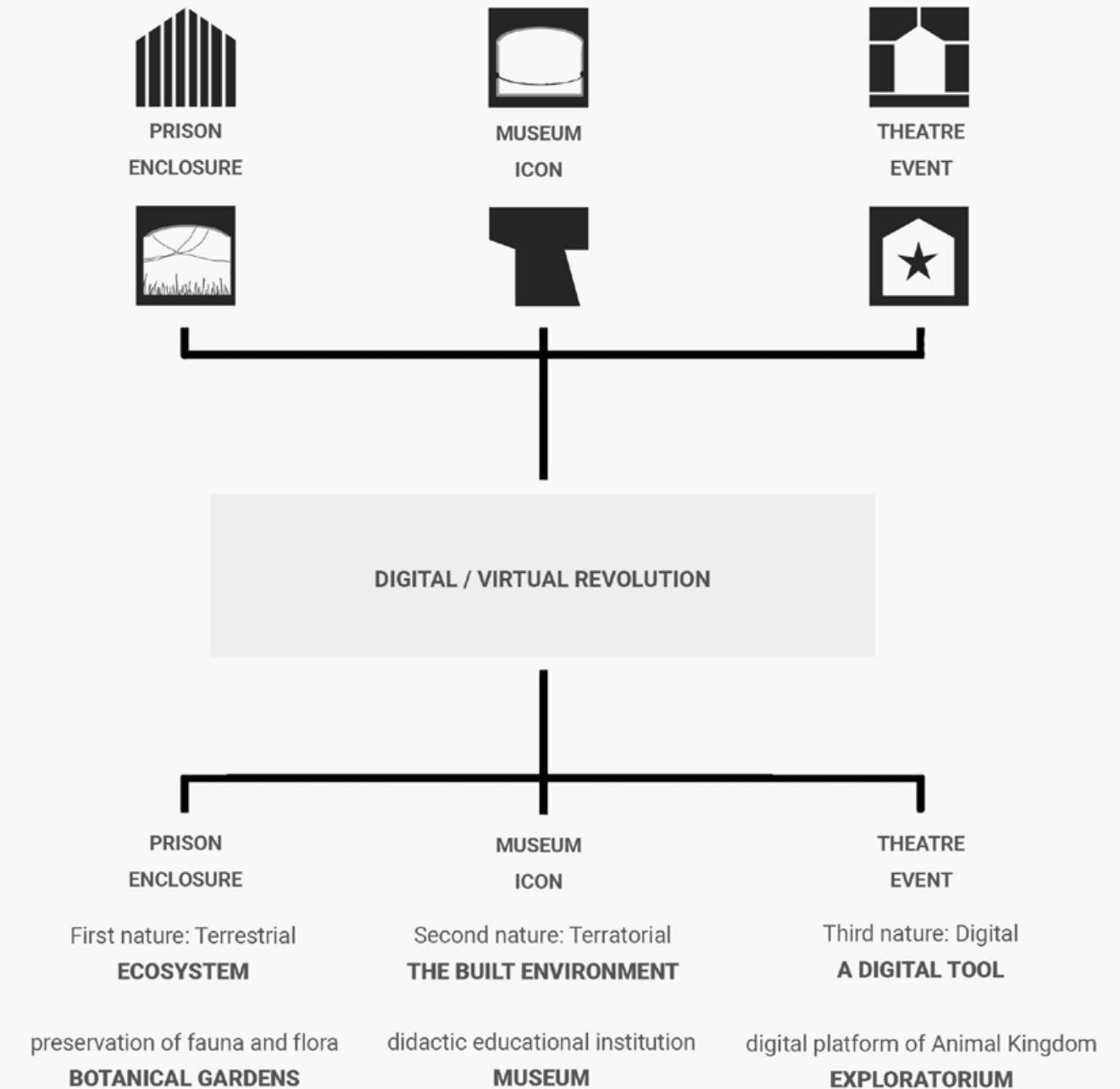


Figure 031: Zoo type and the virtual revolution.  
Source: Author (2020).



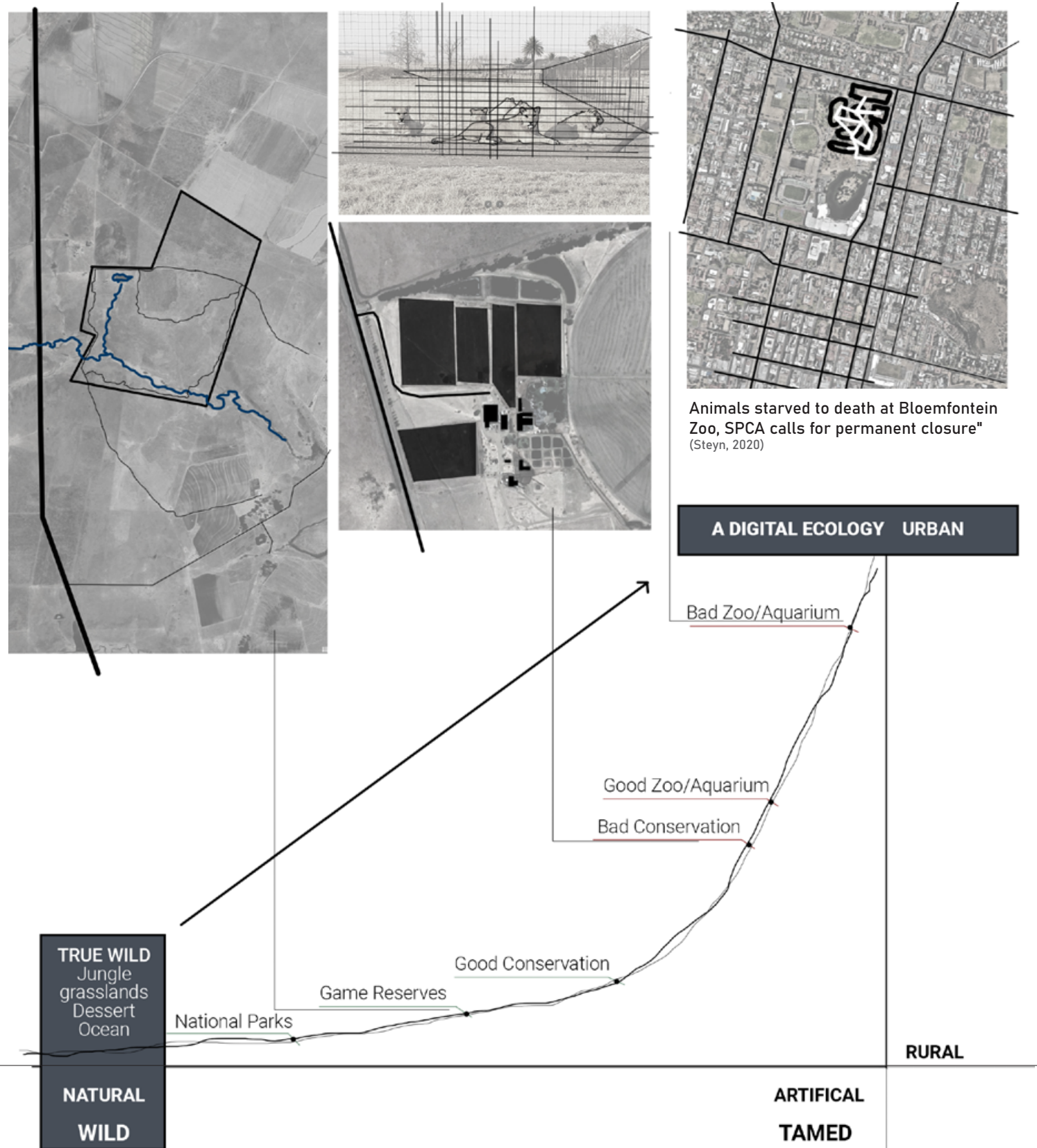


Figure 032: Examples in correlation with the Natural/Wild to Artificial/Tamed in correlation with Urban to Rural.  
Source: Author (2020).

The opportunity for zoo/aquarium to develop beyond captivity, is through the possibilities of an embodied experience of the 'true wild' in an urban context. This is essentially what this thesis is uncovering, the digital ecology (refer to 35).

Using the idea of spatial layering of information, the first, second and third natures which will manifest in the building type of the zoo/aquarium under the new title of Virtual Eco-park. To understand the nature of the virtual eco-park building-type, as well as where the design fits in scales of animal enclosures, the graph draws comparisons between rural/urban and natural/artificial and shows the levels of intentions behind these projects.

In the graph (figure 032) the reserve is located in the rural the true wild, while the zoo and aquarium relies on an audience – meaning that the zoo is located in the urban. The animals are modeled to the habitat of the human. The animals, therefore, have no territorial habitat as it is artificial. Artificial habitats are created to constrain and restrict. Prof Dr Meuser defines the essential factors of this context are confinement, and presentation and dissemination of knowledge (Meuser, 2018).

The digital ecology has the intention to be in the area of the urban and the artificial while capturing the essence of the 'wild'. The potential of the project breaks down the buildings influential types by the 3 natures. By referring to figure 032 you can understand that the core understandings find themselves in architectural building types. The ecosystem, the built environment and the digital tools represent the new manifestations of the zoo/aquarium type.

This new manifestation draws from new components that categorise 'digital ecology'. It is important to identify what each of the three natures influences as building types. **Ecosystem** applies to the **preservation of fauna & flora**. This is background space and its new schemes of containments of the physical and spatial components of 'the prison'. **The built environment applies** to the **didactic institution** of the park and therefore as the museum typology. **A digital tool** is a form for representing the digital platform of **the animal kingdom** and exploratorium as the 'theatre/event'.

PRISON  
ENCLOSURE

First nature: Terrestrial  
**ECOSYSTEM**

Preservation of fauna and flora  
BOTANICAL GARDENS

MUSEUM  
ICON

Second nature: Territorial  
**THE BUILT ENVIRONMENT**

Didactic educational institution  
MUSEUM

THEATRE  
EVENT

Second nature: Territorial  
**THE BUILT ENVIRONMENT**

Digital platform of Animal Kingdom  
EXPLORATORIUM



## THE PRISON AS BOTANICAL GARDENS

The Intentions of this thesis is the priority of the eco-centric ideal. Thus the representation of fauna and flora is incredibly important. The preservation & remediation of fauna and flora in a park design is meticulous landscaping to provide conditions for specific requirements. Humidity, sunlight control, watering, soil densities are factors in creating climates toward the conditions which allow for flourishing.

Botanical Garden is defined by a garden for the exhibition and scientific study of collected, growing plants, usually in association with greenhouses, herbariums, laboratories, etc. The park landscape can exhibit a range of exhibits, especially with the possibility of controlled climates that conservatories can provide. The range of possibilities is endless in terms of cultivating a landscape inside controlled interiors.

For example, figure 033 on the right exhibits the range between the contemporary, traditional and organic conservatory types.

For the purpose of this thesis, the examples shown are extreme climate manipulations that the structures created to house the imported/artificial landscapes.

To prioritise the eco-centric ideals in this thesis, the intention is to proudly portray local fauna and flora for the enjoyment of the audience. Therefore presentations of non-indigenous artificial landscapes are considered tamed landscapes and contributors to the anthropocentric vision. Therefore the conservatory type is not a focus for this building type. What will be investigated is the notion of representing these landscapes. Especially in terms of the reconnected ecosystem that this thesis' urban planning framework intends to clarify (more in chapter 3, Nature of Physical Context).

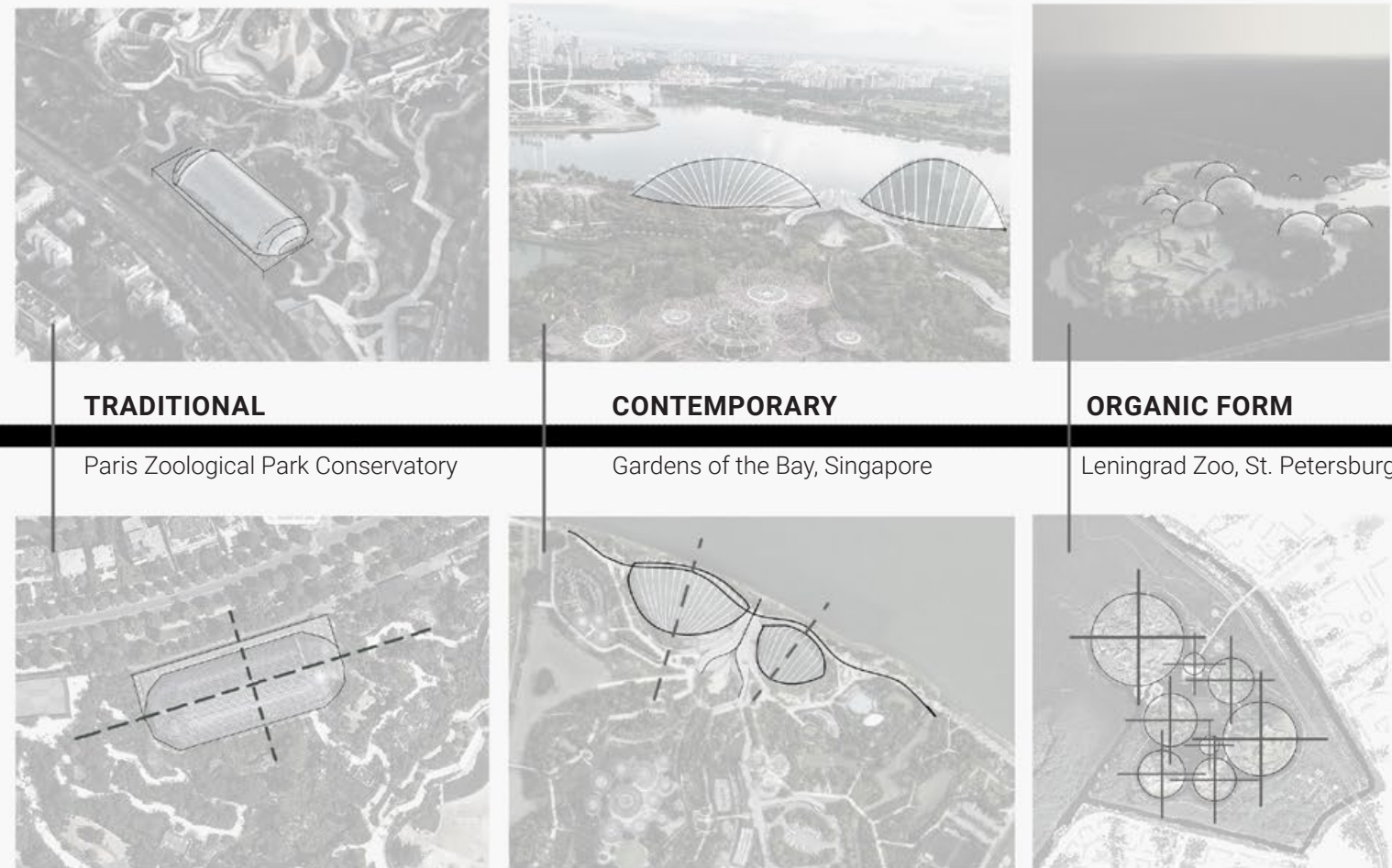
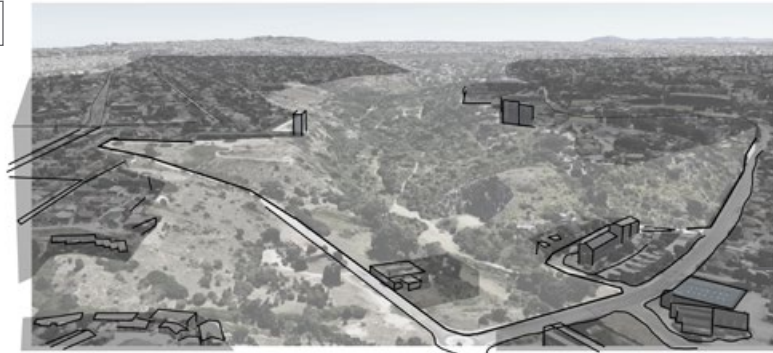


Figure 033: Tradition/Contemporary/Organic Conservatory Buildings  
Source: Author (2020).

The example of Port Elizabeth's landscapes are a variation from the reserve, nested/neutral, imported or forgotten. By the diagram below it can be understood the differences of each variation.

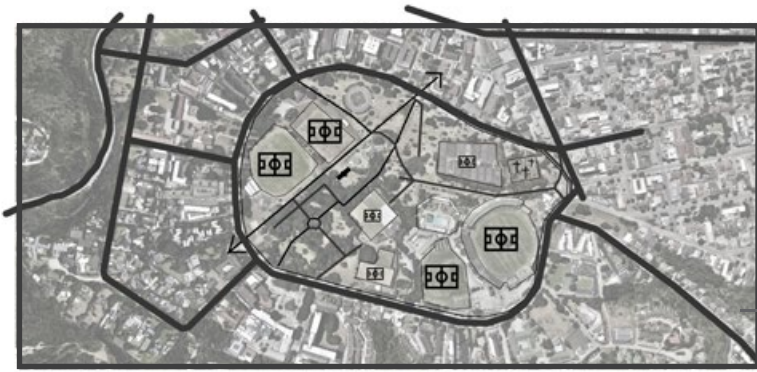
**RESERVE:**

There are different examples of what the reserved exhibition is. Generally, it can be described as the protected land for fauna, flora, geological and other special interests for conservation (dictionary.com, 2020). Port Elizabeth has variations of Reserves such as the Settlers Park Nature Reserve, Sylvic Local Authority Nature Reserve and NMU Nature Reserve. These parks exhibit a light touch by human presence.



**NESTED/NEUTRAL:**

These are generally green spaces that are nestled into the urban fabric. Locations are normally predicted through historical significance or via the industry that these support (such as public sports grounds). Port Elizabeth's example of the nested/neutral are places like St. George's Park, Victoria Park and Nelson Mandela Metropolitan University (NMU) Campus. These parks exhibit curated and sculpted landscapes.



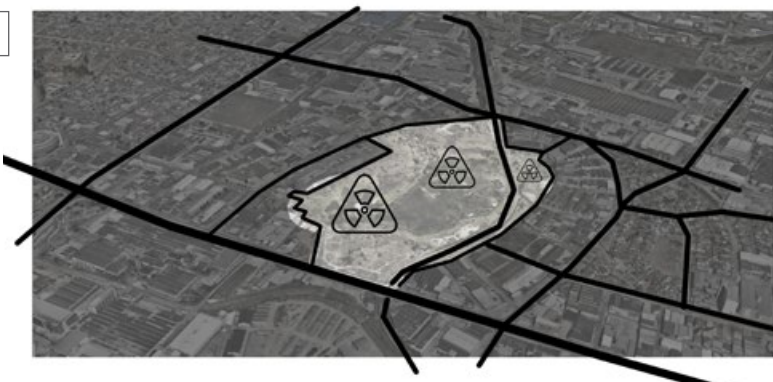
**IMPORTED:**

This landscape is the artificial creation of natural experiences. These are normally isolated islands of space that have the effect of immersive experience of 'transportation'. An example of this in Port Elizabeth is the Boardwalk. It acts as an exotic experience that rejects its urban context.



**FORGOTTEN:**

The forgotten landscape is the designated green areas around the city that have the appearance of dilapidation and pollution. The land is susceptible to illegal dumping and increased crime. The locations of landscapes like these are normally areas of marshes, valleys and poor neighboring conditions. Port Elizabeth's examples are the Korsten Dry Lake and Upper Shark River Valley.



representation of a reconnected landscape. This is curving toward the direction that the surrounding context and park design intend to employ as a landscape type in terms of botanical garden and connected systems.

The nested/neutral is the most ideal

Figure 034: Types of Landscaping in the City.  
Source: Author (2020).





Figure 035: Photo of Nelson Mandela University in landscape.  
Source: Author (2020).

To further explain this, a precedent of this in the design of NMU south campus are tightly nested within the notions of contained spaces. As you can see in the diagrams on the left. The building plan sites connected to an ecological flow. Essentially inclusive to space and networks, expansions and iteration, changes. In plan and in elevation, the building alludes to restricted space through the use of line, leader and volumes of suggestions. Multiple dimensions of activities happen across the grounds according to flow and function.

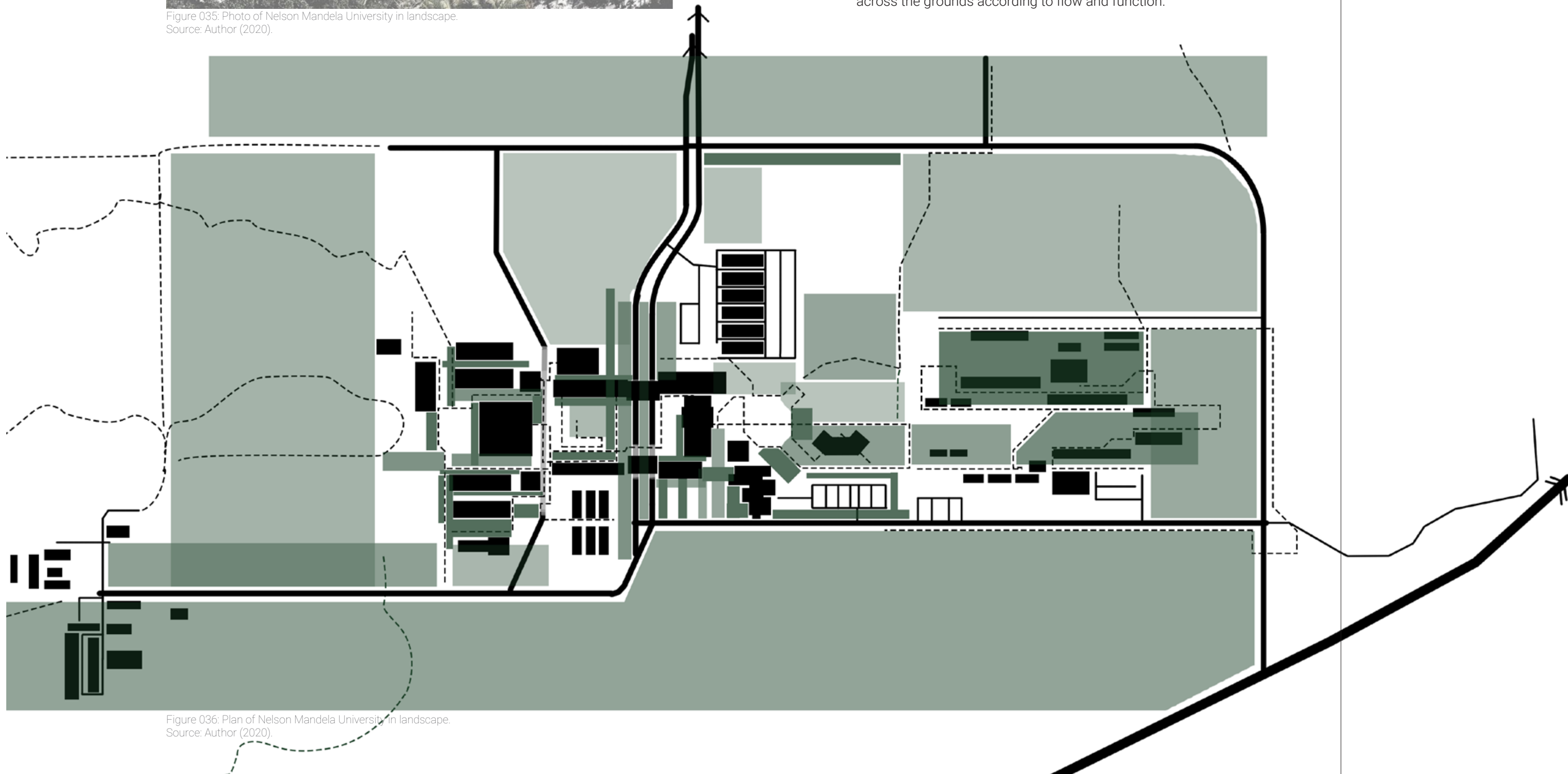


Figure 036: Plan of Nelson Mandela University in landscape.  
Source: Author (2020).

MUSEUM AS  
SUCCESSFUL DIDACTIC INSTITUTION

The built environment in terms of the territorial nature is where the didactic institution as a physical component resides. The intentions of architectural strategies portray a perspective of priority. Anthropocentric or Ecocentric. The approach to the design of buildings outlines these intentions.

As mentioned before, in Solving for Digital Ecology in Chapter 1, in order for the building to be appropriate in its building environment it must consider the following. **Function, expression and technical resolution** should be strictly guided by **context**(socio-economic, cultural, physical and theoretical), **program, materiality**(aesthetic expression and technical constitution) & **resources/energy efficiency and sustainability**.

Renzo Piano's California Academy of Science's building negotiates these categories as efficiently as possible. The encouragement of pushing for passive design has improved its appeal to its audience and has its educational effect. The didactic effect of moral instruction through these techniques naturally contribute to a building's public popularity.

As it has been established, the museum as a type is an educational platform for the viewer. The education that prioritizes eco-centric ideals. The mechanism that this design falls under can be categorised as Biophilic design or Landform Architecture.

**Biophilic design** is a concept used within the building industry to increase occupant connectivity to the natural environment through the use of direct nature, indirect nature, space and place conditions.

**Landform architecture**, which allows land to be engaged in an architectural representation, penetrates multi-dimensional architectural meaning through the manipulation of space, material, and structure.



ANTHROPOCENTRIC  
PORT ELIZABETH BAYWORLD MUSEUM



ECOCENTRIC  
THE CALIFORNIA ACADEMY OF SCIENCE

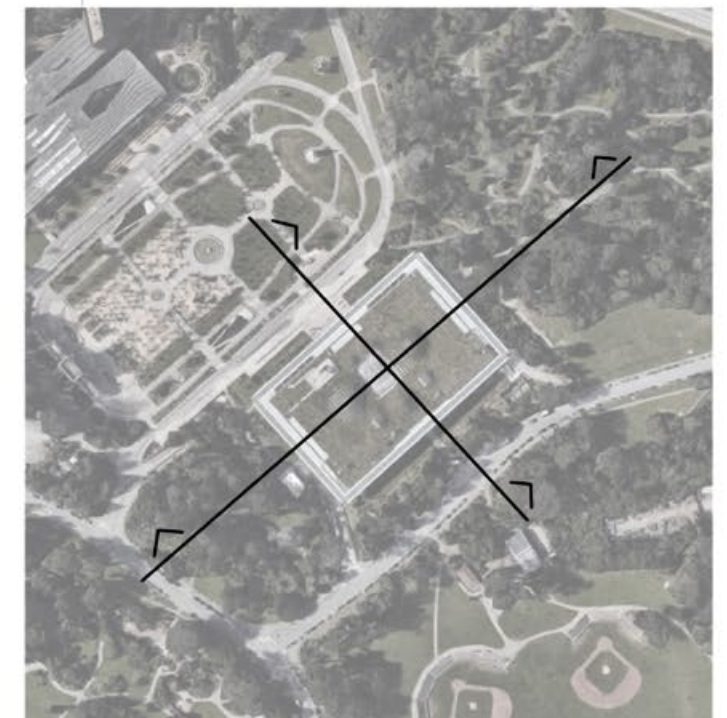
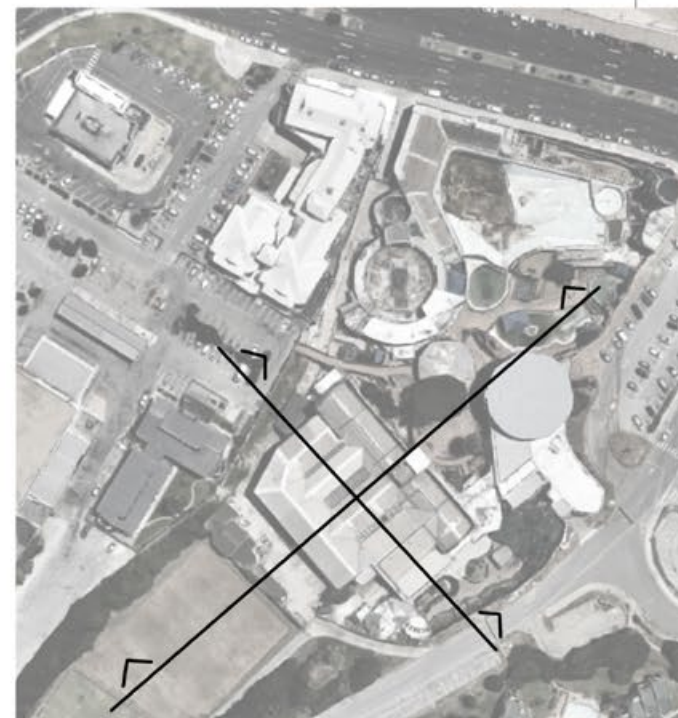
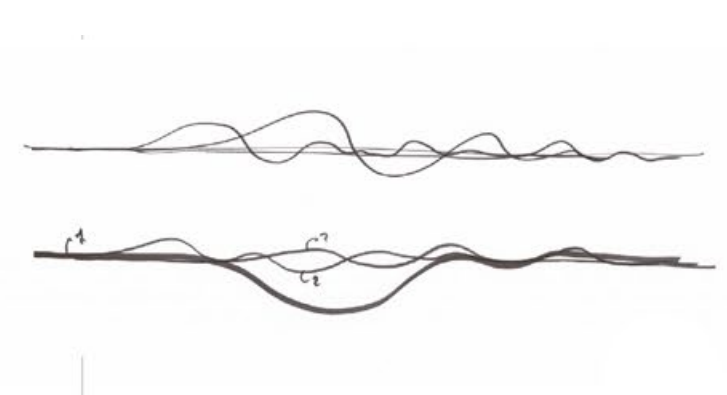
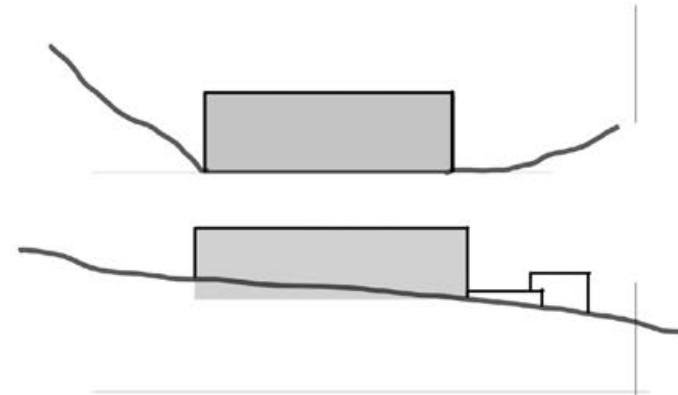
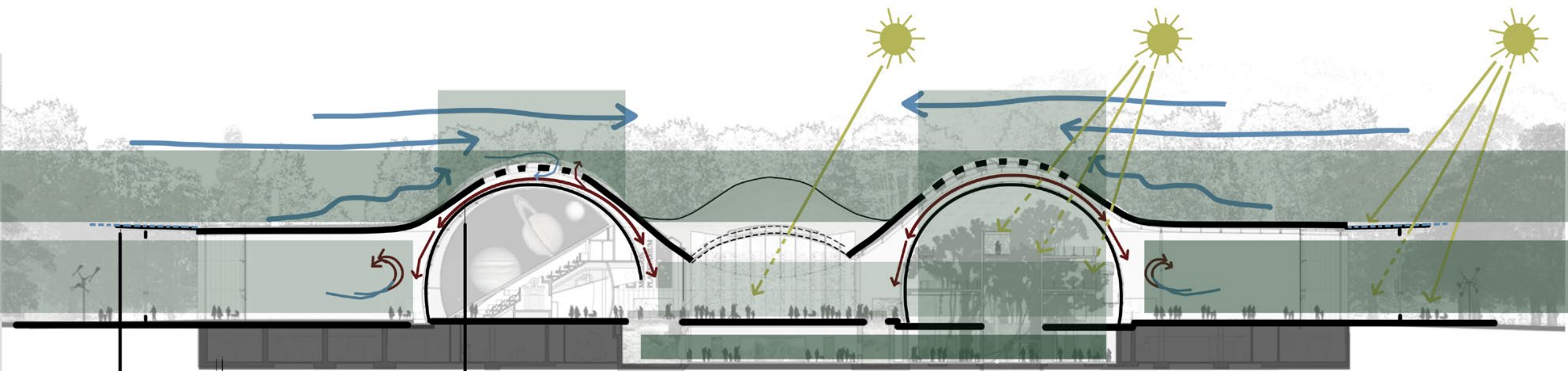


Figure 037: Anthropocentric to Ecocentric as a Didactic Institution  
Source: Author (2020).





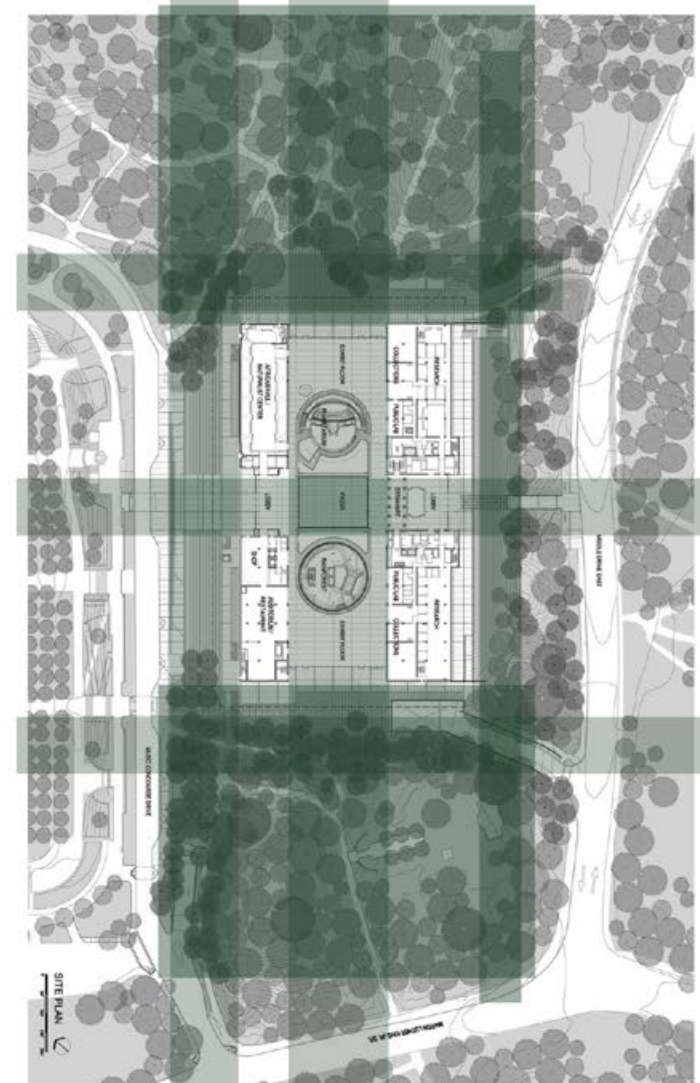
**Design features of the building combined make the building more efficient:**

Energy efficiency  
 Water conservation  
 Recycled materials

- Natural air conditioning
  - Automatic skylights open to release warm air as needed
  - Automatic blinds open and close to block sunlight and keep building warm/cool
  - Staff offices have manual windows to regulate temperature

— Rimmed with 60 000 photo-voltaic provide & shade

- Radiant Heating
- Natural Light
- Materials



The California Academy of science building by Renzo Piano promotes the innate connection to nature and the engaging with its surrounding context. Following guidelines to "quote" the art director.

