URBAN [infra]STRUCTURE:

- using neglected infrastructure as a framework for the regeneration of inner city voids -

Buckley Rodger Thompson

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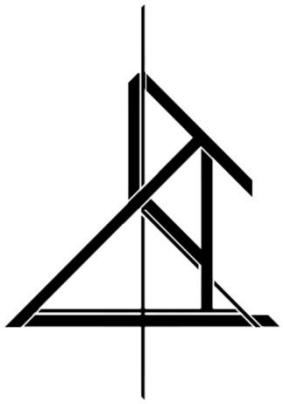

B u c k l e y R o d g e r T h o m p s o n

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"The dissertation suggests a shift in thinking, from an architecture as object to an architecture which, like a machine made up of components in relation, creating a "system of forces that give shape and rhythm to the everyday life of the body. Thus the object - be it a building, a compound site, or an entire urban matrix would be defined now not only by how it appears, but rather by practices: those it partakes of and those that takes place within it".

Sanford Kwinter
(Architecture of Time, 2001)

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PURPOSE:

Submitted in fulfilment as part of the requirements

for the degree of Master of Architecture (Professional),

MArch(Prof), in the Faculty of Engineering,

Built Environment and Information Technology.

UNIVERSITY:

Department of Architecture

University of Pretoria

South Africa

2015

DEGREE:

Master of Architecture (Prof)

Infrastructure

COURSE CO-ORDINATOR:

Dr. Arthur Barker

STUDY LEADER:

Dr. Arthur Barker

KEYWORDS:

Infrastructure, Regeneration, Urban Decay, Periphery Condition

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PROGRAM:

Community Green Station

SITE LOCATION:

Block of Brown Street

Central Business District

Pretoria

COORDINATES:

25°44'27.24"S

28°11'37.53"E

ARCHITECTURAL THEORETICAL PREMISE:

Theories of Decay and Regeneration are synthesised so as to

formulate an appropriate theoretical premise for the regeneration of urban voids.

ARCHITECTURAL APPROACH:

The exploration of Regenerative Architecture as a means of re-imagining the potential of

infrastructure to rehabilitate a state of urban decay brought about by a periphery condition.

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CHAPTER

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P R E A M B L E

As the architectural discipline is a profession where reason is rooted in understanding, this investigation aims to present a logical and compelling argument. This document serves therefore not only as a design informant but also as a record of the overall design process. The composition of this book illustrates the narrative of the project and guides the reader through the various contextual, theoretical and precedential informants of the design process. The project is grounded on an awareness of the past, present and future. Architectural design for the future, based on an understanding of the past, in reference to the present **(see figure 0.1)**. Being established within current realities, the project is non-speculative in nature and should be viewed, understood and interpreted as such.

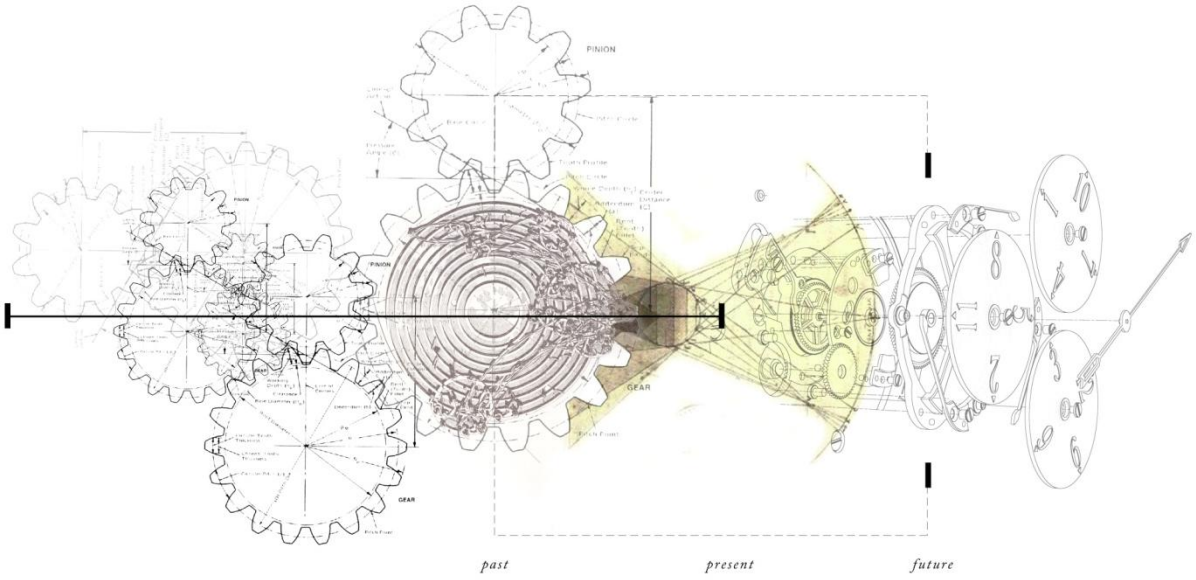

Figure 0.1 : Conceptual diagram of the project strategy in terms of past, present and future (Author, 2015).

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> Buildings will inevitably decay, and there is nothing architects or those charged with a building's upkeep can do about it. So, what is an architect to think or do about it?

Lebbeus Woods

(Inevitable Architecture, 2012)

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Figure 0.2 : Exaggeration of degenerative state of Brown Street (Author, 2015).

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CHAPTER

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Project Summary

by Study Leader:

D R . A R T H U R B A R K E R

“

The project deals with a crime ridden area within the North Eastern periphery of the Pretoria CBD called Brown Street. Imagined for a future condition of water scarcity which, having come true recently in Gauteng, implies the current relevance of the projects intentions (Barker, 2015).

The project creates architecture from its infrastructural role which, amongst other, contains water collection, treatment, power generation and recycling. It is imagined that a number of these interventions be replicated in similar conditions all around the city at varying scales and containing varying programs (Barker, 2015).

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CHAPTER

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A B S T R A C T

November of 2014 saw the approval and commission of Tshwane's 2055 vision for the city (Tshwane municipality, 2013: 6). It seeks the restructuring and rejuvenation of the inner city in an attempt to remedy a state of stasis resulting from urban decentralization and fragmentation. Although Tshwane's proposal has potential, its formal exclusive nature and prioritization of the city centre has initiated a process of decay in the informal zones of the urban periphery. This process of decay is particularly evident within the city block of Brown Street. Once a place where many a union march started, Brown Street now exists as a shadow of its former self (Valeska, 2013). A lack of supporting infrastructure and appropriate spatial conditions have facilitated a sharp increase in crime. The consequent privation of safety has, in turn, prompted vacancies of onsite industries. (Valeska, 2013). The loss of formal economic infrastructure (energy) alongside the simultaneous degradation of adjoining infrastructure has inevitably led to the decay of this city block.

This dissertation focuses on the possibility of rehabilitating and regenerating the decaying "in-between" (Woods, 1997: 13) spaces of the city block within its urban periphery. A theoretical approach to transformation is proposed, which, instead of opting for demolition, seeks to expand on existing systems. Therefore, by harnessing site potential, the project suggests that the neglected infrastructure become part of a regenerative machine; a system of components that will stimulate the re-investment and development of the city block. The main intention of the [infra]structure is to establish a coordinated relationship between the formal and informal of the city, the vision and the void. The goal is to create an organized centrality, where fragmented realities are brought together harmoniously using the neglected infrastructures as mediator.

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"I can do all things through Christ who strengthens me."

Philippians 4: 13 NKJV

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CHAPTER

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A C H N O W L E D G E M E N T S

I cannot express enough thanks to my family for their continued support and encouragement: Rodger Buckley Thompson, my father; Linda Caroline Thompson, my mother; and Eloise Caroline Thompson, my sister. I offer my sincere appreciation to my parents for the learning opportunities provided.

The completion of this project could not have been accomplished without the continued support of my study leader, Dr. Arthur Barker. The faultless guidance you displayed toward me throughout the year will not be forgotten.

Finally, to my caring, loving, and supportive friend, Marni van der Hoven, my deepest gratitude. Your encouragement and companionship comforted me through the roughest of times. From this, Mr and Mrs van der Hoven for providing a home away from home.

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UNDERSTANDING

[terminology]

STASIS:

(n.) 1. inactivity resulting from a static balance between opposing forces; 2. an abnormal state in which the normal flow is slowed or stopped.

VOID:

(n.) 1. an empty area or space; vacancy; emptiness; vacuum; 2. the state of nonexistence; nothingness; nullity; nihility.

VEIL:

(v.) 1. making undecipherable or imperceptible by obscuring or concealing; obscure; blot out; obliterate; hide; 2. to obscure, or conceal with or as if with a veil; (opp. of unveil)

INSULA:

(n.) 1. city block, including all the units that constitute the structural fabric as a whole for a city street block; 2. the individual units of private property that were isolated within the structural fabric of that street block.

INFRASTRUCTURE:

(n.) 1. the stock of basic facilities and capital equipment needed for the functioning of a country or area; base; 2. the basic structure or features of a system or organization; substructure.

DEGENERATION:

(n.) 1. passing from a more complex to a simpler biological form; retrogression; 2. the process of declining from a higher to a lower level of effective power or vitality or essential quality; devolution; (opp. of development, evolution).

REGENERATION:

(n.) 1. forming again (especially with improvements or removal of defects); renewing and reconstituting; reformation; 2. the activity of physical renewal; 3. feedback in phase with (augmenting) the input; positive feedback; 4. (biology) growth anew of lost tissue or destroyed parts of organs.

ENTROPY:

(n.) 1. (thermodynamics) a thermodynamic quality representing the amount of energy in a system that is no longer available for doing mechanical work; "entropy increases as matter and energy in the universe degrade to an ultimate state of inert uniformity"; randomness; s.

RESILIENCE:

(n.) 1. the physical property of a material that can return to its original shape or position after deformation that does not exceed its elastic limit; resiliency; 2. an occurrence of rebounding or springing back; resiliency.

PERIPHERY:

(n) 1. the outer limits or edge of an area or object; 2. A marginal or secondary position in, or aspect of, a group, subject, or sphere of activity.

SATELLITE:

(n) 1. an artificial body placed in orbit round the earth or another planet in order to collect information or for communication; 2. something that is separated from or on the periphery of something else is nevertheless dependent on or controlled by it.

HUB:

(n) 1. a centre of activity or interest or commerce or transportation; a focal point around which events revolve

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STRUCTURING

[contents]

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INFRASTRUCTURE

[a brief history]

The word itself, "infrastructure" is derived from a combining of the Latin words *infra*, used by the Romans to mean "below", or "underneath", and the Latin word *structura* which means "building" or "structure" (Oxford Dictionary). The term is defined as "the basic physical and organizational structures and facilities needed for the operation of a society" (Dictionary.com). The development of infrastructure from an archaeological standpoint can be traced back to the earliest of times, however if one based such a study on the etymology of infrastructure, its origins can be traced back to ancient Rome. In fact, the ancient Romans are referred to as the "fathers of infrastructure" (Assante, 2009: 1). In ancient Rome the most significant of these organizational components included structures such as temples, amphitheatres and public baths however, the Appian Way and the Aqua Appia **(see figure 1.1)** - both planned and constructed by Appius Claudius Laeus (340 - 273 BC) became the model for the design and construction of greater Roman roads and aqueducts and left a mark as one of the greatest infrastructures (Assante, 2009: 1). Aqueducts were considered by the Romans as one of the most critical elements of infrastructure. They were essential to ancient Roman civilization and its evolution from a regional power into a vast empire with tranportational reach and influence. The Romans required aqueducts to grow and sustain larger populations. The first Roman Aqueduct, constructed in 313 BC brought fresh water to the city from the surrounding hills. Its construction coincides with that of the Appian Way. Sextus Tulius Frontinus, appointed to oversee and manage the system, wrote "with such an array of indispensible structures carrying so many waters, compare if you will, the idle pyramids or the useless, though famous, works of the Greeks".

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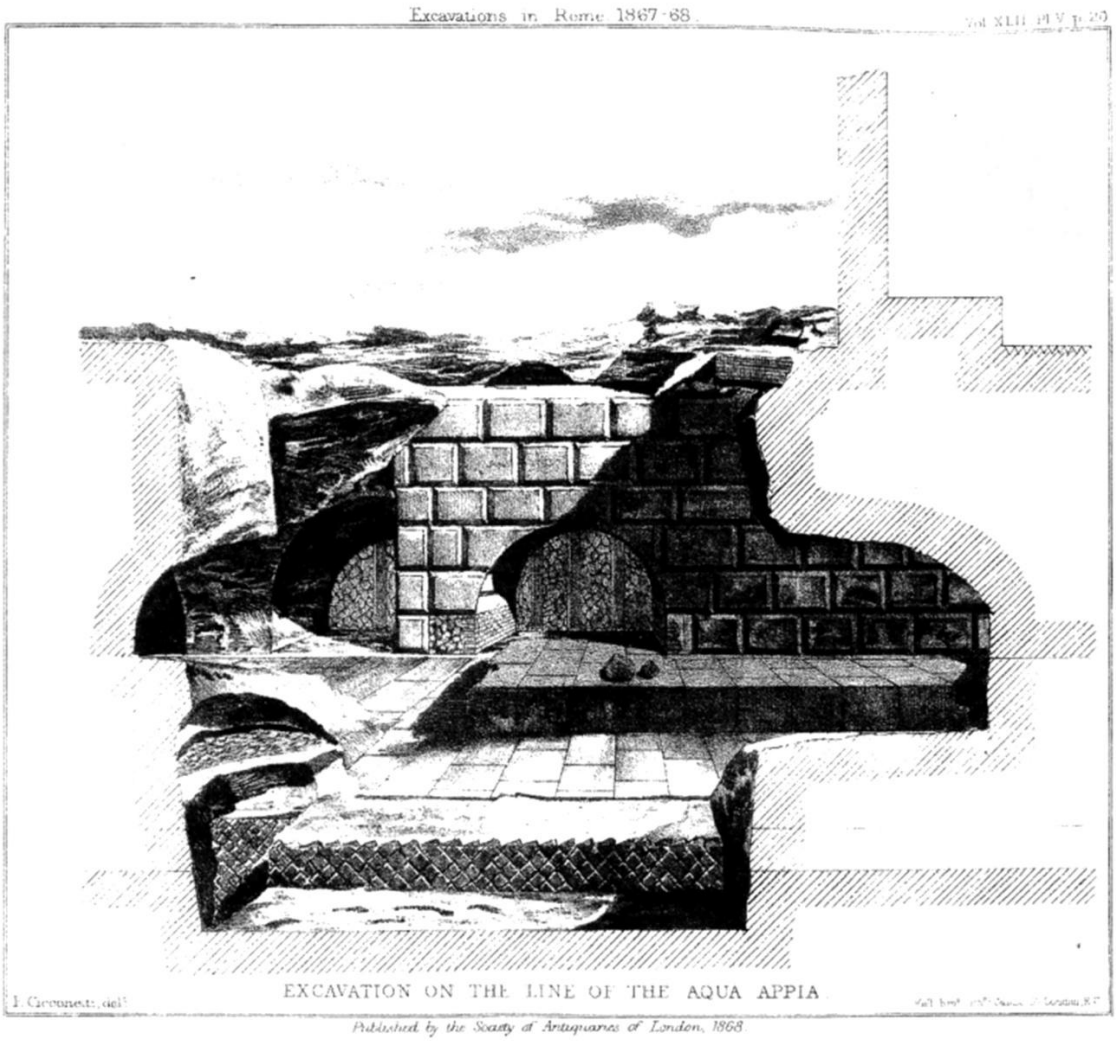

Figure 0.3 : drawn section of the roman Aqua Appia. Illustrating spatiality of water infrastructure (Assante, 2009: 3).

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FLEXIBILITY

[the infrastructural era of architecture]

There is of recent a tendency of architects toward the design of infrastructure **(see figure 1.2)**. This is because, due to the fact that our urban spaces are undeniably influenced and ultimately shaped by economic exchanges, architecture can no longer tend toward the idle and the object but instead toward the flexible. David Harvey (Zaera-Polo, 1994: 25) explains in his theory entitled "flexible accumulation" that cities adapt to over-accumulation, not by means of density but through "mechanisms of spatial and temporal displacement". This implies that cities adapt their form to an increasing mobility or recourses and capital. Cities are therefore required to maintain a flexible organization so as to absorb a continuous spatial reformation without losing their specificity and centrality (Delalex, 2006: 51). Therefore, as fluidity of urban condition draws architects attention toward the links that establish themselves between objects and buildings, they naturally enforce their interest for infrastructure (Delalex, 2006: 53).

Urban projects often carry infrastructural meaning; not only because of their size but also because of the large-scale forces they attempt to integrate. This suggests that architecture is shifting towards the field of infrastructure (Delalex, 2006: 53). As stated by Stan Allen (1997: 52): "they [architects] can begin to redirect their own imaginative and technical efforts toward the questions of infrastructure. A toolbox of new and existing procedures can be expanded by reference to architecture's traditional alliance with territorial organisation and functionality". Since architecture attempts to stitch territorial scales it approaches a more material form of practice, which Allen labelled as "infrastructural urbanism". Infrastructural urbanism interprets buildings as infrastructures (Allen, 2006: 54). It favours instrumental approaches and realistic strategies. These are not devoted to the design of autonomous objects, but rather to the production of material conditions; conditions that are similar to those of peripheral districts.

This is not a return to master planning as it still incorporates a certain complexity of the real, meaning that architects redirect their interest toward questions of scale, use, movement, flow and ex-change, moving toward an infrastructural design. As architects reclaim their original tools, they relate architecture to material practices, such as ecology and engineering, which are concerned with the conception and transformation of large scale assemblages over time (Delalex, 2006: 54). Having failed to make provision for the flexibility of its urban centre, the City of Tshwane now exists in a state of stasis. No longer able to meet the requirements of its governing body, this national landmark has begun to decay. However, contributing considerably toward the decay of the country's capital, is predicted water scarcity. It is projected that by 2025 water supply will have become as much of a crisis as electricity is currently.

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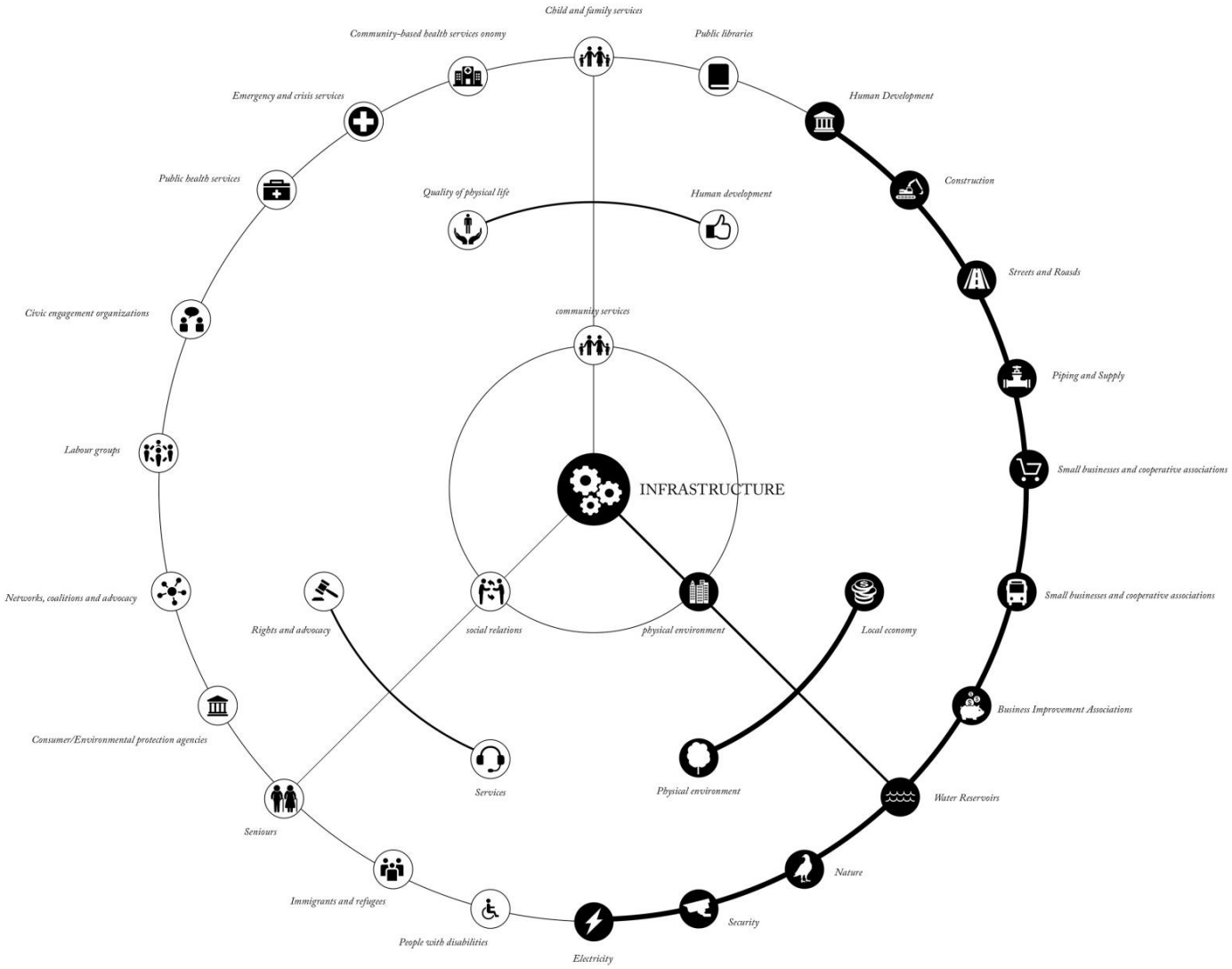

Figure 0.4 : Diagram of the three primary city infrastructures and their various components (Author, 2015).

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CHAPTER

01

[introduction]

urban decay as a result of neglected infrastructure

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The chapter seeks to ground the project in a clear understanding of both the conceptual and practical issues that frame the dissertation. The site is briefly discussed and leads up to a series of research questions and dissertation intentions.

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Formal Structures of the City

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PROBLEM STATEMENT

This dissertation is guided by the overarching issue of urban decay as a result of a periphery condition. The intention is to use neglected infrastructure as a framework for a regenerative design, which is aimed at addressing the resilience of decaying inner-city fabric.