Figure 038: The California Academy of Science by Renzo Piano. Source: Author (2020).



**EVENT/THEATRE AS EXPLORATORIUM**

The digital tool as a tool to represent the animal kingdom in the third nature. Using advancing technologies to represent what was previously captive, the zoo/aquarium loses the need to constrain the captive. The range of experiences through digital interfaces are vast and has the potential to create an entirely immersive experience. The event and theatre type base of the zoo-type is now in the display of immersive experience attributed by the digital experience of the Virtual Eco-Park.

- 2D** Screens/TV
- Social Networks
- LED Panels
- Panoramic Domes
- Children Interactive
- Virtual Reality
- Robots
- Augmented Reality
- 3D+** Holograms
- Drones

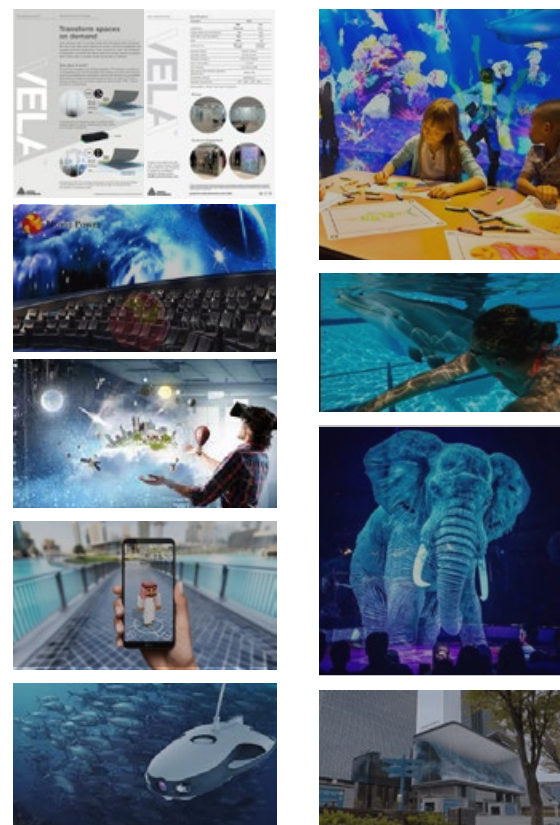


Figure 039: Photo Collage of the immersive experiences achieved by technology. Source: Author (2020).

The Exploratorium is a public learning laboratory exploring the world through science, art and human perception – and encouraging inquiry-based experiences that transform learning worldwide. The presentation tools the exploratorium makes use of, explore the potentials of technology. The facility is generally a mixed-use platform that will host scholars, academics and the public. The building will be used to educate students, host conferences and be used as an exhibition space. It can cater for the young and old and inspire all.

The immersive dome seeks to expand the imagination of all, sharing science in ways that will captivate its audience regardless of age. It can take one into the outer reaches of our universe, or to the depths of our deepest oceans.

The centre will be a place of community engagement and international conferences, as well as for hosting exhibitions and events. The goal is that this facility will be accessible to all.

**2D:**

The 2D applies to a single screen view of experience. Scales of such screens dramatically create opportunities to be creative. While it is relatively normal for social networks to promote live feeds of special or popular animals, the potential for large screen optical illusion is great.

Dome experiences are a common mechanism for understanding difficult concepts – such as the Solar System. These domes use projectors to display certain media onto the constructed dome.

The LED panels, while generally of a small scale, represent the potential for optical illusions. These screens allow for 'voided space' – an immersive experience allowing for the creative manipulation of space.

**Interactive:**

Virtual Reality allows for an unlimited creation of experiences. Drones in the air, or underwater, can provide live experiences of the natural world without interrupting its natural processes. Robots have been used to mimic animal movements and acts.

**3D +**

Creating merged environments between reality and an overlaid digital code creates illusions of reality. Using devices like Augmented Reality (AR) headsets make these experiences reachable; a phone screen can also achieve augmented reality by filtering the physical and manipulating the screen.

The design of the created space engages with modelling software generating in the 4th dimension. The relationship between form and image are integrated, flowing into each other in unification. Stephen Perrella defines this as the hypersurface.

*"Perrella argues that hypersurface designed with animation software are media images intertwined with deconstructed forms, representing the collapse of the two conventionally distinct realms."* (Perrella and Toy, 1999). The mismanagement of the use of technology to represent the future is the simple projection of a fixed image onto architecture. Perrella defines this as a superficial application of media images onto architecture. The inventive form and image-making are integral for the acceleration of this innovation. This means understanding the nature of the digital/computer's logic and emanating it into the world. Perrella's hypersurfaces are his attempt at reflecting social conditions and our integral part of the media we have created.

With warning from Perrella for creating a superficial 'form', using this technology creates new possibilities of immersive experience that are artificial realistic representations. This third layer to the natures, when applied together, can create the 'digital ecology'. Thus on the scale(refer to figure 032) of where the 'digital ecology' stands, it can be implemented anywhere in the urban fabric as long as the appropriate infrastructure can be set up.

PRISON  
ENCLOSURE

First nature: Terrestrial  
**ECOSYSTEM**

Preservation of fauna and flora  
BOTANICAL GARDENS

MUSEUM  
ICON

Second nature: Territorial  
**THE BUILT ENVIRONMENT**

Didactic educational institution  
MUSEUM

THEATRE  
EVENT

Third nature: Digital Tool  
**VIRTUAL & DIGITAL**

Digital platform of Animal Kingdom  
EXPLORATORIUM

## THE NATURE OF THE PHYSICAL CONTEXT 3

City as Environmental Conservation
Site Criteria
Metro Analysis
Applying categories of site
Precinct Analysis
Port Elizabeth Harbour
Conceptual informants and the disconnection
Conceptual informants to urban plan
Zoo/aquariums and Port Elizabeth
Conditions of kings beach/humewood/harbour
Present contaminants
Site findings

This chapter interrogates the spatial and physical attributes of the site across various scales. By looking over the site with the lens of the city as digital ecology, the investigation into morphology and the analysis of the precinct will provide insight into the character and nature of the area under investigation. The design informants will be determined through man-made and the natural structuring elements by identifying the spatial and physical conditions of the precinct and immediate site. The analysis and investigation will define the problem statement, and a constraint and informants' diagrams will generate the design framework. These are used to manifest Part II of this document.



## CITY AS ENVIRONMENTAL CONSERVATION

Using the notion of the city as environmental conservation through the use of the 'digital ecology' where the nature of the physical context is established. Using the concluding remarks of chapter 1, the concept of the three natures and its application of layering to building type is also the lens of looking at the nature of a site.

By encouraging interconnected systems of the eco vs ego diagram (figure 004, page 8), it would be important to apply the notions of reconnection to the scarred landscape. This ecological reconnection of the city can be seen in the diagram below, as highlighting similar projects that seek to connect to the green systems of the city.

Using field conditions to analyse and establish categories of the site, and to iterate the notion of spatial layering; field conditions and the Flock, Schools, Swarms and Crowds became instigators of the categories of the site (Allen, 1985). The next page explains the spatial layers of the site into the destroyed and scarred, the disconnected digital, the missing crowd, and the absent swarm.

The interrogation of type aligned the scales and site requirements. Informed by the previous chapter, the site of choice will be a large area of land, to be re-established with the city as environmental conservation by using the tool of 'digital ecology'.

The interrogation of type aligned the scales and site requirements. Informed by the previous chapter, the site of choice will be a large area of land, to be re-established with city as 'digital ecology'.

Port Elizabeth locals have a great appreciation for their bay, and find great pride in the city's vibrant beachfront and active ocean. The city developed out of its historical core, which is the location of the 1820 British Settlers. The major development occurred along the valleys in the area, namely Hume River, Baakens Valley and Happy Valley. As natural barriers, the city development is hugely affected by escarpments and the topography defining the edges of the built fabric.

A history of infrastructure development both of and around the harbour has also mitigated the divide of places and supplying the area with the problem of terrain vague. Currently, the harbour area isolates itself in post-industrial instability.

The beachfront has incorporated sporadic activity areas from Summerstrand to stopping abruptly at the foot of the harbour.

The natural valley structures are home to rich ecological systems which are isolated and encroached upon. Urban development of the area has fragmented the systems, therefore compromising biodiversity of the ecosystems. Port Elizabeth has also created a barrier between the city and the ocean – where the highway cuts into the system and allows for high-speed streets right through until the waterfront connection.



Figure 041: A Reconnected Ecosystem for the Prioritisation of the Post-Anthropocentric. Source: Author (2020).

## SITE CRITERIA

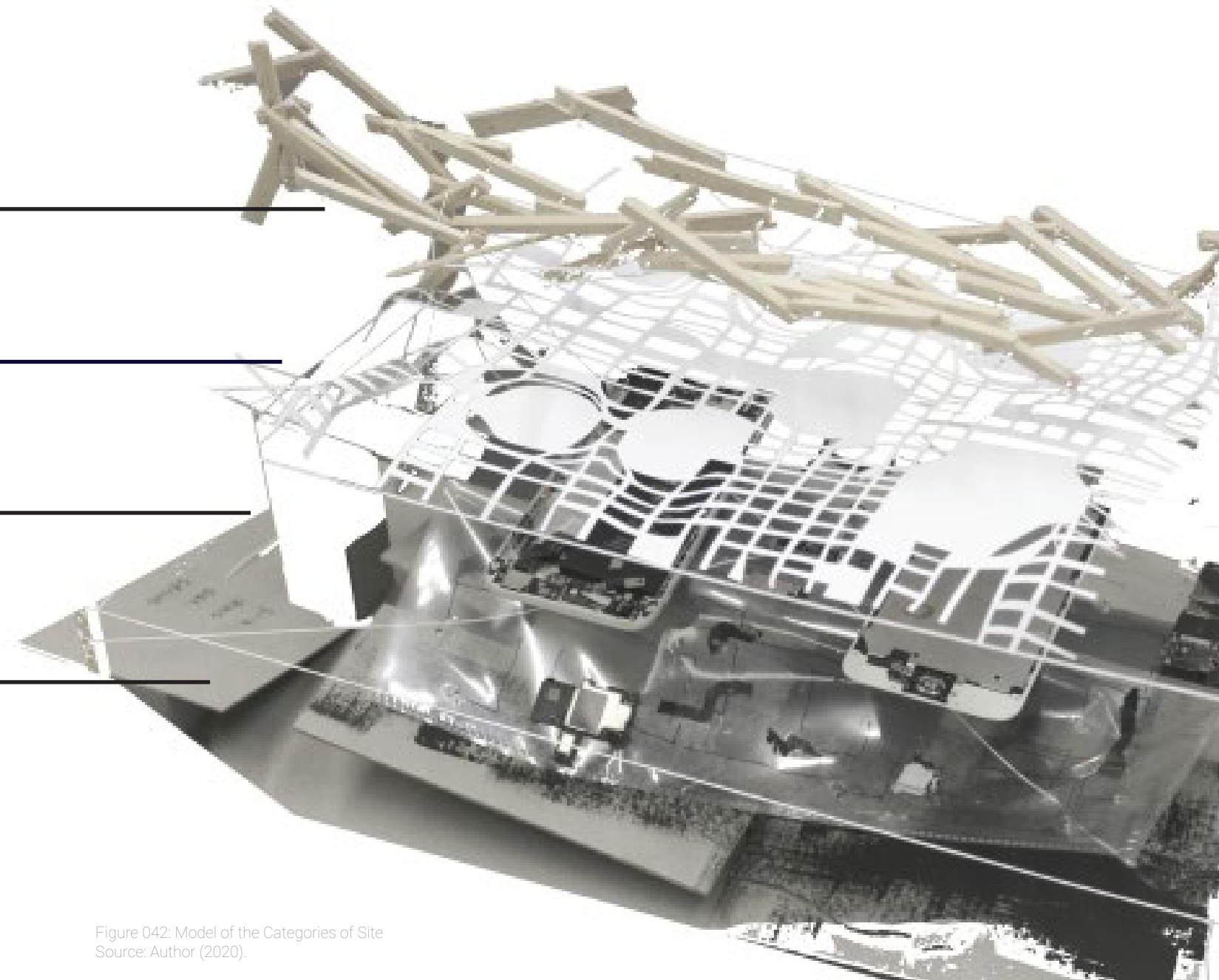
- 1 Site must be located so that the project and the urban framework can become a focal point for the city as digital ecology.
- 2 The site is to be disconnected from nature, as an example of terrain vague.
- 3 That can be re-established as positive space/public landscape.
- 4 Its location must fill a missing link in such a way that the activation of the site is logical.

**THE ABSENT** SWARM

**THE MISSING** CROWD

**THE DISCONNECT** DIGITAL

**THE DESTROYED** SCARRED





**METRO ANALYSIS:**

The purpose of a metro scale analysis is to understand the natural and man-made structuring elements of Port Elizabeth. The focus of my analysis is to understand the ecological flow (or lack there of) within the city. This will delineate the relationship between natural and man-made elements in the city.

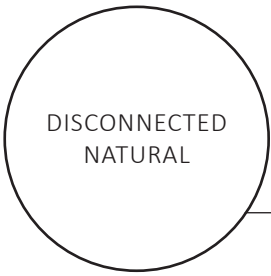


Figure 043: Metro interpreted through natural & built structuring elements. Source: Author (2020).

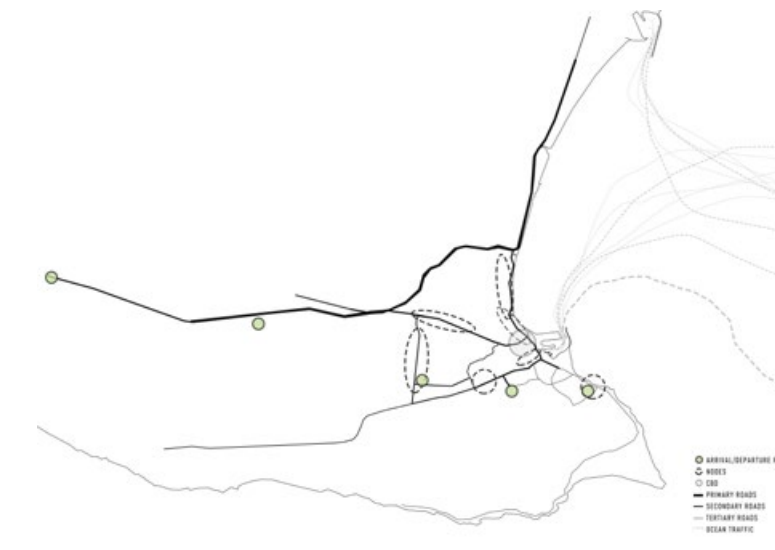
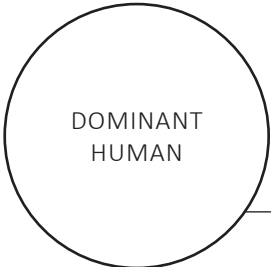


Figure 044: Metro interpreted through movement framework. Source: Author (2020).

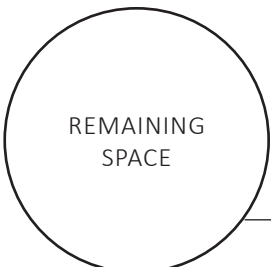


Figure 045: Metro interpreted through degrees of endangerment. Source: Author (2020).

**NATURAL AND BUILT STRUCTURING ELEMENTS:**

The structure of Port Elizabeth is defined by its water systems. The natural valley systems create dramatic escarpments, encouraging urban fabric to develop along and out from the city centre. Unfortunately, the continual spread and conditions of modernist urban planning results in sprawl which continues to fragment and separate spaces by category.

**MOVEMENT FRAMEWORK**

The local and international guests of the city use primary and secondary routes within Port Elizabeth. Entry and exits into the city are predominantly via the N2, the harbour and the airport. Two main public nodes include the historical city centre and another along the beachfront precinct. The conditions of sprawl have set up the outer edge of the city with poor social spaces – such as vehicle dominant movement patterns and the shopping mall-type. It is important to note that the two main nodes of the beachfront and the historical city centre are separated by dominant streets and highways.

**DEGREE OF ENDANGERMENT**

The endangerment of the natural systems have been heavily affected by urban development and the condition of sprawl as a by-product of poor urban planning.



Figure 046: Metro composite diagram of the metro.

The diagrams display a composite of the layers that represent the disconnections by our dominance, and the spaces that remain. The outlined square highlights scope of site including the storm water & valley system at work.

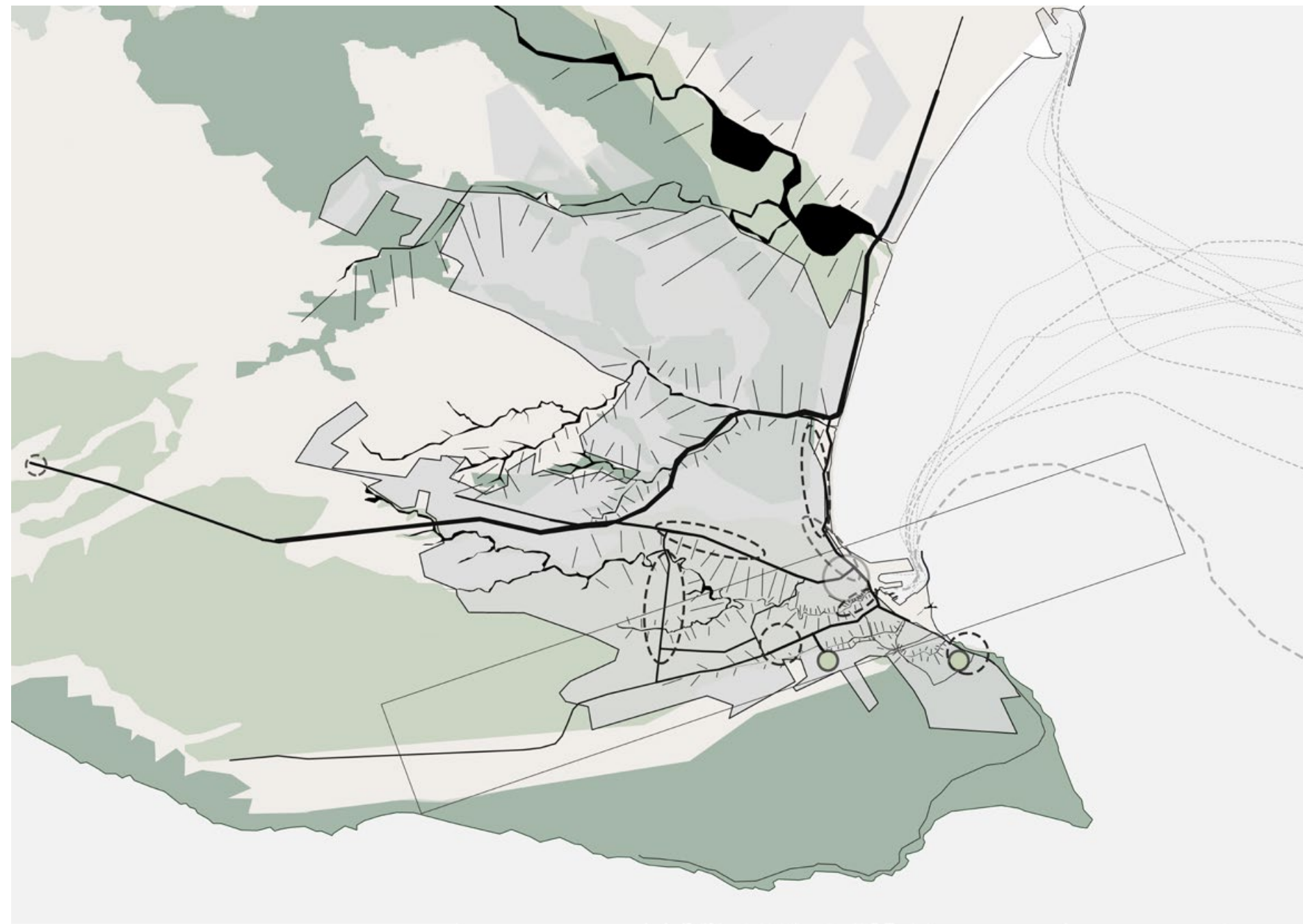


Figure 047: Metro Composite.  
Source: Author (2020).

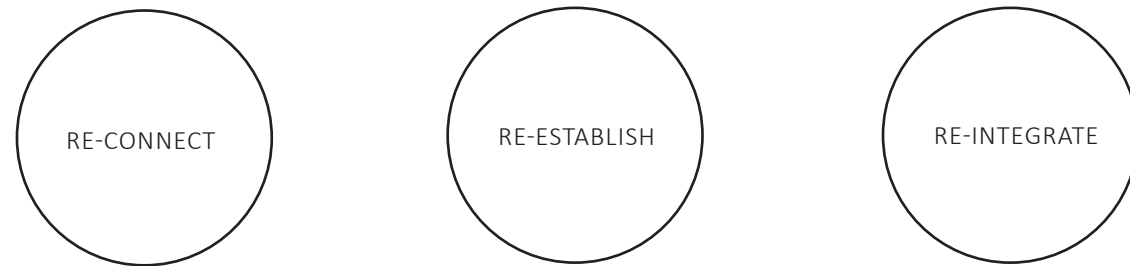


## APPLYING CATEGORIES OF SITE:

The following analysis was initiated via a physical model. From the initial stage the categories of site (Figure 042: Model of the Categories of Site) have established the layers of categories onto the site.

By doing an investigation in this manner, the surrounding conditions of the area of site are introduced: in this case, the Port Elizabeth Harbour. The intention is to understand both the natural and man-made structural elements. Specifically the ecosystems that are interrupted. Followed by the separation of the tourist hubs/attractions and the variations of polluted contaminated areas spread along the coastal edge.

Figure 052 is a photograph of the site at sub-metro scale. It is an emotive/evocative response of the site of investigation, and intends to capture the relationship of the dialogue between urban and the green. – Essentially highlighting the problems of the area. These can be established as barriers to disrupted systems; a disconnection of the ecological flow in a horizontal and vertical manner. Therefore it is with intentions of remedial action that the site be re-established, re-connected, and re-integrated.



The following diagrams are these categories of site layered and installed onto the site.



Figure 048: Diagram of Natural systems & polluted landscape.  
Source: Author (2020).



Figure 049: Diagram of animal movement.  
Source: Author (2020).

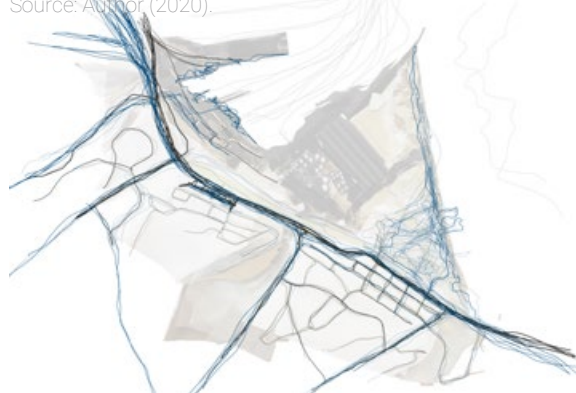


Figure 050: Diagram of Movement analysis.  
Source: Author (2020).



Figure 051: Diagram of Network and Range.  
Source: Author (2020).



Figure 052: Model of the emotive analysis  
Source: Author (2020).



The application of categories have highlighted the disconnection of the city to a large component of the city, the harbour. Flows of public accessibility, ecological flow, diversity of program and the arterial roots that encourage this dissection are expressed in the diagrams below.



Figure 053: Diagram of Natural systems & polluted landscape & animal movement.  
Source: Author (2020).

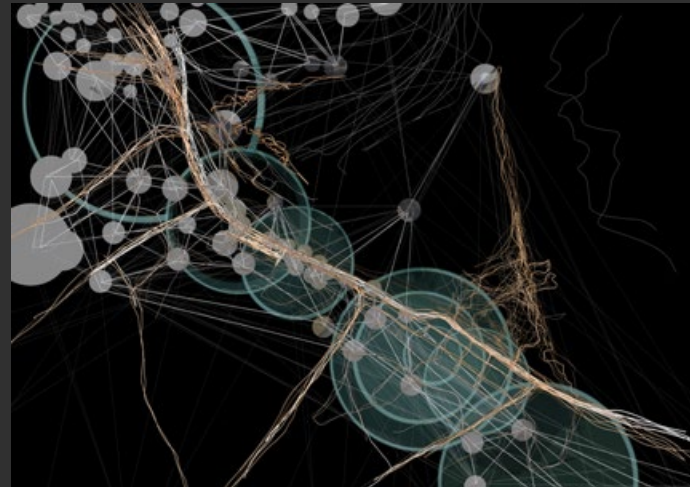


Figure 054: Diagram of Human Movement over-layed with network and animal movement.

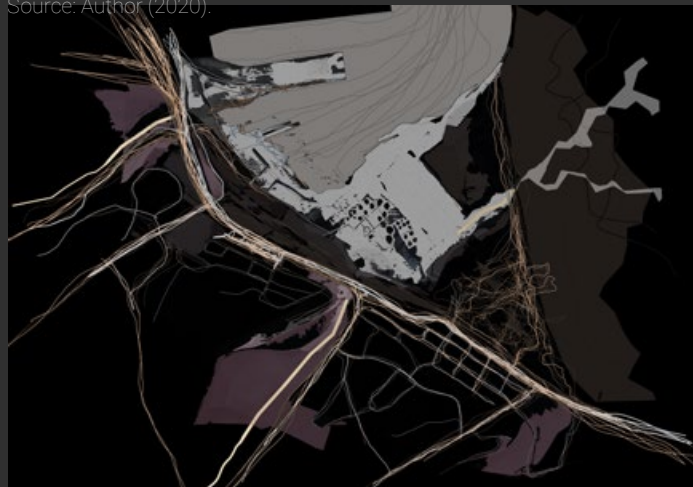


Figure 055: Diagram of Natural systems & polluted landscape & human movement.

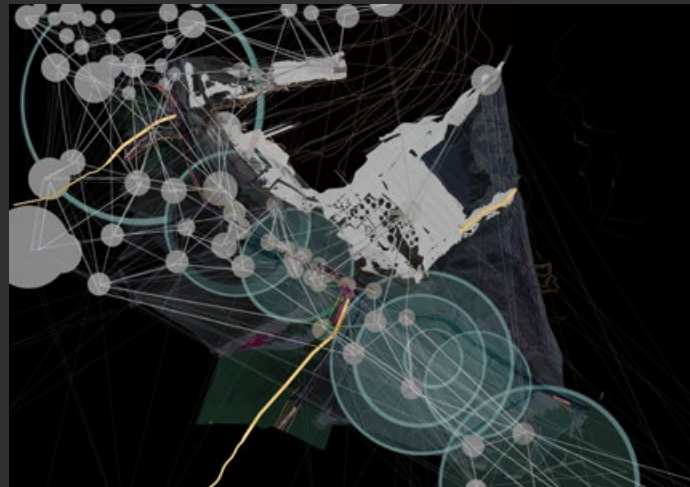


Figure 056: Diagram of Networked systems  
Source: Author (2020).

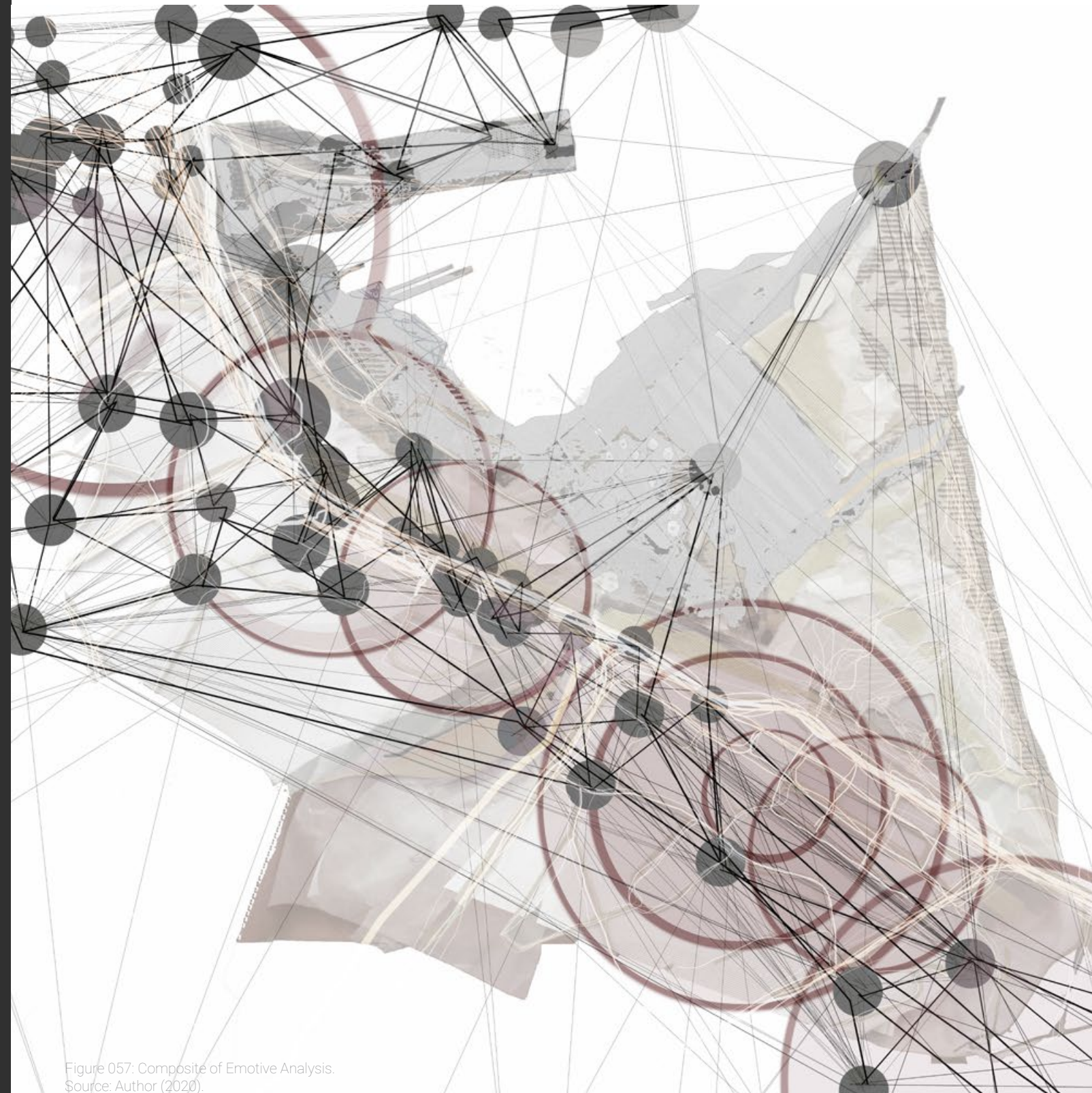
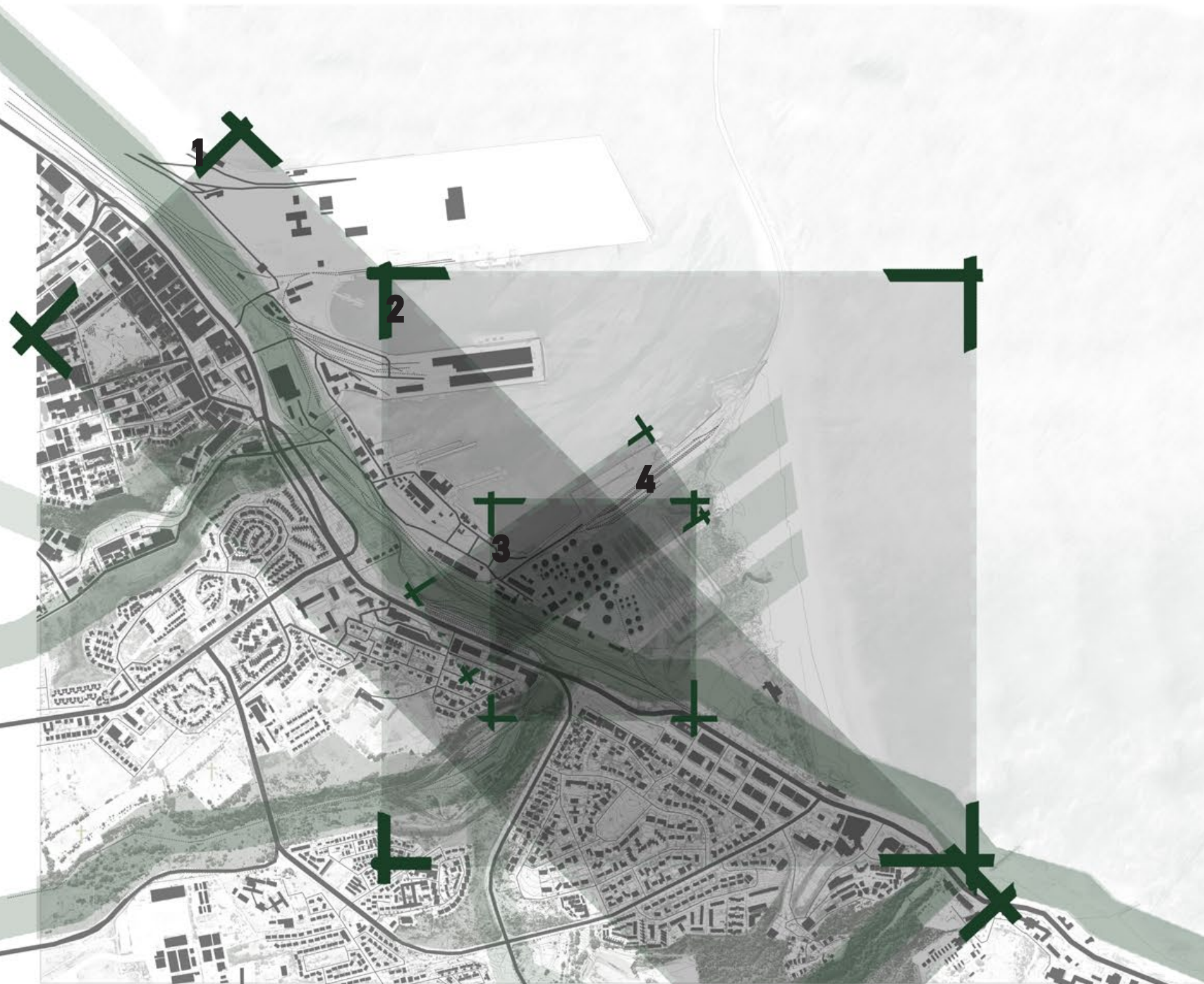


Figure 057: Composite of Emotive Analysis.  
Source: Author (2020).



PRECINCT ANALYSIS:



Scope of project:

- 1** Re-establishing the Water front
- 2** Harbour's largest area of terrain vague
- 3** Full complex of Petroleum Tanks
- 4** Water Edge and Specific Site

Figure 058: Scope of Site  
Source: Author (2020).



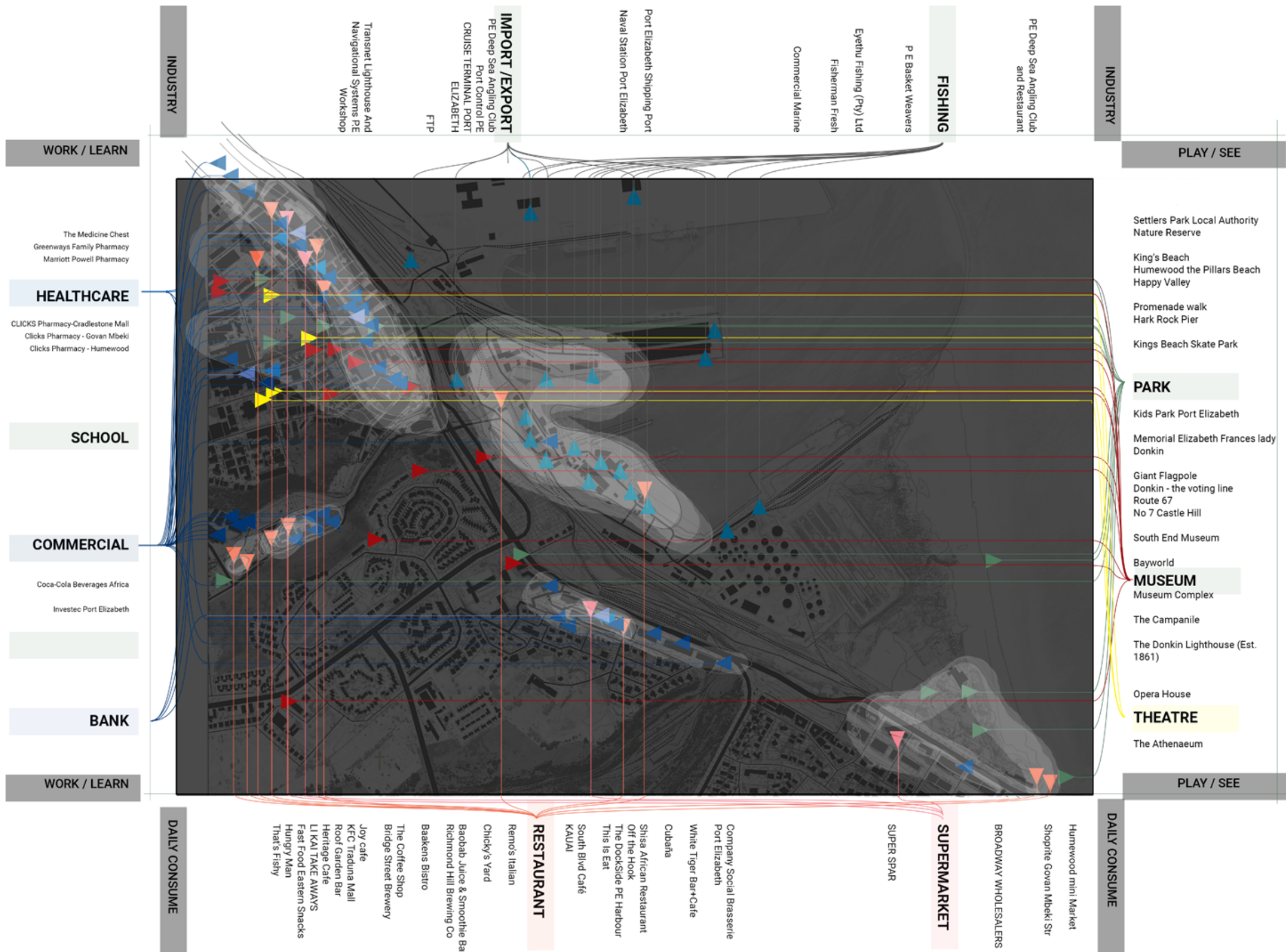


Figure 061 is a composite analysis of the program of the contextual areas. Comparison in the program according to **Play/See - Work/Learn** and then to **Industry - Daily Consume**. Clearly hubs of space can be identified, and the Industrial nature of the harbour is clearly isolating. Figure 062 below identifies the major spatial components of the harbour.



Figure 062: Harbour Systems  
Source: Author (2020).

- CONTAINERS
- AUTOMOTIVE
- BREAK BULK / MPT
- MARITIME COMMUNICATIONS
- COM LOGISTICS
- FISHING
- VESSEL REPAIR



## PORT ELIZABETH HARBOUR

The operations of Port Industries in the Port Elizabeth harbour are responsible for the current presence of heavy metals in the soil, sediment and groundwater at the harbour. The main contributor is the Manganese Terminal and Tank Farm. The site's environmental impact analysis reports of **manganese ore dust pollution, industrial waste, toxic ground surface stains and oil spills**. According to the Transnet Environmental Management programme done in 2009, the heavy metal readings exceed 'safe human and ecological exposure values' (Olver, et al. 2009).

Given the high toxicity and contaminated nature of the site, it aligns itself as the tainted category for the tamed landscape. For example, the natural systems are disrupted, the spatial conditions are barred, and public movement is denied. These disruptions and the disconnected are explored further on page 87.

Industry leaders and government officials have been engaging in discussions about the potentials that a maritime development of the port can have for the city of Port Elizabeth. At the inaugural Eastern Cape Ports and Maritime Conference in 2013, Coega Development Corporation (CDC) Project Manager and the inaugural Eastern Cape Ports and Maritime Conference coordinator, Mfundo Piti, said: "The aim of the conference is to chart a route to harnessing the maritime potential and leveraging off existing industry assets". The development of Ngqura Deepwater port initiated the opportunity to relocate industries currently located at the Port Elizabeth Harbour. These moves thereby present as a more appropriate site for the Manganese Terminal and the Oil Tank Farm (Fayos, 2013).

According to Schalk Burger, Creamer Media Senior Contributing Editor, the combination of the existing ports at the centre of Port Elizabeth and its mature infrastructure has contributed to the decision to relocate the petroleum storage and distribution facility to the Port of Ngqura (Burger, 2019); **the potential for tourism amongst other sectors are also mentioned as considerations for the move.**

This commission for the new terminal, happening in November 2020, will see that the tanks currently in use be decommissioned and the land redeveloped. Burger says that the city's plan is to clean up the terminal's **facilities to develop the commercial and tourism sectors** (Burger, 2019).

The relocation has both financial and ethical prospectives and economically beneficial initiative for Port Elizabeth and Ngqura. This treatise bases itself on the premise that the relocation is imminent. The need for a new urban plan is to be established and the development of the post-industrial sites be informed through the theoretical and conceptual areas of research.

Historically, the potential of harbours has been a discussion for city planning since the establishment of the Burggraaf Committee in 1985. According to Olver, the committee sought to investigate "the potential for greater public use of South Africa's Harbours"(Olver, 2008).

The development potential of the land was initiated by Portnet in the 1990s. In 2003, then Mayor Nceba Faku introduced the project 'Vision 2020', with firm support from the Nelson Mandela Bay Business Chamber to unlock this piece of land as it would translate to long-term economic benefits. Nomkhita Mona says the unfortunate delay of this project is due to the delay by Transnet's relocation project of the Tanks. The new Premier of the Eastern Cape, Oscar Mabuyane, has recommitted the government to Nelson Mandela Bay.

According to Olver, the Vision 2020 plan included 1039 hectares of land, including the waterfront area, existing harbour, Port Elizabeth CBD (old) and other central areas. The plan intended to utilise the potential of development opportunities, as well as to redefine land use and to begin accommodating the commercial, recreation and leisure sectors – with the intention to grow the GDP, and boost tourism and job creation (Olver, 2008).

In 2004, The Mandela Bay Development Agency was established and assigned the "Mandate Area". This Agency concerned themselves with the urban renewal and regeneration of existing infrastructure. Paired with GAPP Architects and other associates, they developed the Strategic Spatial and Implementation Framework (SSIF) for the area.

For the purpose of this analysis, and the application of the **city as environmental conservation** and the '**digital ecology**', the conceptual barrier and the reconnection uses conceptual informants of the **ecological disconnection, the movement disconnection, the urban disconnection and the digital disconnection**. The next section sets up the steps for urban interventions as conceptual drivers.

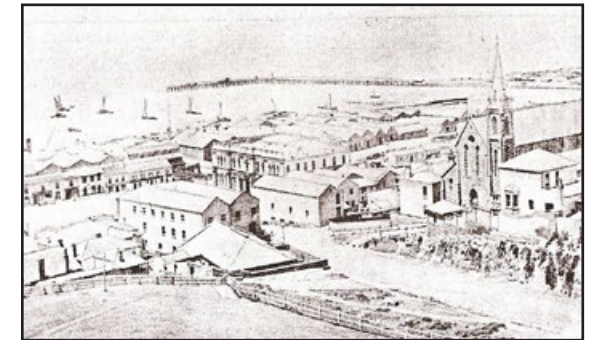


Figure 063: Harbour History  
Source: (Port Elizabeth | The Heritage Portal, 2020)



Figure 064: Harbour History in 1936.  
Source: (Port Elizabeth | The Heritage Portal, 2020)



Figure 065: Harbour History in 1958.  
Source: (Port Elizabeth | The Heritage Portal, 2020)



Figure 066: Harbour History.  
Source: (Port Elizabeth | The Heritage Portal, 2020)



CONCEPTUAL INFORMANTS AND THE DISCONNECTION

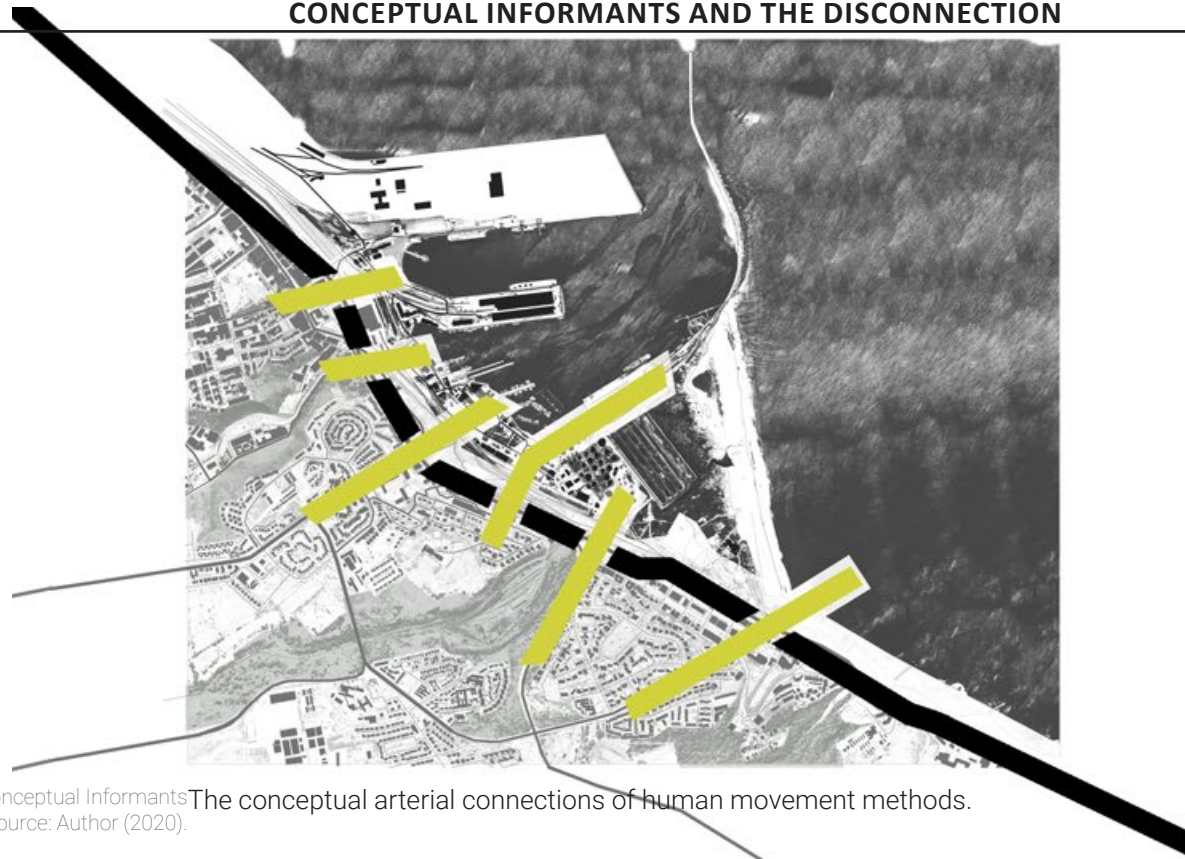


Figure 067: Conceptual Informants 2 The conceptual arterial connections of human movement methods.  
Source: Author (2020).

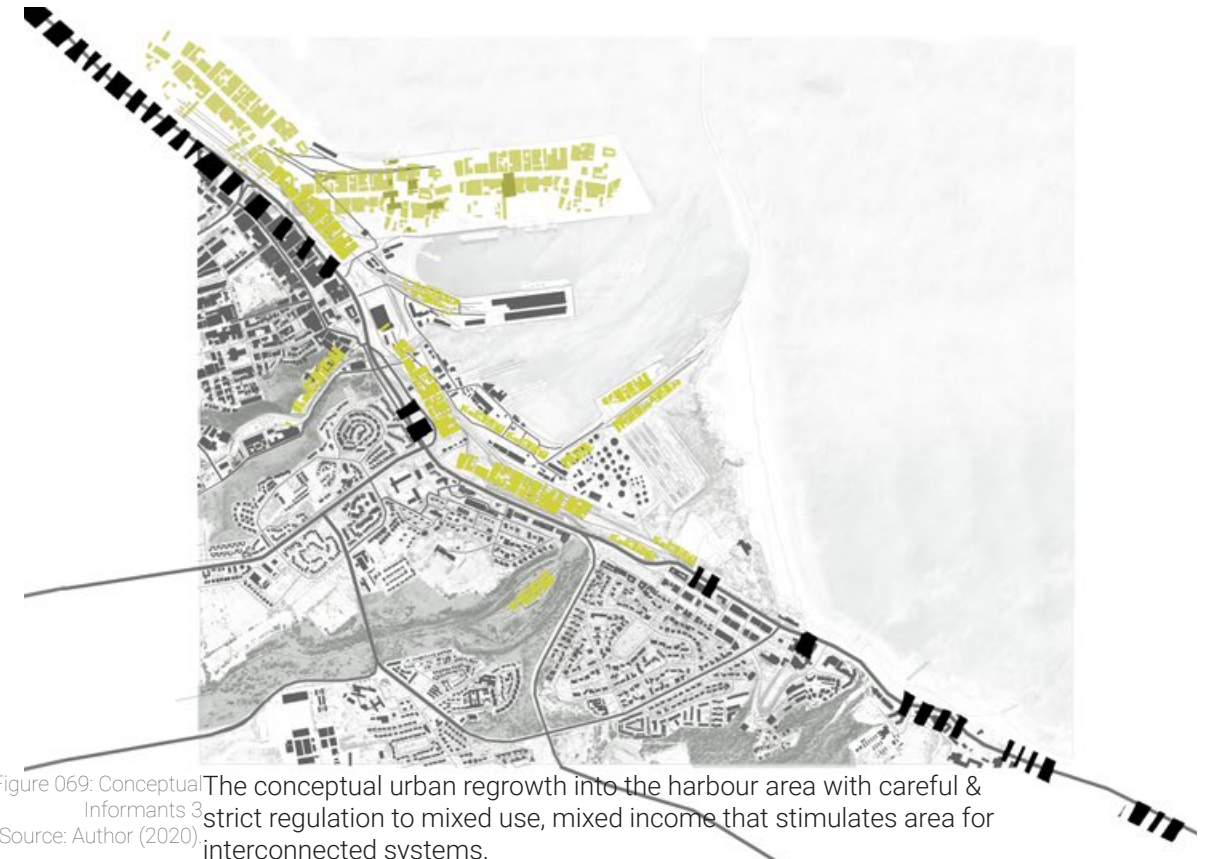


Figure 069: Conceptual Informants 3 The conceptual urban regrowth into the harbour area with careful & strict regulation to mixed use, mixed income that stimulates area for interconnected systems.  
Source: Author (2020).

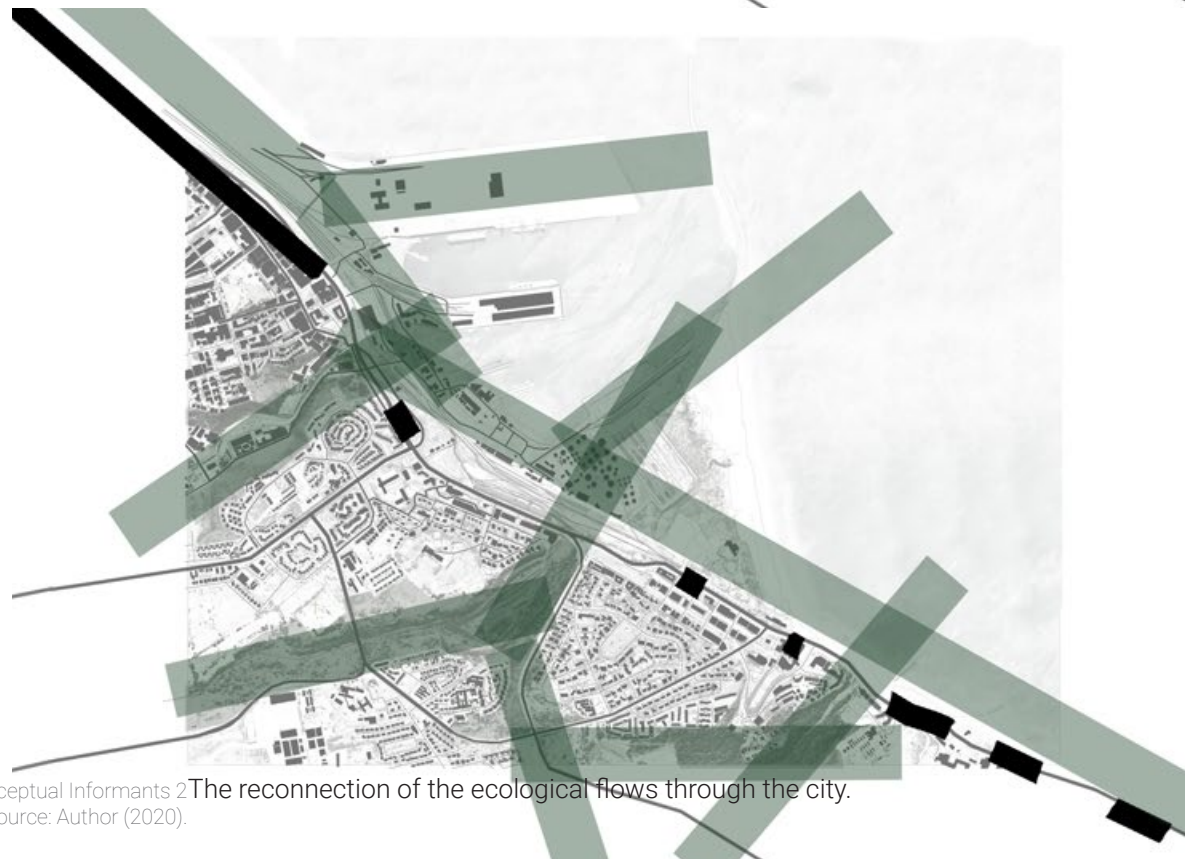


Figure 068: Conceptual Informants 2 The reconnection of the ecological flows through the city.  
Source: Author (2020).

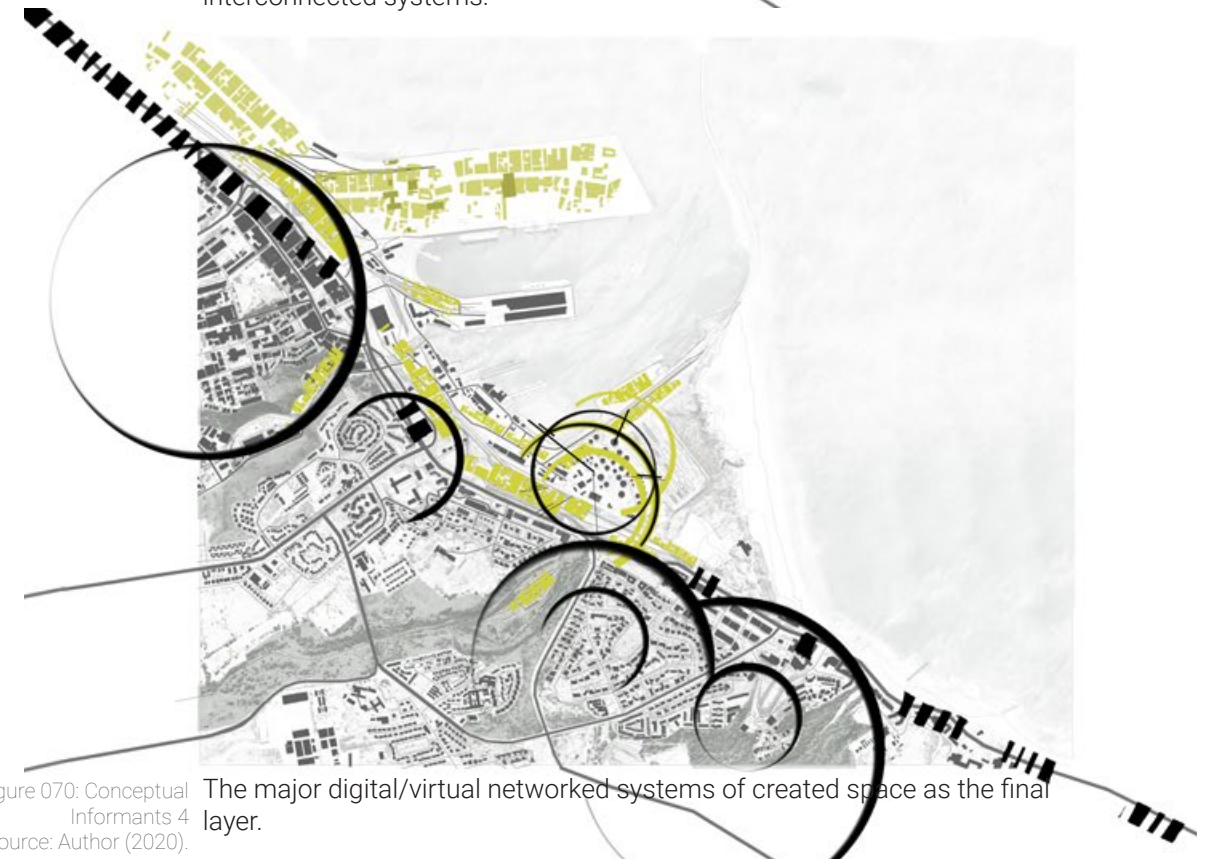
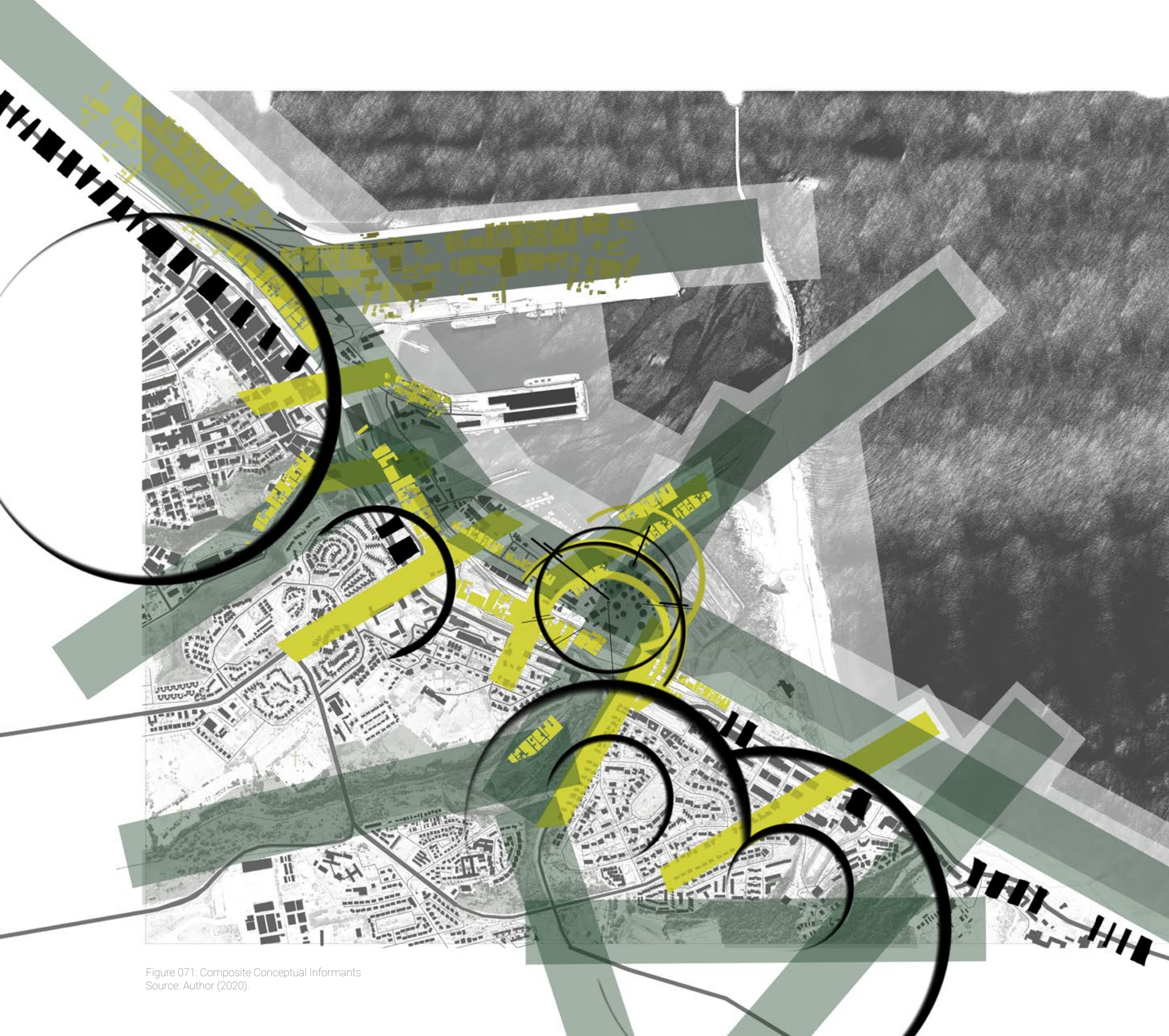


Figure 070: Conceptual Informants 4 The major digital/virtual networked systems of created space as the final layer.  
Source: Author (2020).





**A composite conceptual urban framework.** Consisting of applying the movement systems for public accessibility, the connected green routes through the city, the urban fabrics intervention and the final layer of the digital/virtual.

The focal point of the layers-at-work set up for the Manganeze Tanks site for the building location.

Figure 071: Composite Conceptual Informants  
Source: Author (2020).



CONCEPTUAL INFORMANTS TO URBAN PLAN

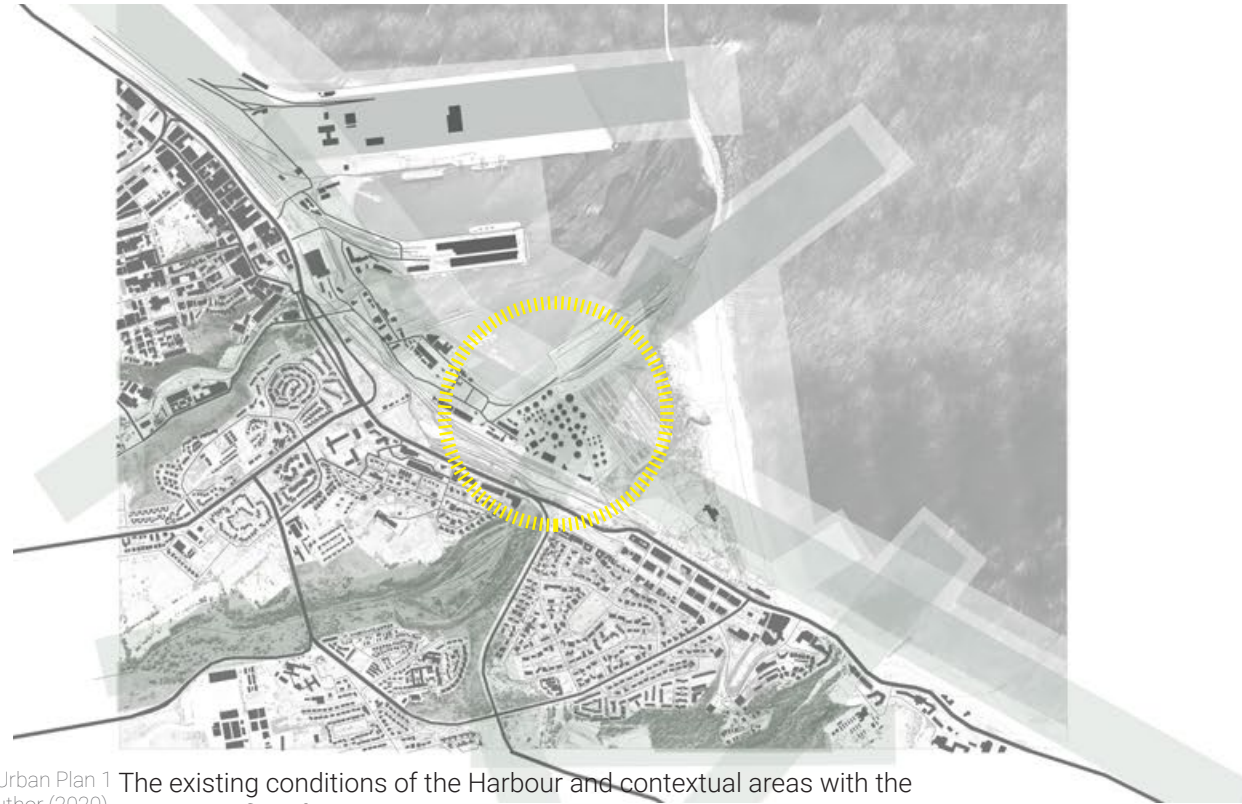


Figure 072: Urban Plan 1 The existing conditions of the Harbour and contextual areas with the ecological flow for reconnection.  
Source: Author (2020).

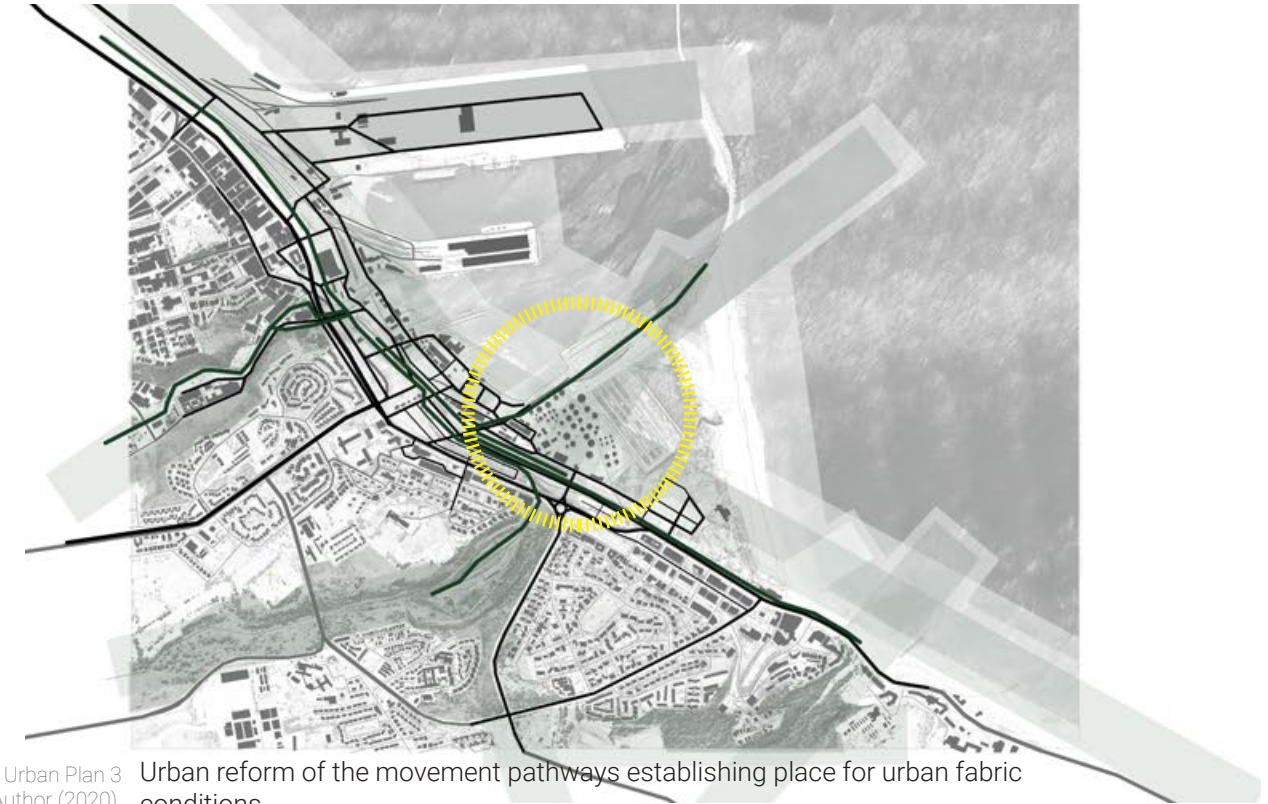


Figure 074: Urban Plan 3 Urban reform of the movement pathways establishing place for urban fabric conditions.  
Source: Author (2020).