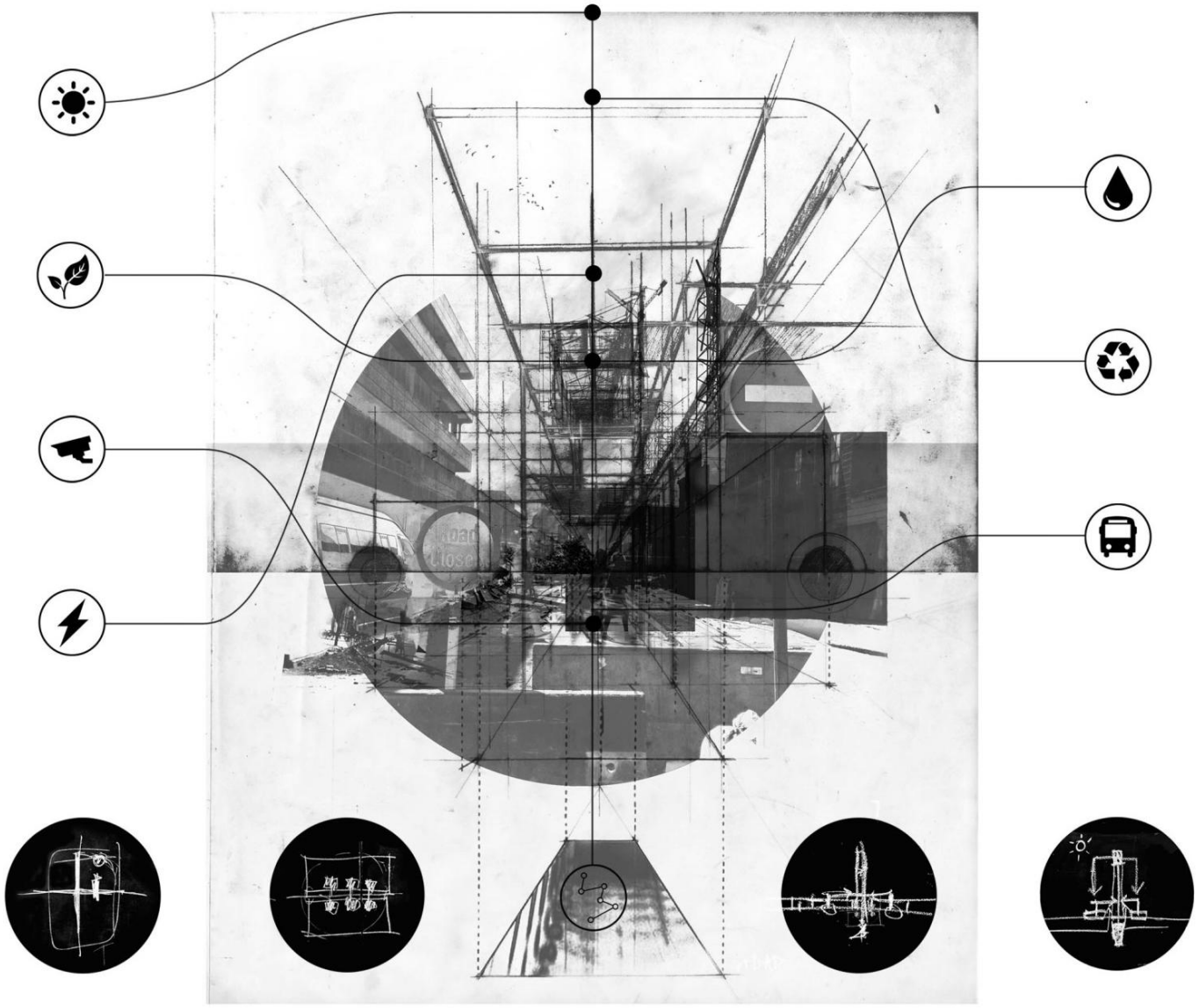

Figure 1.1 : Conceptual diagram of various infrastructural components to be contained within Urban [infra]Structure (Author, 2012).

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[general issue]

Today, urban decay is a common concern in cities. Resulting from a unique range of contributing factors, these parts of cities are generally non-contributive and are associated with degeneration not only of themselves but also of their context. This dual degeneration is highly visible in the specific block of Brown Street that this dissertation considers.

The city block of Brown Street is ideally located with close geographical and visual proximity to the Union Buildings. It also defines the large Soutpansberg gateway into the city and is a historical site associated with public assemblage. Since its association with crime in the mid OOs, the block has become excluded from the urban structure of the city and left to decay. However, due to its latent infrastructural resource potential, harnessed by the proposed [infra]structure, the block of Brown Street will once again be included within the structure and workings of the city, positively contributing to its context, the city's propose framework, and toward the inevitable projected growth and development that Tshwane will experience in the near future.

Inner-city voids must be valued for what they can offer the city in a time of resource scarcity and environmental concerns.

[urban issue]

The latent resource potential of the site offers opportunities for regeneration by enhancing existing site conditions to stimulate the creation of new social, economic and bio diverse infrastructures which can provide resources capable of meeting current and foreseeable demands of the immediate urban context.

Externally, the block is occupied by the city's marginal informal sector, creating a vibrant energy of commerce on the adjacent streets which has, over time, stemmed from the presence of an informal transport HUB. However the inaccessible and hidden nature of the site has allowed the internal fabric to decay.

The intent of this dissertation on an urban level, is to design a solution which re-presences the site and establishes an awareness of infrastructures values and potentials in creating an urban environment conducive of re-investment and development.

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[architectural issue]

How can architecture address the degenerative nature of decaying inner city fabric and at the same time enable a process where the potential of existing infrastructure is understood and realized?

The ideal is to create a hybrid of architecture and infrastructure. By enhancing "existing systems and ways of knowing" (Woods, 2001: 13), one can re-establish a productive environment where the collection and communication of resources create circumstances conducive to re-investment and development.

Awareness should also be raised on the latent potential of city infrastructure to not only sustain but also regenerate the surrounding area.

[research question]

What research approaches can be utilized to determine the latent [infrastructural] potential of degenerative urban fabric in order to contribute to the resilience of these sites?

Is it possible to apply Regenerative principles to transform the site to that which mutually benefits its surrounding urban components?

Currently the urban fabric of Brown Street is disconnected from the proposed vision of the city of Tshwane 2055, a factor which primarily feeds the degeneration of the site. Therefore, can architecture, through spatial articulation, suggest the inclusion of Brown Street within the proposed urban structure of the city to stimulate interaction between the informal and formal communities of the city?

The disconnected nature of Brown Street has resulted in a lack of the specific infrastructure necessary to promote its safe re-inhabitation. This begs the questions:

Can architecture be designed so as to include these neglected infrastructures and at the same time suggest regenerative possibilities of these infrastructures which will not only stimulate resilience of the site but also that Brown Street becomes regenerative in its context?

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[dissertation question]

Can infrastructural architecture provide a spatial interface to not only transform the nature of Brown Street as an area of urban decay but also to illustrate the regenerative possibilities of such infrastructure?

Regeneration, in this context, is defined as an architectural approach not only concerned with re-formation of urban fabric but that within such process, the environment becomes an equal stakeholder in the architecture. (definition should happen earlier)

Therefore, can a closed loop system be created where the processes relating to on-site industry and the natural environment be integrated into hybrid system where the product of the system is greater than the sum of its parts, having a positive existence?

[dissertation intention]

The intention of this dissertation is to serve as a illustrative documentation of an architecturally designed intervention. The project aims to unveil the latent potential of infrastructure in the process of regenerating decaying inner city fabric. Thus allowing infrastructure to contribute to the resilience and sustainability of the urban fabric of the city of Tshwane.

The initial goal is to identify the regenerative potential of the decaying urban fabric within the city of Tshwane. Theoretical principles of *Radical Reconstruction*, *Regeneration* and *Resilience* will be applied in order to reveal potential from which ideal architecture can be designed. Site potential will be articulated by the architecture in order to create an interconnected closed loop infrastructural system. A system of neglected infrastructures which, architecturally designed, is articulated in such a way as to transform the visual concept of the site from one of degeneration to one of regeneration.

Visually the architecture intends to be informative, educating the viewers and users of the importance of architecture and regenerative infrastructure.

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CHAPTER

02

[context and site analysis]

urban decay as a result of neglected infrastructures

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The chapter seeks to contextualize the conceptual and practical issues hitherto discussed. The project focuses on the analysis of three major scales of intervention: urban, precinct and site scales. Analysis further reveals physical and conceptual content to be used as potential design generators.

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Fabric Decay

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BACKGROUND AND DELIMITATIONS

For the purpose of this dissertation, the block of Brown Street is studied in relation to t he North-Eastern urban context of the Pretoria CBD. This sees analysis done on both a macro- and micro-level. Understanding of the site's current condition is sought through a brief study of its history.

PRETORIA

[historical core of the larger City of Tshwane]

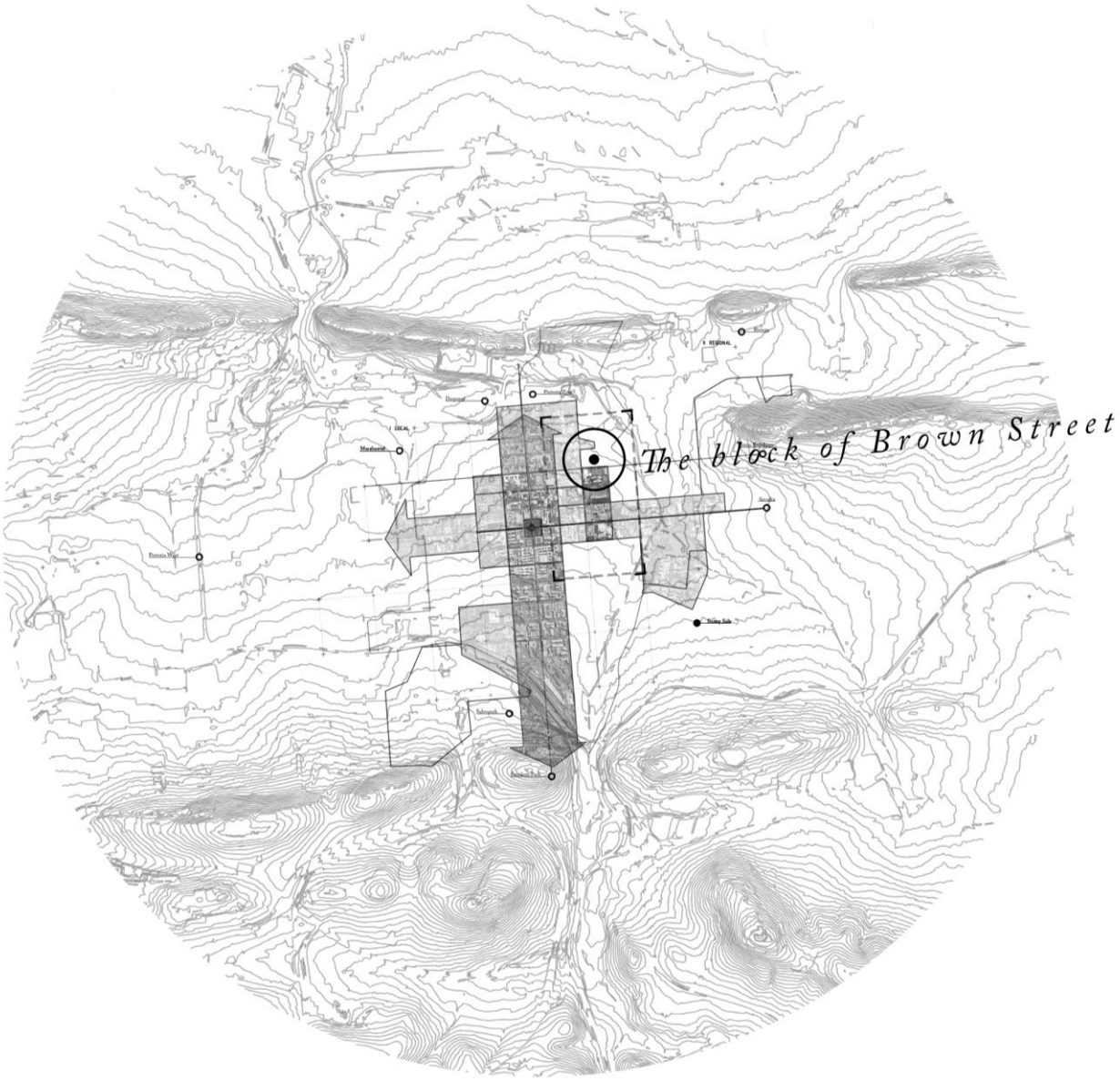

Figure 2.1 : 5m contours showing Re Kgabisa Framework within the Apies river valley (GIS, 2015).

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MACRO ANALYSIS

2.1 CONTEXTUAL ANALYSIS

2.1.1 [a brief history]

Nestled between the Magalies Mountain- and Bronberg ranges, Pretoria is located on the 'watered' plains in the Apies river valley at about 1300m above sea level. It forms the historical core of the larger City of Tshwane. The Tshwane Metropole is located in Gauteng Province, the economic heart of South Africa. The city has approximately 2.9 million inhabitants spread over an area of 6298 km^2 (City of Tshwane 2013). The history of Pretoria can be traced back to the 1850s when iterant Boere established Pretoria as the capital of the Zuid-Afrikaansche Republiek (ZAR). Granted independence by Great Britain, the ZAR dominated Southern Africa politically (Clarke & Corten, 2009: 883).

Pretoria's agrarian origin is evident within its urban fabric. Single storey buildings were incorporated within a strictly regulated orthogonal grid. These buildings were used as residences with large backyards; offices for administration and regional services and also as shops for trade. Citizens were obliged to plant and maintain trees in front of their properties in order to provide the streets with shade. Dwellings were supplied with fresh water via canals fed by the source of the Apies river; a fountain located to the south of the fledgling settlement at Elandspoort.

The discovery of gold in 1886 led to an enormous influx of people. This saw the transformation of the rural community of Pretoria into an urban society (Clarke & Corten, 2009: 883). The first expansion stemming from this transformation was comfortably accommodated in the centralized grid. The Apies River to the North-East and the Steenhovenspruit in the West formed its borders.

It was in 1880 that the city had expanded beyond its central grid. A new central grid, entitled Sunnyside, was established to the South-East to satisfy the increasing demand for residential dwellings. The next expansion, called Arcadia, was situated directly east of the city centre. The idea was that it constitute a direct extension of the city's core via Church Street (Clarke & Corten, 2009: 883). These expansions sparked a series of developments to the South-East, including Hatfield, Brooklyn, Menlopark, Menlyn, Lynnwood, Irene and Centurion. Based on economic centres, these are responsible for the urban decentralization which has inevitably resulted in Pretoria's current state of stasis.

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FACTS

2.2 CITY OF TSHWANE

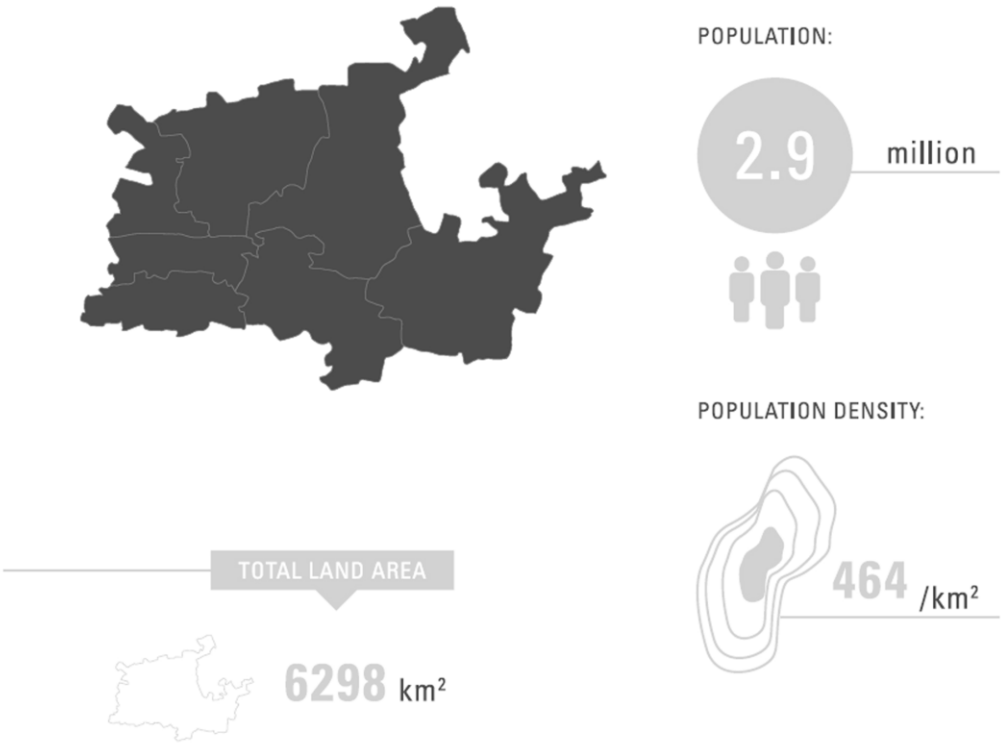

Figure 2.2 : City of Tshwane: Fast Facts about our City (City of Tshwane, 2013 : 42).

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TSHWANE

2.3 CONTEXTUAL ANALYSIS

2.3.1 [a city in stasis]

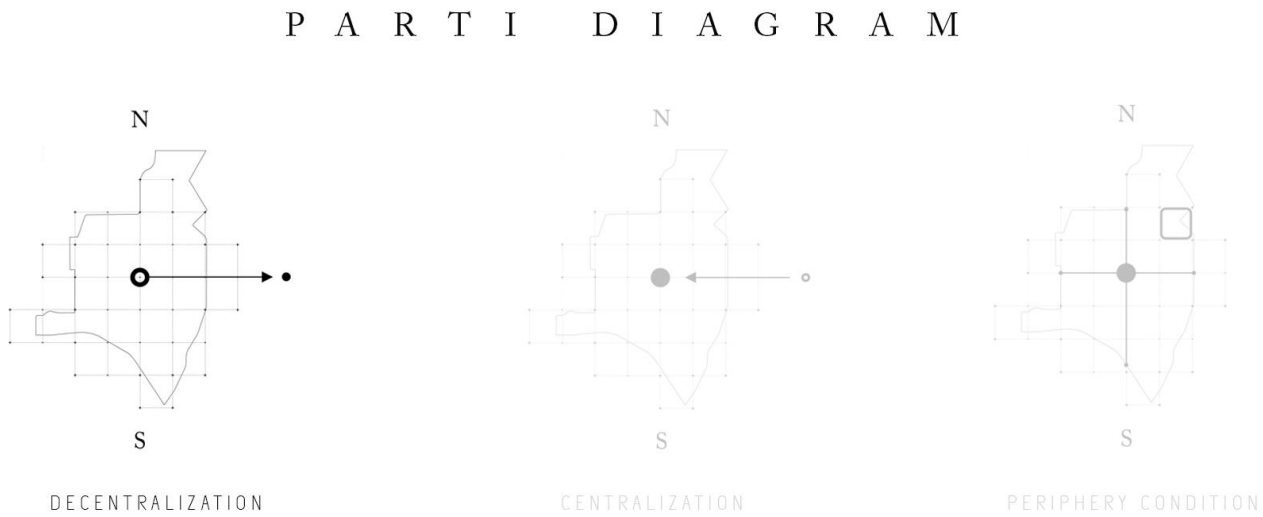

Figure 2.3 : parti diagram illustrating decentralization from the Pretoria CBD (Author, 2015).

Currently the city of Tshwane exists within a state of stasis relating to its urban condition. This condition has inevitably resulted from forces of decentralization and fragmentation. Commonly referred to as urban sprawl, decentralization and fragmentation may lead to the urban decay of the country's capital (Oelofse, 2012). According to Jan Oelofse, leasing agent and broker for JHI Properties, "the absence of new developments has resulted in the stagnation of this important national landmark, with a gradual migration away from the precinct, resulting in vacant buildings with little demand for the space."

This urban migration is thought to be an effect of the central business district (CBD's) growing inability to meet the requirements of government. These requirement include its various communal, social and physical infrastructural components **(see Figure 2.3) - infrastructure diagram.** "Poor infrastructure is a major impediment to development, poverty reductions and improved standard of living. For example, road congestion, poor public transportation, poor facilities for pedestrians, poor sanitation, and power outages, etc. are major infrastructural deficiencies that hinder development" (Myeza, 2013: 96). The city of Tshwane has therefore proposed a vision, which by the year 2055 sees the implementation of several infrastructural projects. These projects, via a process of re-centralization, will rejuvenate and restructure the inner city of Pretoria and include amongst others, a ceremonial boulevard, government precinct and civic precinct.

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Provincial Cabinet Decision of July *2004*

"Approved development of strategic plan for accommodation of National Government in the Inner City of Pretoria…" (Tshwane, 2004).

Provincial Cabinet Decision of May *2005*

"Noted progress to date… approved the implementation plan for the project." (Tshwane, 2005).

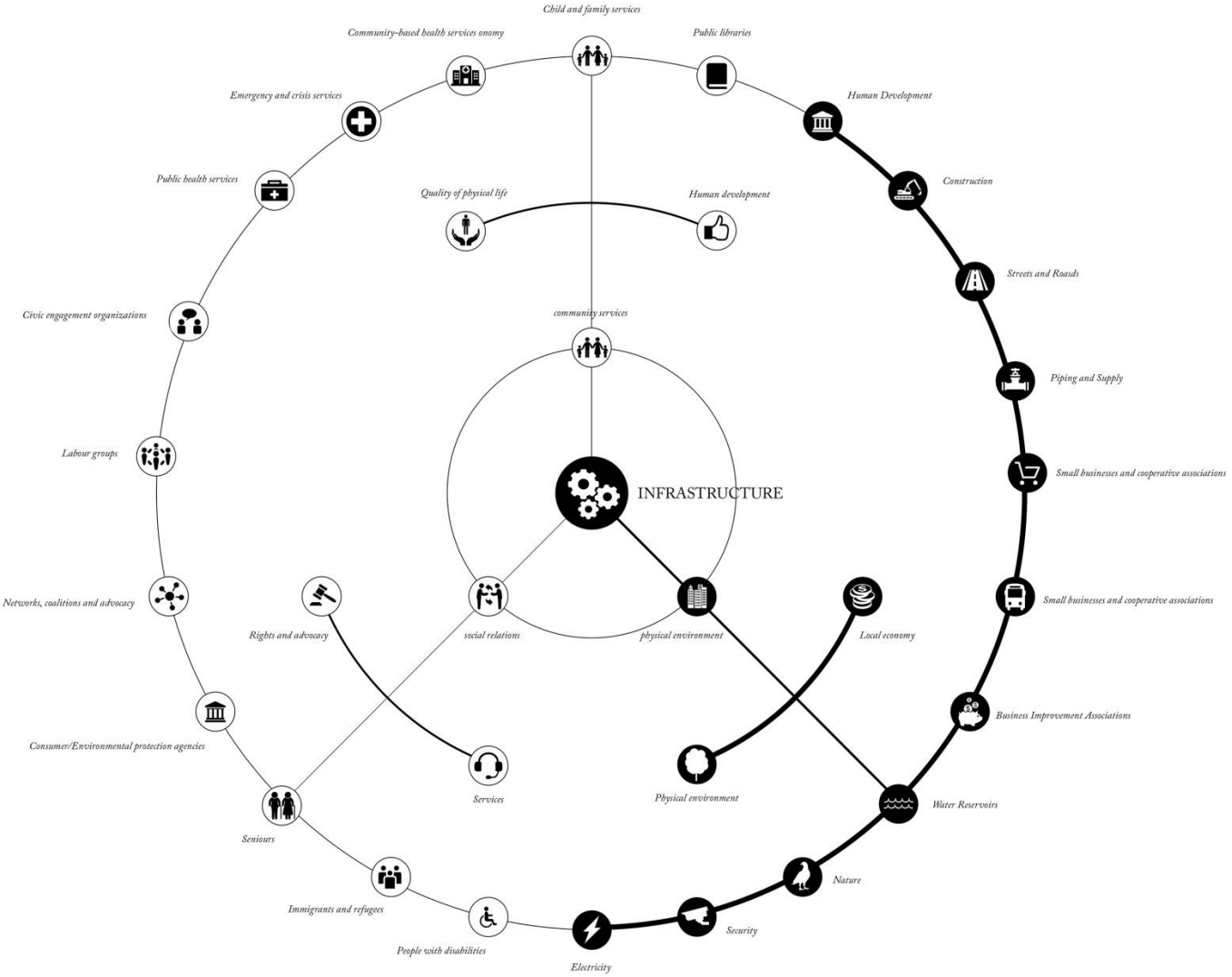

Figure 2.4 : Diagram of the three primary city infrastructures and their various components (Author, 2015).

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In 2005 the National Department of Public Works, along with the Department of Public Services and Administration and the City of Tshwane Metropolitan Municipality launched the 'Re Kgabisa Tshwane' program. The program was a direct response to disinvestment in property in the city's centre, which led to associated decay of the core and urban sprawl in areas of lower density (Clarke & Corten, 2009: 883).

2.3.2 [Tshwane Vision 2055]

The Tshwane vision consists of various component frameworks that aim to strategically restructure the entire city. The 'Re Kgabisa Tshwane' Framework is the components that focuses more specifically on the development of the CBD. It concentrates on the development of the two main corridors of Pretoria's inner city; its *Cardo* and *Decumanis*.. The 'Decomanis' is imagined to become a ceremonial boulevard which intends to promotes a safe public network with accessibility to government departments (City of Tshwane, 2006). The 'Cardo' is to form the primary axis for the proposed civic and government precincts.

OBJECTIVES

[objectives as highlighted within published proposal documentation]

- Maximizing functionality of existing city infrastructure specifically those which directly relate to the Pretoria CBD.

- Creating an infrastructural spine that promotes private development.

- Ensuring improved urban safety by means of ensuring well utilized public space as well as accessibility to those spaces.

- Providing commercial opportunity

- Linking symbolic and heritage sites of Freedom Park, Church Square and the Union buildings via a visual axis.

SHORTCOMINGS

[shortcomings relevant to the degenerative condition of the North Eastern periphery]

- No intention for the transformation / development of the North Eastern Corridor.

- No densification programme for inner city degenerative urban fabric of the block of Brown Street.

- Lack of connection between Brown Street and the proposed structure for the city, more specifically, the Civic Precinct.

- Insufficient provision of public safety infrastructures in places with high rates of crime

- No recognition of infrastructure potential to circumvent present and future crises, such as electricity- and, more importantly, water scarcity.

- No recognition of the informal transportation HUB which currently feeds the North Eastern quadrant of the CBD.

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MACRO ANALYSIS

2.4 URBAN ANALYSIS

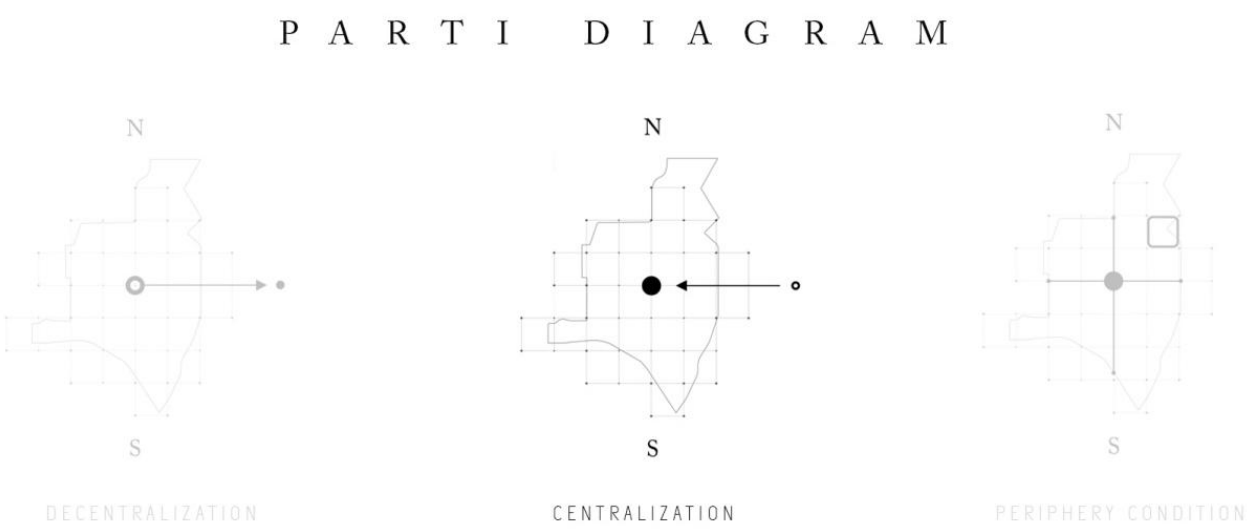

Figure 2.5 : parti diagram illustrating centralization from the Pretoria CBD (Author, 2015).

2.2.1 THE VOID

[formation of the void]

In November of 2014, the Tshwane 2055 vision for the city was approved and an extensive 40 year implementation process initiated (Sacommercialpropnews.co.za). Although the proposed framework has merit, it continues to facilitate the formation of voids within the city's fabric.. Voids, in this context, are defined as zones within the CBD that the Tshwane vision for 2055 fails to recognize. These voids persist as a result of municipalities' continued restriction of capital (Woods, 1997). The most prominent of these voids exists within the North Eastern quadrant of the CBD's metropolitan municipal boundary. Currently occupied by the city's marginal informal sector, this void does not, as the literal definition suggests, exist as a placeless vacuum. Rather, it is a place of energy; a vibrant energy of commerce that has stemmed over time from the presence of an informal transport HUB.

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MACRO ANALYSIS

2.5URBAN ANALYSIS

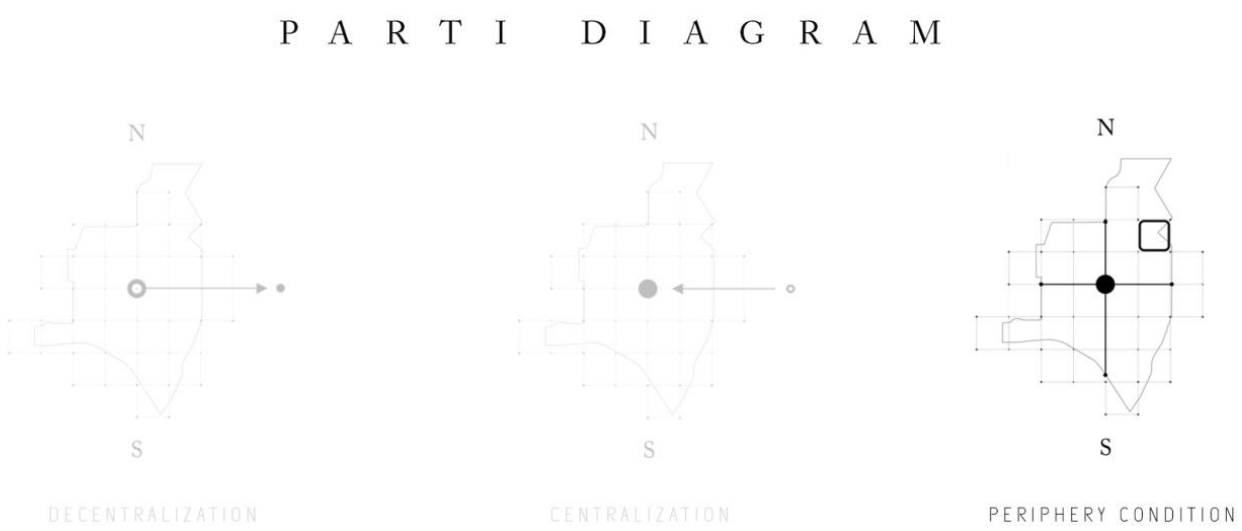

Figure 2.6 : parti diagram illustrating North-Eastern periphery from the Pretoria CBD (Author, 2015).

2.2.2 NORTH-EASTERN GATEWAY

[the unveiling of hidden urban potential]

In relation to the 'Re Kgabisa' spatial framework, there are three city blocks within the North-Eastern quadrant of the CBD that have been excluded. Of these three city blocks, the block of Brown Street is most evidently impacted by both a state of neglect and this exclusion. Despite its degenerative nature, it does however have the most potential for intervention due to its ideal location in relation to the city's urban structure.. It is not only situated on the Northern border of the intended Civic Precinct but also defines the North-Eastern Soutpansberg gateway of the CBD (see Figure ##). Although neglected, the North-Eastern gateway holds much potential as a possible mediator between the CBD's formal and informal occupants. The formal is to occupy the zones as demarcated within the 'Re Kgabisa' spatial framework. The rest, the informal, then manifests within the neglected periphery; the zones that have not been included within the framework. The informal nature of the North-Eastern periphery is ascribable to the fact that it's one of the most prominent access points to the city's core from the North. The potential value of the north-eastern gateway can be realised as a thoroughfare between the North and the South via the Southern Gateway. . The mediation between the formal and informal elements is thus stretched far beyond the border of the CBD. This is accomplished through the formal establishment of a connection between the previously mentioned decentralized nodes (Arcadia, Hatfield, Brooklyn, Lynwood, Menlyn, Irene and Centurion) of the South-East.

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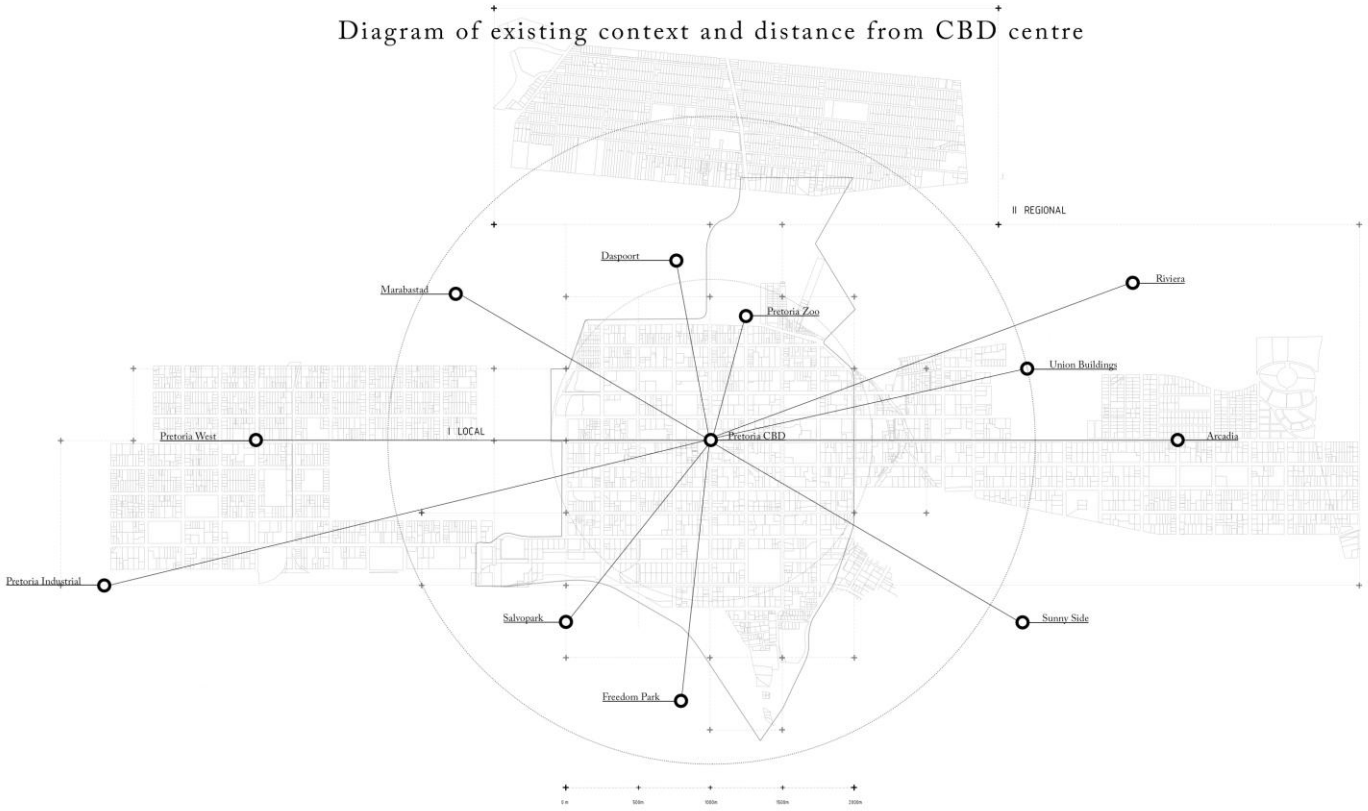
CONTEXT

Diagram of existing context and distance from CBD centre



DECENTRALIZATION

Diagram showing economic node as well as distance from CBD

Figure 2.7 : diagrammatic illustration of Pretoria CBD context and decentralization (Author, 2015)

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Figure 2.8 : Spatial structure of the Central Business District as per the Re Kgabisa Framework (City of Tshwane, 2013 edited by Author, 2015).

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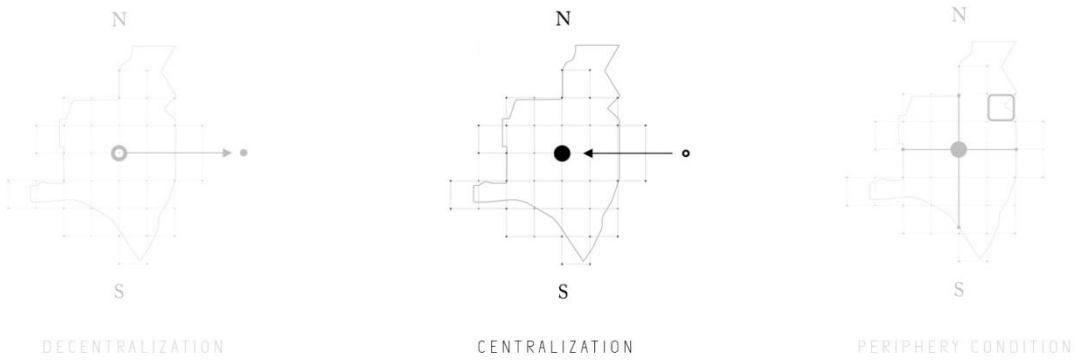

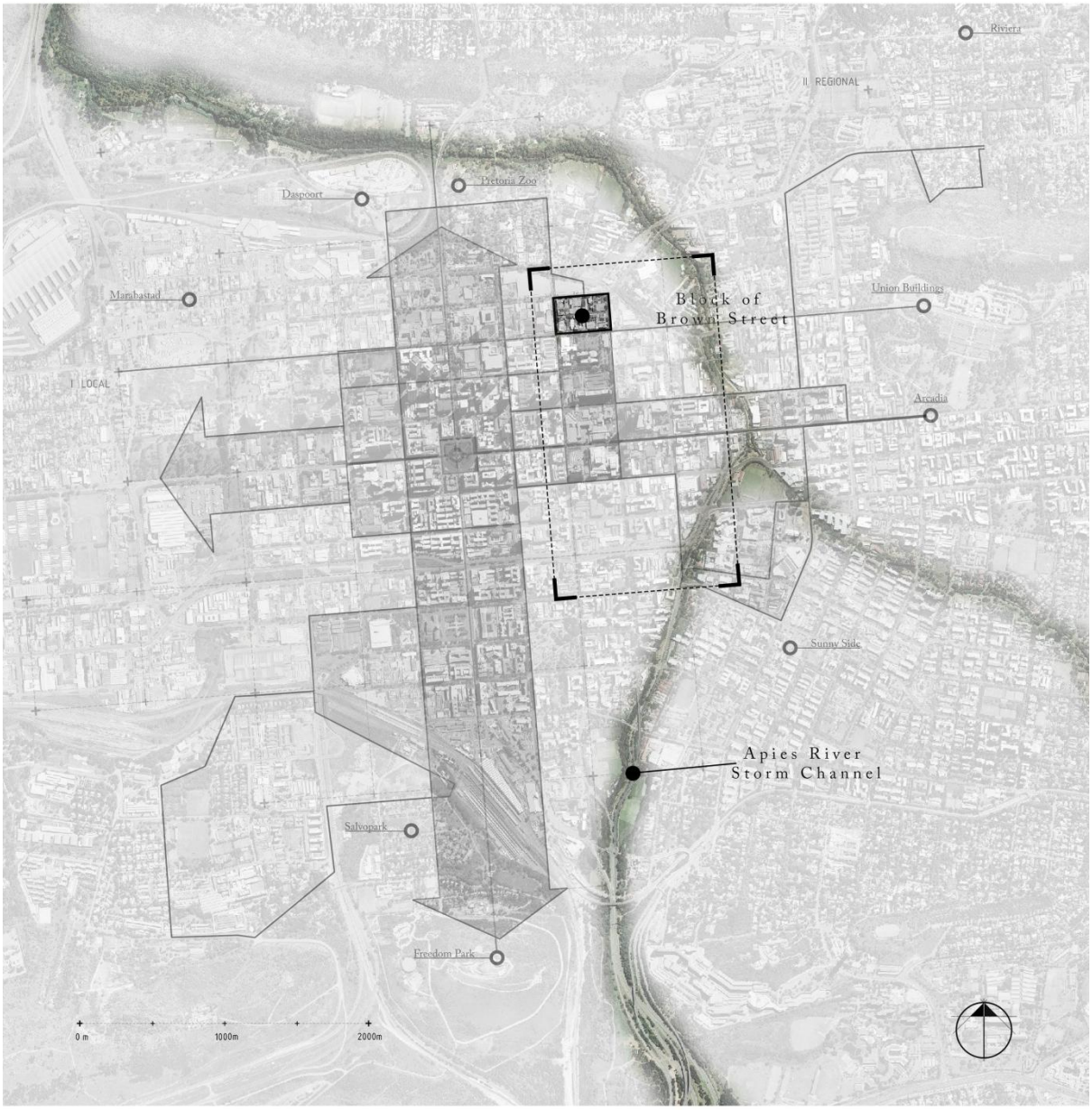

THE "ORPHANED"

[Identified decaying infrastructures]

Figure 2.9 : North Eastern periphery condition in relation to Re Kgabisa framework (Author, 2015).

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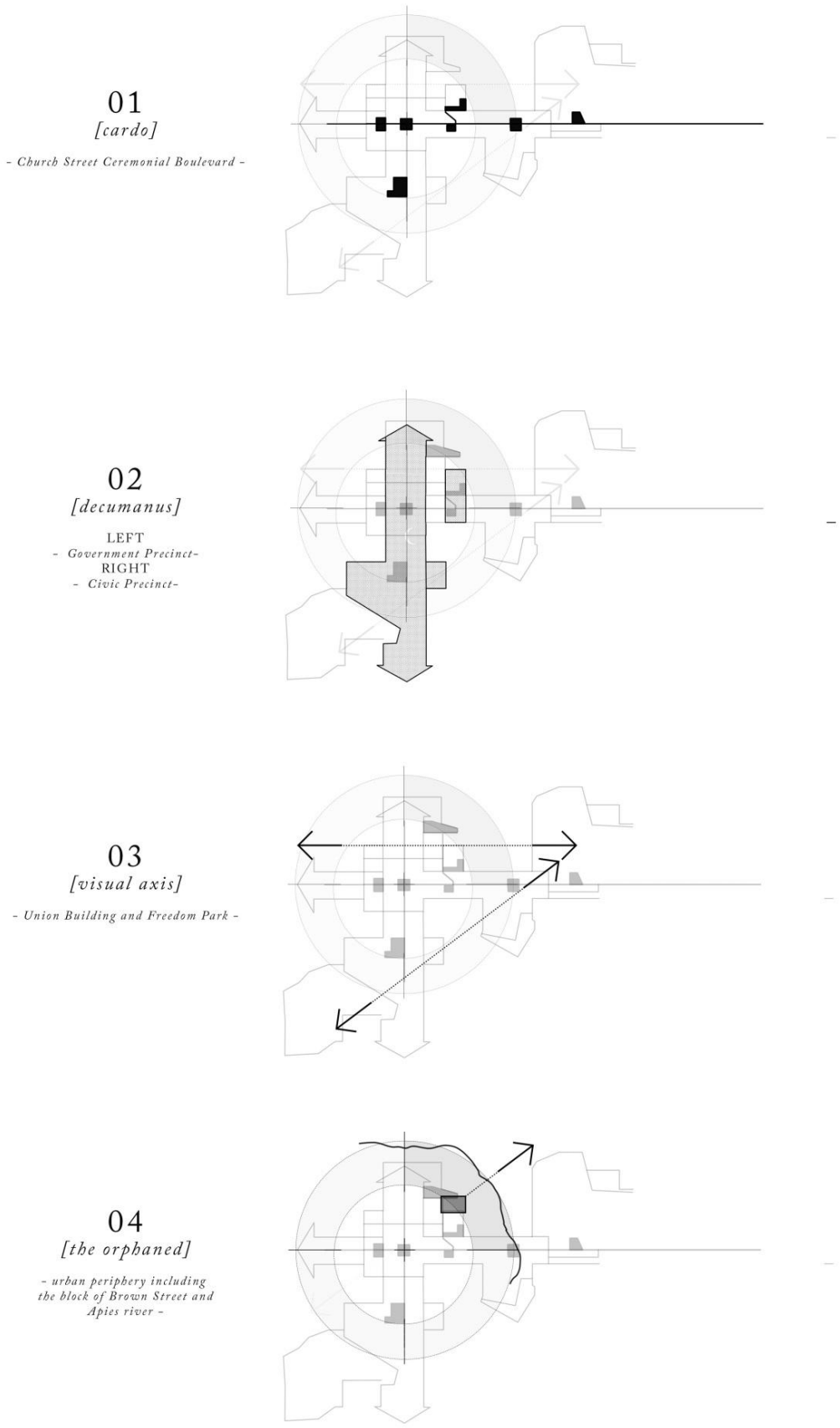

Figure 2.10 : Diagram components of Re Kgabisa inner-city Framework (Author, 2015).