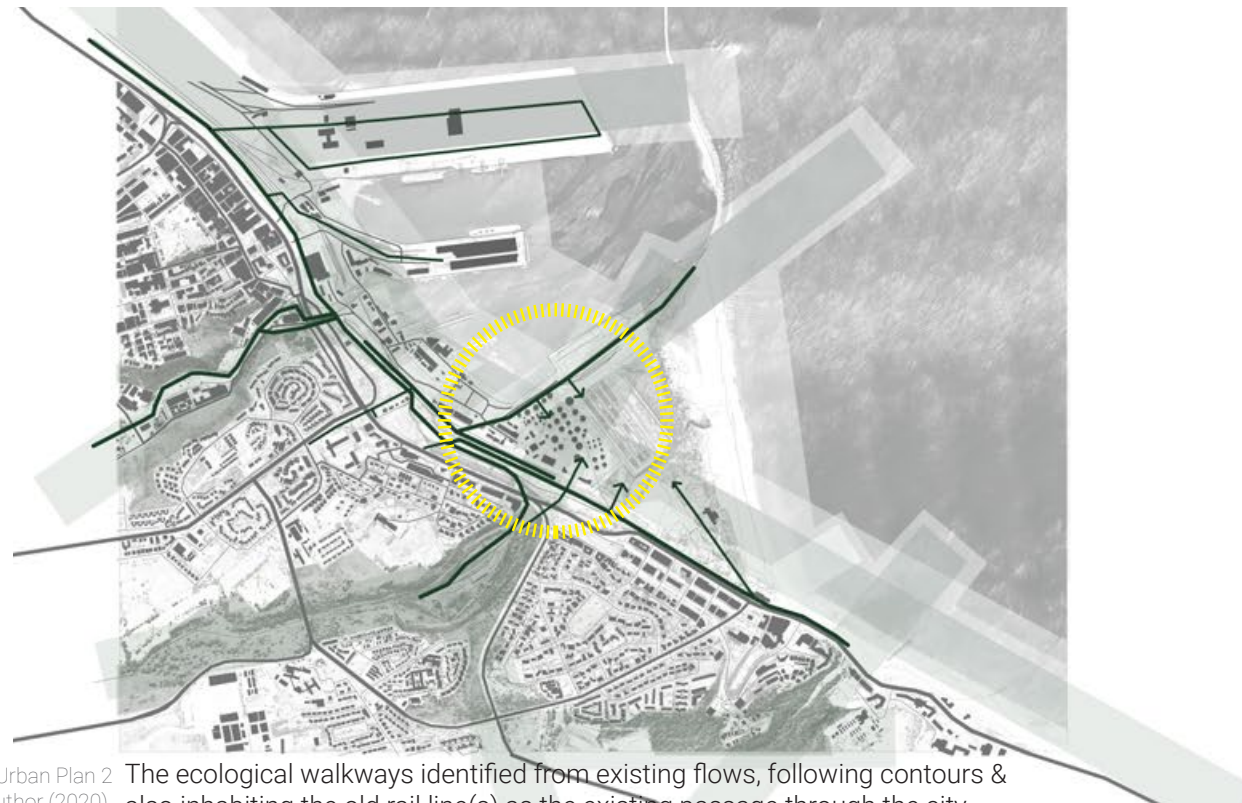


Figure 073: Urban Plan 2 The ecological walkways identified from existing flows, following contours & also inhabiting the old rail line(s) as the existing passage through the city.  
Source: Author (2020).

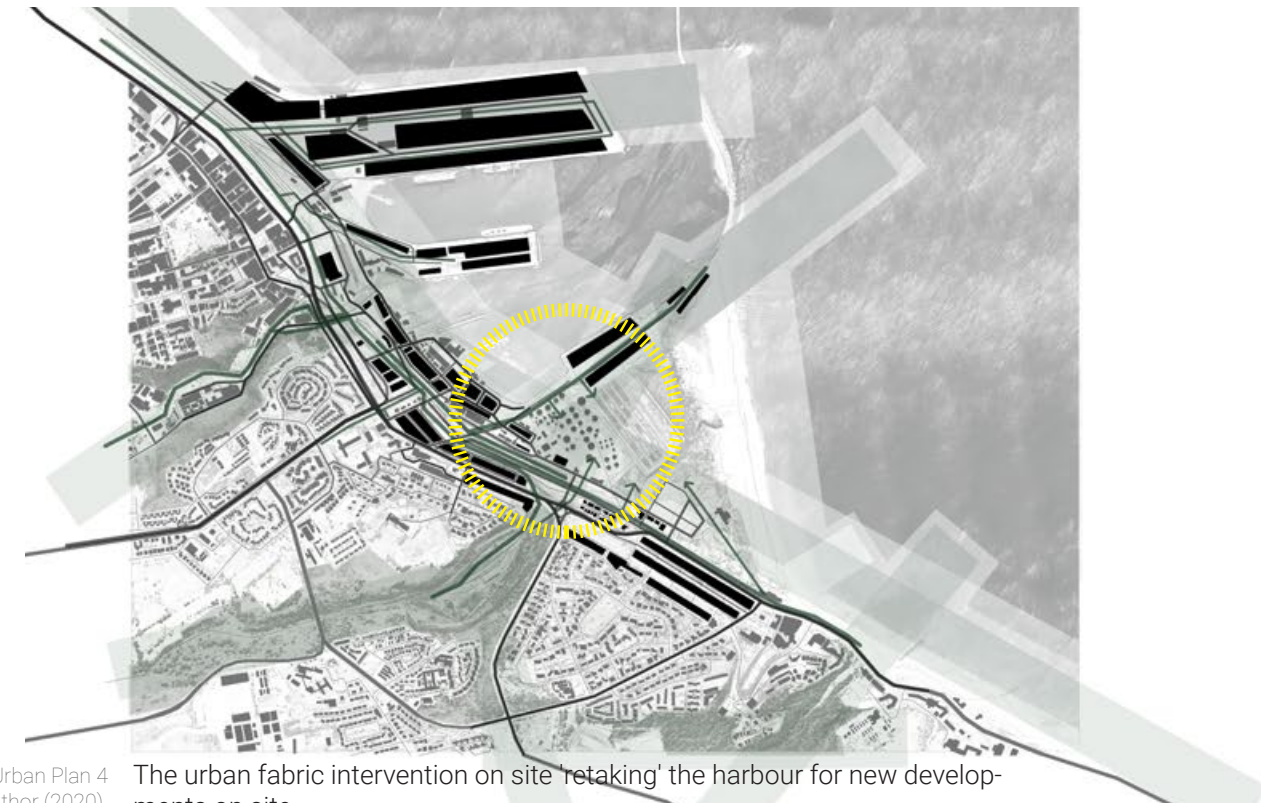
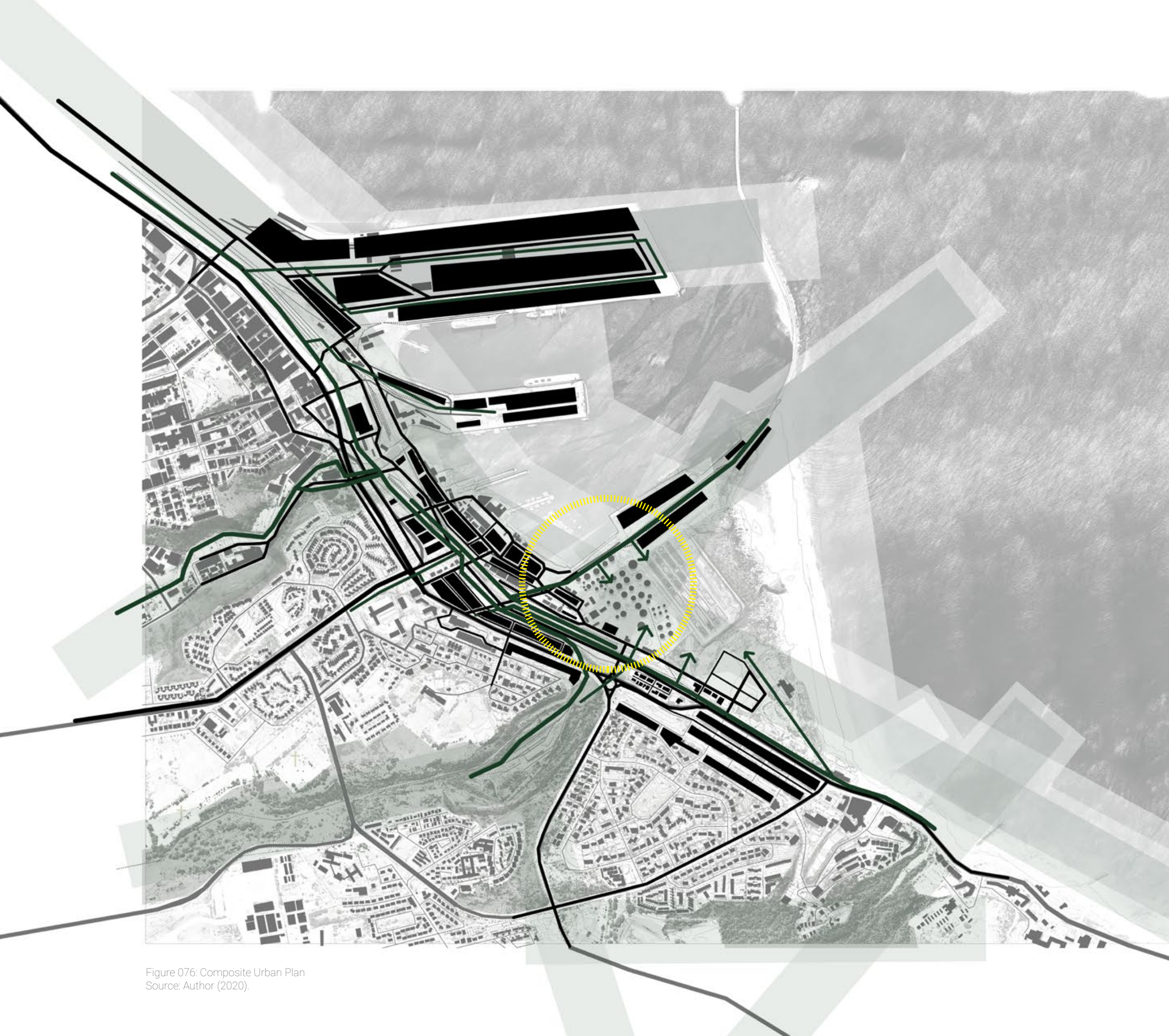


Figure 075: Urban Plan 4 The urban fabric intervention on site 'retaking' the harbour for new developments on site.  
Source: Author (2020).





The **urban framework for the city** – generated through the layers of ecological connection, public routes, movement pathways and access ways, and urban fabric that stimulates a positive space.

The urban framework for the city cultivates the location of the site to establish the four categories of site and remedial action for the environmental conservation of the city as 'digital ecology'.

Figure 076: Composite Urban Plan  
Source: Author (2020).





## ZOO/AQUARIUMS AND PORT ELIZABETH

Dolphins in Captivity

1854	Museum is considered. Municipality acquired land and began construction on a building to house the town hall, municipal offices, library, and an Athenaeum.
1856	Expanded, received constitution.
1897	Became Port Elizabeth Museum
1906	F.W FitSimons revitalised the museum exhibits and added live snake exhibits.
1933	Seal Pool – very popular, removed because of the seals barking at night which interrupted the city residents. Seals were banished.
1939 to 1945	Museum received an appeal from the South African Institute for Medical Research for larger supplies of venom
1958	The museum had grown considerably and - needed to move. New snake park facility.
1959	Oceanarium was completed
1968	The dolphin lake is added and a seal pool
1972	A topical house, horticultural and bird exhibit opened in 1972.
1975	Museum research expanded into marine mammals, gannet biology and ecology, marine predator-prey relationships and herpetology. An education centre became an important function.
1960	First opened with four Dusky dolphins, did not last long due to pelagic nature and higher sensitivity to stress
1962	First Bottlenose dolphins – one died within a month.
1963	Another three to replace. Two more died.
1963	Captures three Humpback dolphins
1964-1981	Seven more dolphins were captured for the South African Park.
1967	Two dolphins added and the first calf born in captivity. Named Dolly.
1976	One dolphin(named Daan) is released to the wild. Public story is he grew too large, but in reality, according to Nick Carter of Dolphin Action and Protection Group, his release was due to Daan's increasingly "aggressive behavior"
1977	A new dolphin was kept in isolation, after a mistaken pregnancy. Only entertainment was a child surfboard. After getting a severe infection. Only in 1979 was she moved to the dolphin lake with three new dolphins caught that year. Only to die in 1980.
1979	Five dolphins die, according to Colin Tayer(Dolphin Trainer) "stress was the main cause of three recent dolphin deaths".
1980	The Dolphin Lake needs repairing, dolphins are moved to an off-site pool.
1981	Dolly, First calf born to captivity gets ulcers from ingesting the pool lining.
1985	Acquires a striped dolphin that was found stranded.
1990	Striped dolphin dies.
1995	Three dolphins die in six month period
1999	Officially changes its name to Bayworld
2000	Cause of the deaths from 1995 came to light when the Cape Argus newspaper published the details.

**Simo** died from a severe stomach and intestinal blockage. The trainers withholding food as punishment. His Necropsy found "his distended stomach contained 19.5kg (43 lbs) of wet sand, 22.5kg (48 lb) of stones, 3kg (6 lbs) of undigested food and 750 grams (1.6 lbs) of broken tile bits from the pool."  
**Lady Dimple** stopped eating after Simo's death and her condition led to her being put down at age 45. Reasons for this were never released.

The third, **Thandi**, was never disclosed, what is known is the previous August, she had developed an abscess on the side of her head, and was given daily treatments for more than a year. She was subject to multiple "injections, gastroscopes, x-rays and biopsies." BayWorld staff sought advice, and a marine mammal vet from Belgium flew in but assistance had come too late. In the end, the cause of her abscess could not be determined; her liver turned yellow and organs bleached white from the prolonged antibiotic treatment.

*"This construction brought with it unrelenting noise, dust and plastic pollution and, on completion, resulted in a spate of unauthorised nocturnal intrusions into the dolphin's environment by irresponsible and thoughtless youths.*

*It is believed that these events had a role to play in Simo's behavior, swallowing foreign objects, and the unsuccessful treatment of Thandi's abscess. stones had in fact been deliberately introduced by the trainers as "toys" for the dolphins to stimulate them in the otherwise barren surroundings of their pool. But none of the trainers had noticed how many stones were being given to the dolphins and how many were being recovered."- Debbie Young*

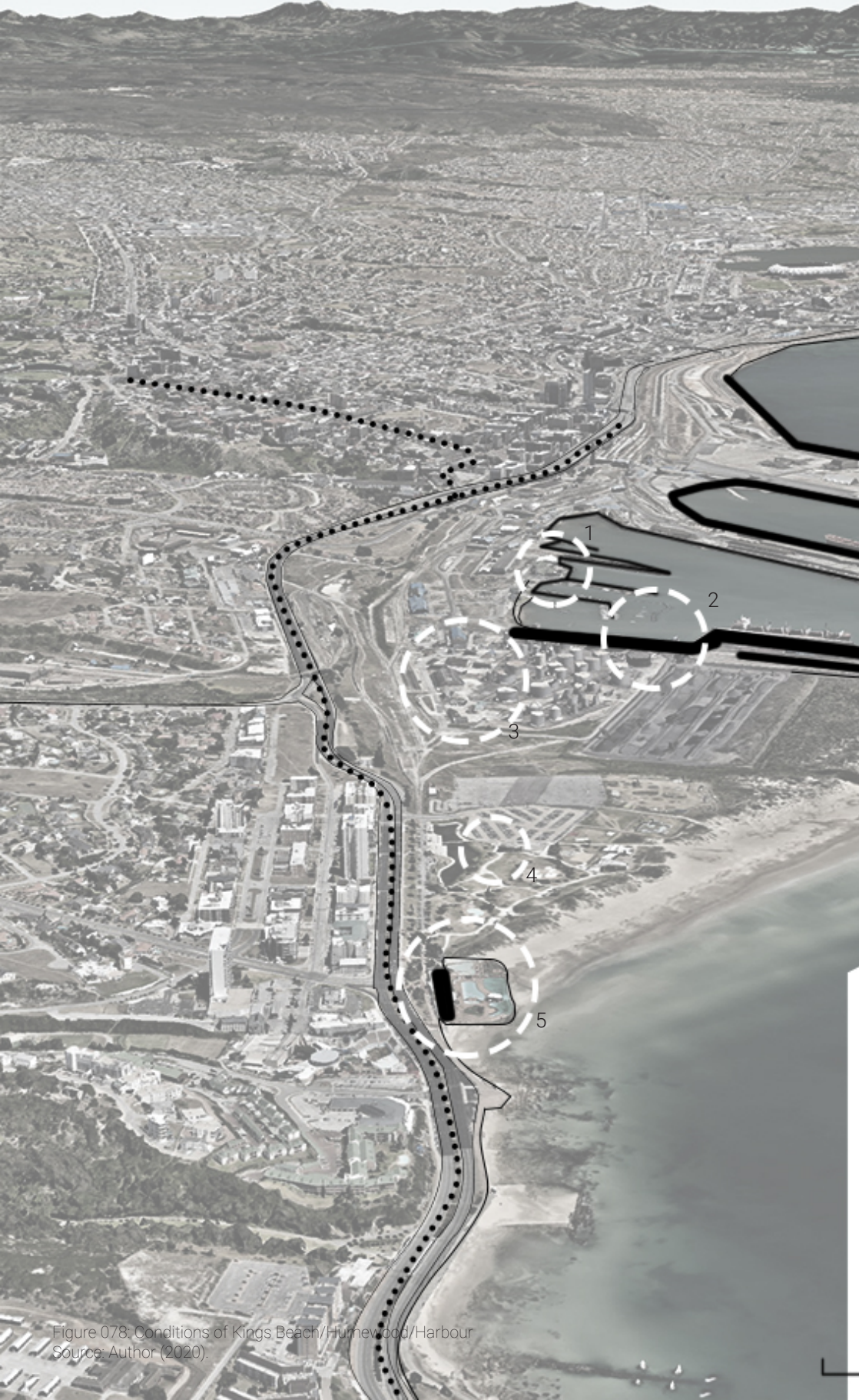
2000	The Department of Marine and Coastal Management grant a permit for the capture of four Indo-Pacific bottlenose dolphins. Bayworld had also been given the green light by marine mammal vet, dolphin broker and catcher Dr. Jay Sweeney, who described Bayworld as "fully acceptable [facility] and in accordance with international standards."
2000	In-Breeding results.
2003	Suspicious death when a dolphin is found floating with a wound to the head, the cause of death was ruled a heart defect.
2004	Another inbred calf is born, Dumisa. Dolly, first captive birth dolphin dies at age 36. Death was believed to be from natural causes. No official death was ever established. (Blogger, 2020)
<b>2009</b>	<b>Two remaining dolphins, Domino and Dumisa, are sent to Hong Kong for a breeding program.</b>
<b>2016</b>	<b>Bayworld tanks in dire state.</b>
2016	PE's dolphins leap again at Bayworld, faced with mixed responses.
2018	Bayworld 2020 Vision is announced.
2020	Bayworld 2020, Nothing has happened

Figure 077: Zoo/Aquarium and Port Elizabeth  
 Source: Author (2020).

Sources: (Kisling, 2001: 342-343), (Blogger, 2020), (News 24, 2020), (Herald,2020)



CONDITIONS OF KINGS BEACH/HUMEWOOD/HARBOUR



Conditions of Port Elizabeth's Kings Beach and surrounding areas are in rapid decline. Kings Beach is an artificial beach, formed during the construction of the Port Elizabeth harbour in 1934. The northern inshore current has drifted the sands to the bank (Rogers, 2020). Kings Beach is declared as a blue flag beach.

Over the years certain threats have made the status of the blue flag beach unstable – such as an increase in crime, and disrepair of the public facilities. According to Renaldo Gouws, the ward councillor is concerned this will cost the beach its Blue Flag status (Bezuidenhout, 2020).

Lower levels of traffic leave these places vulnerable, especially during the coronavirus lockdown this year (Bezuidenhout, 2020). According to Bezuidenhout, the NMBM spokesperson Mamelata Ndamase has said there is communication with safety and security to implement sustainable security measures for the beaches and their facilities (Bezuidenhout, 2020).

There have been cases of illegal sand mining to the dune areas which significantly damages the structure of dunes and the indigenous vegetation covering those set away from the beach (Rogers, 2020). The following page will explore specific contaminants on site.

1



Figure 079: Overview of the Yacht Club Source: (Maxer Technologies, 2020)

2



Figure 080: Manganese Tank Yards Water Edge Source: (Maxer Technologies, 2020)

3



Figure 081: Manganese Tank Site Warehouses Source: (Maxer Technologies, 2020)

4



Figure 082: Kings Beach Skate-park. Source: (Maxer Technologies, 2020)

5



Figure 083: Mac Arthur's Baths Source: (Maxer Technologies, 2020)

Figure 078: Conditions of Kings Beach/Humewood/Harbour Source: Author (2020).



## PRESENT CONTAMINANTS

There are multiple contributions to various levels of pollution to the site, including:

- Litter and garbage
- The Watersheds contributions to Hume River's pollutants
- The Manganese ore dump and oil tank

Litter and garbage are present on site through the acts of littering and illegal dumping. After that, natural conditions such as strong winds and rain can aid the growing amount of discarded litter. The municipality provides removal services to the larger collections of waste that arrives in the area.

The river valley water that contributes to the storm water and natural valley can be seen in figure 084. According to the Legalbrief, plastic is contaminating sea salt. Increasing plastic pollution is found all around the world, where studies are discovering 'micro plastics'. According to the Guardian, up to 12.7million tons of plastic enters the world's oceans every year (LegalBrief, 2020).

Marine ecology and pollution will be a major topic in the build-up to the International Coastal Clean-up initiative in Port Elizabeth. Marine Ecology (LegalBrief, 2020). According to committee member of WESSA, Tim Douglas-Jones, there is a general lack of knowledge (about marine pollution) and education around the dangers of plastic pollution is a problem. Dr. Lorien Pichegru, the Algoa Bay Hope Spot Chair and research fellow in the Institute for Coastal and Marine Research at NMU, says that in 2019 eight tons of rubbish was collected around Port Elizabeth. She emphasises that coastal pollution is a major concern and needs urgent attention (LegalBrief, 2020).

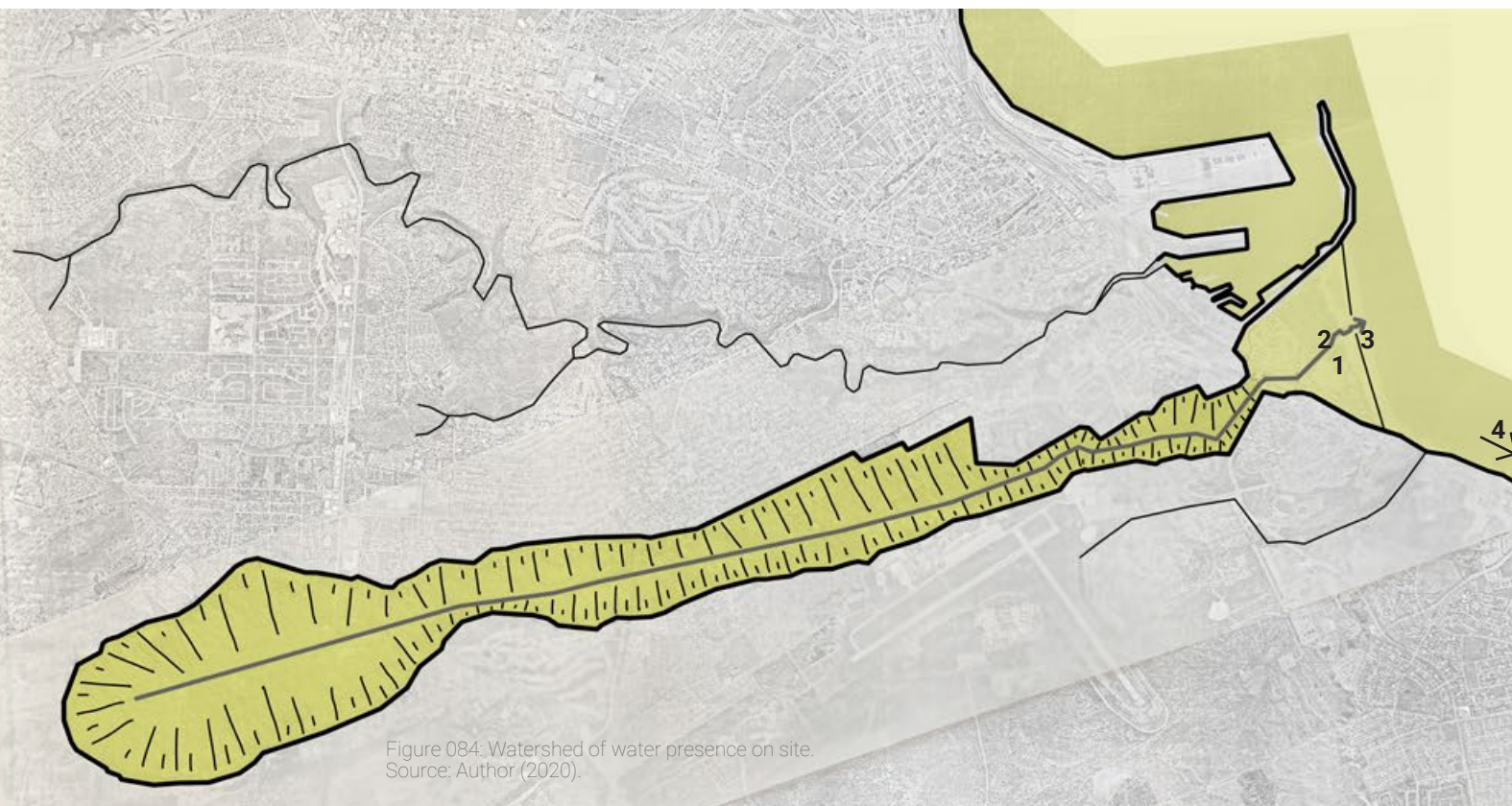


Figure 084: Watershed of water presence on site.  
Source: Author (2020).

The Manganese ore dump and oil tank farm have been permanent fixtures for forty years (Du Preez, Lee and Cloete, 2013). The increase in environmental awareness has led to the relocation of the tanks to Coega. The negative impacts of the tanks include air and water pollution. Due to the farm being an open air structure, and Port Elizabeth's prevalent winds, the dust disperses all over the Nelson Mandela Bay area (Erasmus, Strydom, Tipshraeny and Watling, 2003:45-52).

The ore dust is considered a nuisance pollutant. There has been an increase in respiratory illnesses in people living near the harbour. There is a decline of successful hatching bird eggs (fowls eggs in particular) around the harbour and a decline in passive and active use of the Kings Beach area (Du Preez, Lee and Cloete, 2013).

According to the Bureau of Environmental Health, long term exposure to manganese ore dust could lead to severe respiratory ailments, muscle pain, impotence, muscle pain, chronic headaches and nervousness (Bureau of Environmental Health, 2010).

Oil pollution due to leakages have extended past the periphery of the harbour. This contamination has caused:

- Whales to veer off natural pathways
- the deaths of penguins exposed to oil residue in the water
- local fish population decline
- Turtle nest destructions
- The cancellation of the National Young Lifesavers (Nippers) competition
- A major concern for the effect on the Blue Flag status of the Kings Beach. (Du Preez, Lee and Cloete, 2013).

In Chapter 5 the use of remediation methods will be sought at to aid the harmful actions active on the site.



**Sand samples:** For consistency and comparison, all samples are wet sand

- 1 Soil sample taken in dunes
- 2 Soil sample taken in dunes near water edge
- 3 Soil sample taken in dry pans at waters edge.
- 4 Soil sample at pipe beach down the coast.

Figure 085: Water and Sand Samples taken at Site.  
Source: Author (2020).



## SITE FINDINGS

The conditions of site were for the isolation of the destroyed and polluted landscape, the lack of public access, as well as the missing ecosystem. The manganese ore dump and oil tank farm suits the criteria of the site. The following diagrams display conditions of the site.

The manganese ore dump and oil tank farm is the host of industry. This cultivates inhospitable qualities via means of the scale of the industrial machinery, barrier walls, hard solid surfaces and security measurements.

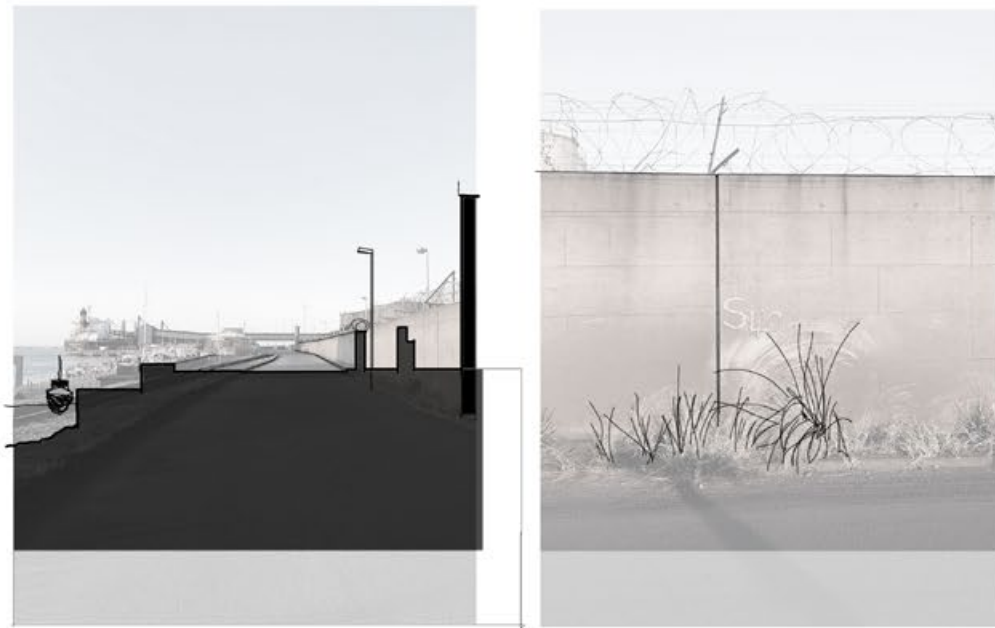


Figure 086: Barrier and Solid surfaces  
Source: Author (2020).

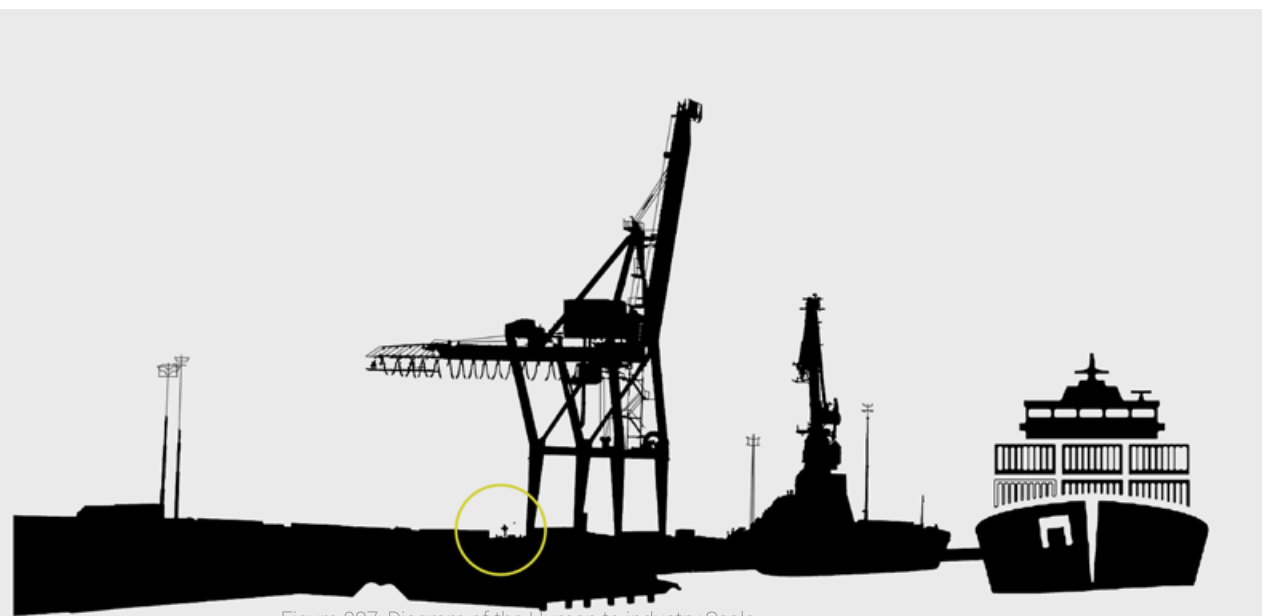
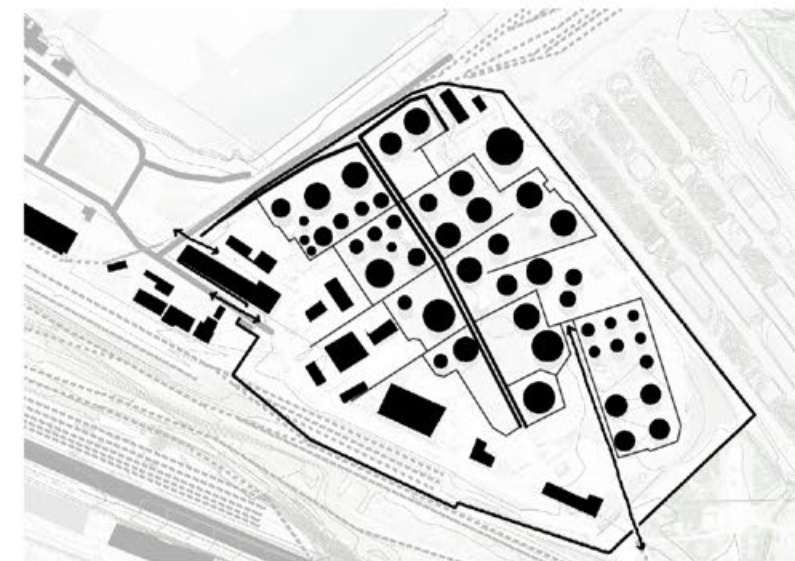


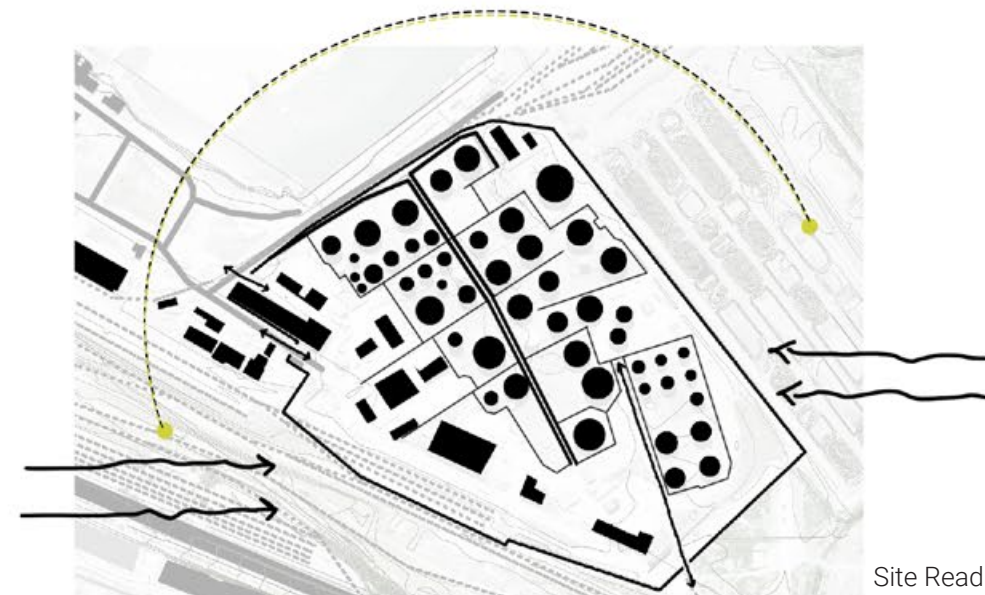
Figure 087: Diagram of the Human to industry Scale  
Source: Author (2020).