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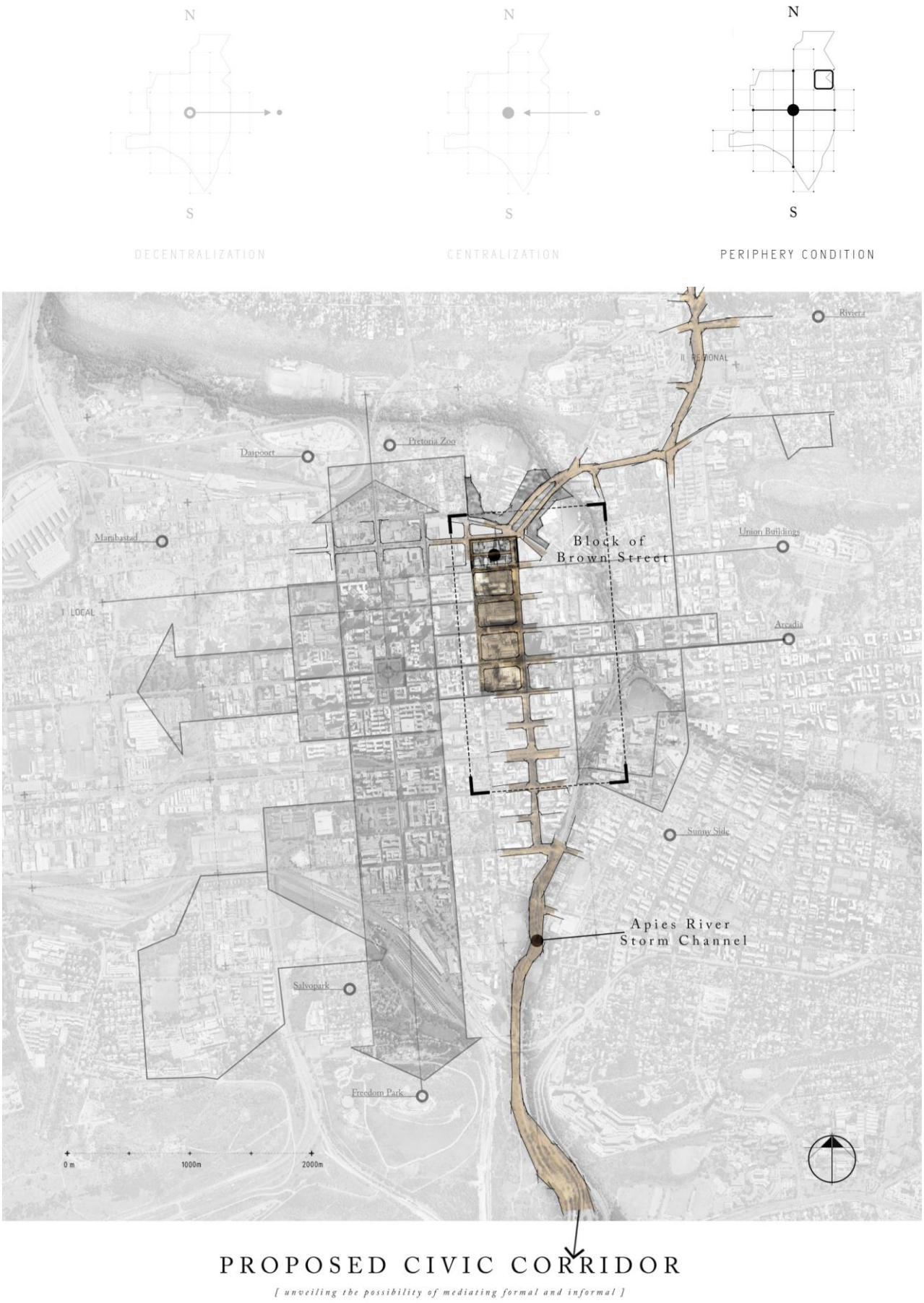

Figure 2.11 : Proposed corridor aiming to include the North Eastern periphery within the proposed spatial structure of the CBD (Author, 2015).

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MACRO ANALYSIS

2.2 PRECINCT ANALYSIS

The North-Eastern quadrant of the Pretoria CBD consists of a wide range of infrastructures. These are essential to the functioning not only of the CBD itself but also of the entire urban structure. Mapped within the following precinct analysis are the infrastructures that significantly contribute towards the public realm of the CBD, specifically within the proposed Civic Precinct. (AS HIGHLIGHTED BELOW)

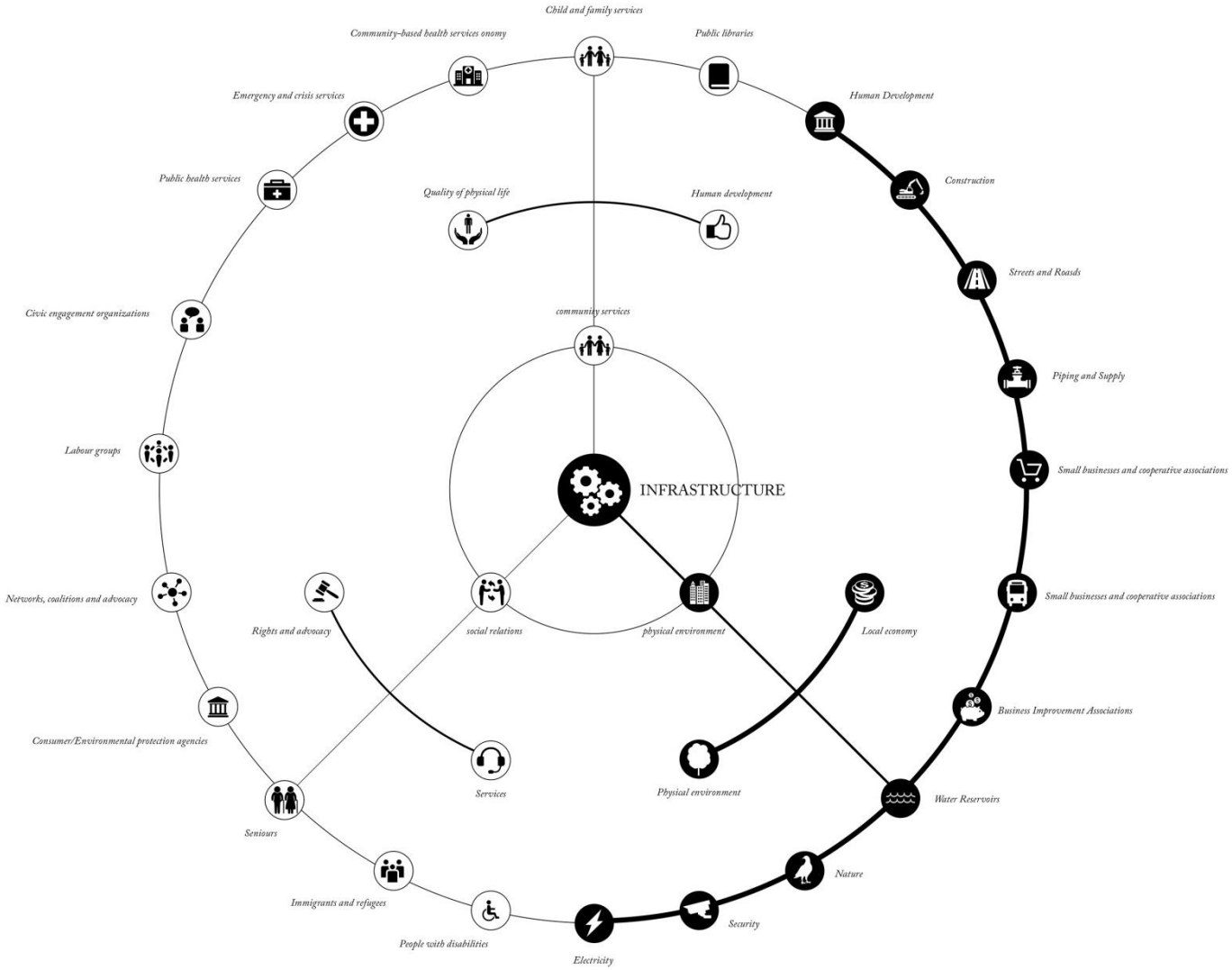

Figure 2.12 : Diagram of the three primary city infrastructures and their various components (Author, 2015).

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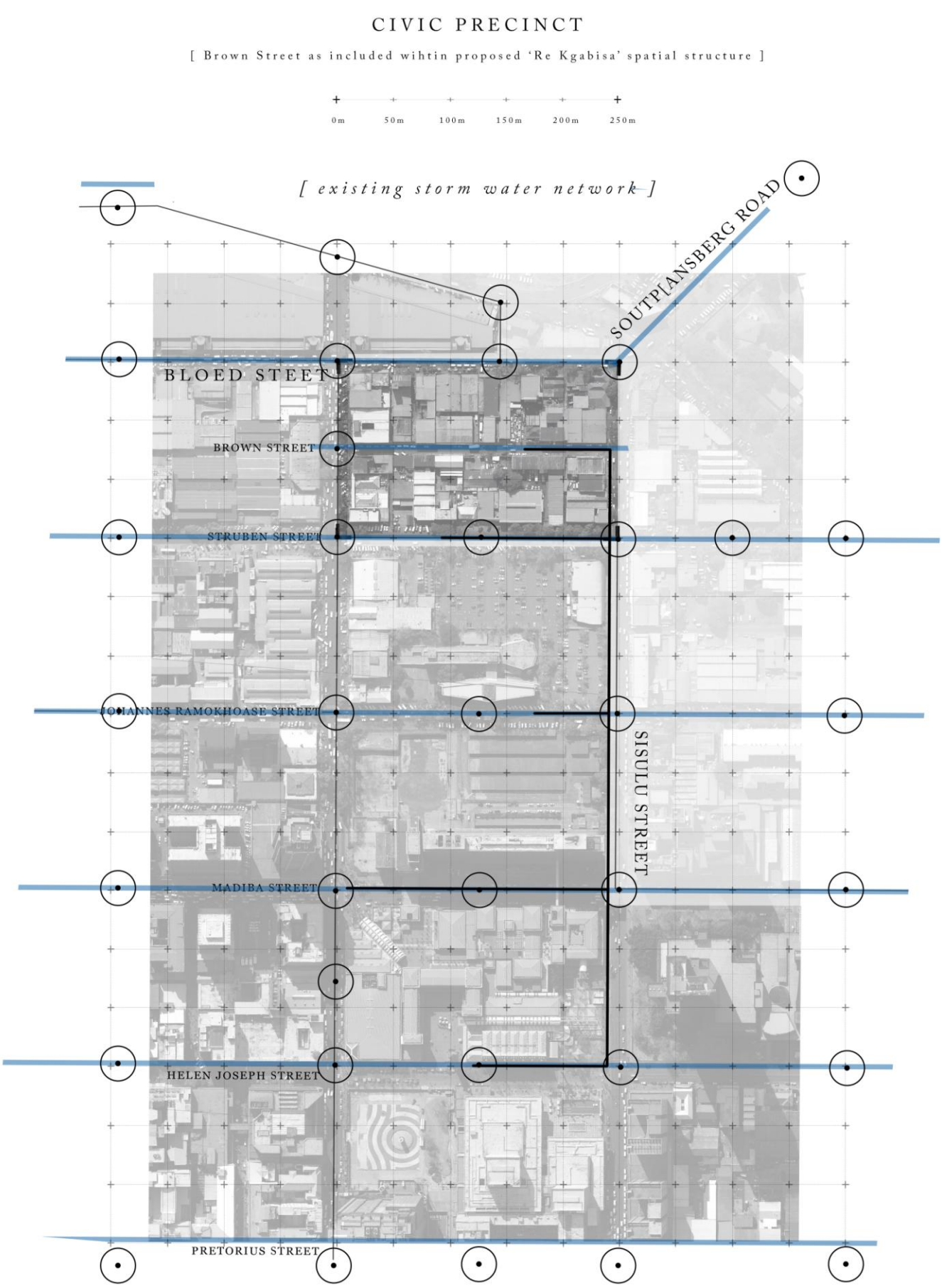

Figure 2.13 : Illustration of Pretoria's storm water network and manhole access points. Based on 1889 plan (Author, 2015).

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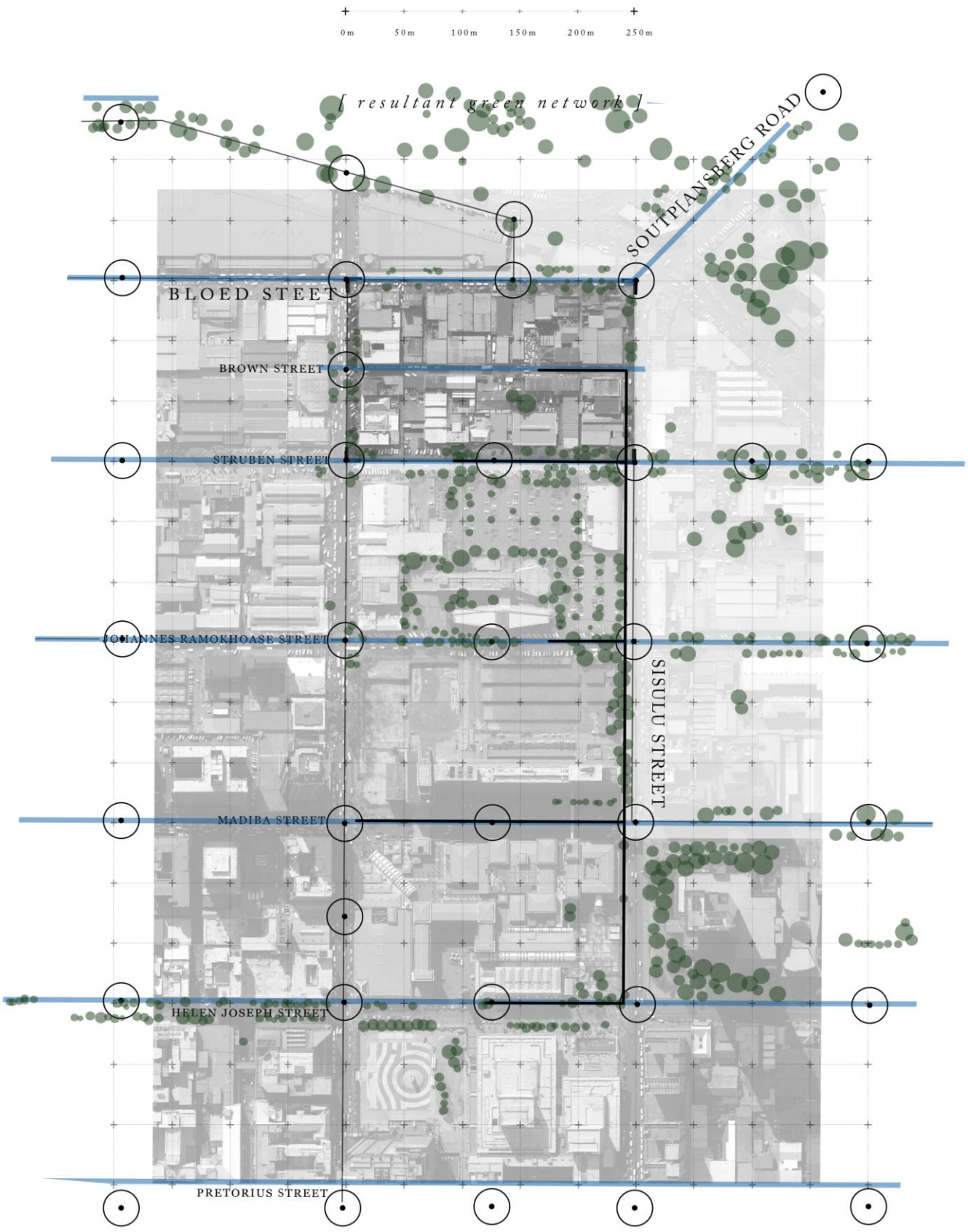

Figure 2.14 : Illustration of Pretoria's green network in relation to storm water channels. (Author, 2015).

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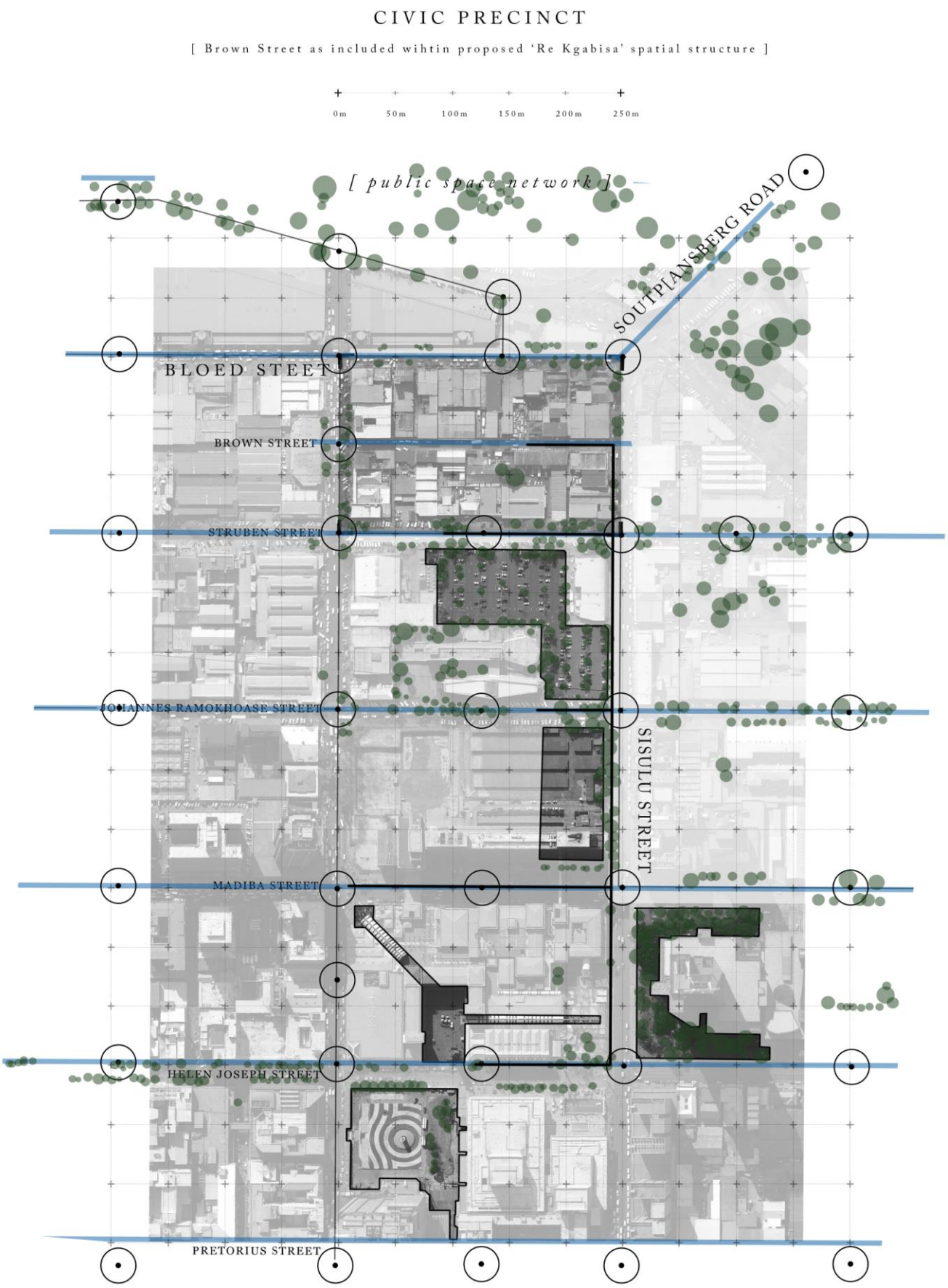

Figure 2.15 : Illustration of Civic Precinct public space network in relation to green network (Author, 2015).

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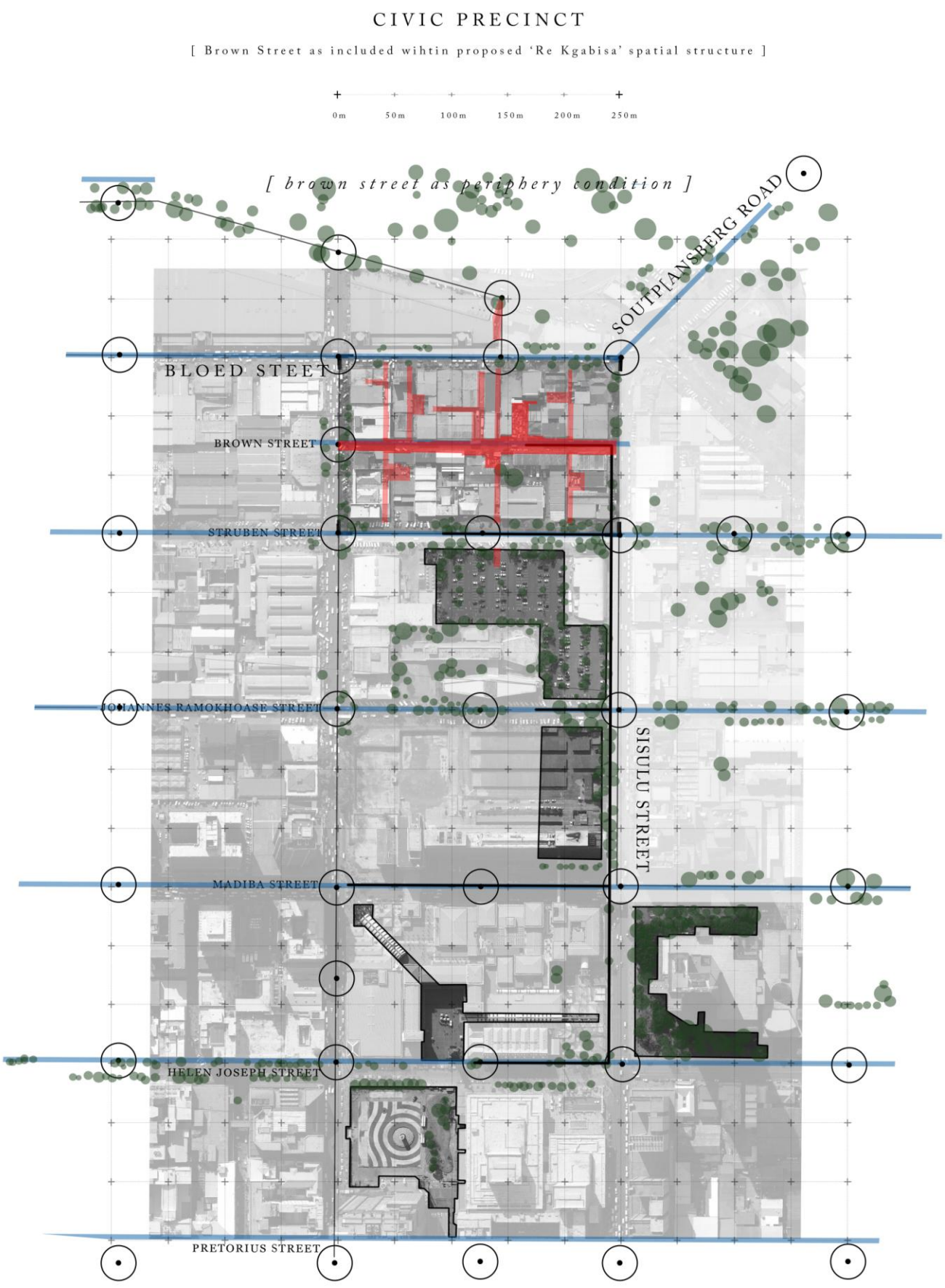

Figure 2.16 : Illustration of urban vision in relation to the in between spaces of Brown Street in red. (Author, 2015).