Containment and Barrier



Structure Lines and Containers



Site Reading

Figure 088: Major components of Site Readings.  
Source: Author (2020).



## CHAPTER CONCLUSION

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The application of city as environmental conservation and the 'digital ecology', as the tool to address the barrier of site. Encouraging reconnection in the urban framework. Using conceptual informants of the ecological disconnection, the movement disconnection, the urban disconnection and the digital disconnection, the concluding hope of which is a sustainable, regenerative revival of the harbour and surrounding areas.

Architecture & and a Terrestrial Nature

Architecture and Indigenous landscape  
Architecture & Containment

Architectural and a Territorial Nature

Architecture and Built Form  
Architecture and Background

Architectural and a Digital Nature

Architecture and Integrated System  
Architecture & Virtual Exhibition

The purpose of this chapter is to establish the architectural responses to the issues defined in the preceding chapters. The purpose is to provide generating principles as it pertains to the intentions of this thesis. These intentions define the 'digital ecology' as the application for environmental conservation in the city and for the Virtual Eco-Park in Port Elizabeth. This chapter is the concluding chapter to the research component of this thesis. Therefore, the conclusions of this chapter are the particular principles informing the design.



# ARCHITECTURAL AND A TERRESTRIAL NATURE 1

Architecture and Indigenous landscape  
Architecture and Containment

## Architecture and Indigenous landscape

Architecture and the indigenous landscape is intended to highlight the importance of ecological flow, active space and the non-hierarchical relationships and networks in the city.

How the urban, natural and built forms are designed critically negotiated the success of the created spaces. The conditions of cities today exhibit disconnections, historical segregation as delineated in the site chapter, and designated zones for industries which develop the creation of edge conditions of inactive, mismanaged spaces. The Industrial landscapes condition inherently defines dominated landscapes. The re-zoning of this land leaves behind the post-industrial condition which provides the opportunity for creativity. As delineated in chapter two, the intention to create nested/neutral green space is the way forward – therefore implementing the intentions of NMU south campus and the California Academy of Science.

The edge is the delineation between separate spaces. When the edge is the fringe of a natural environment, the edge conditions unattended to are generally inactive, mismanaged spaces. Tension is naturally created in these transitions between spaces. The 'forgotten' natural landscapes between spaces – be it private or public due to management or governmental control – become barriers between green spaces.

These in-between spaces are open to modification, especially if pollution is a factor. Remediation to the site is necessary, especially in brownfield sites. Brownfield is the legal term for urban soil that is contaminated with hazardous waste or high levels. Chapter three notes the soil contamination on site, as noted the options for remediation are physical (excavation, immobilization, soil washing and soil vapour extraction) and biological remediation techniques (microbial remediation and phytoremediation). The diagram to the right are the options for remediation methods. A combination of these methods are suggested as the methods for site applications and will be explored as design principles in part two of this document.

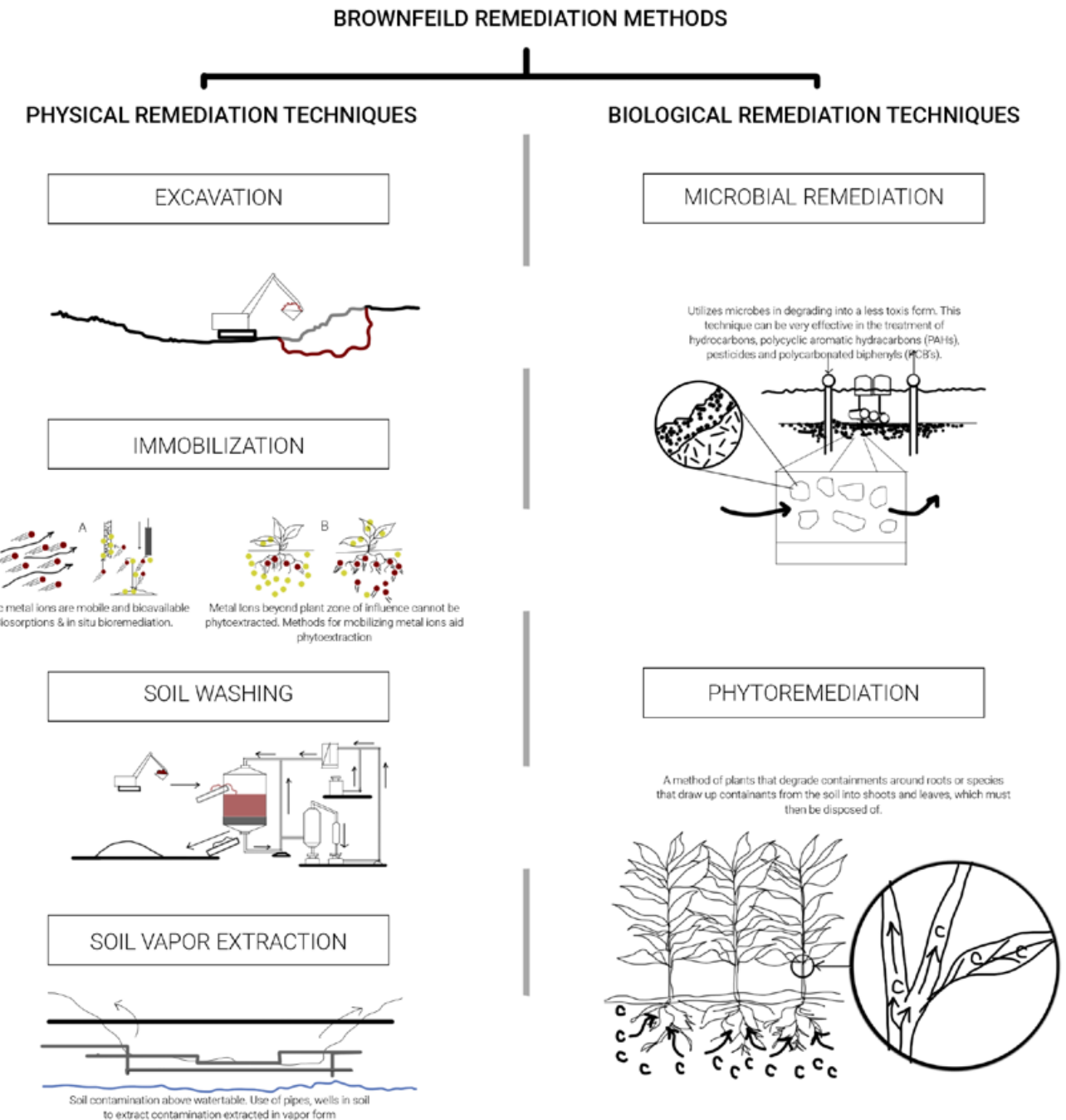


Figure 090: Brownfield Remediation Methods. Source: Author (2020).

## Architecture & Containment

Architecture and containment as principles drawn from the type of the prison, and containment in chapter two which explores the nature of the building type. In chapter two the prison type defined the need for captivity, but for the virtual application the need for pens/cages and protective barriers do not apply. This meant that the new form of containment became its negotiation of non-hierarchical space, and the use of field conditions to create the immersive experience of the zoo.



Figure 091: Example of Stormwater Management.  
Source: (Turenscape, 2020).



Figure 092: The New York High Line.  
Source: (Baan, 2003)

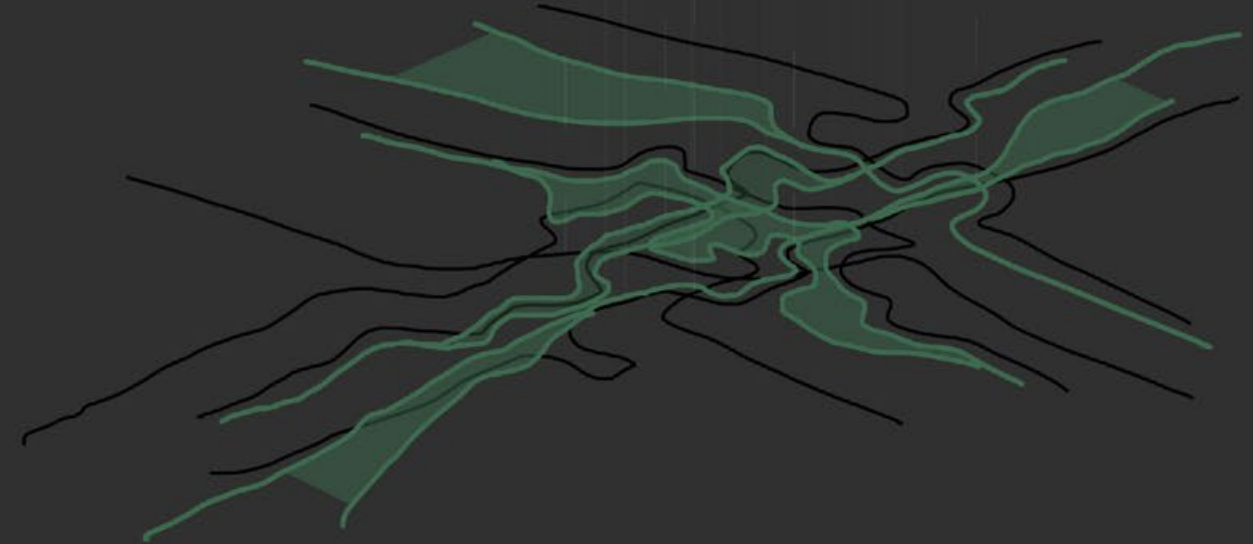
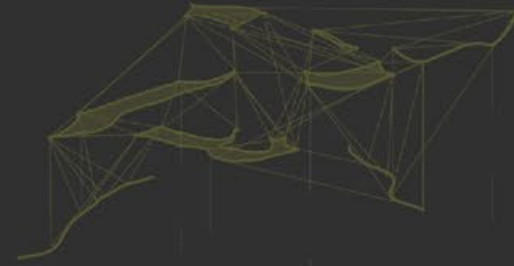


Figure 093: Digital Ecology Layer 2.  
Source: Author (2020).



## ARCHITECTURAL AND A TERRITORIAL NATURE 2

Architecture and Built Form  
Architecture and Background

### Architecture and Built Form

Architecture and the built form ideally collaborates with the surrounding context to promote positive public space. Informed by the composite constraints and informant to consider the contextual systems.

Architecture and the built form ideally collaborates with the surrounding context to promote positive public space. Informed by the composite constraints and informant to consider the contextual systems.

The principles for a post-anthropocentric urban agenda and architecture is not an immediate alteration. The architecture of the post anthropocentric would naturally be within the sustainable movement – where meeting the needs of today does not compromise the needs of the future.

The reality of the transition is that it wouldn't be a sweeping change. In prioritizing the green connection and positive outdoor spaces, while enforcing the strict urban planning structure that the city is guided by, the Waterfront will emerge over the phased developments set out by the urban framework. While this architecture and built form is setting up a territorial nature, it is important that what is done is to the encouragement of cohabitation.

Architecture has measurements of quality that uphold the conditions of the institution. The use of regulations in building techniques are to be approved by the South African Council for the Architectural Profession(SACAP). The advancing technologies that provide eco-friendly and thermal qualities for affordable prices encourage buildings that contribute to conditions of an eco-centric society.

By the major markers of an area and the intentions for positive public places, not only the emphasis of the post-anthropocentric vision, this is defined by the public realm as a stimulant for social change. Multi-use and multi-income developments in the area are crucial for the stimulation of sustainable city conditions.

The architecture that correlates between property developments that are dedicated to the post-anthropocentric manifest in the Biophilic domain.

*Biophilia, which I will be so bold as to define as the innate tendency to focus on life and lifelike processes - Edward O Wilson.*

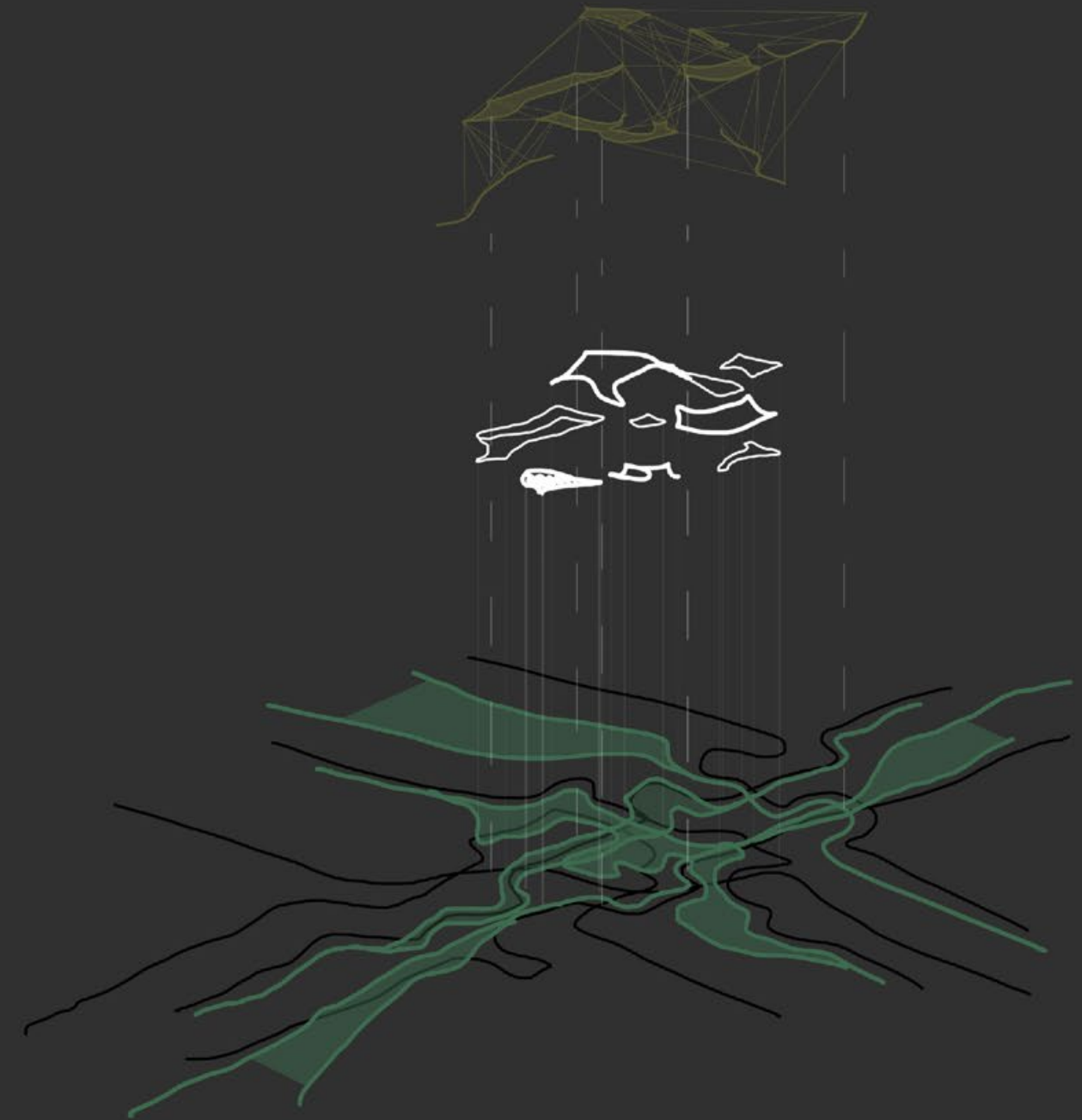


Figure 094. Digital Ecology Layer 3  
Source: Author (2020)

## Architecture and Background

Through the use of complex and hybrid landscapes that create these ecocentric ideals. In an exhibition by SFMOMA and inspired by Stan Allen's essay, "Field Conditions" presents more accurate depictions of the entropy of reality. The exhibition promotes and attempts a new spatial architecture that incorporates modern technology and the changing dynamics of society.

In field conditions by Stan Allen, the opening passage by Sanford Kwinter "The field describes a space of propagation, of effects. It contains a function, vector and speed(not matter or material points). The local relations of differences with-in fields of celerity, transmission or of careering points, in a word, what Minkowski"(Allen, S. 1985).

Stan Allen associates the field condition in six categories. First, from object to field, it tries to explain the associations of the singular to the collective. He suggests the use of field conditions can identify the users of architecture, "*speculate new methodologies to model program and space*". Understanding field conditions and generating configurations to determine the behaviours of the field. Designing from the bottom-up phenomena that are generated by these intricate local connections, the configurations and behaviour of the field are the challenges of the ecocentric ideal that the 'Digital Ecology' seeks.

*"The conclusion I draw is optimistic: to the degree that we come to understand other organisms, we will place a greater value on them, and on ourselves."* - Edward O Wilson.

A principle to draw from is the concepts of background not foreground. In chapter two, a modern zoo, the project of Renzo Piano's Paris Zoological Park, uses this concept to blend the architecture between animal and human. To follow this concept, the virtual Eco-park would exhibit qualities of this concept – refraining from objects in architecture and avoiding hierarchical space.

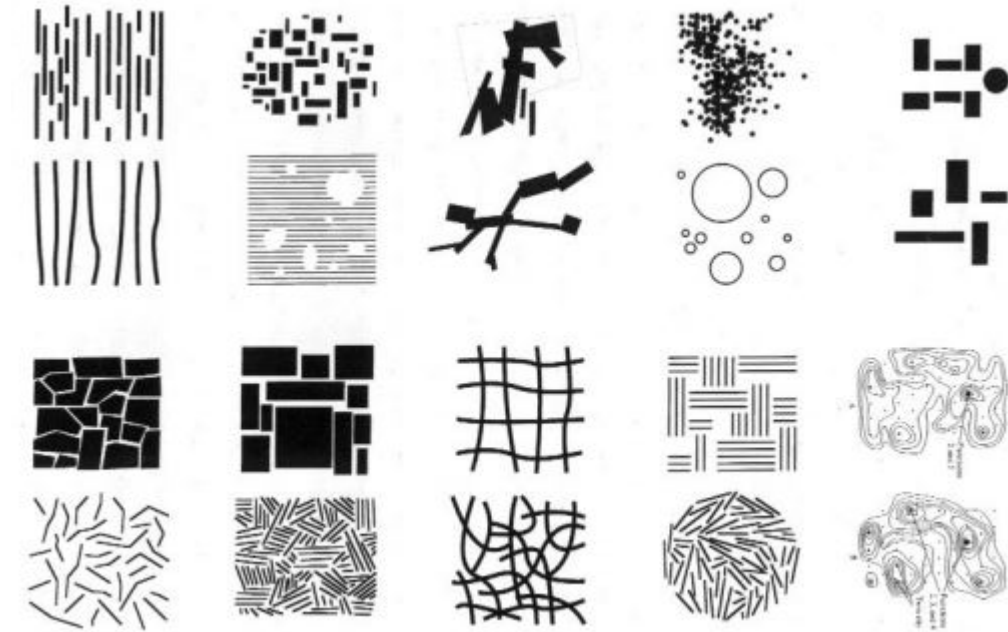


Figure 095: Field Condition Diagrams.  
Source: Allen, S (1985).



Figure 096: Paris Zoological Park as Field  
Source: Author (2020).



### ARCHITECTURAL AND A DIGITAL NATURE 3

Architecture and Integrated System  
Architecture and Virtual Exhibition

#### Architecture and Integrated Systems

Architecture and an integrated system applies the final layer of the 'digital ecology'. Timothy Luke explains the reliance of the three natures to each other and also the condition that the inter-relation of each exists for the other. The ability of heterogeneous interactive realms of the human experience of a new space that opens a 'door' for volume from the real to the digital (Perella and Toy, 1999). The creation of a temporal scape that does not admit to the same systematic rules as the two natures it is bonded too.

These three can be understood as the major layers of the spatial stacking system proposed for the success of a post-anthropocentric integrated system. Together, this spatial stacking allows for a theoretical application for the architectural response. While integrating itself into the configurations and urban condition of the 'digital ecology'.

#### Architecture and Virtual Exhibition

Then the next becomes a created space of eternal manipulation of the cybersphere. This creation of a temporal scape that does not admit to the same systematic rules as the two natures it is bonded to. Radical modification and limitless potential allow the recreated space to be interpretable.

In chapter two, Exploratorium, the elements that allow this created space starts in forms of 2D to 3D and beyond. The intentions are for the immersive experience of the event/theatre. The way design of the created space engages with modelling software generating the 4th dimensions, the relationship between form and image are integrated flowing into each other in unification – which is the definition of the hypersurface, according to Stephen Perrella (Perella and Toy, 1999). The creation of future thinking pursuit is further than the simple projection of a fixed image onto architecture. Perella defines this as a superficial application of media images onto architecture. (Perella and Toy, 1999). The inventive form and image-making are integral for the acceleration of this innovation. This means understanding the nature of the digital/computer's logic and emanating it into the world. Perella's hypersurfaces are his attempt at reflecting social condition and our integral part of the media we have created.

Using the notions of Perella's warning about superficial digital application. For the digital ecology this invites an interesting condition of space, while using all developing technologies to implement this 'digital ecology'. As seen in chapter two, Exploratorium, all developing technologies play with bound space.

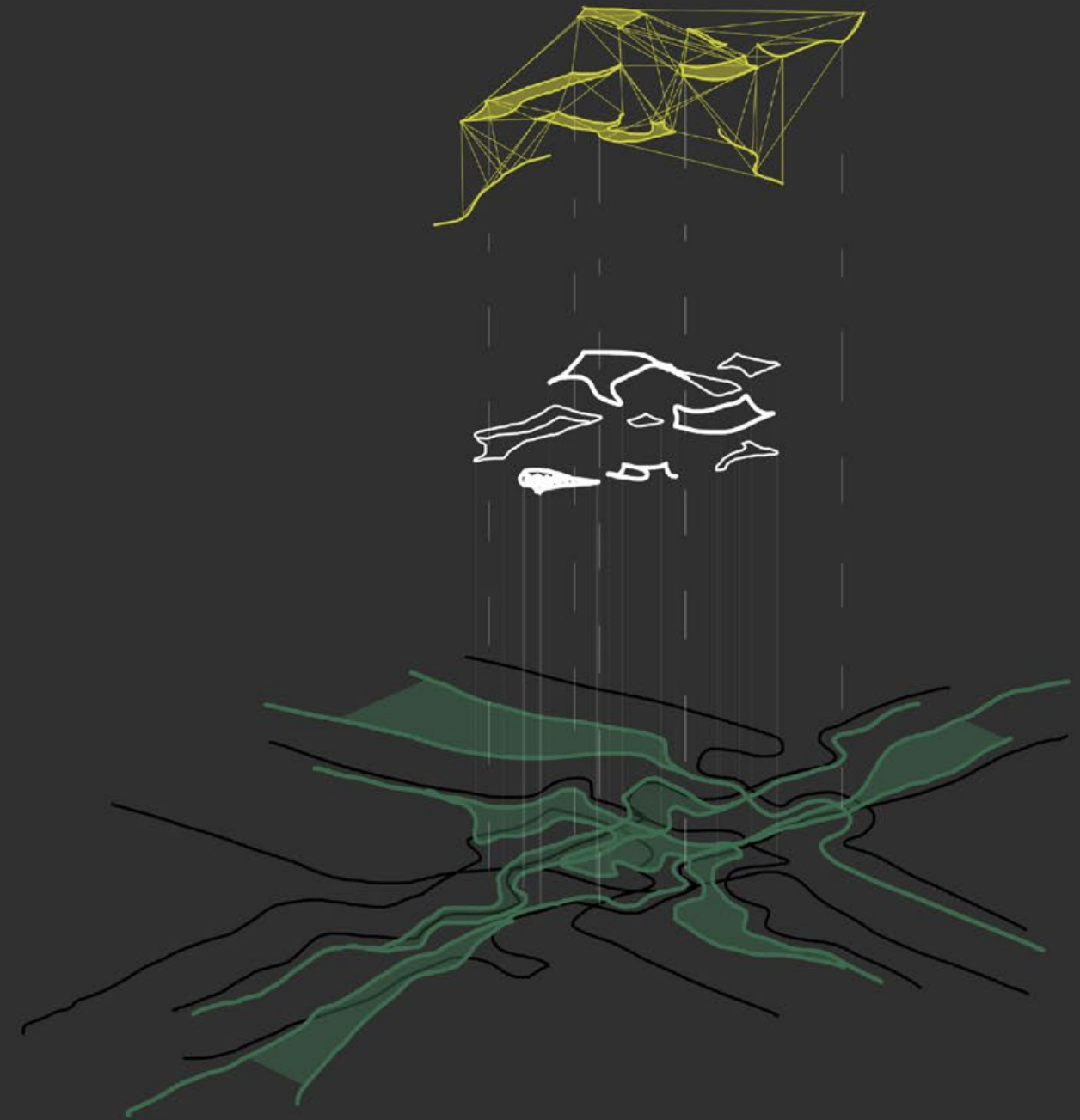


Figure 097: Digital Ecology Layer 4  
Source: Author (2020)

## CONCLUSION:

The architectural responses defined in this chapter categorise the application of 'digital ecology'. This chapter is the concluding chapter to the research component of this thesis. The diagram below is the composite of the three layers needed to create the design of a Virtual Eco-Park.

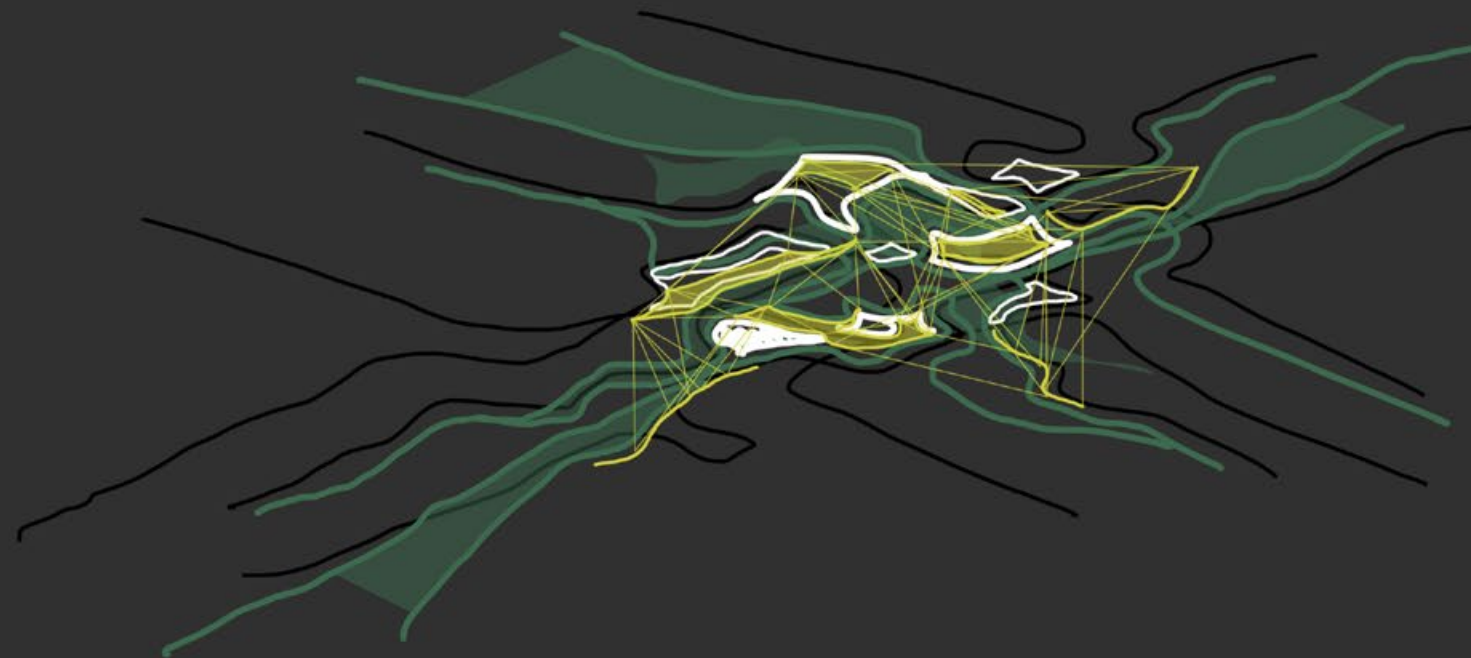


Figure 098: Composite Digital Ecology  
Source: Author (2020).



**PART 2**

Design Development

Final Design

Developing The Brief

Urban Intervention

Nature of contextual spaces

Accommodation Schedule

Accommodation schedule Arrangement

Design Development: Applying 'Digital Ecology'

Planning Development

This chapter is the documentation for Design of the Virtual Eco-Park. Exploring the spatial and physical design of a spatial development framework for the Post-Anthropocentric principles in design. The application of 'digital ecology' is applied as per the research done in part two. By establishing the brief and needs of the accommodation schedules. A development of diagrams and architectural responses on site to conclude in the design of a Virtual Eco-Park.



## DEVELOPING THE BRIEF

The information gathered through part one was to understand the components that will further develop the Virtual Eco-Park program. To consider the formal functions of a Digital Park of Nature, the social dynamics of the site, and urban revival opportunities the site could create.

The design will be the creation of building demands from Chapter two, Nature of Virtual Eco-Park. A Botanical Garden/Museum/Exploratorium compound. The design intends to create a post-anthropocentric building.

The research developed in Part One has led to the framework of the three natures, these three natures as specified are outlined as Terrestrial, Territorial and the Digital. These layers will be used as the conceptual drivers of the design along with how that negotiates with the program.

The intentions are to design an interconnected spatial stacking of layers to create the immersive experience of the 'True Wild' in the depth of the Urban fabric. The design of a Virtual Eco-Park enlightens a new perspective and educational platform.

The research has identified the site in Port Elizabeth's harbour area, the re-establishment of a new urban framework has been established and the priority of the 'green-connection' has been encouraged as well as the remediation of the Kings' Beach area as an extended component of this project.

This establishes the composite constraints and informants of the site that is ready for the Virtual Eco-Park. The site as it is, is a closed-off, out of scale and separate institution in the Port Elizabeth harbour area. The industrial qualities of the site create an opportunity to deconstruct and to re-integrate into the new urban framework that has been established.

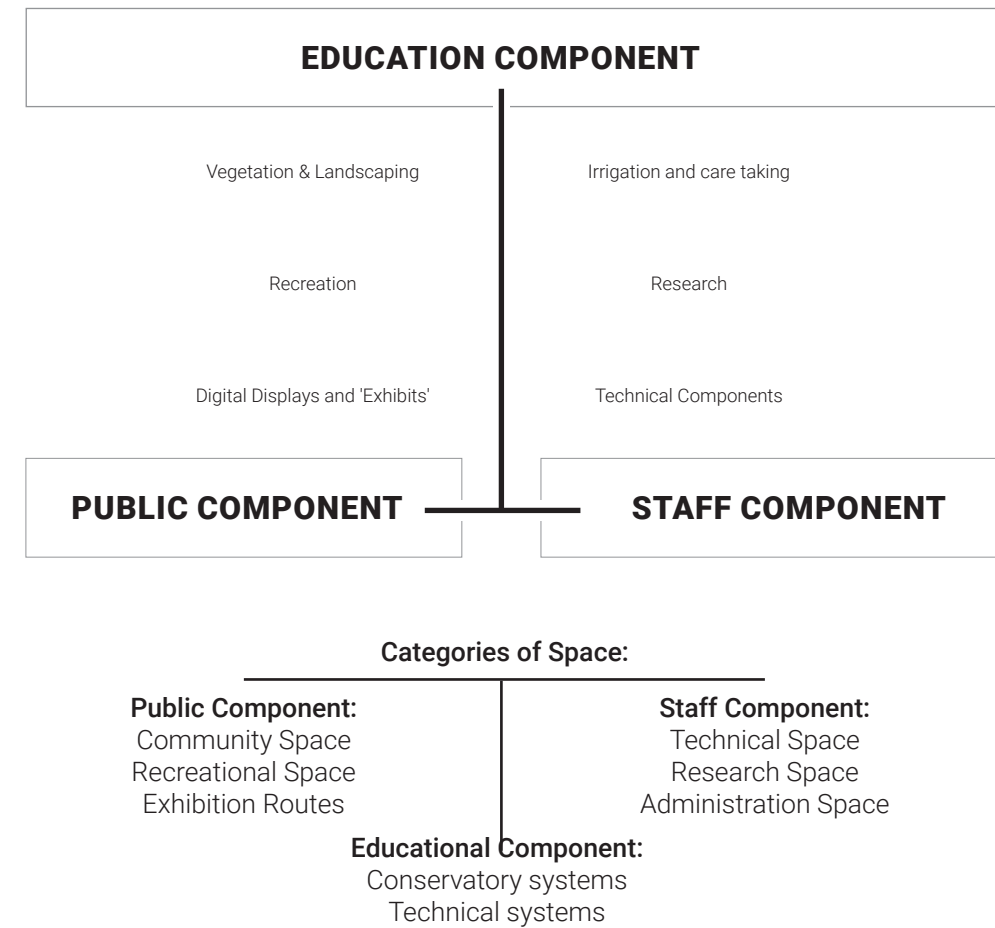


Figure 100: Diagram of Components of Space.  
Source: Author (2020).



Desert



Fynbos



Forest



Nama Karoo



Succulent Karoo



Savannah



Grassland



Fresh Water



Marine

To create the spatial stacking of interconnected systems, it is important to strip away Anthropocentric conditions of hierarchy. This is done by applying 'Digital Ecology' as the principle exploration of space and potentials of space. The accommodation schedule and arrangement will be allocated accordingly.

Being a park in Port Elizabeth, South Africa. The vegetation on display will be indigenous landscaping that filters in from the create scheme of the Port Elizabeth green passages. The South African Zoo would traditionally show the species from our terrestrial and Aquatic biomes, in some cases international. Diagram 99 shows the collection of biomes that display our biodiversity in South Africa.

TERRESTRIAL

AQUATIC

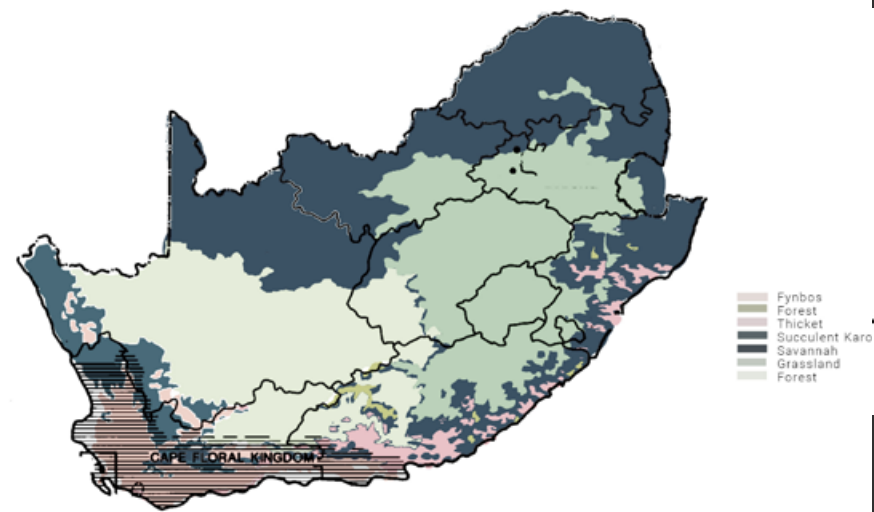


Figure 99: Diagram of Components of Space  
Source: Author (2020).



## URBAN INTERVENTION

### DEVELOPING CONSTRAINTS AND INFORMANTS

This section looks at the urban framework and research from chapter three and intends to address the aspects that will create urban constraints and informants. It is essential to establish the constraints and informants for the Manganese ore dump and oil tank farm and respective areas. As chapter four established the principles for architectural intent, putting architecture and Indigenous landscape first is the first layer of the three components of 'digital ecology'.

In chapter three, the analysis of contaminants present on the immediate and surrounding areas of the site found the need to provide remedial action to prevent any further damage. The dune landscape, the existing tank farm, and ore dump are to be addressed.

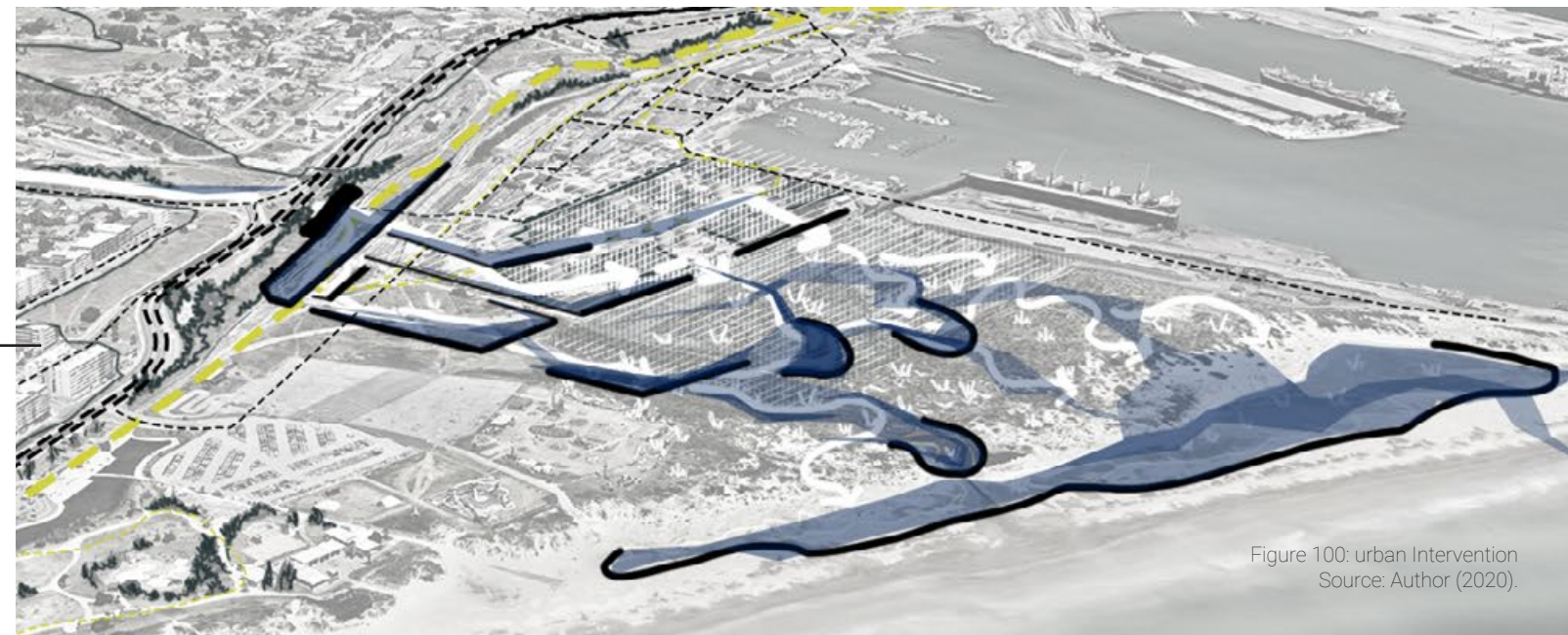
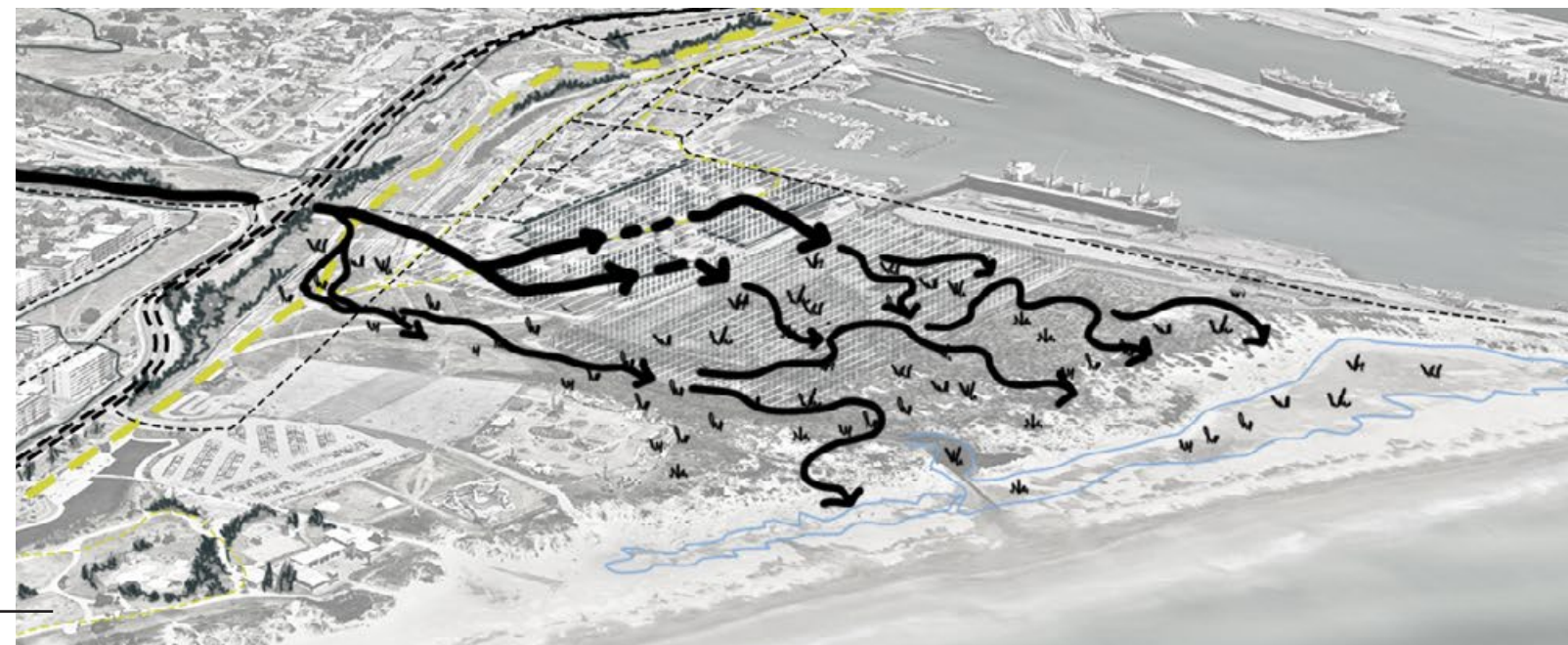
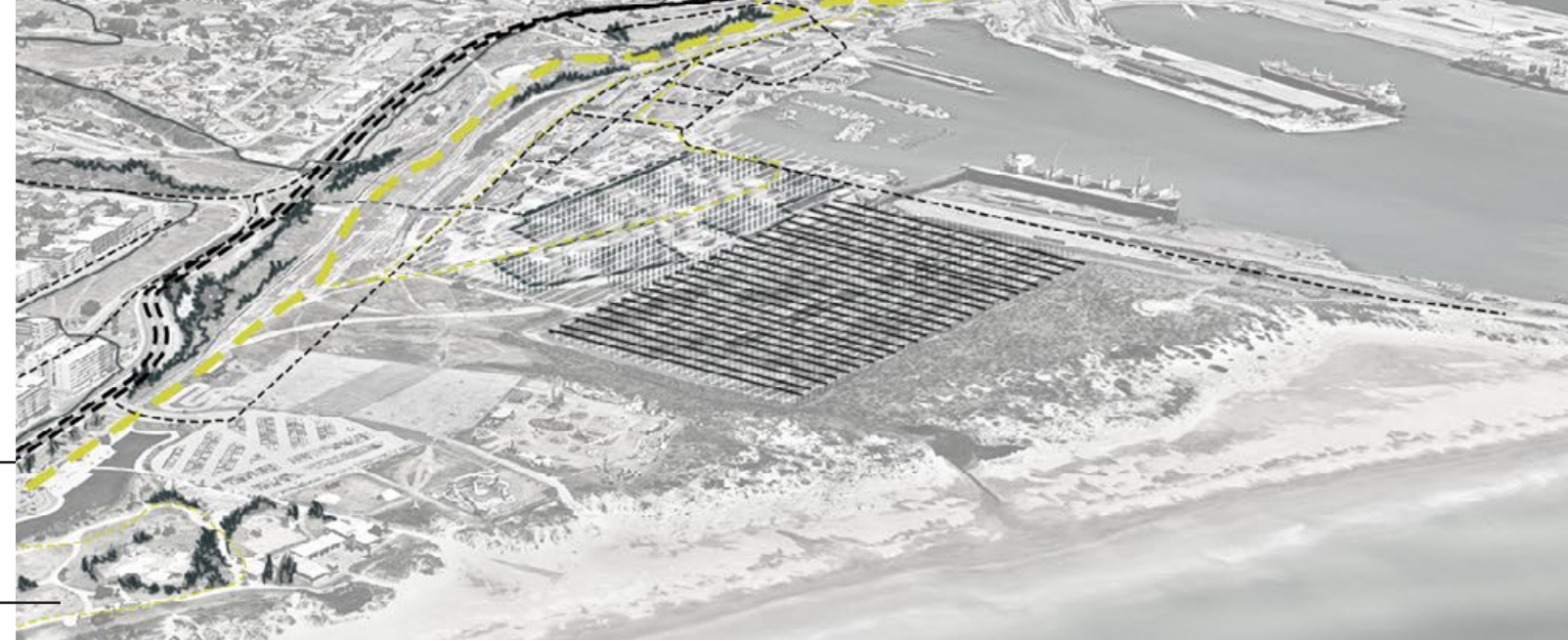
In chapter three, part 1 - figure 090, identified mechanisms of brownfield remediation methods. A combination of these methods will be used in order to re-mediate the land and restore a balance.

Firstly, the removal of the Ore dump and tanks will use the technique of excavation. The relocation of the tanks will remove the majority of Ore, but the infrastructure will be harder to remove. It will be necessary to consult, and on-site guidance during this process as the conditions of the soil/sand underneath the dump is unknown.

Once excavation of the dump occurs, the presence of the Hume rivers water body will be used as a water filtering system through the dune landscape. A phased approach will be implemented to funnel and guide the water to shift dunes. The water guides the dunes through a mixture of immobilization (B) and phytoremediation mechanisms. These plants are to be introduced throughout the dunes to apply cleansing strategies. A focus would be based on the pans at the beach edge to collect/stop/remove before it seeps into the ocean.

Amongst the need to re-mediate the pollution from Ore dump and tanks, it will be necessary to also act on the pollution from the storm-water and rivers watershed. The presence of micro plastics, litter and other hazardous material will need to be addressed by the use of filtering/collection systems (this would be necessary at all rivers in Port Elizabeth).

The maps/diagrams and plans intend a phased approach to the remedial action of the area. These, in combination with the Urban framework, will develop the composite constraints and informant map on the next page.

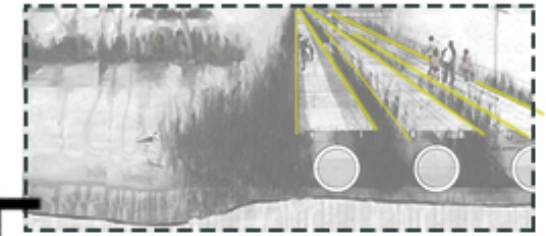
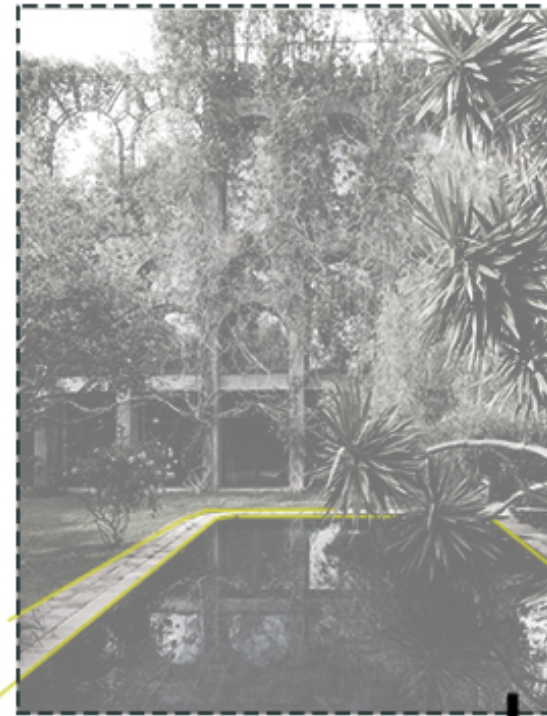
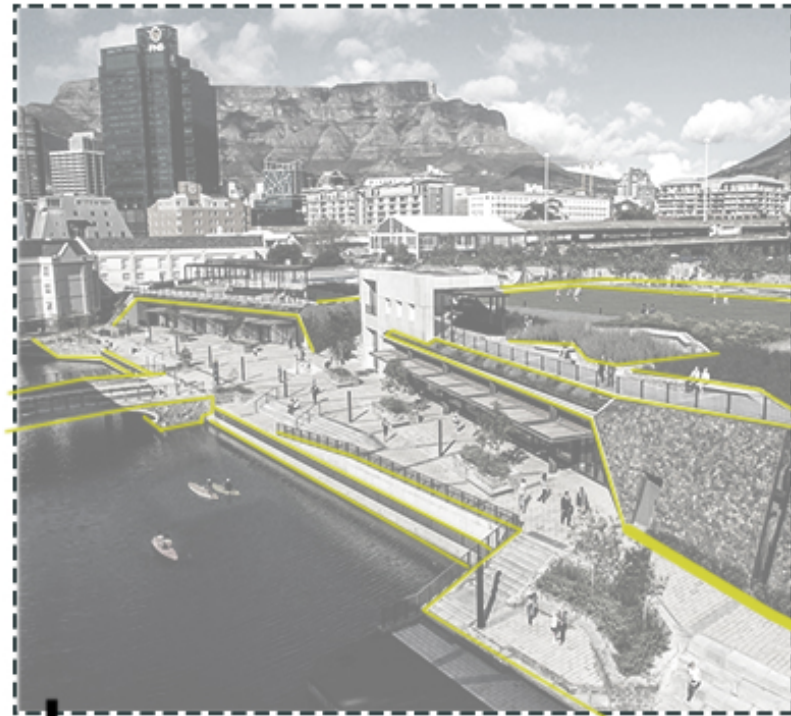




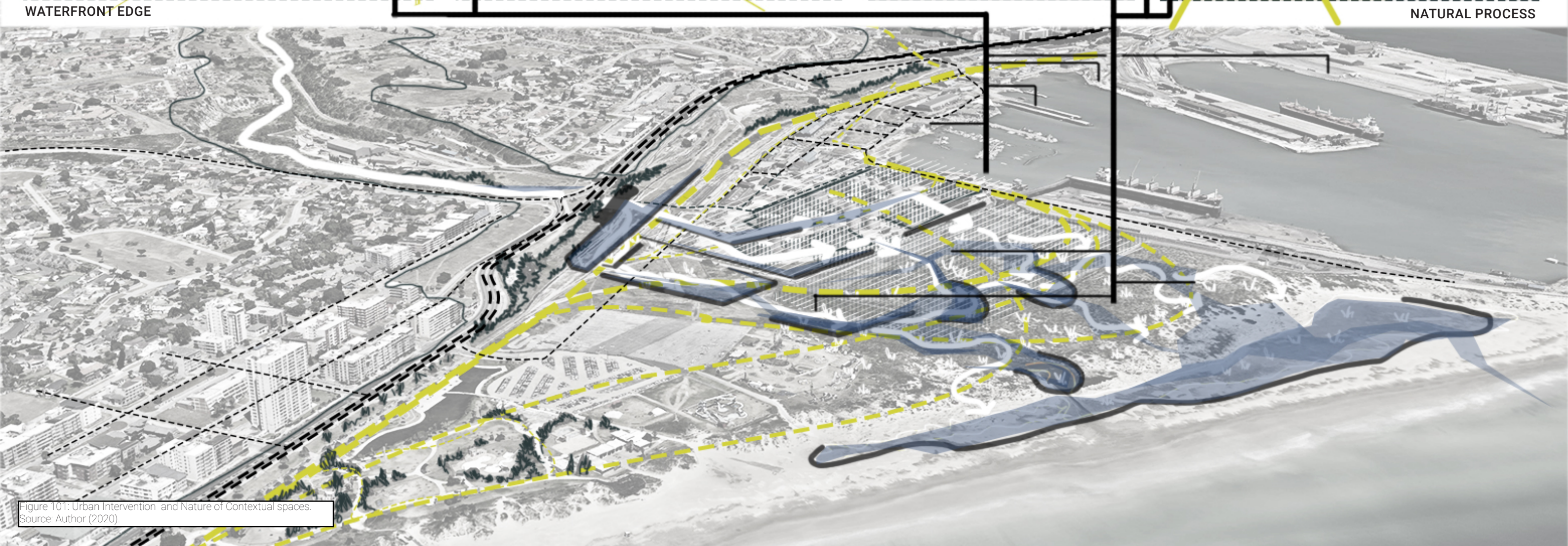
# NATURE OF CONTEXTUAL SPACES



WATERFRONT EDGE



NATURAL PROCESS





## ACCOMMODATION SCHEDULE

### EXHIBITIONS -

EDUCATION / INFORMATION / COMMUNITY AREAS /PUBLIC FACILITY AREAS

Foyer / Atrium	150	
Reception		25
Security Room/ Surveillance	15	
Restaurant and Coffee Bar		300 2x Cafes/Restaurant
Display Areas/Public Participation	500	SEPERATED BETWEEN FOLLOWING AREAS
Hologram Circa		
Hologram Exhibition Space		
Virtual Reality Arcade		
Virtual Reality Aquarium		
Multipurpose Space		
Virtual Arts and Science Facility		
Ocean Science Facility		
Virtual Reality Cubicles		
Retail Store		
Ablution Facilities	35	
Seating Area		
Conference /Meeting Rooms	150	3x
Meeting Rooms	100	5x

### CENTRE MANAGEMENT - ADMINISTRATION AREAS

Open Plan Offices_Staff	100	
Administration		50
Finance	50	
Construction Management Dept.		200
Operation and Maintenance Dept.	150	
Research and Development	200	
Pause Rooms	36	
Staff Lounge	160	
Private spaces	40	
Setback spaces	40	
Community spaces		100
International Sales Department		50
IT department	150	
Staff Kitchen		100
Eating Area	160	
Chill out area / Games room		50
Outdoor seating areas		
Conference areas		160
Team Rooms		125

### BUILDING MANAGEMENT SERVICES -

Parking	1500	
Waste Management System	50	
Water Retrieval System – Recycling Gray Water,		Part of above.
Rain Water Storage Tanks	120	
Maintenance Closets	15	
Back up generator	20	
Pump room – irrigation + Fire	25	
Main Electrical Room – Integrated Control		20
PV System - Battery Banks – Inverters	45	
Mechanical Ventilation Room + Duct Shafts		35
Solar Water Storage System	35	
Service Lifts and circulation lobbies	50	
Public Lifts		50
Escape Stairs		
Central Server Room		35
Fire Water tanks – Linked to storage Tanks		50
Refuse and Collection	25	
General Storage (per floor)		160
Service Area	25	
Restrooms, lockers and bathing amenities		150

GROSS FLOOR AREA - (of layer 2)

/

Concepts of the 'digital ecology' are applied in a manner that encourages the interconnected system of the integrated building. The following diagram disperses the program of application throughout the three layers that create the 'digital ecology'.

**ACCOMMODATION SCHEDULE ARRANGEMENT**

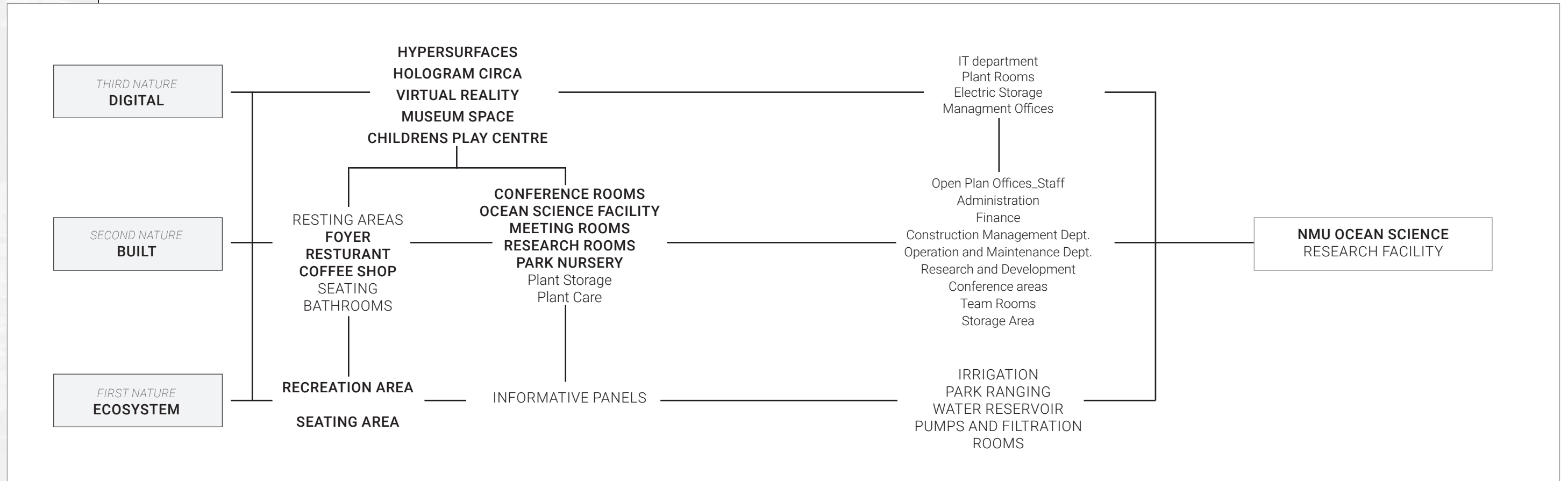


Figure 102: Diagram of Accomodation layout and the 'digital ecology' layers.  
Source: Author (2020).



## DESIGN DEVELOPMENT: APPLYING DIGITAL ECOLOGY

The following diagrams and drawings apply the 'digital ecology' principles onto the site and the location of the site. These continue through to the conceptual diagrams and plans of the site.

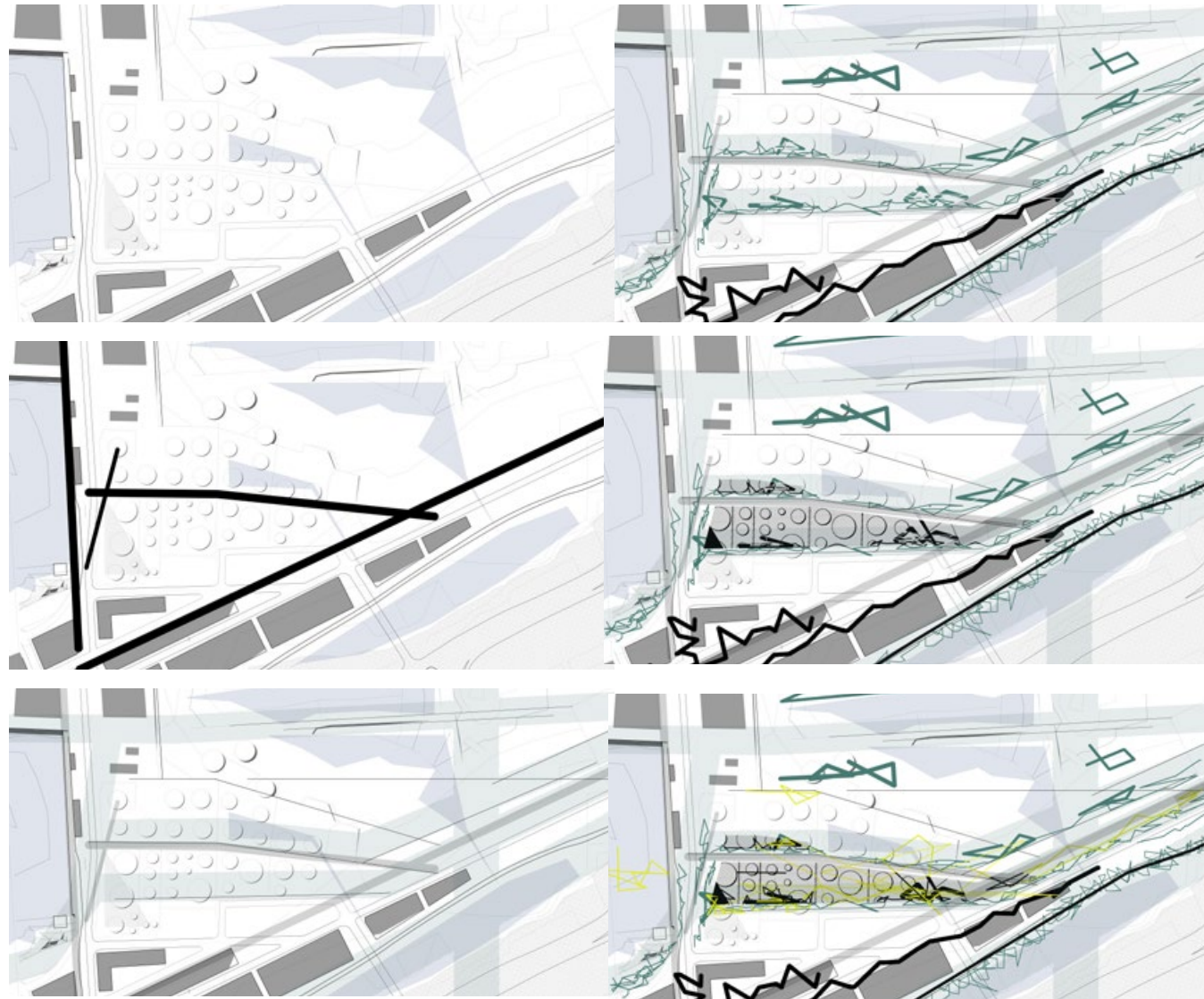
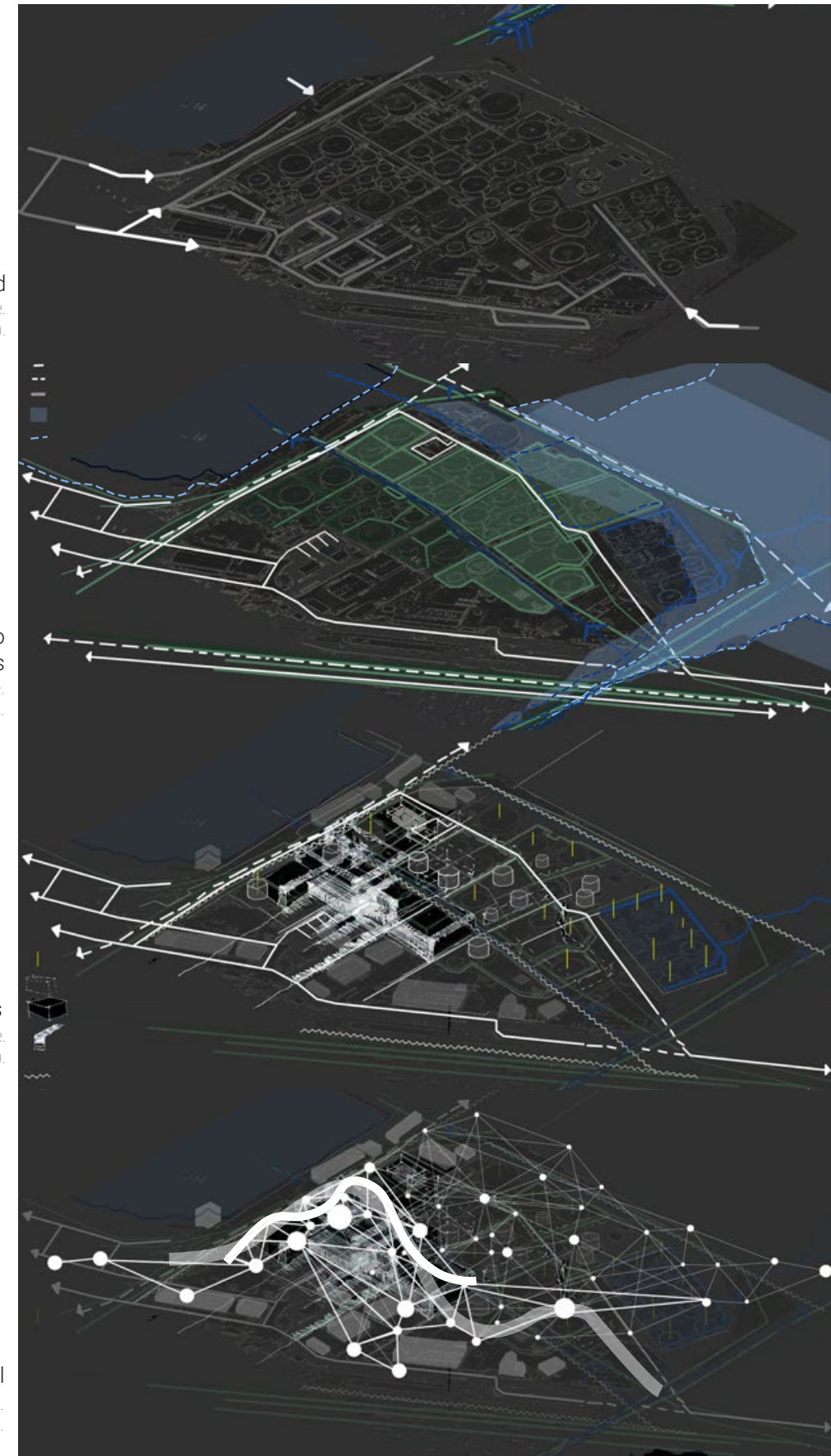


Figure 103: Diagram of Components of Space.  
Source: Author (2020).

### Existing & Scarred

Figure ??: Contextual Informants on site.  
Source: Author (2020).



### Connection of the ecological flows to the ecosystem and surroundings

Figure 104: Contextual Informants on site.  
Source: Author (2020).

### Spatial application from contextual inputs

Figure 105: Contextual Informants on site.  
Source: Author (2020).

### Application of the Digital

Figure 106: Contextual Informants on site.  
Source: Author (2020).



An early composite of the digital ecology application to create the negotiation of the territory of the site. To create a continuation of the park landscape and navigation of the harbour area.

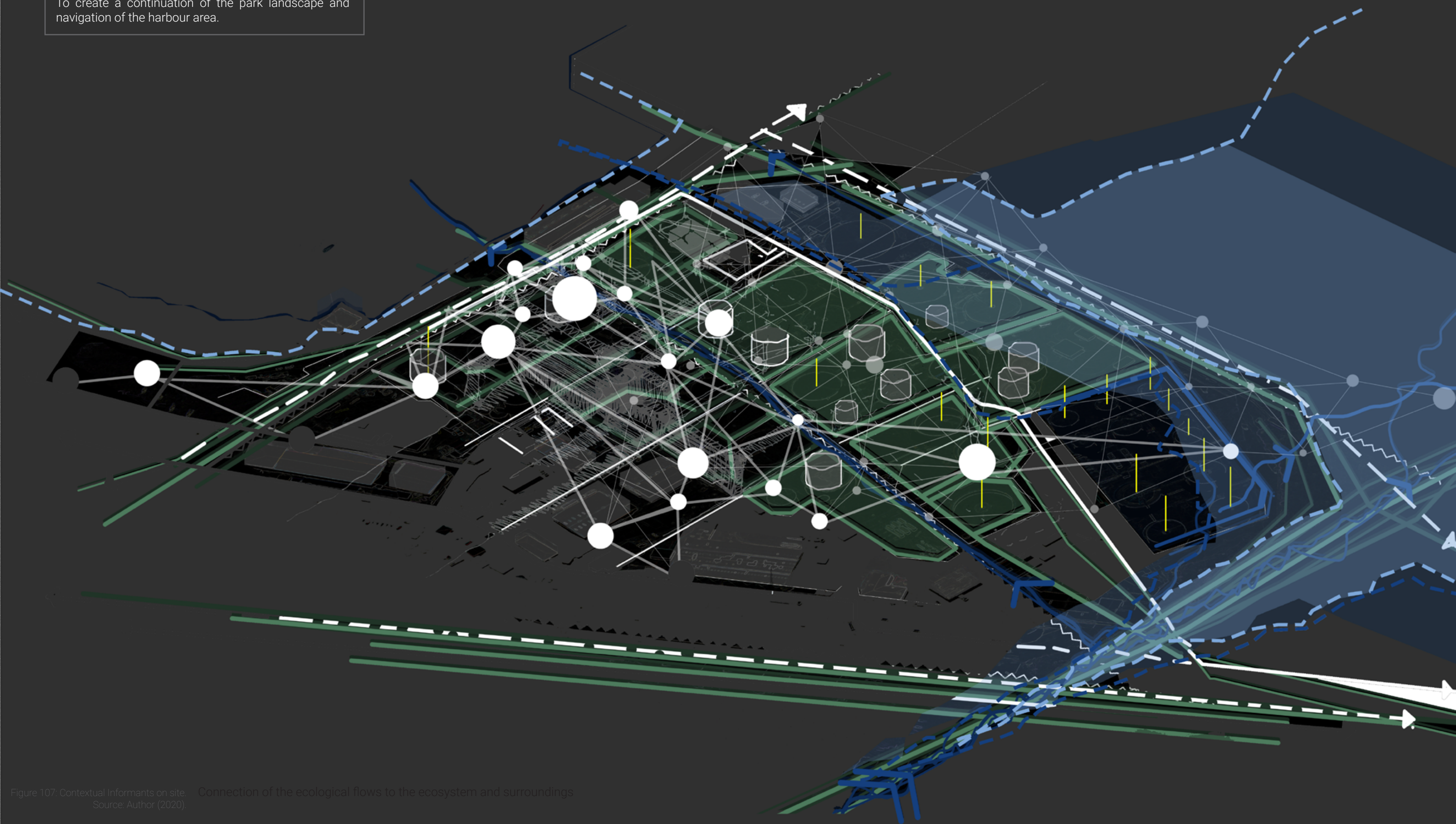


Figure 107: Contextual Informants on site. Connection of the ecological flows to the ecosystem and surroundings  
Source: Author (2020).