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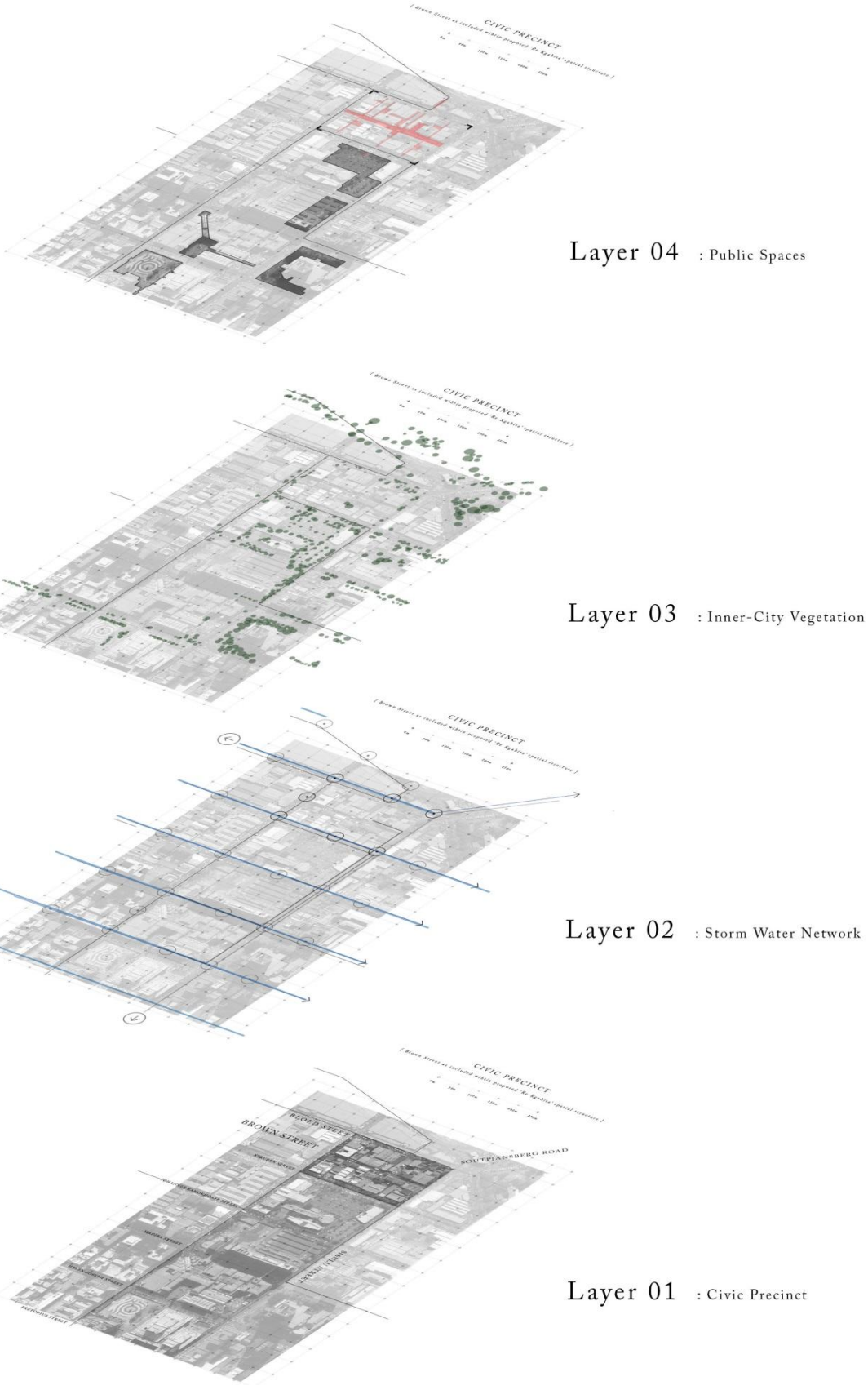

Figure 2.17 : layered illustration of urban vision (Author, 2015).

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MICRO ANALYSIS

[the block of Brown Street]

Figure 2.18 : Photography of Western access point of Brown Street (Author, 2015).

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MICRO ANALYSIS

URBAN HUB CHECKLIST

[as per urban hub design toolkit for the city of Tshwane]

The Urban Hub Design Toolkit, published in February 2013, was drawn up in response to the National Development Program's (NDP) requirements. The NDP recognises the need to invest in Urban Hubs as a "strategy to enable the long term restructuring of our larger urban settlements" (Urban Hub Toolkit, 2013: 1). The toolkit provides a structured guide allowing for the following tasks to be undertaken:

- Identification of key opportunities, constraints and challenges
- Identification of the extent / boundary of the hub precinct
- Identification of key infrastructure interventions
- Planning of land use components

"The toolkit methodology should serve as a reference for designers and planners of Hub Precincts, a guide for municipal officials and simultaneously an evaluation tool for the NDP who will be overseeing the work of the Municipalities. It can be used to guide planners and designers through a process but can also be used as a design reference source to be dipped in and out of as required" (Urban Hub Toolkit, 2013: 3).

[brown street]

Brown Street's lack of supporting infrastructure and its veil-like spatial condition has led to the enablement of high rates of crime and to the accumulation of grime within the CBD's periphery. The density of Brown Street's urban fabric directly contributes to the degenerative nature of its current spatial conditions.. This dense urban fabric comprises primarily of industrial portal frame buildings. The building typology relates directly to the buildings function and need for flexibility. The street's historical significance is eclipsed now by a brazen drug trade..

As a result, high levels of crime and violence in the area has created an inhospitable urban environment. Subsequently, in fear of becoming victims of unlawful activity local businesses and pedestrians have fled; leading to vacancy and resultant decay of the urban fabric. The inner buildings, those with direct access to Brown Street, have become uninhabited. Also having been abandoned by the Cities Improvement District (CID) for reasons unknown, it is predicted that the degenerative condition of the city block worsen (reference article). Today, Brown Street is truly a mere shadow of its former self.

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ZONING ANALYSIS:

The currently veiled and fragmented nature of the city block is revealed by municipal zoning areas. The block of Brown Street is split both vertically and horizontally. Horizontal fragmentation forms the basic nature of Brown Street, whilst the vertical fragmentation takes the shape of service alleys. The "in-between" spaces created by this fragmentation have the potential to establish a series of public thoroughfares. These provide a platform for the conceptual mediation between the existing industry that surrounds Brown Street and the block's external commercial interface. The degenerative nature of this site has, however, led to the obstruction of these "in-between" spaces. Instead of being utile thoroughfares, they are accumulations of large quantities of industrial waste.

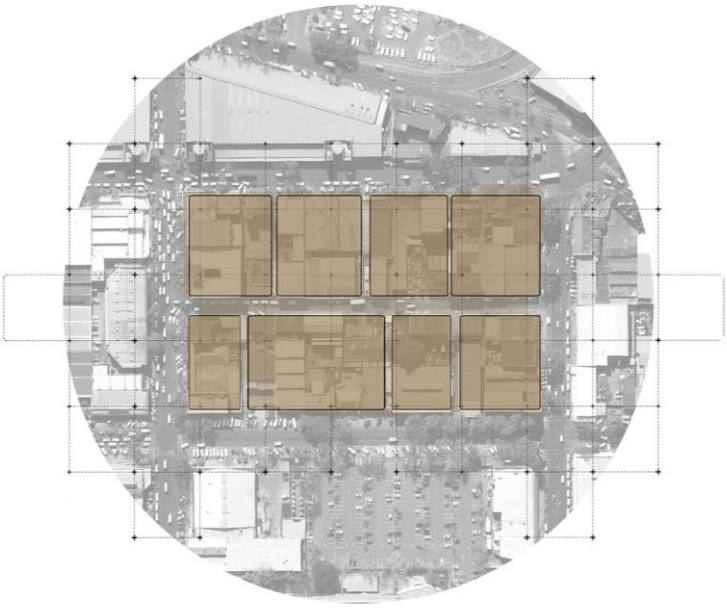

Figure 2.19 : Zoning analysis. Not to Scale (Author, 2015).

SIGHT LINE ANALYSIS:

The density of the urban fabric of Brown Street does not allow for much visual accessibility. It is this limited visibility that has facilitated the formation of a veil like spatial condition, which allows crime related activity to take place on the street. As the service alleys are closed off by property owners, Brown Street is only revealed from strategic anchor points on the block's periphery (specifically the street's Western entrance and Eastern exit). This veiled characteristic of the site emphasises the sight line study as an infrastructural design informant concerned with public safety.

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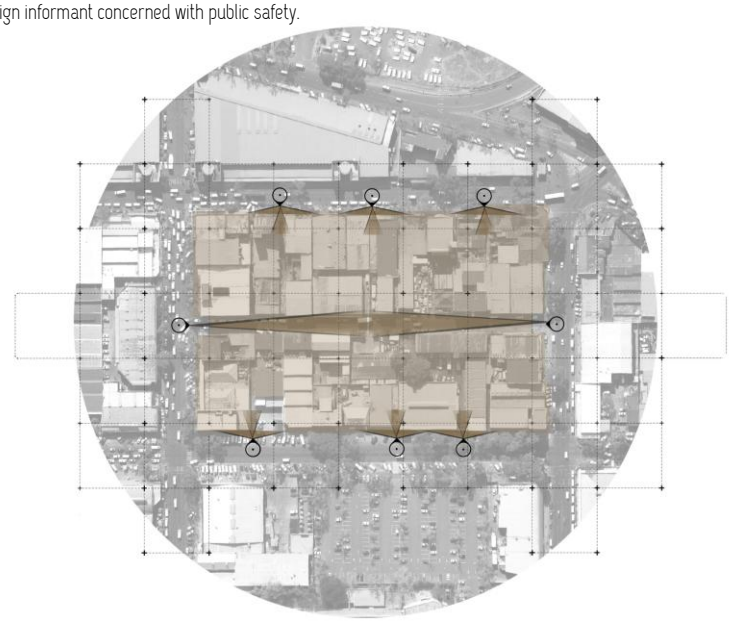

Figure 2.20 : Site Line Analysis (Author, 2015).

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EDGE CONDITION:

As mentioned above, the veil like spatial condition is a result of the privatised character of the city block's fabric. The Northern and Southern perimeters of the city block limit public accessibility due to fenced off service routes. The fenced character of the site limits the potential of public movement and accessibility; contrasting with that which is possible through the municipal **erf** layout..

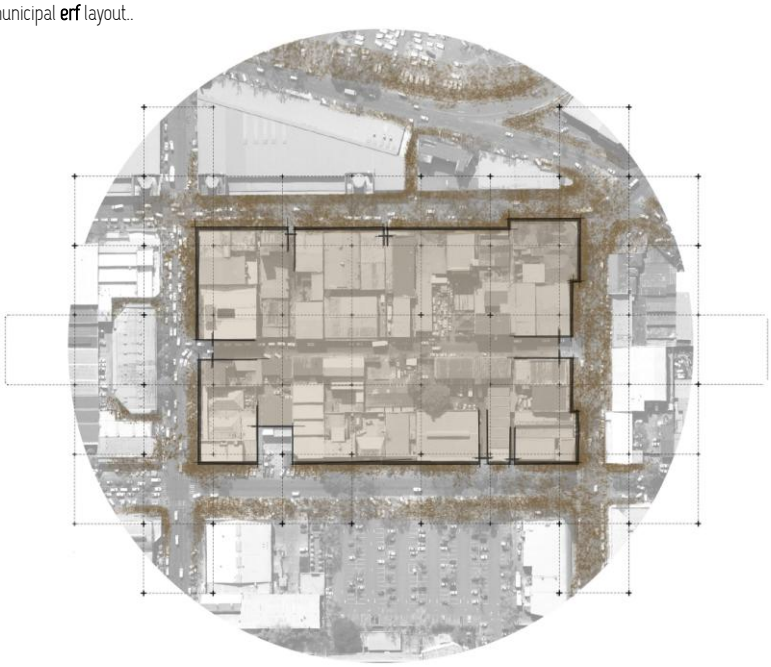

Figure 2.21 : Corridor development (Author, 2015).

TRANSPORTATION STRUCTURE:

Transportation from Bloed Street provides a large percentage of the surrounding area's transportation structure. This is a potential asset to the Brown Street transformation. The SAPD (South African Police Department) has blocked the Bloed Street (the West entrance) to Brown Street. As this was the city's block only access point, the site is now inaccessible by vehicle. The service ways between the existing buildings are, in most cases around 4500mm wide for the purpose of vehicular accessibility.

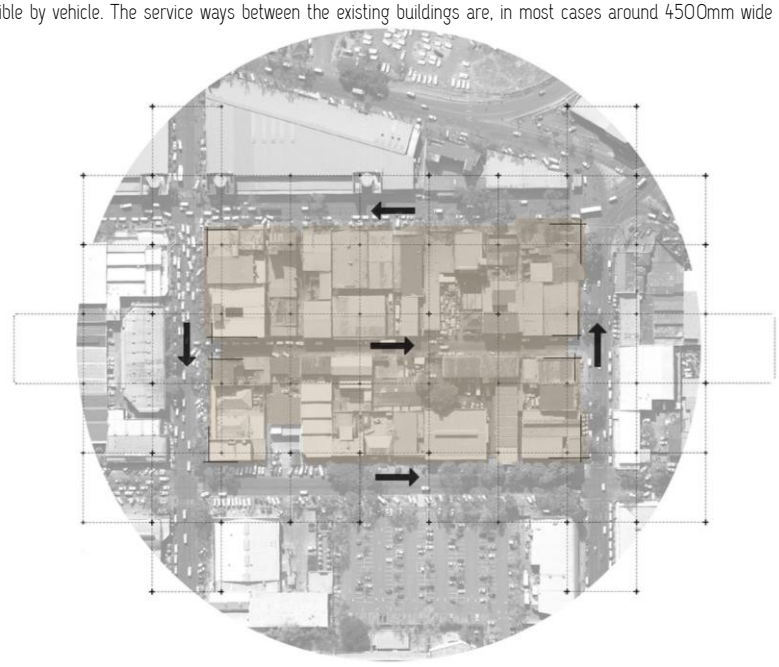

Figure 2.22 : Transportation structure (Author, 2015).

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DENSITY AND FABRIC ANALYSIS:

The block of Brown Street has a dense urban fabric with the majority of buildings ranging between one and two storeys. However, there are 6 buildings on the perimeter of the block which ranges between 3 and 4 storeys of which 4. Due to the presence of industry to the core of the block, residential components are located on the outer edge. This facilitate for dormant activity which contributes to the degenerative nature of the core of the block, Brown Street.

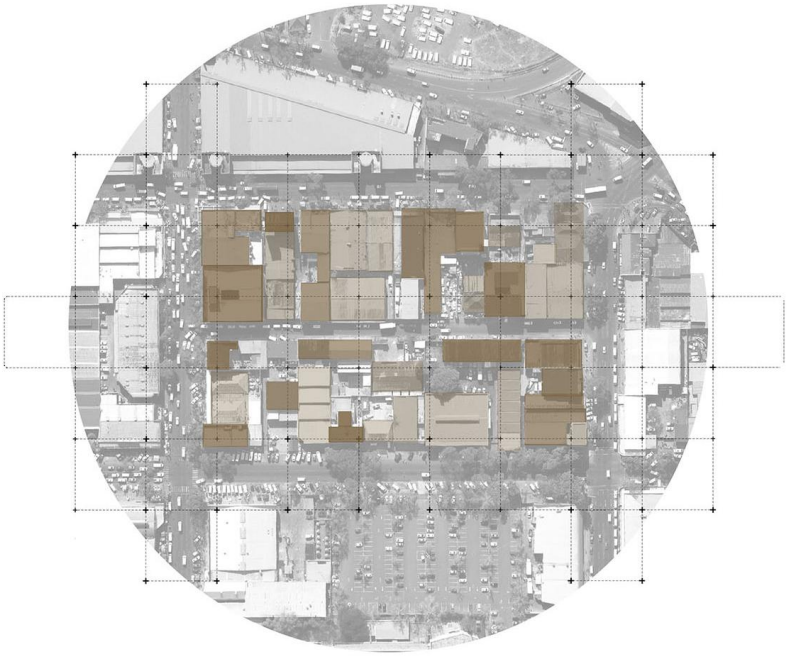

Figure 2.23 : Density and fabric analysis (Author, 2015).

SITE CIRCULATION ANALYSIS:

Primary roads form a ring around the block of Brown Street. These streets include Bloed Street (North), Lilian Ngoyi Street (West), Struben Street (South), and Sisulu Street (East). Secondary and tertiary roads, Brown Street and the service ways, allow access to the inner buildings of the block. Currently underutilized, these secondary and tertiary roads contain the potential of becoming pedestrianized to allow for site permeability and therefore maximizing public movement.

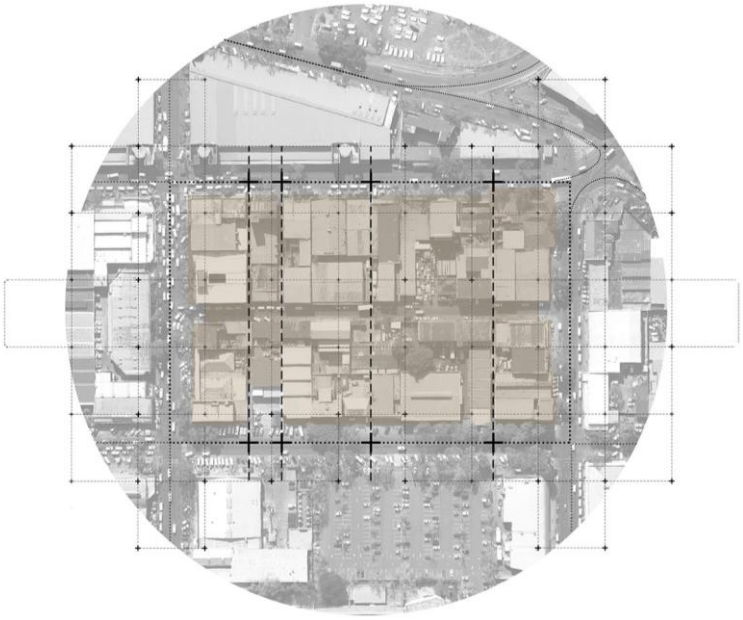

Figure 2.24 : Circulation analysis (Author, 2015).

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SITE HYDROLOGY ANALYSIS:

Due to the contour gradient, the block of Brown Street is located in the lower North-Eastern quadrant of the CBD. At present, the site does not make use of any method of water catchment. The lack of a water management system has induced the growth of vegetation in areas alongside the street where soil from surface runoff has accumulated. The lack of this essential infrastructure forms an important design informant. Hydrological activity, as illustrated below, becomes a major design generator..

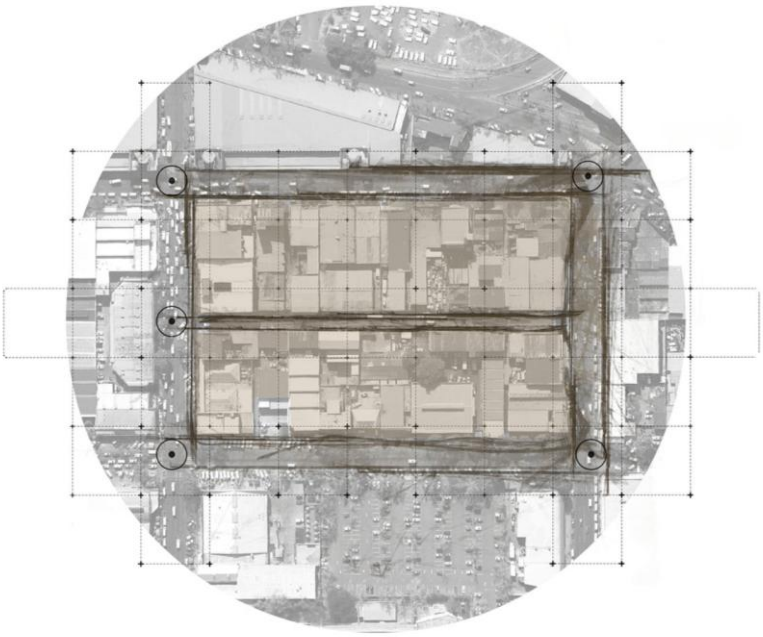

Figure 2.25 : Hydrology analysis (Author, 2015).

DESIGN POTENTIAL:

A series of design informants are superimposed to create an initial illustration of the design potential in the regeneration of Brown Street. This design potential diagram takes into account the conclusions reached in the micro analysis. It illustrates areas, located alongside service ways and based along Brown Street as the primary axis, that allow for maximum interaction of the [infra]structure with all existing structures on site..

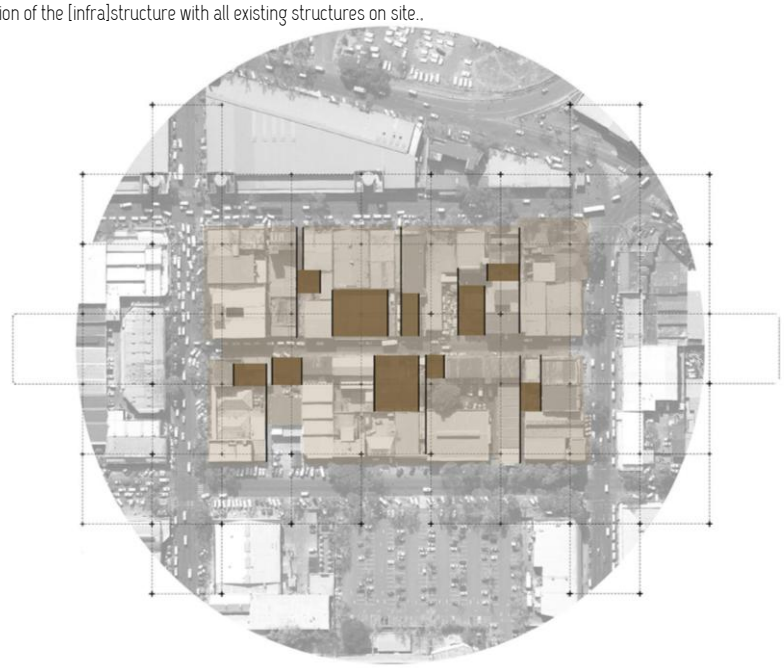

Figure 2.26 : Design potential (Author, 2015).

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MICRO ANALYSIS

[photographic site study]

This study is done to establish a visual understanding of the architectural and urban characteristics of the block of Brown Street. The decaying state of urban fabric emphasises the neglected and derelict state of the site since its decline in 2013. Brown Street now only exists as a manifestation of entropy.

THE NEGLECTED

[contextualizing neglected infrastructures]

In the next ten years' time, the city will face a water crisis. The Institute of Security Studies (ISS) suggests that it will equal the electricity pressure we are currently experiencing (reference article). A water plight will heavily impact the functioning and liveability of the city. This is an infrastructural issue and could lead to a further decay of the city's infrastructure.

[contextualizing dissertation intentions]

Therefore the intended *urban [infra]structure* will address the looming issue of water scarcity and will, use this infrastructure alongside other neglected infrastructures as a means to rejuvenate the decaying condition and fabric of Brown Street and its surroundings. This will done by harnessing regenerative potentials relating to the infrastructure of water. Other neglected infrastructures include: security, informal transportation, power and 'biodiversity'.

However, due to the increasing unreliability of these infrastructures to provide the necessary services, the idea is to alongside rejuvenation, create an infrastructural typology which not only sustains the fabric of Brown Street but is also regenerative in its context.

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A BRIEF HISTORY

[water and pretoria]

With a population of 2.9 million people, the city of Tshwane requires almost 800 million litres of fresh water per day. Although the population has grown considerably since its founding in 1855, the pristine drinking water from the fountain valley met all water requirements until the 1930s, after which subvention became necessary. People need water on a daily basis, whether it be for the purpose of drinking, washing or recreation. However, what is of little concern to the users of the water is where the water comes from.

Ground water has supplied the city with water for over 160 years. In fact, Pretoria was founded due to its vast water recourses. These are in the form of two natural springs in the Groenkloof region. The Bronkorst brothers established the farms of Eelands poort and Groenkloof in 1839 mainly due to the presence of these springs. The farms were then purchased by the Zuid-Afrikaanse Republiek in 1863 for water supply to Pretoria. President Paul Kruger declared Groenkloof a conservation area in 1895 to protect the wildlife in this region. The reserve also protects the dolomite aquifer that supplies water to the two springs; the upper and lower fountains respectively. These springs also contribute to the upper reaches of the Apies river. They supply up to 46 000 000 litres of water to Pretoria per day while still allowing surplus water to enter the Apies river.

In 1860, following Pretoria's selection as the seat of government, a network of furrows was constructed to divert water to the central part of Pretoria by means of gravity. The furrows were covered by slate in approximately 1885; then overlaid with earth and finally with paving. They served as storm water channels until the 1940s.. Remnants of these furrows can still be observed between Sammy Marks Square and the State theatre. The central fountain of Pretoria once stood in the middle of Church Square. It was later replaced by the statue of Paul Kruger and the fountain was moved to its current location at the Pretoria Zoo.

Pretoria's population growth may have been a function of its vast water resources, combined with its proximity to the Witwatersrand gold field and its status as capital city.. The city's population within the municipality gradually increased from about 35 000 in the 1900s to around 700 000 in the 1980s.. Since then the population as well as its municipal land area has increase rapidly which led to the creation of addition adjacent municipalities. A survey of done in 2013 revealed that the population has surged to about 2.9 million within a 640 000 hectare municipality. Water demand has followed the same trend; from 700 million litres per year in the 1930s to 88 000 million litres in the 1980s, and finally a present demand of 270 000 million litres per year.

Pretoria is a city with a strong history. An origin ascribable to two natural springs uninterruptedly supplying high quality water has developed into a city that houses the administrative capital of South Africa.. Within the context of a continuously developing and changing city the springs remain a consistent source; in both their faithful supply and outstanding water quality. Water is clearly one of main reasons for Pretoria's founding and rise to the leading city it is today. However, in order for this success story to endure, water should continue to be prioritized as an enabler. The occurrence of ground water, the formation of springs, the intricate geological history and the important hydrological heritage shaping the history of the city and the nation should not be overlooked.

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It should be appreciated for being a fundamental human need which governs our existence, our development, and the status of Pretoria in South Africa and the world. It is only with interest and knowledge that we can manage this precious hidden resource and its only with management that we can sustainably use this resource for the foreseeable future.

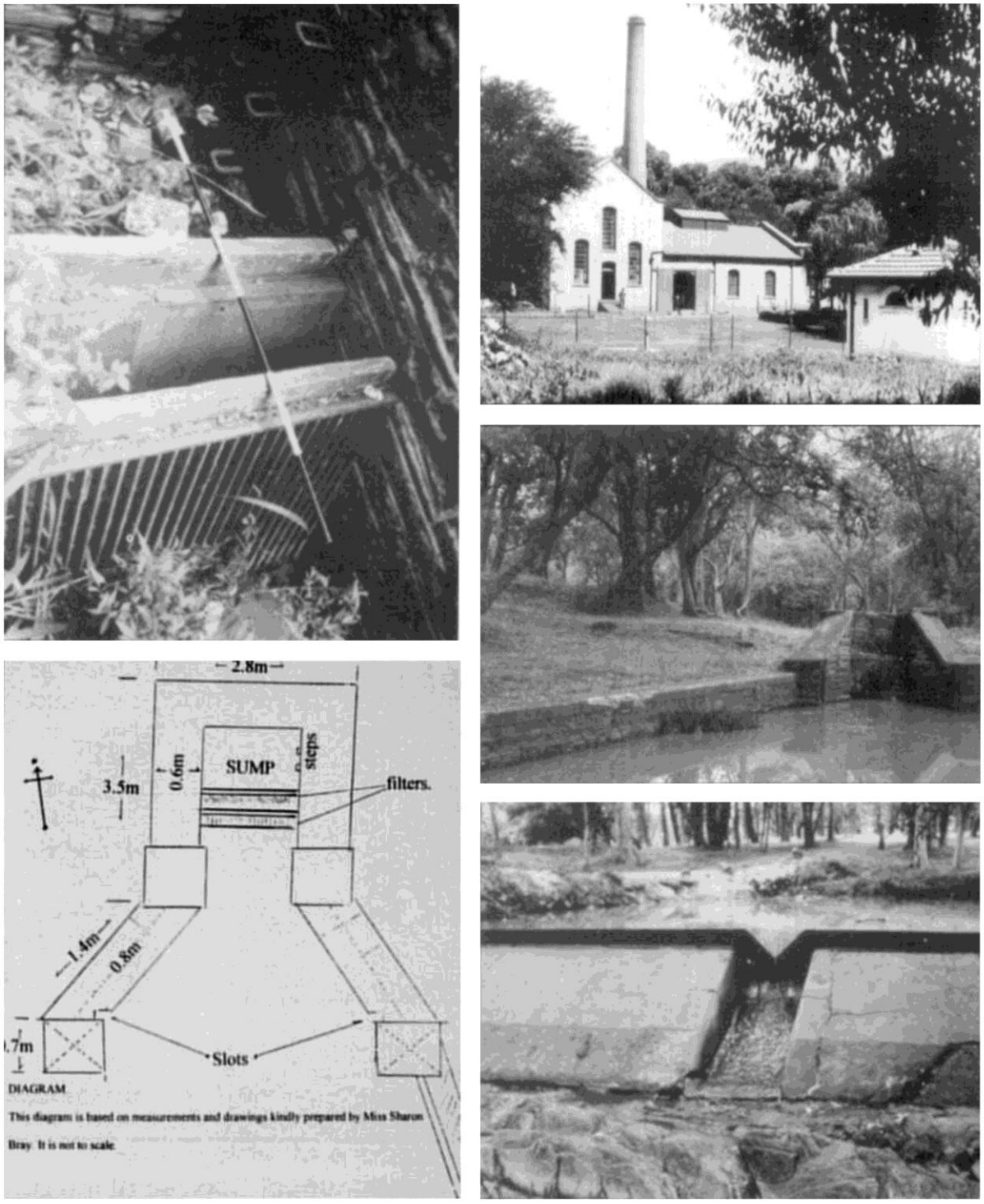

Figure 2.27 : Photographs of Pretoria's old pumping station (Author, 2015).

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CONCLUSION

[Urban Regeneration]

Pretoria as a heritage city has unprecedented potential. However, it is the discrepancy between old and new that deprives the city from achieving this potential. Koolhaas (1998: 1248) explains that "Not only is the centre by definition too small to perform its assigned obligations, it is also no longer the real centre but an overblown mirage on its way to implosion; yet its illusory presence denies the rest of the city its legitimacy".

The regeneration of the physically dilapidated fabric of the North Eastern periphery is not merely a matter of repair and restoration. As dilapidation of urban areas usually result from social and economic disorder (Clarke and Corten, 2009: 882), the aim then would be to restore the social cohesion and economic feasibility of these areas. This is to be achieved by means of an infrastructural architecture, which should in turn provide a sustainable platform for the surrounding fabric to be rehabilitated. Thus, the main intention for the block of Brown Street would be to tempt inhabitants and investors to invest in the precinct in an appropriate way. According to Clarke and Corten (2009: 882) this may be achieved by firstly formulating a clear perspective on the area's future. This future should be provided or secured by the local authority; it should be legally secured in an appropriate development plan. The development plan must be supported by a political will with a life longer than a single political term of office.

The first step toward integrating historical centres and future developments is to convince decision makers of the development potential the urban periphery has to offer. They must be assured that the city will benefit from such integration. A policy entitled "Integrated Conservation" aims at revitalizing dilapidated city quarters by reusing existing building stock and infrastructure. This entails (appropriately) their adaptation to meet current social and economic requirements (Clarke and Corten, 2009: 882).

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CHAPTER

03

[theoretical argument]

urban decay as a result of neglected infrastructure

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The following chapter focuses on theoretical argument; firstly, concerned with an understanding of the reason for the decay of urban fabric; secondly, with how one is to deal with such conditions; and thirdly, contextualization of a solution.

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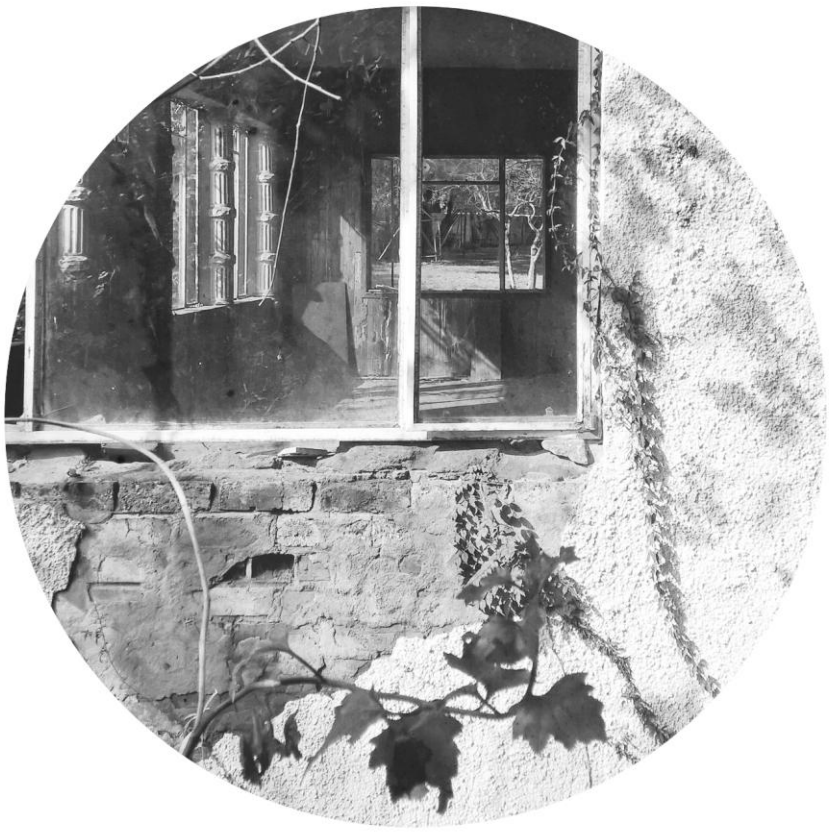

Entropy

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BACKGROUND AND DELIMITATIONS

To truly fathom the site and the various forces that have impacted its state of gradual decline, an attempt at a theoretical and often philosophical understanding is made in this chapter. It illuminates an awareness of the influences that initiate urban decay and provides insight into how architecture as infrastructure can lead to the regeneration of the site.

//

UNDERSTANDING THE URBAN

[the periphery condition]

The term periphery is used in conjunction with the term centre as the existence of the former implies that of the latter. These terms often appear in discourse on the urban fabric. They usually refer to a geographical positioning in space where the one exists in relation to the other. Generally, the centre is defined by the periphery. However, departing from this notion One could also say, simultaneously, the presence of the periphery implies a centre (Sennet, 2005: 1). If one were to examine the evolution of the geographical centre and the functions it historically hosted, an association and display of authority and power, where the empowered class is be revealed (Sennet, 2005:1). In ancient Greece the geographical centre is defined by markets and a public space and in conjunction, a place of decision making. In the medieval period, the city's centre was occupied by a religious function normally based around a square and city hall (Sennet, 2005:1). These historical roles all point to an empowered class functioning in the city centre. In Western cities, a desire to inhabit the centre roots from a desire for power and control. Therefore, the periphery is the essential threshold where the true nature of the centre is revealed. The centres existence through identity and function (Sennet, 2005: 2). The city of Tshwane is the administrative capital city of South Africa. As stated in the contextual analysis (Chapter 2, Figure 2.7), The primary means of inner city rejuvenation is the centralization of government departments. The Tshwane Vision for 2055 will see the accommodation of these government departments within the primary axes of the CBD. This centralization is intended to remedy the extensive and negative effects of stasis resulting from decentralization.

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'Identity centralizes; it insists on an essence, a point. It's tragedy is given in simple geometric terms. As the sphere of influence expands, the areas considered as central become larger and larger, hopelessly diluting both the strength and the authority of the core; inevitably the distance between centre and circumference increases to the breaking point. In this perspective, the recent, belated discovery of the periphery as a zone of potential value – a kind of pre-historical condition that might finally be worthy of architectural attention – is only a disguised instance of the priority and dependency of the centre: without centre, no periphery; the interest of the first presumably compensates for the emptiness of the latter. Conceptually orphaned, the condition of the periphery is made worse by the fact that its mother is still alive, stealing the show, emphasizing its offspring's inadequacies. The last vibes emanating from the exhausted centre prelude the reading of the periphery as a critical mass. Not only is the centre by definition too small to perform its assigned obligations, it is also no longer the real centre but an overblown mirage on its way to implosion; yet its illusory presence denies the rest of the city its legitimacy" (Koolhaas, 1998: 1248).

As evidenced by the proposed Re Kgabisa spatial framework (see Figure 2.7), the Tshwane vision fails to recognize the North Eastern periphery of its CBD as a zone of potential value. Using Koolhaas' (1998: 1248) terms; the Tshwane CBD's North-Eastern periphery remains in its "orphaned" state. It continues to be labelled as a zone of which the potential values remains "a disguised instance" (Koolhaas, 1998: 1248). he oversight and neglect of the periphery may be due to firstly, the municipality's "priority and dependency of the centre" and secondly, the peripheral fabric's current state of decay.

The planned centralization of the Tshwane vision's extensive 40 year long process is robbing its urban periphery of legitimacy.In *Radical Reconstruction*, Lebbeus Woods describes the physical urban fabric of the periphery as a "wall". "These most primordial of architectural elements are necessitated by the state of contemporary culture, which finds itself in the midst of a crisis that can be met fully at its peripheries and edges, but not at its core, even though that is where its causes and most fatal effects are found. At the core, this crisis is effectively disguised, while towards the boundaries, which are always to some degree neglected and at the limits of control from centres of authority, the disguise slips somewhat, and the crisis is revealed. The disguise is, of course, not simply an effect of the crisis, but a primary cause of it" (Woods, 1997, 13).

From Woods' theory we can thus conclude that neglect of the north eastern periphery is due to the fact that it remains excluded and therefore beyond limits of control. It is within the periphery, beyond the proposed spatial structure of the city, that the "crisis", urban decay, is revealed.

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[conclusion]

Although the roles of the centre and the periphery differ, they remain in close spatial relation to one another. It is only of recent that the terms "centralized periphery" and "marginalized centre" have come to challenge the grounded nature of the terms from its geographical place (Sennet, 2005: 2). These new terms originate from the manner in which the roles of the centre and periphery are reversed."Centralized periphery" is used to indicate the shift in interest from the centre to the periphery.

The Urban Hub Design Toolkit states that in contrast to the heart, which is considered the most central, public, dense and intense area, the peripheral zone provides the most flexibility but also needs to be the most responsive to the surrounds (Urban Hub Design Toolkit, 2013: 13). The primary role of the periphery is to mediate between The Heart and Corridor Zones of the surrounds. The periphery is less dense than the centre and should encourage **residents** in the surrounding areas to move into the **hub** and spaces that accommodate existing urban operators who cannot be accommodated in the more intensely developed zones (Urban Hub Design Toolkit, 2013: 13).

The intention of the Urban [infra]Structure is then to transform the North-Eastern periphery from being an environment of degeneration to one of regeneration. This is to be accomplished by means of inserting, within the heart of this degenerative environment (Brown Street), an infrastructure to highlight the importance of the urban periphery as an essential component of the urban fabric. In acknowledgment of urban theory, this infrastructure should respond to its surrounds in a way that its flexibility lends itself to a variety of uses relevant to its urban context. The idea is also that, due its intended infrastructural nature, the block of Brown Street be a sustainable component within its urban context, not longer dependent on the centre for its survival. Koolhaas suggests such a condition within his theory, "*The Generic City*".

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THE GENERIC CITY

[the independent periphery]

The generic city is a city liberated from the captivity of the centre. It is no longer part of the destructive cycle of dependency. However, such a city is also free of its identity. Koolhaas (2005: 16) proposes the concept of the 200% city; where the city is both 100% generic and 100% specific. The generic comprises of a set of standardized components. These components are responsible for providing the city with a visual language that determines the form, orientation and setting of public architecture. The generic components that influenced the planning of Pretoria range from its natural fortifications to its cardo-decumanus (Jordaan, 1989: 26).However, Pretoria is not only comprised of the generic, it is also forms part of a '100% specific city' in its projection of its African identity.

However, due to the lack of public infrastructure, the African identity has primarily taken places within the cities periphery. Within the context of this periphery the African identity has manifested itself within the "in-between" spaces of the urban fabric. It is an informal identity in the form of informal trading and taxi ranks. More specific to the "in-between" nature of Brown Street, the manifestation of this identity has revealed the formation of informal industries based on the creative recycling of remnant scrap metal from the on-site motor vehicle industries. This 'opportunistic' identity, unique within its context, is visible in the everyday activities played out in the streets of the north eastern quadrant of the CBD.

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Figure 3.1 : photograph of "in-between" SPACES of Brown Street. Informal Scrap Industry (Author, 2015).

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These most primordial of architectural elements are necessitated by the state of contemporary culture, which finds itself in the midst of a crisis that can be met fully at its peripheries and edges, but not at its core, even though that is where its causes and most fatal effects are found. At the core, this crisis is effectively disguised, while towards the boundaries, which are always to some degree neglected ar at the limits of control from centers of authority, the disguise slips somewhat, and the crisis is revealed. The disguise is, of course, not simply an effect of the crisis, but a primary cause of it. Some essential realities are being masked by what has been referred to as the "self-satisfaction" of mass culture."

Lebbeus Woods

(Inevitable Architecture, 2012)

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UNDERSTANDING THE CONDITION

[entropy]

"Most architects dislike the idea of buildings' decay and work hard to avoid it by the careful selection of materials, systems, and methods of assembly that will withstand the forces of nature continually attacking them, chiefly those of weather. Nevertheless, there is a tendency to decay inherent in materials and systems themselves – an entropy – that no amount of care in design or maintenance can overcome" (Woods, 2012).

Entropy, as used by Lebbeus Woods in understanding the principle of decay, is a term that describes the natural tendency of the universe to fall into disorder. The term was born into the world of classic thermodynamics (describing energy and its effect on matter) in 1865 by German physicist Rudolf Clausius. It was coined in 1865 by German physicist Rudolf Clausius to describe energy and its effect on matter in the field of classic thermodynamics.

Architect Erich Mendelson states "ever since science has come to realize that the two concepts of matter and energy, formerly very apart, are merely different states of the same primary element that in the order of the world nothing takes places without relativity to the cosmos without relationships to the whole" (Bullock, 1971 : 72). From this one can deduce that matter is inseparably part of energy and energy is part of matter. If matter is defined as "that which occupies space and possesses rest mass" (Oxforddictionaries.com) and architecture is defined as a profession where matter is manipulated in order to create space, then surely that which is created should be entirely influenced by energy. This concludes that architecture is inevitably subject to entropy.

Ben-Naim (2012: 6) declares that entropy occurs on both microscopic and macroscopic scales. On a microscopic scale entropy occurs on a molecular level; energy is exchanged between atoms. On a macroscopic scale entropy can be observed through a "tangible piece of matter that you can see and work with". Similarly, disorder can be observed within the complex exchanges between objects of matter in a system. In the Built Environment, the material manifestation of architecture is vulnerable to such disorder due to its societal ideals.

In most cases the built environment exists as a strictly controlled system which, while controlled, remains in an initial state of equilibrium as it is maintained. Maintenance enables its operations to take place. These operations normally require an environment that exists almost in isolation from its natural surrounds. However, once human activity is removed, an increase of entropy is inevitable. This can most often be observed in abandoned industrial sites where components of the

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system, which were once isolated, are able to become part of that system. This results in a new state of equilibrium; a state of continual transformation. In this state, natural processes create a disordered "entropic condition" in the system. What an architect here ponders is: How can we prevent this from happening? A more logical question should then be proposed: How can the architect acknowledge the condition of entropy so as to not conflict with nature but instead change and decay with nature? Smithson notes that "architects tend to be idealists, and not dialecticians". He proposes "a dialectic of entropic change" (www.robertsmithson.com).

Lebbeus Woods believes that there are three ways of dealing with the entropic condition of decay. The first and most common approach is that of denial. For example, we as humans deny "our own inevitable decay and extinction [and] proceed in life as though we will live forever" (Woods, 2012). Without any promise of endurance, architects would become "paralyzed by despair" (Woods, 2012). This is probably why Lebbeus decided to never build anything; he was well aware of the inevitable fate of the building. The second approach of dealing with the entropic condition is to "embrace or at least accept decay" (Woods, 2012). However, Woods found this approach problematic, as he felt that "the evocative power of ruins" is too often exploited for ideological, religious and political purposes, but they are rarely used to advance knowledge" (Woods, 2012). The third approach is the "acceptance of decay of buildings" (Woods, 2012). Architecture has the power to "inform our understanding of the human condition and enhance its experience" (Woods, 2012). We should therefore "include within the design a degree of complexity, even of contradiction embodied in the simultaneous processes of growth and decay in our buildings that heightens and intensifies our humanity" (Woods, 2012).

This approach to design aims to include a continued palimpsest of layers, which, instead of having a new building decay and eventually be entirely replaced, introduces the complexity of a layered perception of time. This is referred to by Woods as "inevitable architecture" (Woods, 2012).

Entropy must therefore not be considered as a destructive force. It is a progressive force that reminds us of the fact that nature cannot be overlooked or ignored. Thus, architecture that accepts the complexity of decay is able to anticipate change and transformation. It demonstrates flexibility in the design. Such a design accepts the inevitability of decay in the way its spaces come to express the layering of time. Harmony should then be found by the way in which the entropic narrative of the context is continued in the architectural design of the new. Feeding off of this narrative, in which ever form these may be, can lead to the unveiling of various potential and energies. Energies and potentials, relating to the sites origin, which seek to be reinstated.