Composite of the digital ecology application to create the park landscape of the site. To create a continuation of the park landscape and navigation of the harbour area.

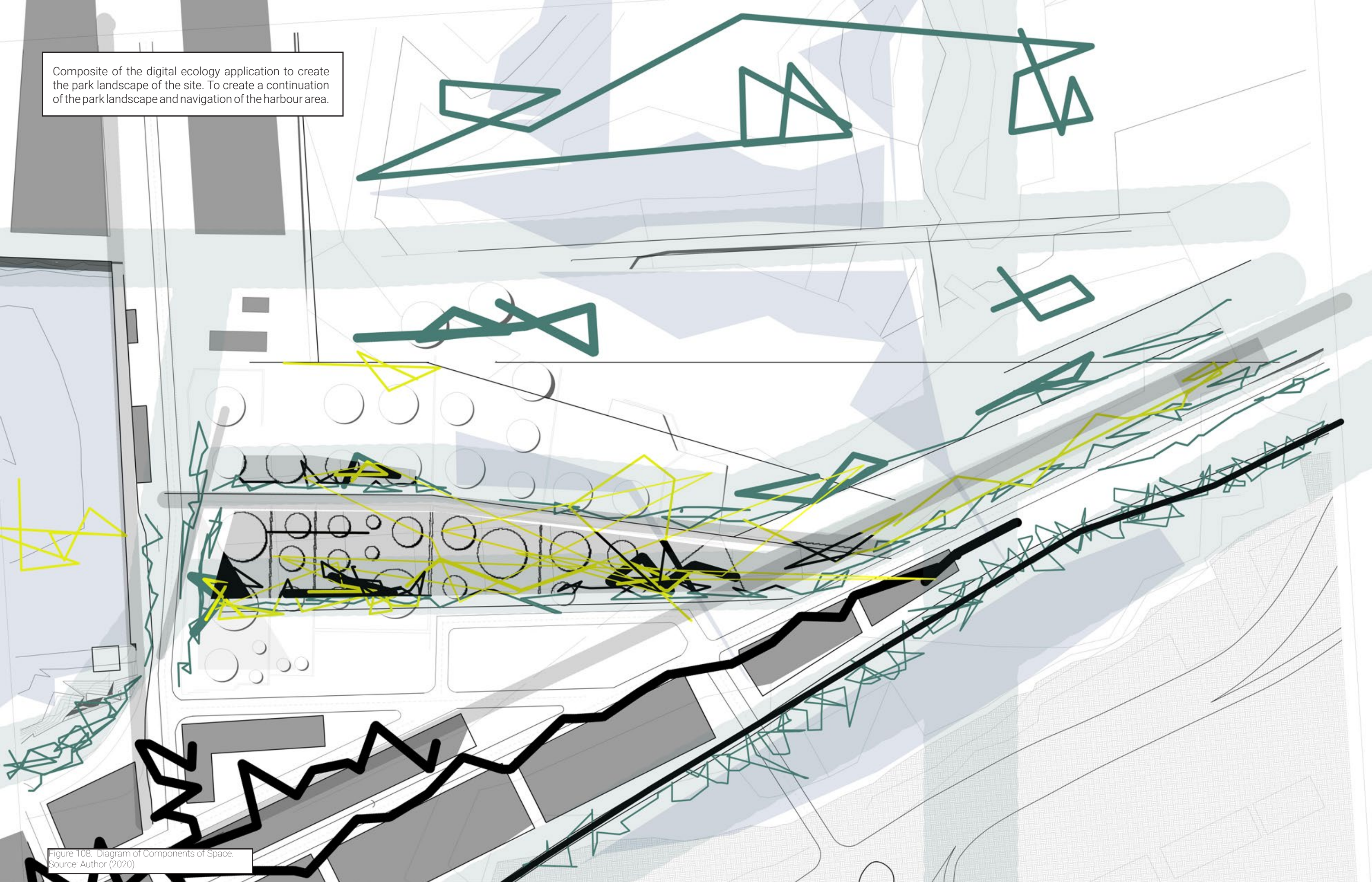


Figure 108: Diagram of Components of Space.  
Source: Author (2020).



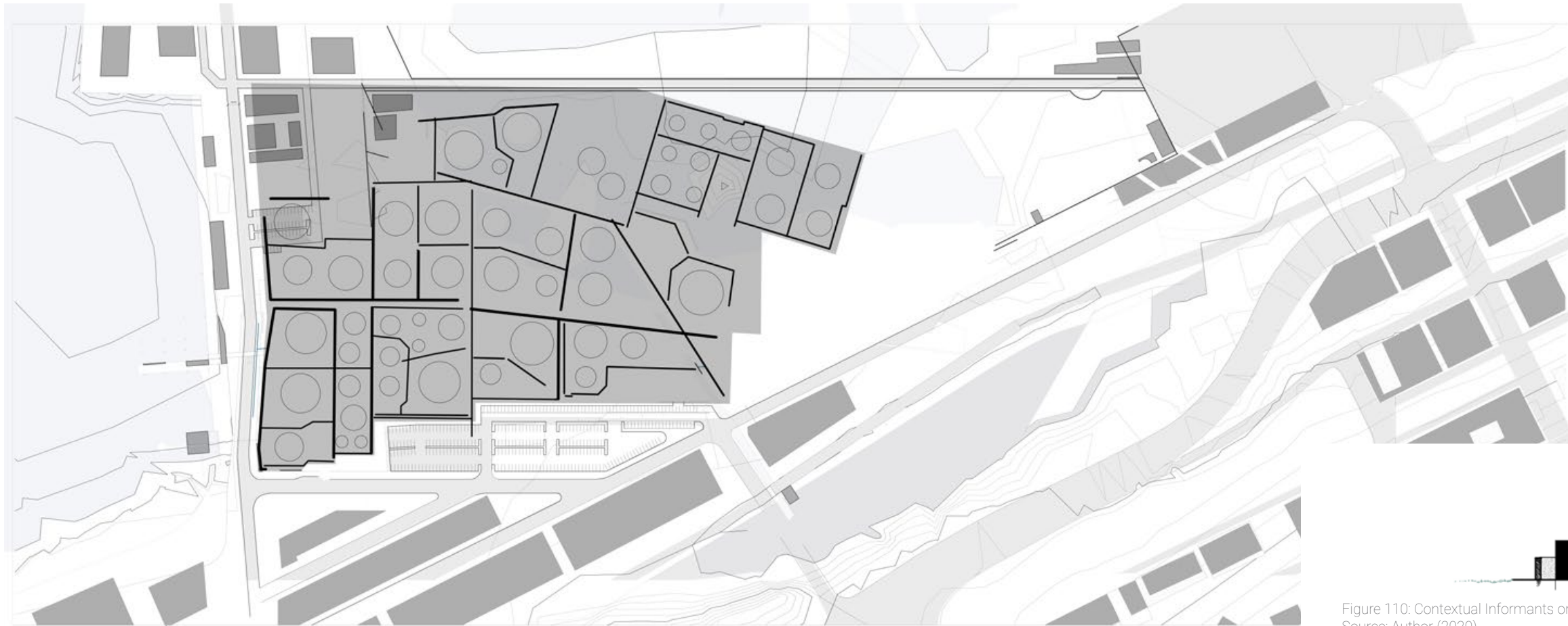


Figure 109: Contextual Informants on site.  
Source: Author (2020).

First Layer: Existing site exists as an exclusive and unapproachable fortress.



Figure 110: Contextual Informants on site.  
Source: Author (2020).

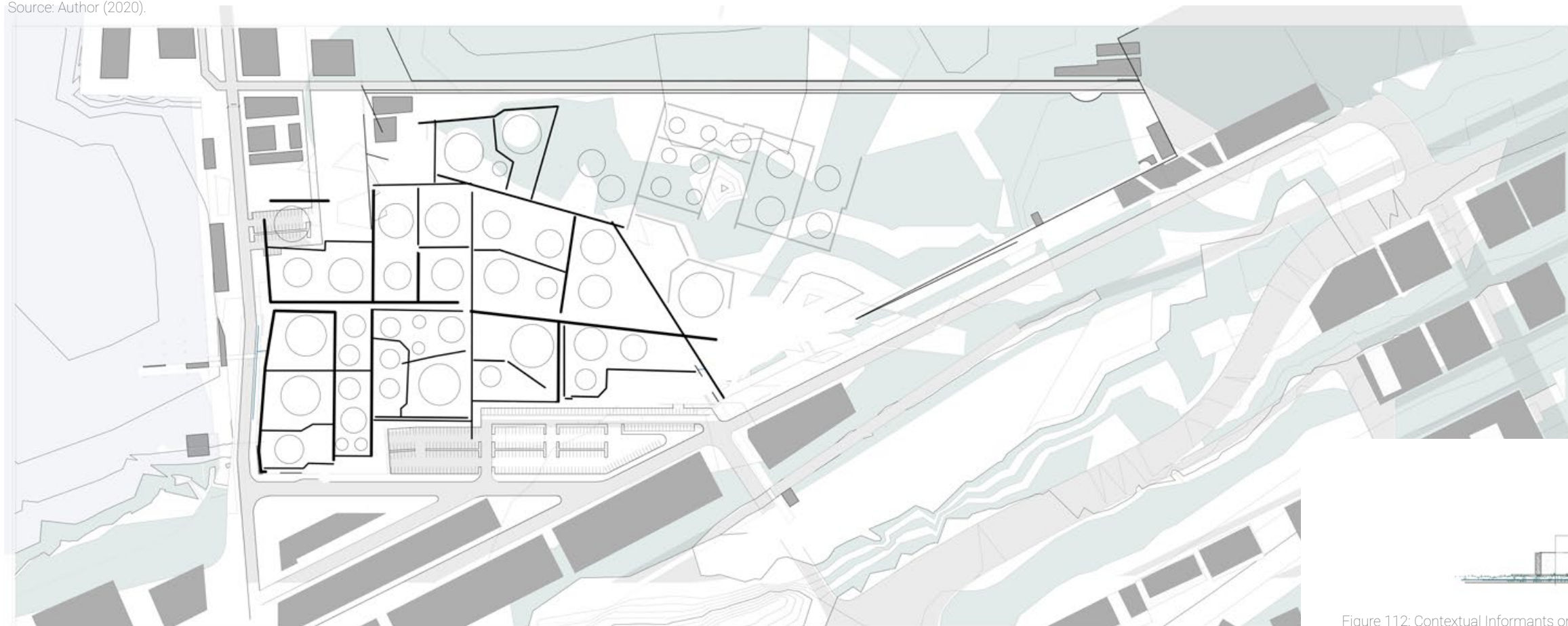


Figure 111: Contextual Informants on site.  
Source: Author (2020).

First Layer: Activating the ecological connections of the context and Urban Scheme.



Figure 112: Contextual Informants on site.  
Source: Author (2020).



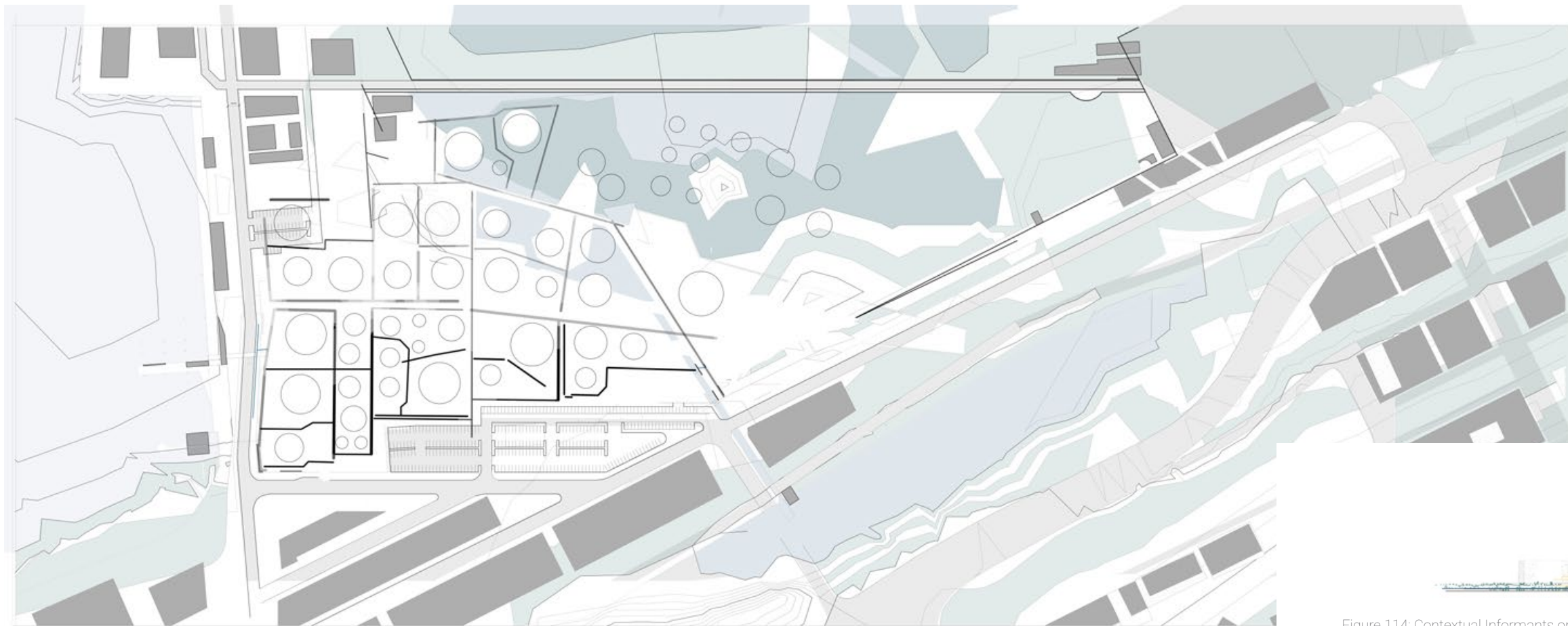


Figure 113: Contextual Informants on site.  
Source: Author (2020).

First Layer: Including/inviting the green corridor into the site, allowing nature to take back (Dunes and Vegetation).

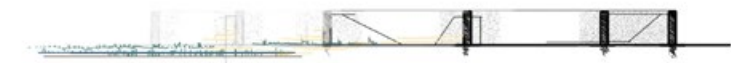


Figure 114: Contextual Informants on site.  
Source: Author (2020).

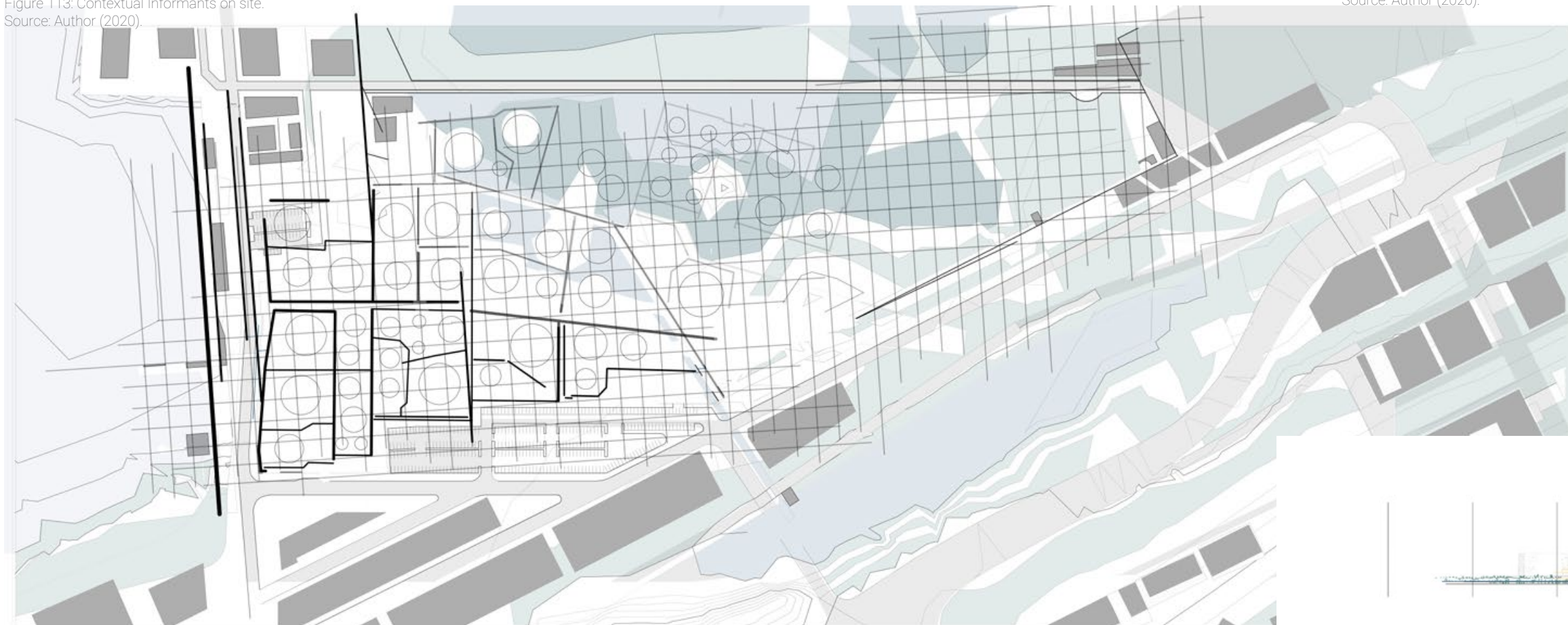


Figure 115: Contextual Informants on site.  
Source: Author (2020).

Second Layer: Within the multitude of informants, a regular grid is used to regulate human intervention.

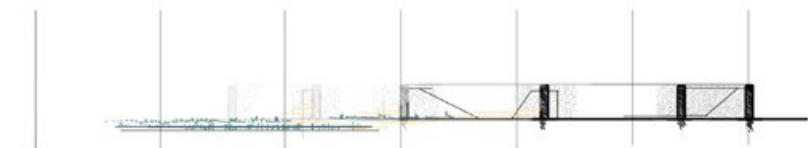


Figure 116: Contextual Informants on site.  
Source: Author (2020).



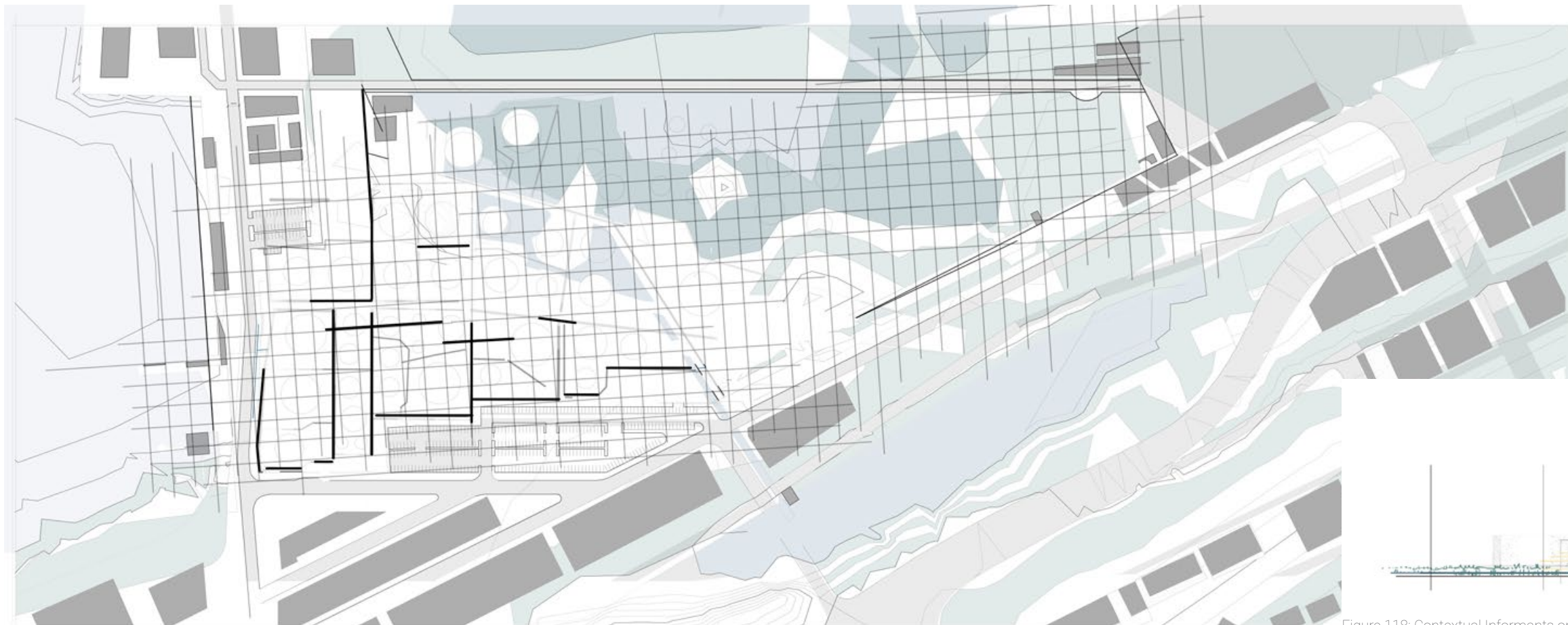


Figure 117: Contextual Informants on site.  
Source: Author (2020).

Second Layer: The grid provides delineation to the old barriers of the past, the new program being applied to complement and integrate with new/reintroduced first layer.

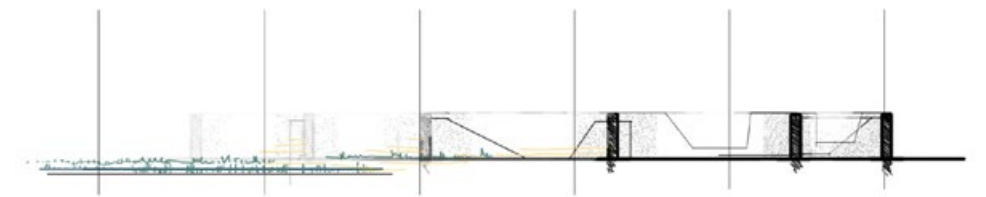


Figure 118: Contextual Informants on site.  
Source: Author (2020).

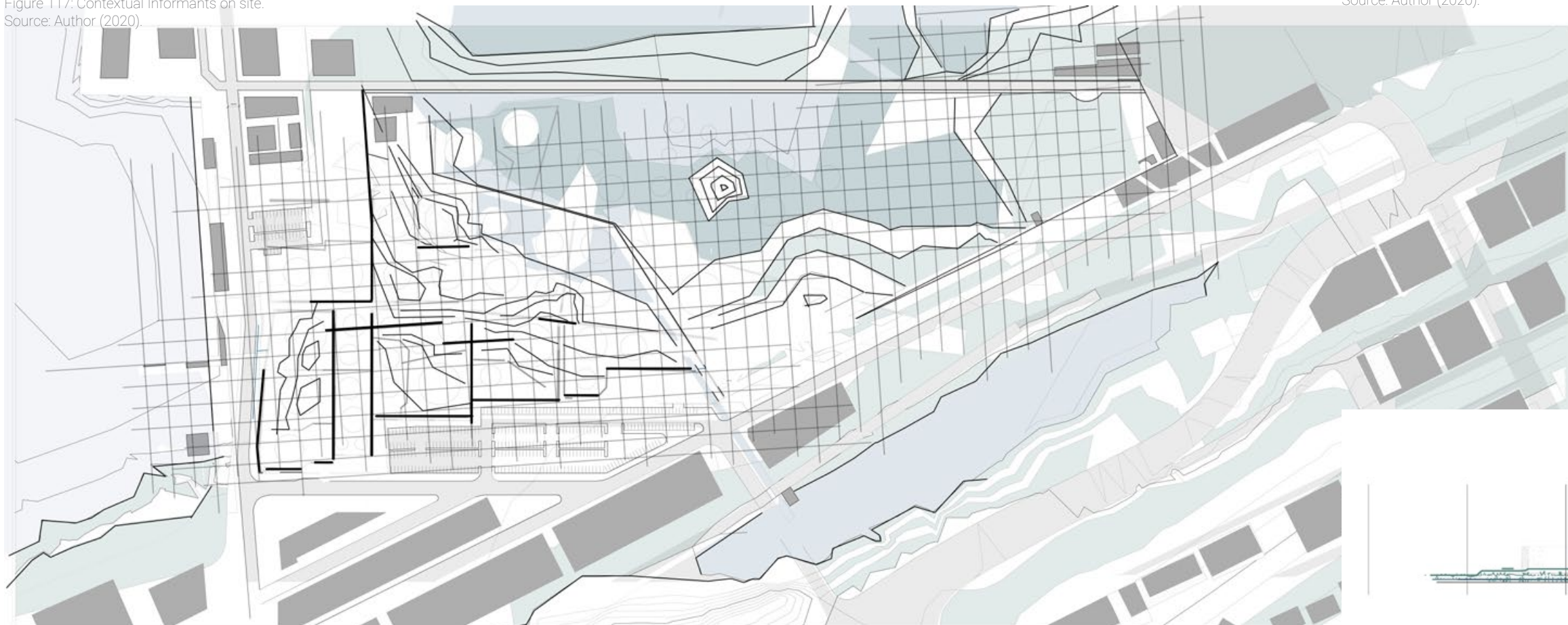


Figure 119: Contextual Informants on site.  
Source: Author (2020).

Second Layer: Once the first layer bonds with the industrial footprint, the program can be introduced. The dune landscape taking back territory between the partially removed barrier walls.



Figure 120: Contextual Informants on site.  
Source: Author (2020).



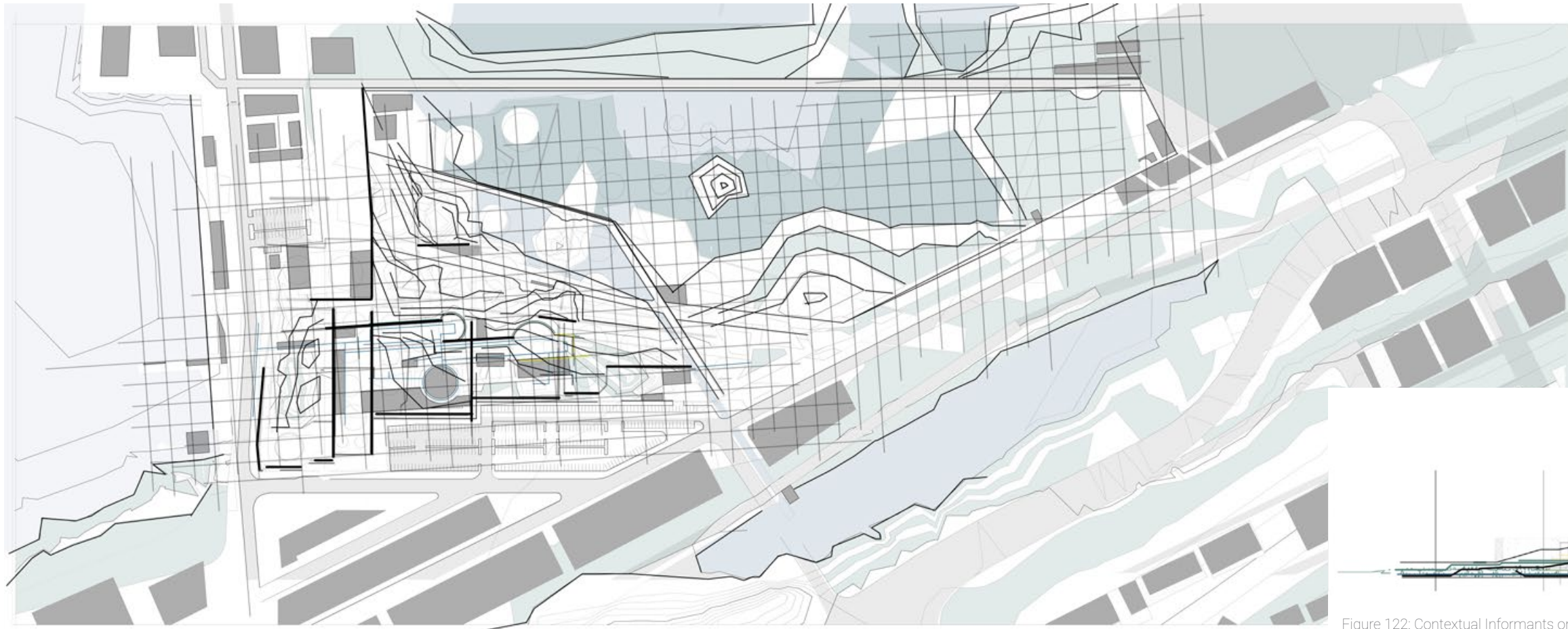


Figure 121: Contextual Informants on site.  
Source: Author (2020).

Second Layer: The building footprints are intended to integrate into the landscape, emulating the interconnected intentions of the digital ecology.

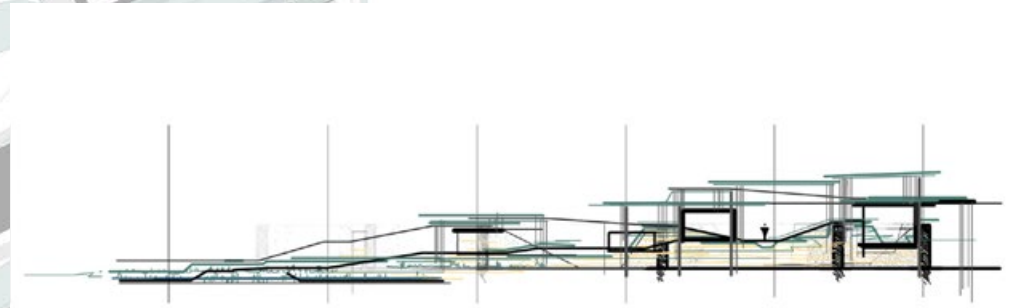


Figure 122: Contextual Informants on site.  
Source: Author (2020).

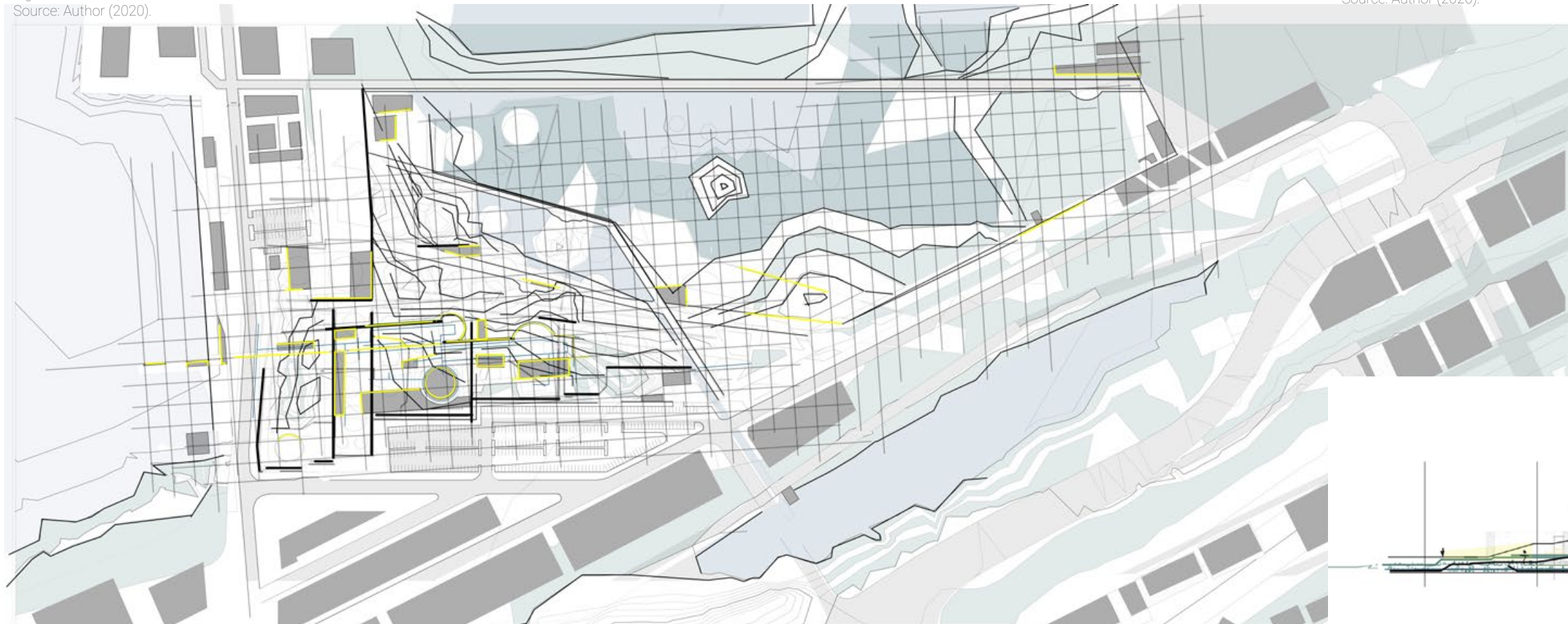


Figure 123: Contextual Informants on site.  
Source: Author (2020).

Third Layer: With the first two layers created the structure for the third to exist. The digital landscape can be superimposed for the immersive experience of the Virtual Eco-Park.