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Figure 3.2 : Photographic illustrations of decay in architecture (Author, 2015).

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UNDERSTANDING THE POSSIBILITIES

[regenerative architecture]

\Rooted in the idea that decay is a natural phenomenon and that it therefore should inherently exist in harmony with nature and its processes, architecture should engage the natural world as a medium for and generator of the design.

Regenerative architecture stems from sustainable architecture, in that sustainability focuses on trying to make buildings "less bad". It is a standard that requires very little regarding the environment. In the world of sustainability, a built structure is celebrated if it employs any level of environmental acknowledgement.

Regenerative architecture differs distinctly from sustainable architecture. It utilizes the living and natural systems on site to become the "building blocks" for the architecture.. It has two focuses; it is an architecture that focuses on conservation and performance through a focused reduction on the environmental impacts of a building. This focus relates closely to the intentions of sustainability. However what distinguishes regenerative architecture is that it prioritizes its intentions on the treatment of the environment as an equal stakeholder in architecture. The practice of this type of architecture employs "a full understanding of natural and living systems in the design of a structure (Littman, 2009: 1). "It is an architecture that embraces the environment and uses the millions of years of engineering and evolution as the foundation for a regenerative structure" (Littman, 2009: 1). Regenerative architecture is based on the premise that everything we build has the potential to integrate the natural world as an "equal partner in the architecture" (Littman, 2009: 2).

Architecture is defined as "the art or practice of designing and constructing buildings" (merriam-webster.com). However, this definition of architecture excludes the breadth of possibilities of the regeneration and integration which as a result limits architecture to only the design of a building (Littman, 2009: 2). Buildings always exist as part of a place, the site, however this component is neglected within the above definition. The question then becomes why we as architects tend to remove the building from its site in the defining of architecture? Littman (2009: 2) states that "the building requires the site for its existence, but we view them as separate elements. Perhaps we can expand the definition of architecture to "the art or practice of designing and constructing place, through the integration of the site and building". By including the site, in as many way as possible, is the only way in which architecture is able to be " beyond sustainable" or regenerative (Littman, 2009: 2). Applying the current definition of architecture to the design thereof, will result in a static entity devoid of

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environmental integration and this leads to a linear model of consumption and waste (Figure 3.2). Removing the building from its site requires the constant input of energy and recourses that end up as waste. This is a degenerative approach and with a finite amount of resources available, we can no longer afford to base the design of buildings on the linear model. It is essential to note that there is no such thing as waste in the natural world. Everything that is produced naturally gets recycled; an imperative part of the cycle of life (Littman, 2009: 3).

Architecture is therefore regenerative when its definition includes more than just the building "The architecture is the place, the site, the systems, the energy, the building, the fauna and flora, etc. It is an architecture that is purely embedded into the site. It exists as one piece, only system that co-evolves as one complete entity. Once this understanding of architecture is adopted, the opportunities for regenerative architecture become almost limitless" (Littman, 2009: 4).

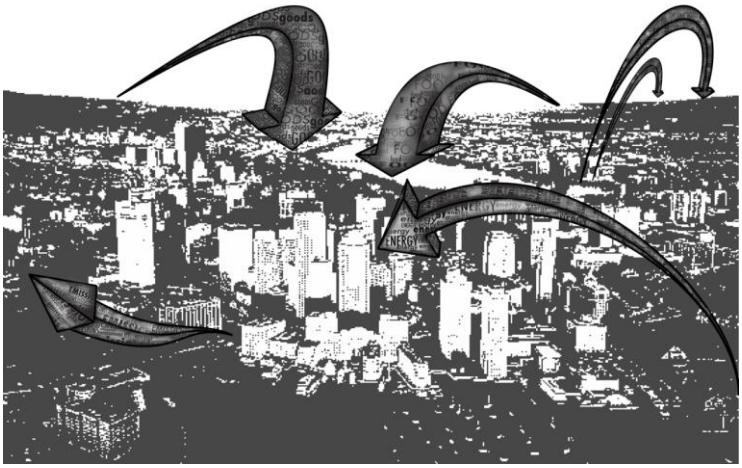

Figure A: Current model of resource and material treatment (Littman, 2009: 3).

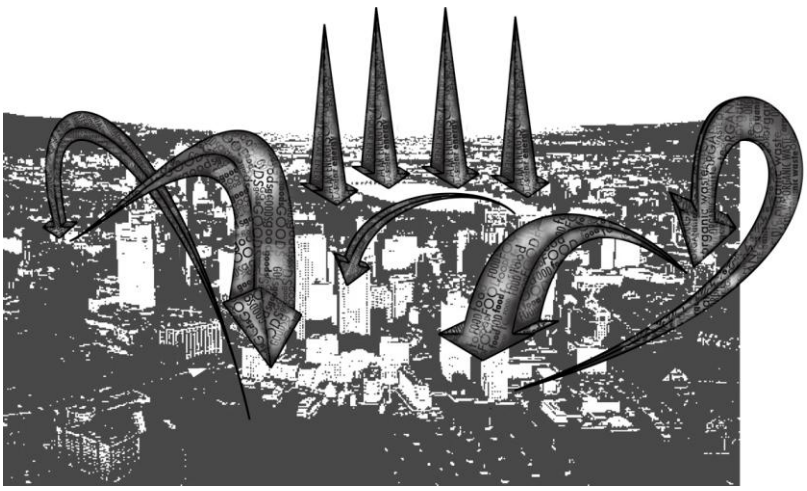

Figure 3.3: Model of regenerative urban system (Littman, 2009: 3).

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CONCLUSION

[Rethinking Infrastructure]

As cities exponentially increase in scale and complexity, practitioners in the fields of design, specifically architecture, struggle to understand and translate the impact made by infrastructure on the urban environment. Since the discussions of "landscape urbanism" in the 1990s, architecture began looking at other disciplines to provide clues as to how to deal with the complex nature of contemporary cities: for example, the way in which the practice understands and utilizes dynamic systems to allow landscape architecture the ability to articulate ground conditions (Seewang, 2013: 1).

"For architects in particular, the definition of what might constitute an architectural approach to infrastructure remains somewhat unresolved since the effects of infrastructure on an architectural scale are almost absent from contemporary discourse and comprehension at the urban scale often focuses on the diminishing significance of form and boundaries - concrete architectural concepts - in the face of a system of networks and floes in the contemporary metropolis" (Seewang, 2013: 1).

The practice of architecture works by synthesising a disparate array of information in order to produce a physical form that meets a range of social requirements. Dialogue between the various parties in the design process broadens the scope of questions asked and assists in determining possible solutions."The ability to convert diverse qualitative information into formal responses - to think architecturally - is a fundamental strength of architectural methodology, independent of the scale and form that the response takes" (Seewang, 2013: 1).

Infrastructure directly influences the city; moreover, it is the most immediate way to address human needs. Reyner Banham states in his 1965 essay for *Art in America* "A Home is not a House,"; likewise infrastructure acts as the agent between the social component and the architecture that it accommodates. Infrastructure should then form part of the design process, mediating between the questions and their architectural responses. Various infrastructural case studies highlighted by Seewang illustrate the mediation between natural resources to supply urban needs reframes the concept of "the city" into a complex site of social, political and economic forces. (Seewang, 2013: 2)

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Figure 3.4: Skeleton Forms: Network of infrastructure projects in nineteenth-century London overlaid on top of *Fortifications of London City* (Carrelo-Mendez, 2009: 3).

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CHAPTER

04

[precedent study]

4.1 Theoretical / **Magnets** / C. Price 1996

4.2 Functional / **Parc de le Villette** / B. Tshumi 1982-1998

4.3 Programmatic / **Community Green Station** / Architectural Services Department 2014

4.4 Services Precedent / **Centre Pompidou** / Richard Rogers and Renzo Piano 1977

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The chapter focuses on the four categories of precedent studies; related to components of theory, function, program and services. Each study is discussed with reference to the proposed design for the Block of Brown Street.

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Presistance of Nature

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4.1 theoretical precedent

Magnets

by C. Price 1996

[urban infrastructure and planning]

In 1996 as part of seven projects on the theme of anticipatory architecture 'Magnets' by Cedric Price proposes ten short life structures, to be funded by local authorities, which would provide amenities and stimulate new patterns of public movement. As an 'anticipatory architecture', the magnets were designed as temporary, mobile, structural adjustments to the existing public realm. "The magnets are both pragmatic and polmatic in the way they turn space to the public advantage. Unlike conventional architecture, they are not an end in themselves but encourage the continual necessity for change" (Price, 1996).

The 10 magnets include: Stairways, Promenade, Platform, Arcade, Causeway, Pier, Arch, Transporter, and City Square. These structures were intended to occupy space not usually seen as sites that are available for public use, such as, air space above roads, streets, parks, lakes and railways. They were designed to generate new kinds of access, views, sanctuary, safety and delight; to "overload" underused or misused sites and make them more delightful and playful (Hardingham, 2003: 89).

This concept of building design reveals new possibilities for architecture. Buildings, in the way that they become infrastructural, become part of the urban structure and although they appear light-hearted, they allowed to exceed their conventional functional expectations. The projects of both Tschumi and Price provide planning approaches that are theoretical and contextual and also contain the need to be flexible (see "Flexibility", Chapter 1).

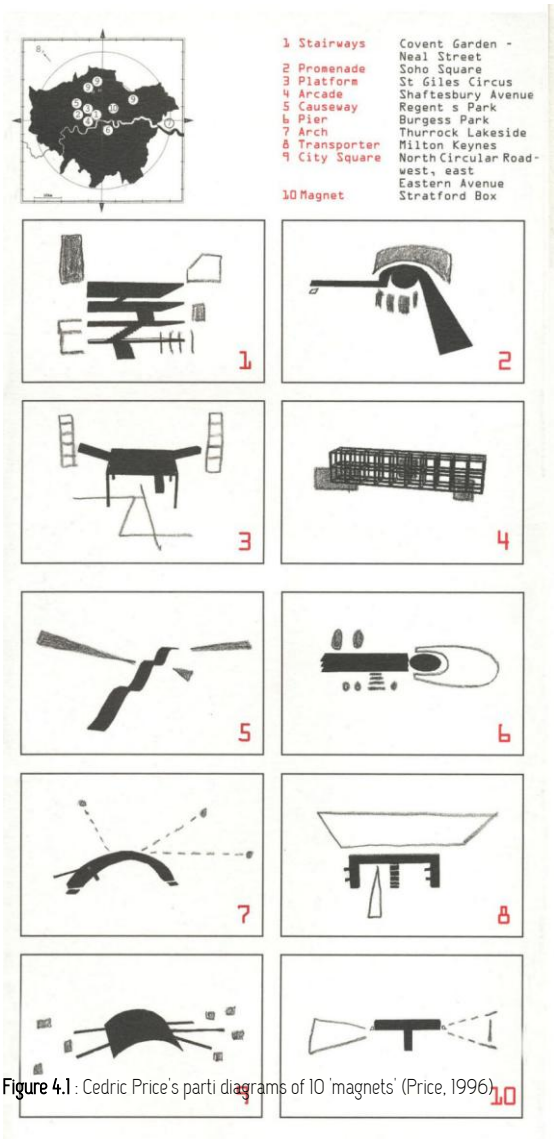

Figure 4.1 : Cedric Price's parti diagrams of 10 'magnets' (Price, 1996).

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cedric price

Anticipating the unexpected

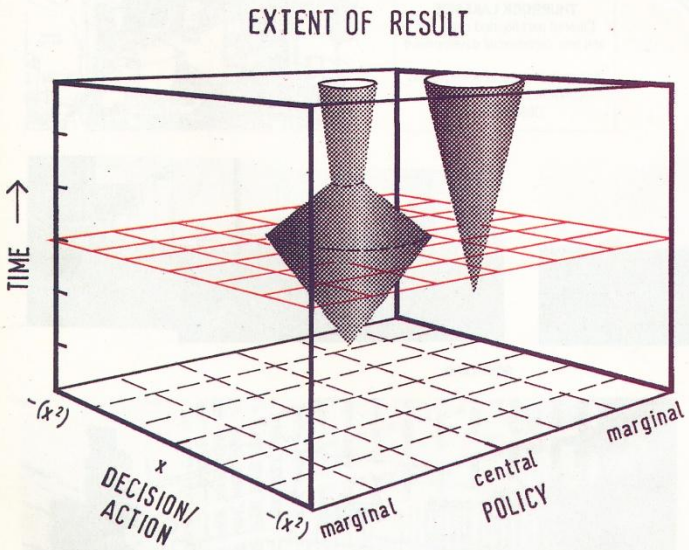
In the following pages Cedric Price explores some of the themes which are examined in his recent work on anticipatory architecture. The work refers to the seven projects outlined below

'There are many situations in which to be systematically late, is to be systematically wrong'

Sir Geoffrey Vickers VC, 'Value Systems & Social Progress' 1968

To establish a valid equation between contemporary social aspirations and architecture it is essential to add to the latter doubt, delight and change as design criteria. Architecture is slow and therefore requires anticipatory design. Clients should never be embarrassed by admitting doubt or ignorance or by changing their minds – that's what we're here for – and why I have selected these extracts of some projects of the 1990s.

Cedric Price



THE LOGIC OF OPERATION APPROXIMATION (OR SHIPS THAT PASS IN THE NIGHT)

STRATTON

A cross-Rhine international road link together with a phased development of previous industrial and dockland zone. A new TGV station is included in the proposed educational, industrial and community plan development to be administered by a new Joint Cities authority. The new motorway enables a variety of uses below, while the motorway itself is incorporated within larger activity volumes. Long-term redevelopment of industrial polluted land creates new demolition and horticultural industries.

HAVEN

Bremehaven recognises the need to increase both tourism and advanced scientific/ oceanographic industries to replace declining ship-building and fishing. A new ocean research dock is established with increased tourism phased with new city access and communication.

RINK

Consideration of a rail Channel link bridge over the Thames, as opposed to a tunnel.

APPEX

Design 'primer' for rail passenger station designers. In-office use only.©

MAGNET

Magnets are installed on existing metropolitan sites which are underused or misused. The structures are transplants providing socially beneficial movement routes. Their planning encourages adjacent future growth while the fixed life structures enable variation and reassembly to be undertaken with speed and minimal disruption.

STRATE

Forty-three hectares of British Rail land adjacent to Stratford E15 centre designated for redevelopment of the existing main-line station together with a Channel link station. Variety of options require further consideration – political, social and economic – occasioning phased future development. Intermittent work undertaken since 1989 – project is on-going.

MILLS

A variety of pedestrian riverside movement is combined with phased agronomy and public space programme in this south end of the Lea Valley Park. Adjacent to STRATE and former site of the proposed FUN PALACE.

Figure 4.2 : Cedric Price's parti diagrams of 10 'magnets' (Price, 1996)

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4.2 Functional Precedent

Parc de le Villette

by B. Tshumi 1982-1998

[public infrastructure and planning]

The Parc de la Villette was designed to revitalize an abandoned and undeveloped piece of land in Paris, France. The idea was to redevelop the land between a meat market and slaughterhouse which dates back to 1860. Briefed to design an urban park, Tshumi envisioned the Parc de la Villerte as a place of culture where natural and artificial are forced together in a state of constant reconfiguration and discovery.

The Parc de la Villette was designed according to three principles of organization that Tshumi classifies as points, lines, and surfaces. The 135 acre site was organized spatially into a grid of 35 points, which he called follies. The series of follies gave a dimensional and organizational quality to the vast expanse; serving as points of reference. The repetitive nature of the follies, though each unique and different, allow for visitors to retain a sense of place.

Similar to the Manhattan Transcripts (1976 - 1981), Parc de le Villette manifests urban life and activity where space, event and movement all converge into a larger system. Criticized of being too large and designed without consideration for the human scale and argued to exist within a vacuum not responding to the history and context of the site. With such a large scale, however, the design becomes an analytical and conceptual approach to the way a human feels within a larger urban setting. The theory is justified and gives meaning to a design that prioritizes creation of space over building.

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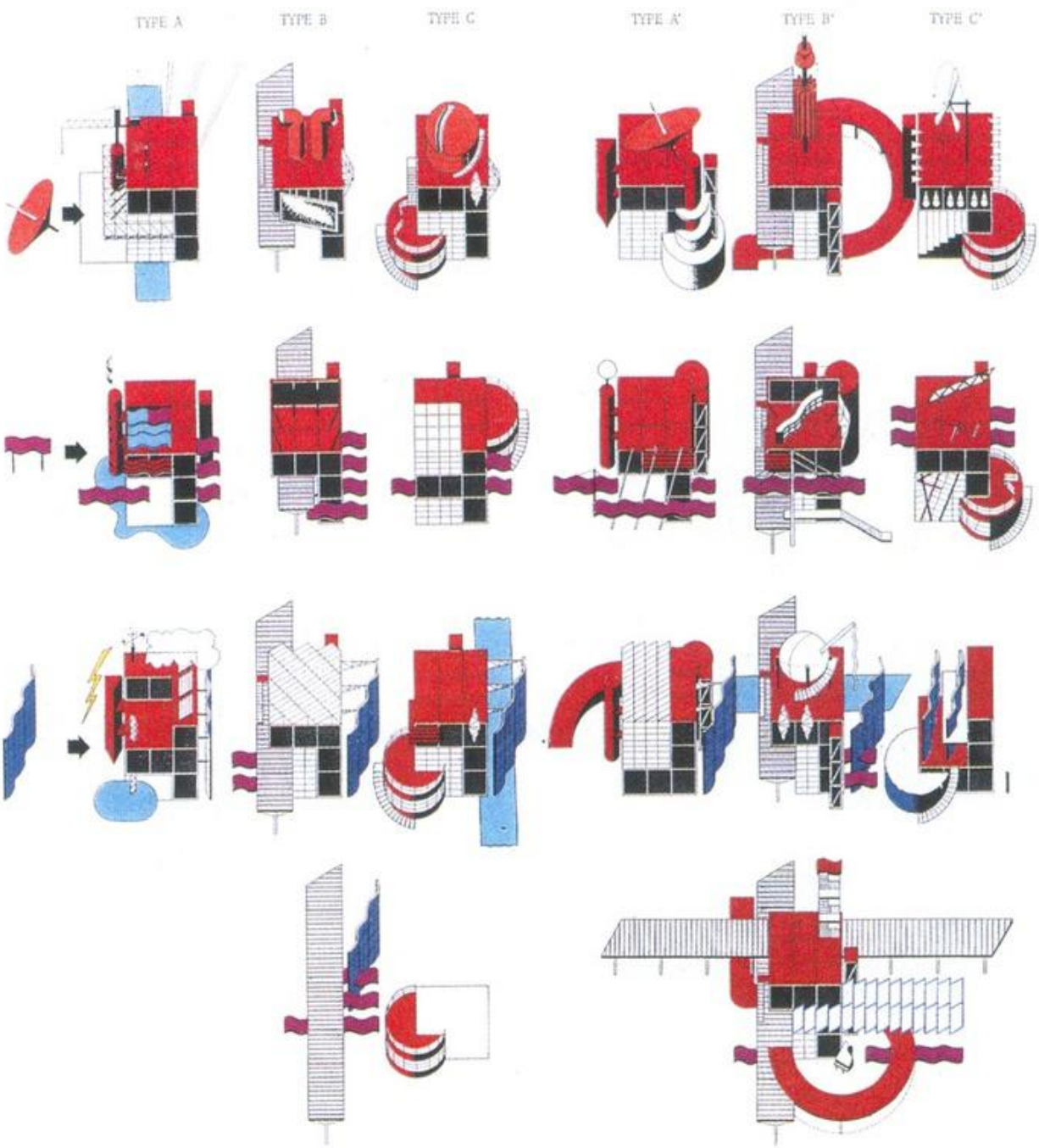

Figure 4.3 : Diagram Series of folly types by Tshumi (Achdaily.com)

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4.3 Programmatic Precedent

Community Green Station

by Hong Kong Architectural Services Department 2014

[program and function]

Located in Sha Tin, Hong Kong, the Community Green Station is a pilot project for the implementation of the Government's 'reduction first waste' management strategy. The project supports recycling efforts at a community level. It also holds exhibitions and offers educational programs to advocate the importance of recycling. The station consists of an education centre, workshop, office and ancillary facilities.

The challenge of the project was to create a temporary recycling station that would have a positive impact on the community. Having turned an underutilized car park into a gathering place, the idea was not create a rubbish collection point but that to fashion a positive addition to the local area. In this way, sustainable design is not treated as a technique, but as a part of local culture.

The design is divided into a garden courtyard and backcourt that serve as a function of exhibition and workshop respectively. Modular containers are modified to suite different functions. A central garden engenders a sense of community in the form of an oasis within the heart of an industrial area. These components bring into being a multi-layered space; from public to private; from open space and semi-open space to enclosed area. It is an interpretation of a pavilion in a Chinese garden.

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Figure 4.4 : Photographys of Community Green Station (Achdaily.com).

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4.4 Services Precedent

Centre Georges Pompidou

by Richard Rogers and Renzo Piano 1977, Paris, France

[architecture and infrastructure]

In the 1970s, architects Richard Rogers and Renzo Piano collaborated on the design of a cultural centre in Paris, the Centre Georges Pompidou. Their primary concept for the building was to portray the museum itself as movement. Secondary to this, but framing applicable precedent for this dissertation, is the concept of exposing all the infrastructure of the building. All the different mechanical and structural systems are shown, not only so that they can be understood but also to maximize the interior spaces without interruptions. The various systems on the exterior of the building are painted different colours to distinguish their different roles. The structure and largest ventilation components are painted white; stairs and elevator structures are a silver-grey; ventilation is painted blue; plumbing and fire control are green; the electrical elements are yellow and orange, and the elevator motor rooms and shafts, or the elements that allow for movement throughout the building, are painted red. Part of making these systems visible to the users of the building is that the articulation and organization of these services not only define spaces but also guide users in and around the building.

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Figure 4.5 : Photographs of Centre Pompidou and its services(Achdaily.com).

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CHAPTER

05

[program development]

urban decay as a result of neglected infrastructure

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The chapter focuses on the theoretical argument concerned firstly, with an understanding of the reason for the decay of urban fabric; secondly, with how one is to deal with such conditions; and thirdly, contextualization of a solution.

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Brown Street

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INTRODUCTION

The proposed program explored by the architecture endeavours to return meaning and value to the decaying condition of the "in-between". It suggests a shift from an environment of degeneration to one of regeneration. which by means of redefining existing infrastructure to establish a new contributive relationship with its surrounds.

The program of the regenerative infrastructure should aim to rehabilitate the city block through the unveiling and harnessing latent potential of neglected infrastructures. This potential can be expanded to provide inhabitants with a sustainable source of resources while maintaining a beneficial relationship between the urban and the natural environment.