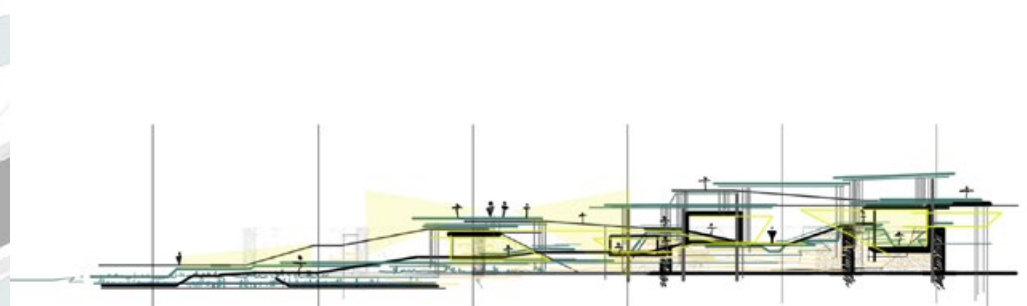


Figure 124: Contextual Informants on site.  
Source: Author (2020).



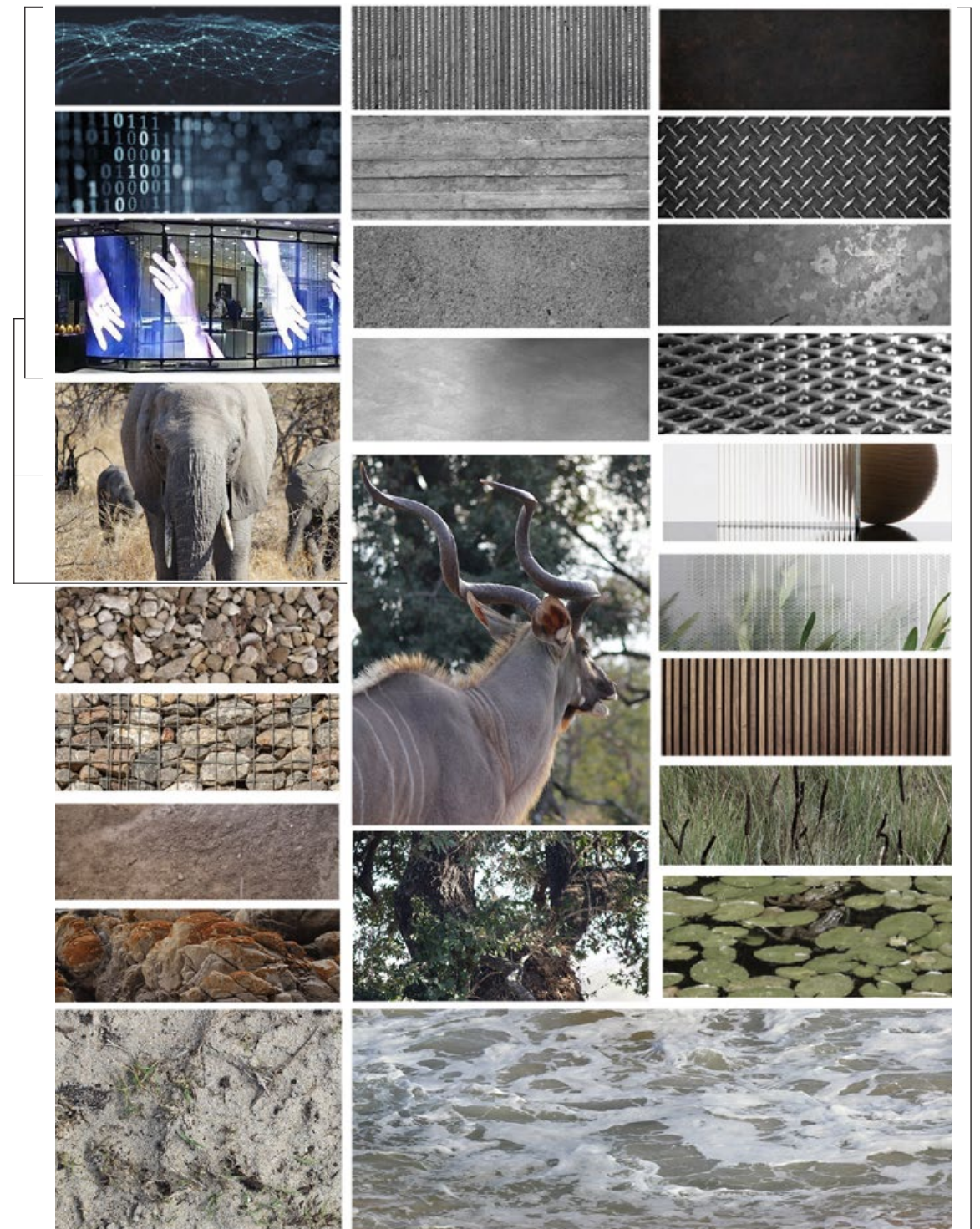
## TECHNICAL STRATEGY

### MATERIALITY AND TECTONICS

The materiality and mode of making are significant informants to the conceptual generators. The proposed design uses the 'digital ecology' to place and integrate. The second layer is the territorial negotiation of demarcated space. The design generators intend for the design to negotiate the landscape.

In one way, the material palette and tectonic strategy are associated with technology, environmental and sustainable measures, in the other way the natural material palette that would be drawn through the indigenous and present materials on-site and landscape.

### ARTIFICIAL PRIMARY MATERIAL PALETTE:



### NATURAL PRIMARY MATERIAL PALETTE:

Figure 125: Diagram of Natural to Artificial Material Palette.  
Source: Author (2020).



**EXPLORING "DIGITAL ECOLOGY" AS A TOOL FOR ENVIRONMENTAL CONSERVATION THROUGH THE DESIGN OF A VIRTUAL ECO-PARK FOR PORT ELIZABETH.**  
By Alexandra Edmayr

This treatise deals with the design of a new Virtual Eco-Park and humankind's relationship to the natural world. The cultural institution of captivity has been positive and negative for the study and conservative approaches of fauna and flora. While this has had benefits, it has resulted in a dominated mindset over the 'other'. This treatise looks at the zoo and aquarium as an outdated educational platform and proposes a new perspective.

This treatise explores 'digital ecology' as a tool of theoretical application. The intention is to provide environmental conservation. The design will use the virtual medium for a new immersive experience instead of the 'live exhibit'.

The 'digital ecology' is also seen as spatial stacking of layers. Using Timothy Lukes theories on the three natures, this thesis applies this theory in a post-anthropocentric way by its role in generating the Virtual Eco-Park. The layers are terrestrial as an ecosystem, the territorial as the built environment and the digital as the immersive experience. These components form the skeleton of the application to the site.

The Port Elizabeth manganese ore and tank farm and the surrounding area has been a dump and polluted landscape for forty years. This treatise, in its entirety, has set up an urban framework that promotes a reconnection to the ecological systems in Port Elizabeth.

The 'digital ecology' and the Virtual Eco Park as a 'building' intends to regenerate/reestablish an old industrial landscape into a new park. The building is designed to become a component of the landscape and not an object on the landscape.

The result of this research will result in a final design that hosts immersive experience—bringing the 'true wild' into the urban landscape by replacing the 'tamed natural'—thereby solving the Anthropocene of the Zoo building type by reframing it as the virtual eco-park of nature.

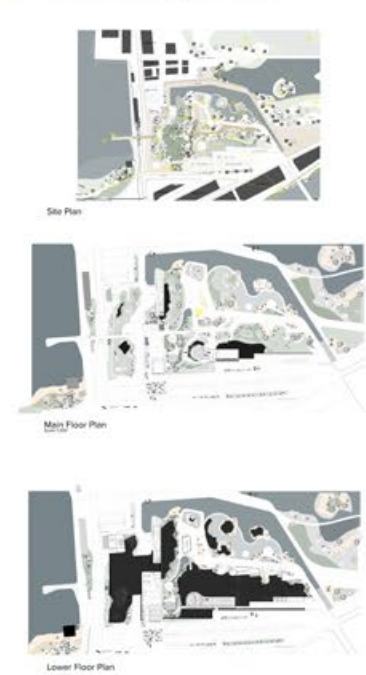
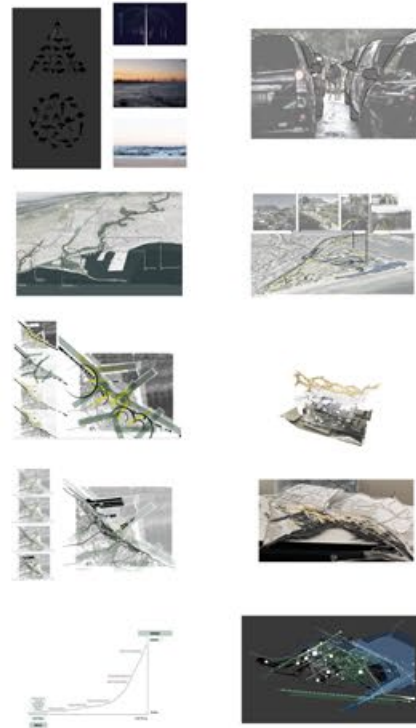


Figure 126: Full presentation. Source: Author (2020).





Figure 127: West Elevation  
Source: Author (2020).

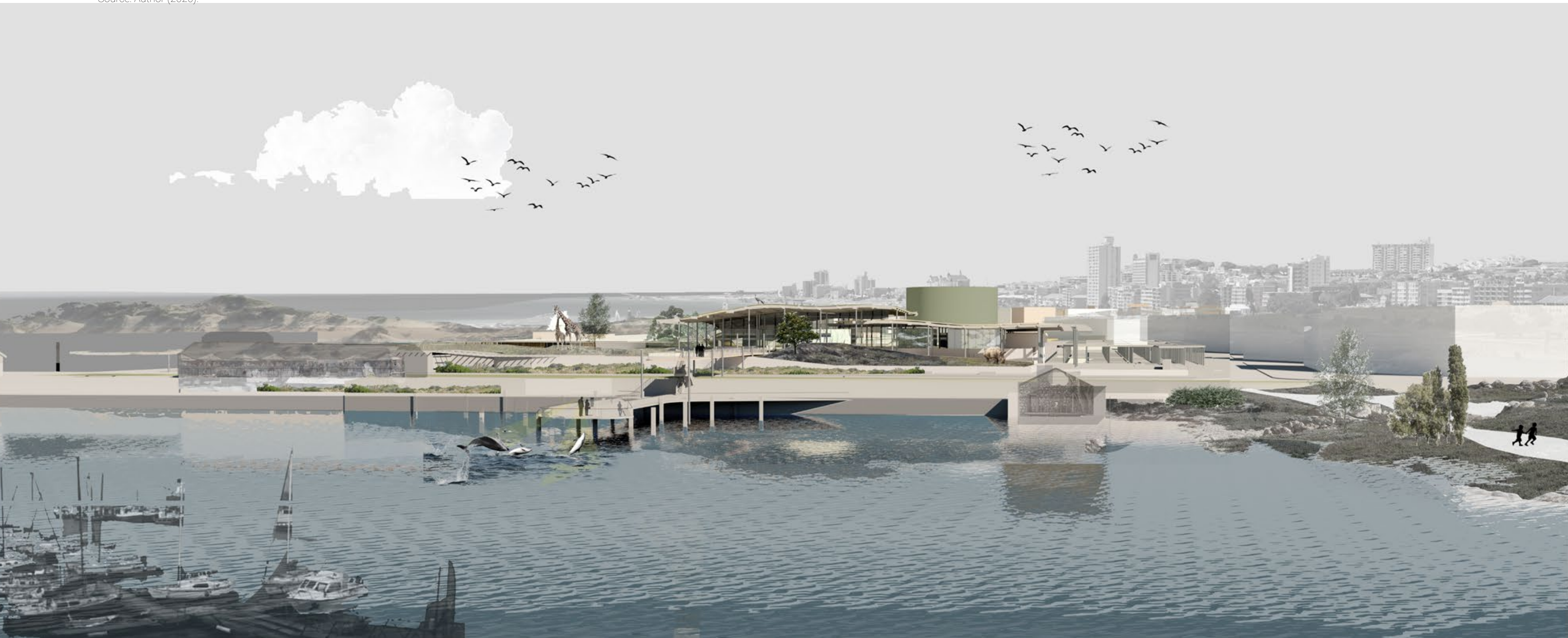


Figure 128: Harbour Perspective  
Source: Author (2020).



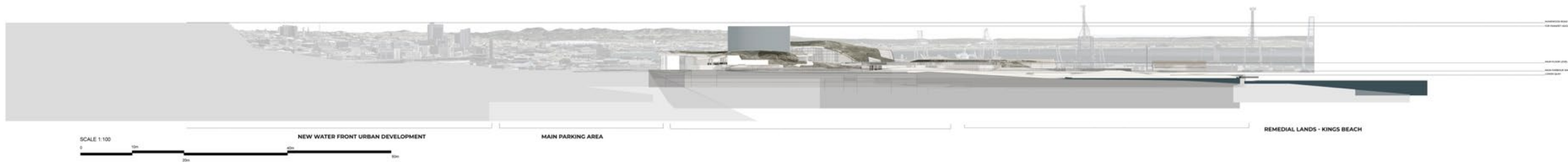


Figure 129: South Elevation  
Source: Author (2020).



Figure 130: South Elevation  
Source: Author (2020).



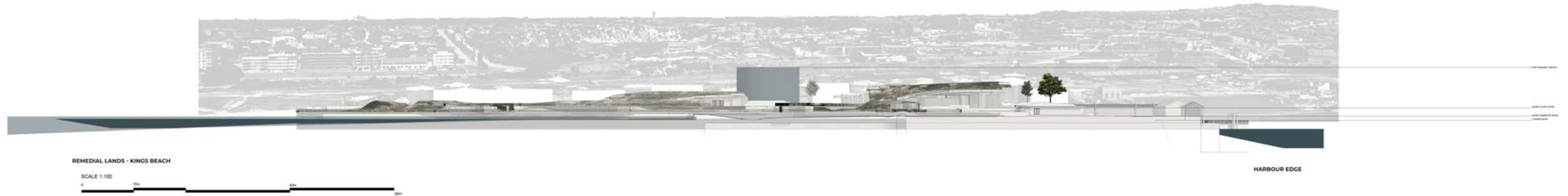


Figure 131: East Elevation  
Source: Author (2020).

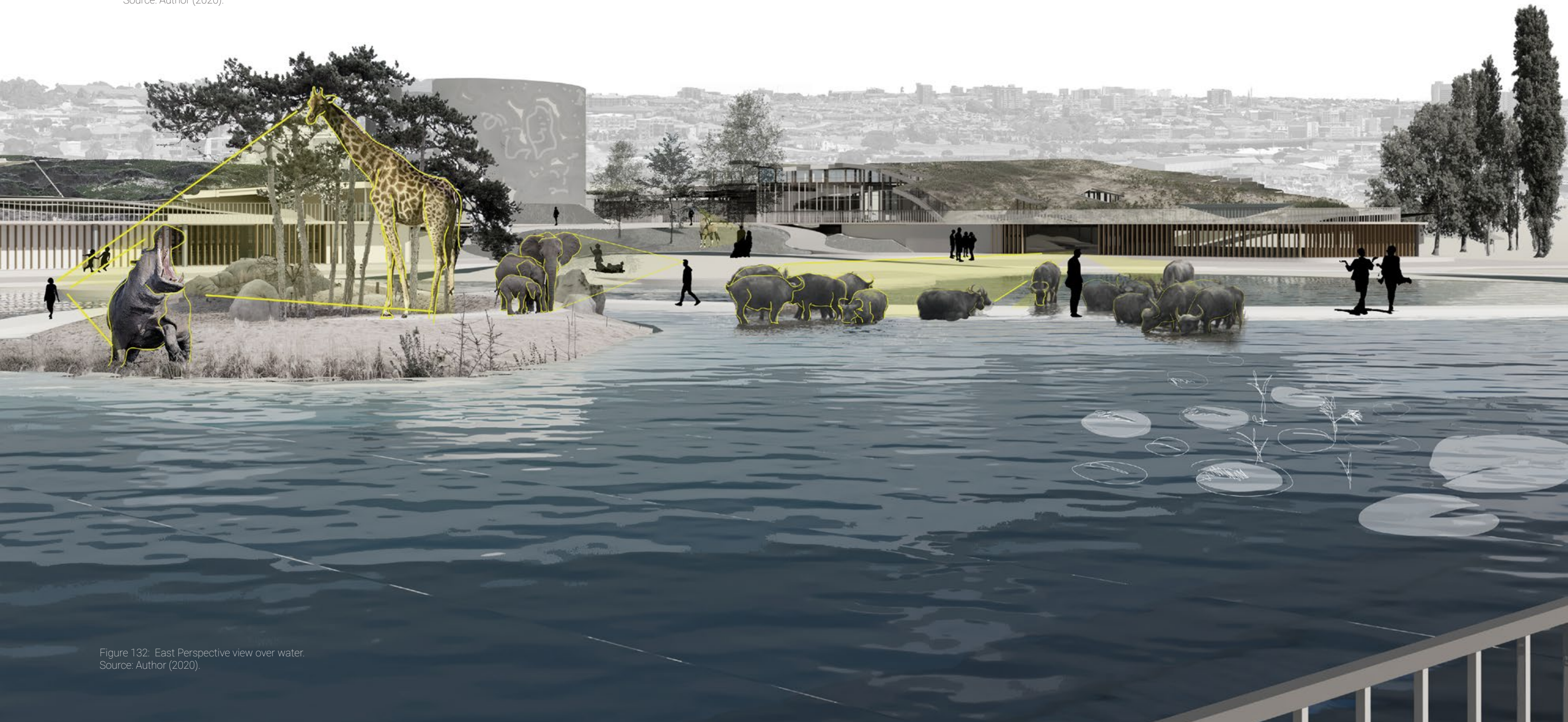


Figure 132: East Perspective view over water.  
Source: Author (2020).



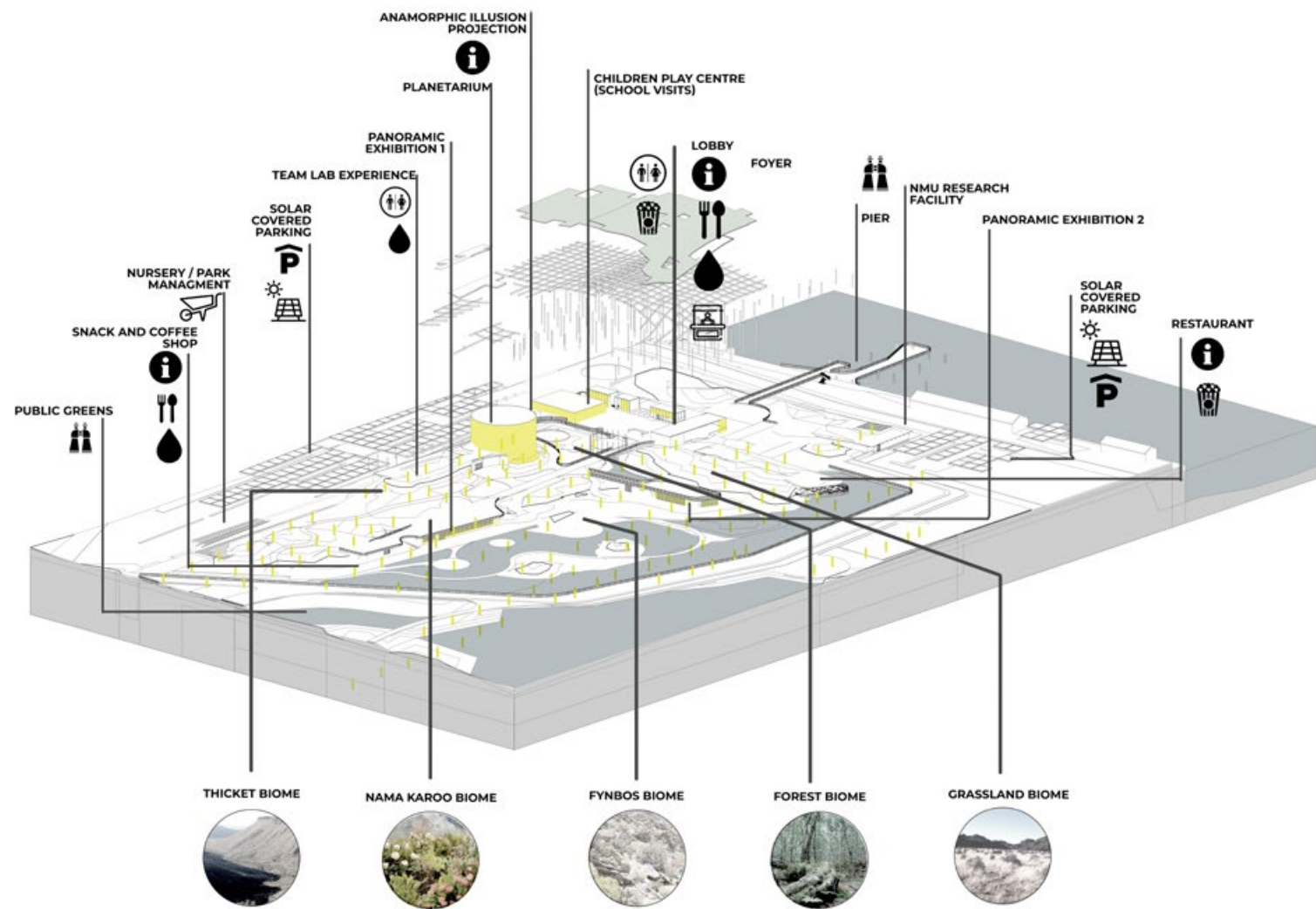


Figure 133: Program Review  
Source: Author (2020).

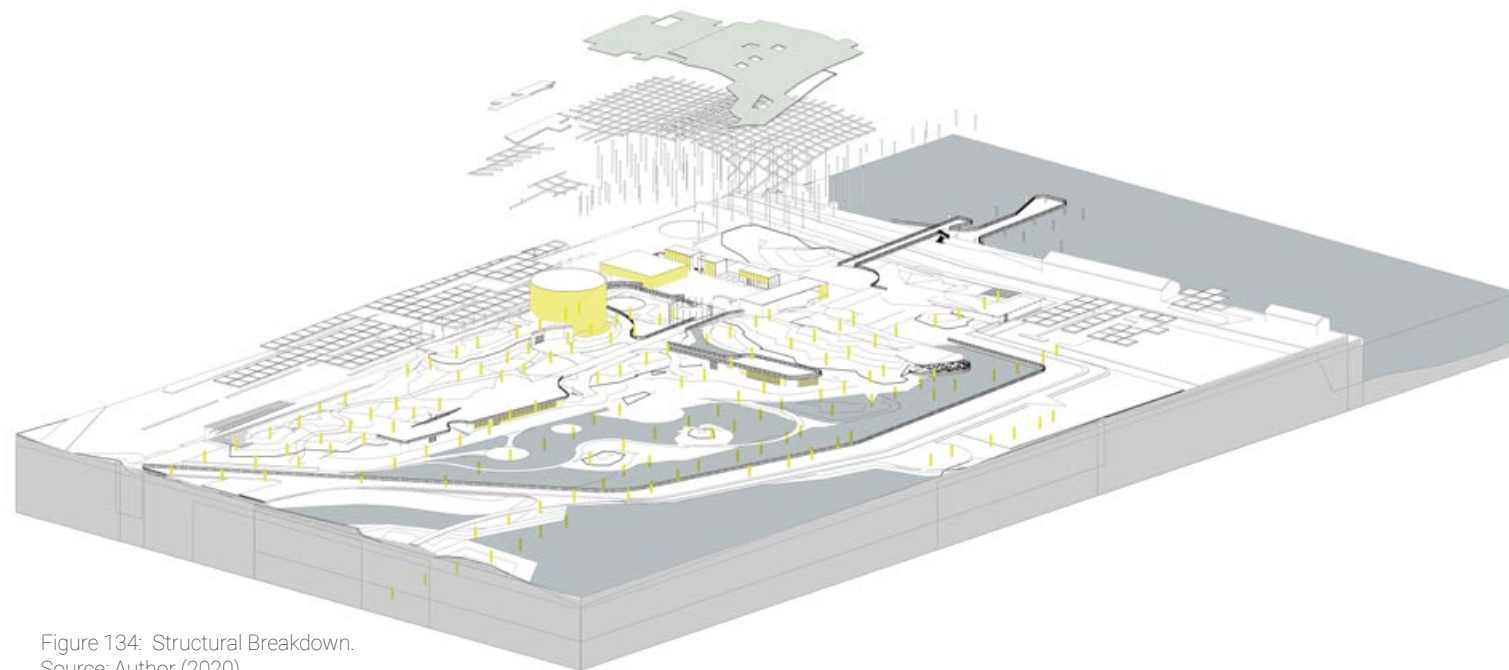


Figure 134: Structural Breakdown.  
Source: Author (2020).



Figure 135: Thicket Biome Perspective  
Source: Author (2020).



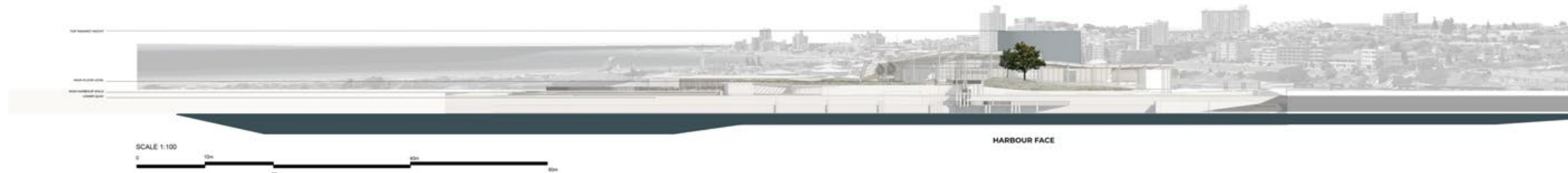


Figure 136: North Elevation  
Source: Author (2020).



Figure 137: Site Plan  
Source: Author (2020).





Figure 138: Section A - A  
Source: Author (2020).



Figure 139: First Floor Plan  
Source: Author (2020).





Figure 140: Section B - B  
Source: Author (2020).



Figure 141: Ground Floor  
Source: Author (2020).



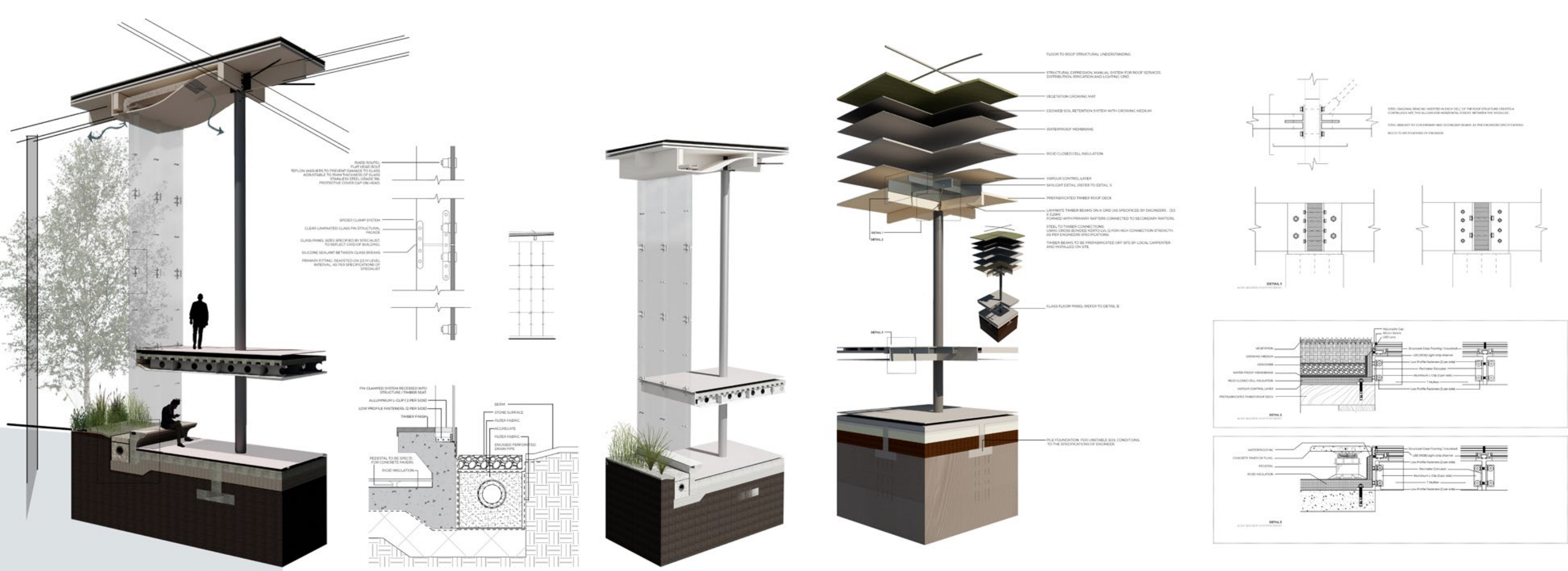


Figure 142: Column and Roof structure with Fin glazing system  
Source: Author (2020).

Figure 144: Column and Roof structure with Skylight Details  
Source: Author (2020).



Figure 143: Walkway Perspective 2  
Source: Author (2020).



Figure 145: Interior Perspective  
Source: Author (2020).









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Application

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List of Figures

Appendices

Declarations



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# APPENDICES

## APPENDIX 1- Technical Understanding

**Control spaces on demand**

The Vela™ System by Avery Dennison is a retrofit window film solution, that transforms transparent windows translucent. The Vela™ System is powered by an advanced electrical controller, designed specifically for the Vela™ System to provide privacy and projection capability at the flick of a switch.

**Vela™ Advanced Controllers**

- Single-channel ON/OFF
- Single-channel DIMMER

**Single Channel Controller**  
Dimensions: 165mm (L) x 102mm (W) x 39mm (H)  
Weight: approx. 680g

- Multi-channel (16 channels)

**Multi Channel Controller**  
Dimensions: 222mm (L) x 102mm (W) x 39mm (H)  
Weight: approx. 920g

**Why do you need a Vela™ controller?**

**Operational**

- Improved controlled area up to 107 sqft /10 sqm
- Different operating modes ON/OFF, dimmer, multichannel
- Fast switching time
- Minimal footprint small size, low weight - easy to connect, install & hide
- Warranty activation

**Safety & Sustainability**

- Improved protection of POLC film (Square wave) over-voltage/DC blocking/short circuit, power surge
- Safe to use UL/CE compliance Dry contact-isolated output
- Reduced power consumption
- Configured for Vela™ product

**Advanced Features**

- DMX interface ability to connect to smart advanced operating systems/ projection & Wi-Fi
- Frequency tuning ability to adjust to different light source with minimal "flickering"

**To learn more about how the Vela™ System can be ideal for your business or receive an installation estimate, please contact:**  
[vela@au.averydennison.com](mailto:vela@au.averydennison.com)  
[www.averydennison.com](http://www.averydennison.com)  
[graphics.averydennison.com](http://graphics.averydennison.com)

**Consumer Engagement**

**Privacy**

Parameter	Value	Benefit
Switching Time	OFF → ON = 10 msec ON → OFF = 130 msec	Fast switching time
Operating Modes	ON/OFF, Dimmer	Unique controller provides functionality and flexibility. Option for multi-channel controller
Operating Voltage	70 VAC sq wave	Square wave output allows for outstanding film transparency. Excellent protection of film from over voltage, DS blocking and short circuit.
Operating Frequency	25-30, 32, 50-60 Hz	Low frequency operation cuts power consumption by 30%-50%. Ability to adjust to different light source with minimal "flickering"
Power Consumption*	2-4 Wh/gm	Low energy consumption
Connecting Platform	DMX interface	Ability to connect to smart advanced operating systems/projection, etc
Connecting Platform	Dry contact	Isolated output (control wires do not carry any voltage)
Connecting Platform	Cascade	Ability to connect one controller to another and sequence them together
Controlled Area	107 8710 sq ft	Ability to control a large area of VELA™ film.

**Power Consumption Indicator\*\***

\* Based on information from consumer guide home and general electric website: [www.chickadeebooks.com/consumer-information/low-to-zero-energy/low-carbon.html](http://www.chickadeebooks.com/consumer-information/low-to-zero-energy/low-carbon.html)  
\*\* Electric consumption for the Vela™ controller to power Vela™ film based on 400' film.

## APPENDIX 2 - Technical Understanding

**Product Information**

**Model:** X-A-100

**Material:** Polycarbonate

**Dimensions:** 100mm (L) x 100mm (W) x 10mm (H)

**Weight:** 100g

**Color:** Clear

**Finish:** Matte

**Installation:** Adhesive

**Warranty:** 5 Years

**Model:** X-A-600

**Material:** Polycarbonate

**Dimensions:** 150mm (L) x 150mm (W) x 10mm (H)

**Weight:** 150g

**Color:** Clear

**Finish:** Matte

**Installation:** Adhesive

**Warranty:** 5 Years

**Model:** X-A-700

**Material:** Polycarbonate

**Dimensions:** 200mm (L) x 200mm (W) x 10mm (H)

**Weight:** 200g

**Color:** Clear

**Finish:** Matte

**Installation:** Adhesive

**Warranty:** 5 Years





DECLARATIONS



DESIGN TREATISE LANGUAGE PRACTITIONER DECLARATION

Please type or complete in black ink

FACULTY: Arts

SCHOOL/DEPARTMENT: Architecture

I, (surname and initials of language practitioner) ASNEW, E

Being the holder of the following qualifications (e.g.: BA (English))

BA (Visual Arts, English major) and BA Honours (Journalism)

Certify that I am the language editor for (surname and initials of candidate)

A C Edmayr

(student number) 216609372 a candidate for the degree Master of Architecture (Professional), with a treatise entitled (full title of treatise):

Exploring "Digital Ecology" as a Tool for Environmental Conservation through

the Design of a Virtual Eco-Park for Port Elizabeth.

Hereby certify that I have edited the language usage and referencing in his/her design treatise document in its entirety and believe that it is ready for examination.

[Signature]  
LANGUAGE PRACTITIONER

15/09/2020  
Date

[Signature]  
STUDENT

16/09/2020  
Date



Change the World

PO Box 77000, Nelson Mandela University, Port Elizabeth, 6031, South Africa



DEPARTMENT OF ACADEMIC ADMINISTRATION

EXAMINATION SECTION

SUMMERSTARND NORTH CAMPUS

PO Box 77000  
Nelson Mandela Metropolitan University  
Port Elizabeth  
6013  
Enquiries: Postgraduate Examination Officer

DECLARATION BY CANDIDATE

NAME: Alexandra C Edmayr

STUDENT NUMBER: 216609372

QUALIFICATION: Masters of Architecture

TITLE OF PROJECT: \_\_\_\_\_

Exploring "Digital Ecology" as a Tool for Environmental Conservation through the Design of a Virtual Eco-Park for Port Elizabeth.

DECLARATION:

In accordance with Rule G4.6.3, I hereby declare that the above-mentioned treatise/ dissertation/ thesis is my own work and that it has not previously been submitted for assessment to another University or for another qualification.

SIGNATURE: [Signature]

DATE: 2020/09/16



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