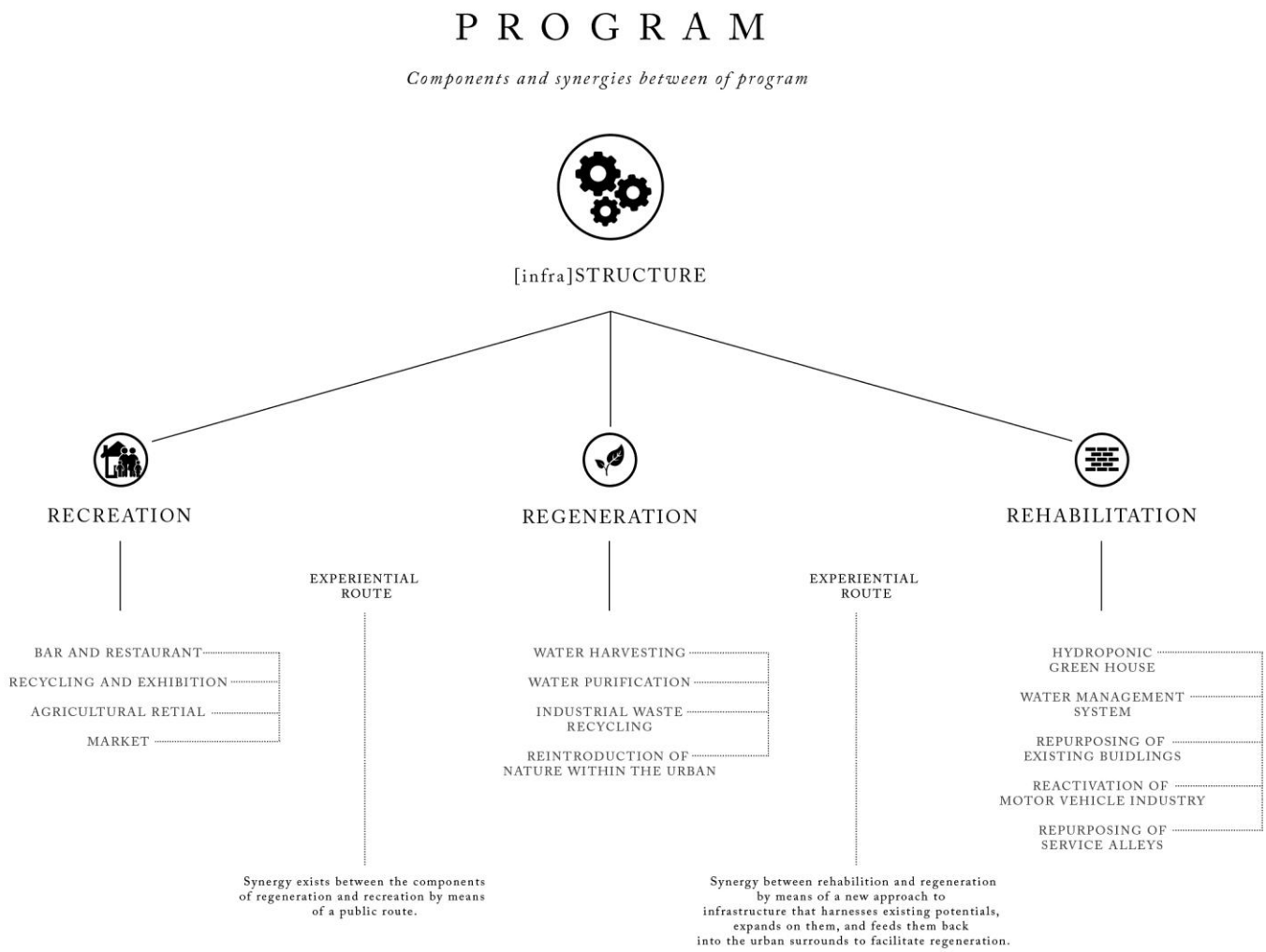

Figure 5.1 : Diagram illustrating components of the program of [infra]structure (Author, 2015).

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PROGRAMMATIC INFORMANTS

6.1 [Macro]

The block of Brown Street, located at the North Eastern edge of the Pretoria CBD, forms the defining threshold of the Soutpansberg gateway. As part of centralization, the Tshwane 2055 vision plans to establish links between the CBD and the economic nodes of Hatfield, Brooklyn, Menlyn, Irene and Centurion via formal transport systems. However, this plan of linked development has failed to recognize the North Eastern gateway, which grants access to the CBD from the North and North East.

6.1.1 [Urban Hub]

One a human level, the hub responds directly to its latent contextual potential of transportation where the various modes of transport are brought together harmoniously. Therefore serving as an urban hub where the collection and communication of people and resources manifest an energy within the core of the city block and initiate a process of transformation. The NDP (National development program) published for the city of Pretoria in 2013 encourage municipalities to invest in urban hubs. The program suggests a strategy that will enable long term restructuring of our urban settlements (NM & Associates Planners and Designers, 2013: 1).

The strategy is based on an understanding of the urban structure, which sees our cities as two distinct but independent networks (NM & Associates Planners and Designers, 2013: 1). The CBD of the city is at the centre of the primary network.

There may be a few networks within a multi-nodal urban system however, such primary network/s functions as an anchor access precinct. The secondary networks feed into the primary network. A "portal" connects the two types of network; bridging between, for example, the secondary networks in a township or a group of townships and the primary network (see Figure ##). Such portals offer access to the primary network/ node via a combination of higher order public transport links. The rail forms the backbone of these public transport networks.

It is for this reason that these points/ nodes/ portals of maximum connectivity between the primary and the secondary become the ideal places for local reinforcement and concentration of resources (NM & Associates Planners and Designers, 2013: 1). If we are to give meaning to the restructuring imperative of the NDP, focus should be drawn to more equitable patterns of access through spatial and social economic integration. Investment in these hubs will be catalytic; their market dynamics will in turn support smaller/lower income neighbouring hubs (NM & Associates Planners and Designers, 2013: 1).

These hubs will form the connection between the CBD and the broader city area. As points of

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connection, they should provide a service not only to the local residents but also those within the broadly defined area (region of district). Hubs should function as urban "service centres ". A number of important public services must here be combined with commercial activities. Essentially, this defines the role of a town centre. Historically, town centres hold symbolic value as they develop over time and so become meaningful to the people who use them. It should therefore be the intention of urban hubs to attain cultural significance (African Identity). Residential components are another feature of town centres. Commercial land use and transport services are heavily reliant on residential developments. Residents also provide essential levels of vibrancy and increased levels of passive security. Without residential integration and the resultant 24-7 occupancy and accessibility, it is likely that these hubs will not succeed. In conclusion, an urban hub should be a service point (key housing/ working destination for local residents); a potential draw-card into the area for outside residents; and a gateway to the broader urban area for local residents. The urban hub has the potential to address a number of needs simultaneously. These include social problems, such as, unemployment, crime, degraded environments, lack of key bulk infrastructure, base local and metro wide connectivity; but also broad concerns of a low private sector confidence level and social economic integration. If these new hubs are to succeed as vibrant, mixed-use environments they must create a sense of place; cater for those on foot; be structured around a safe, convenient, secure and comfortable public space network; and be supported by a mix of land uses and activities.

6.1.2 [Recycling]

Inhabitants of the in-between have turned the condition of decay and disadvantage to an advantage; recycling manageable quantities of industrial scrap metal in the creative production of sculpture. This gives rise to the opportunity of including educational and cultural recycling as a component of the regenerative system (Littman, 2009: 3). The Community Green Station (see precedent 4.3) is an ideal example of how recycling efforts can assist regenerative transformation within a dilapidated area. Accommodating these recycling processes in the proposed [infra]structure will help to reduce waste on site and, in turn, clear the much needed "in-between" spaces of the city block. The design of the building intends to transform these spaces into public routes that improve pedestrian mobility. Therefore, the "people of crisis" or "the inhabitants of the in-between" (Woods, 1997: 13); the informal artisans; and the individuals responsible for the informal recycling efforts are the artists/ artisans responsible for the recycling component of the [infra]structure. These artisans also play another crucial role in added security through surveillance.

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WATER AS ENABLER

[water harvesting]

Water is an essential feature which contributes to the liveability of a city. It is not only necessary to sustain human life but is also to life source of the natural world. Based on the assumption that by the year 2025 there will be a shortage of water, arrangements must be made to assure provision of potable water that is not only sustainable but also regenerative.

The following section describes how contextually driven programs have been formulated to address the potential water crisis, while simultaneously addressing urban decay in a regenerative manner. The inclusion of water in the intervention is important to the immediate site and forms the driver of the project's urban component. It assures the site inclusion in the Tshwane 2055 urban vision.

[the design of living technologies for waste water treatment]

by John Todd

The emerging field of ecological design can address a broad range of issues. It will influence the future of waste water treatment, environmental restoration and remediation, food production, fuel generation, architecture and the design of human settlements. Ecology is the foundation for the development of new technology capable of supporting society (Todd, 1996: 109). Ecological engineering is merely three decades old and attempts to codify design principles thereof must thus be tentative. As a discipline, it is only in the past few years that ecological engineering has been formalized.

The terms ecological technology, living technology and living machine are used interchangeably. Mitsch (1993) states that "ecological engineers participate in ecosystem design providing choices of initial species as well as the starting conditions; nature does the rest". This view represents a fundamental shift in thinking about the relationship of humans with other forms of life in a technological setting (Todd, 1996: 110). Such engineering allows for the same to be said for ecology within the realm of the built environment.

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[infra]structure : water

Infrastructure should form part of the process, mediating between the questions and their architectural responses. As architects reclaim their original tools, they should relate architecture to material practices, such as, ecology and engineering; practices that are concerned with the conception and transformation of large scale assemblages over time (Delalex, 2006: 54). Based on the idea that infrastructure is to become architecture, it is then essential to understand the process of water treatment. It is crucial to grasp how this process facilitates the creation of space.

[the Living Machine]

The Living Machine is an emerging wastewater treatment technology. It utilizes a series of tanks that support vegetation and a variety of other organisms. Engineered by Dr. John Todd, the machine gets its name from the way in which the ecologically-based components are integrated in the treatment process. The Living Machine incorporates many of the basic principles used in conventional biological treatment systems; including sedimentation, filtration, clarification, absorption, nitrification and de-nitrification, volatilization, as well as anaerobic and aerobic decomposition. Primarily, it is the use of plants and animals in the treatment process that sets the system apart from conventional water treatment. It should be noted, however, that while the system is aesthetically appealing, the extent to which the animals and plants contribute to the treatment process in the current design of the Living Machine is still being verified. The Living Machine, Inc. describes a wastewater treatment system that it is capable of achieving tertiary treatment; costs less to operate than conventional systems when used to achieve a tertiary level of treatment; and does not physically require chemicals that are harmful to the environment as part of its treatment process (Living Machines, Inc., 2001).

"Several federally-funded Living Machine® demonstration systems have been constructed, the largest of which handled design flows of up to 80,000 gpd. As configured for these demonstrations, these systems treated municipal wastewaters at various strengths, and reliably produced effluents with five-day biochemical oxygen demand (BOD5), total suspended solids (TSS), and Total Nitrogen < 10 mg/L, Nitrate < 5 mg/L, and Ammonia < 1 mg/L (U.S. EPA, 2001 and see Table 1). With regard to phosphorus removal, the Living Machine® process is capable of about 50 percent removal with influents within the 5-11 mg/L range" (U.S. EPA, 2001). THE COMPONENTS OF THE LIVING MACHINE®: (1) ANAEROBIC REACTOR, (2) ANOXIC REACTOR, (3) CLOSED AEROBIC REACTOR, (4) OPEN AEROBIC REACTORS, AND (5) CLARIFIER.

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Step 1

[Anaerobic Reactor }

When activated, the anaerobic reactor serves as the initial step of the water treatment process. The reactor has a similar function to that of a septic tank and is usually covered or buried below ground level. The main intention of this initial step is to reduce the concentration of BOD_5 and solids in the waste water prior to its treatment by the ensuing components. When necessary, gases are passed through an activated carbon filter to control odour (U.S. EPA, 2001: 2).

Step 2

[Anoxic Reactor]

The anoxic reactor is mixed and has controlled aeration to prevent anaerobic conditions. The main purpose of this component is to promote growth of floc-forming micro-organisms, which will remove a significant portion of remaining BOD_5. Mixing is accomplished through aeration by a coarse bubble diffuser. Additionally, an attached growth medium can be placed in the compartment to facilitate the growth of bacteria and microorganisms (U.S. EPA, 2001: 2).

Step 3

[Closed Aerobic Reactor]

The purpose of the closed aerobic reactor is to reduce wastewater BOD_5 to a low level, to remove further odorous gases and to stimulate nitrification. In order to remove odorous gases the tank is coupled with a bio-filter. The bio-filter is typically situated over the reactor and is planted with vegetation to control moisture levels in the filter material. (U.S. EPA, 2001: 2).

Step 4

[Open Aerobic Reactors]

Next in the process is the series of aerobic reactors. These are similar to the close anaerobic reactors in both design and mechanics; however, instead of being covered with a bio-filter, the surfaces of these reactors are covered with vegetation supported by racks. These plants provide the surface area of the wastewater with microbial growth, perform nutrient uptake and can serve as a habitat for beneficial insects and micro-organisms. The aerobic reactors are designed to once again reduce the levels of BOD_5 and also to complete the process of nitrification. The size and number of these tanks are dependent on the influent characteristics, effluent requirements, flow conditions, and the design's water and air temperatures (U.S. EPA, 2001: 2).

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Step 5

[Clarification]

A clarifier is used as this component in the system. The tank allows for the remaining solids to be separated from the treated wastewater. The settled solids are pumped into the closed aerobic reactor (step 5), or transferred to a holding tank and then removed for disposal. The surface of the clarifier is often covered with duckweed, which prevents the growth of algae in the reactor (U.S. EPA, 2001: 2).

[Applicability of the Living Machine]

The Living Machine is designed to be capable of treating both municipal and some industrial wastewaters. However, due to the fact that the treatment process requires plants, it can take up more space than conventional systems. A positive to be considered is the educational benefits of the Living Machine; to create awareness of the advantages of water treatment and how such treatment processes contain regenerative possibilities.

Figure 5.2 : Diagram illustrating the Living Machine as incorporated into small scale system (Author, 2015).

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Figure 5.3 : Photographs of an original Living Machine system components (reference, 2015).

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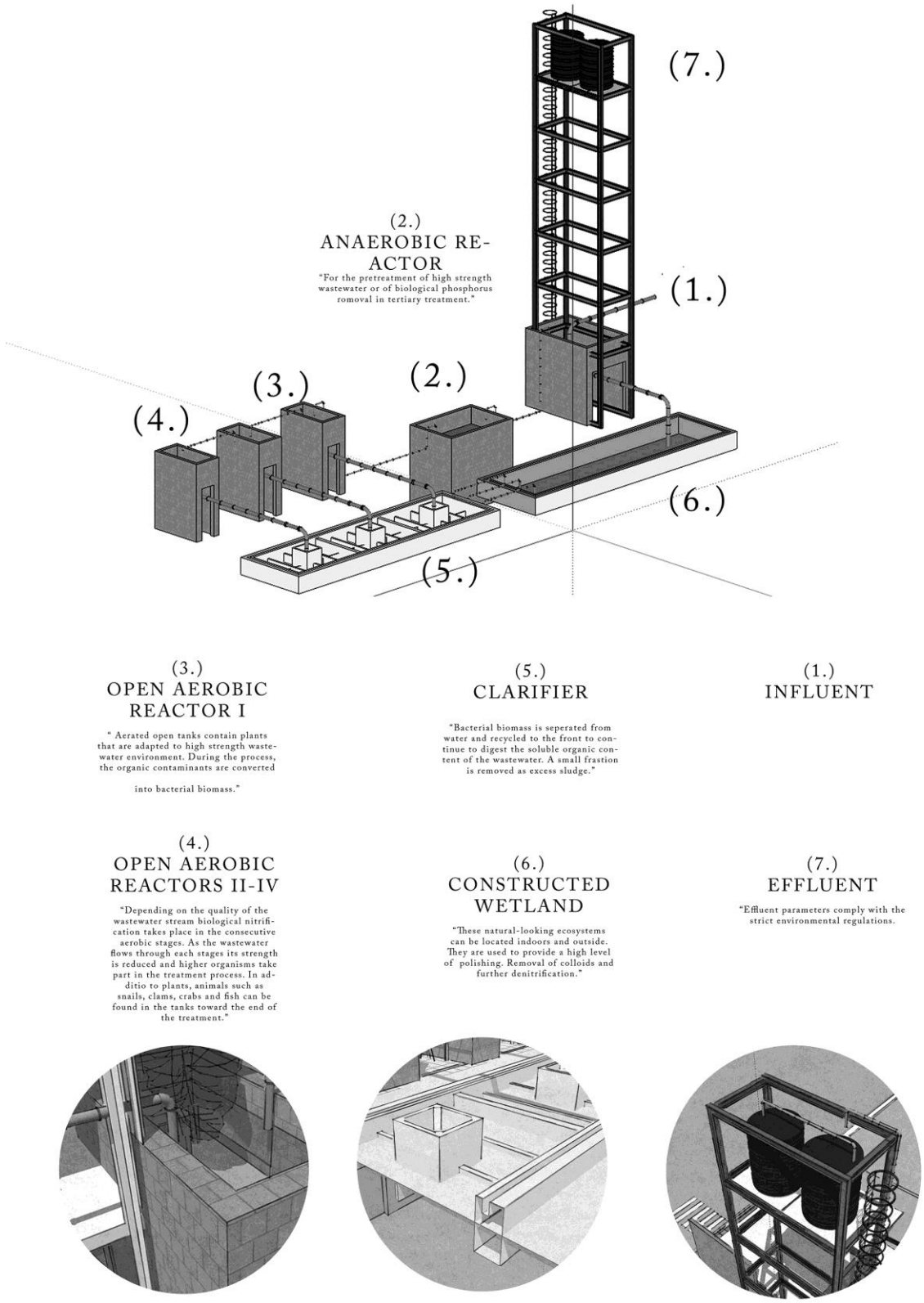

Figure 5.4 : Diagram illustrating components of the Living Machine as incorporated into a baseline iteration (Author, 2015).

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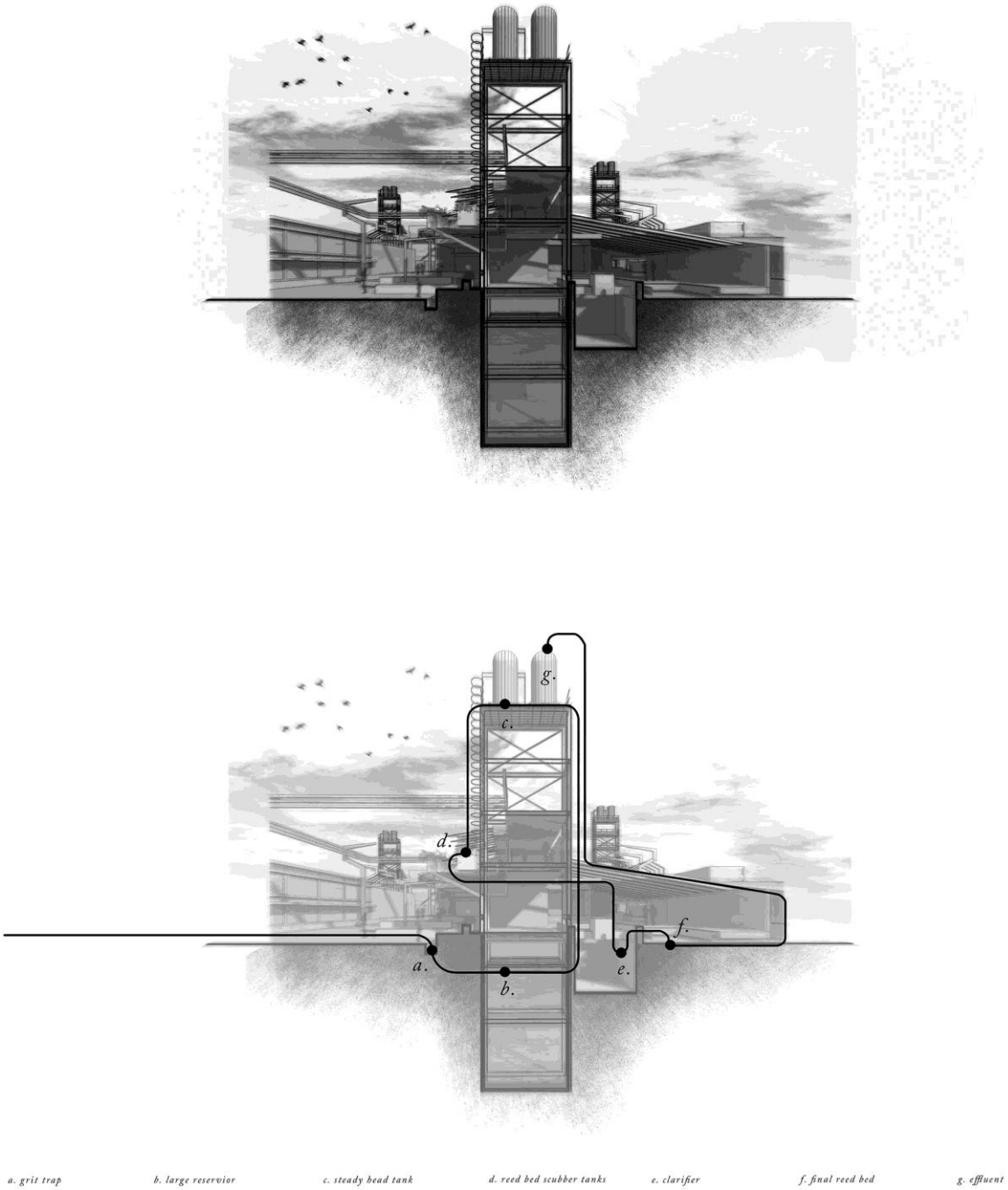

Figure 5.5 : Diagram illustrating components of the Living Machine as incorporated into an early design iteration (Author, 2015).

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CHAPTER

06

[design development]

urban decay as a result of neglected infrastructure

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The chapter focuses on the main design generator and substantiates the decision-making process within the theoretical, practical and infrastructural context of the dissertation.

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Birds of the City

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"There are always people who will come to inhabitthe difficult spaces of the wall. They are the people of crisis, pushed usually unwillingly to confontation with limits, borderline cases of every sort, adventurers, criminals, inventors, con artist, opportunites, people who cannot, or have not been allowed to, fit in elsewhere. They are nomads of the body, refugees of the mind, restless, itinerant, looking without much chance of finding a sure way either forward of back. Instread, they turn the situation to an advantage, making uncertainty a verture, and strangeness an ally."

Lebbeus Woods
(1997, 13)

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INTRODUCTION

The design concept is an amalgamation of the theoretical investigation in Chapter 3. The design of an Urban [infra]Structure results from manifesting the analytical, theoretical, programmatic and precedential premises as discussed in the previous chapters. The project investigates the decay of urban peripheries as well as the way in which the continued neglect of infrastructures have led to their degenerative nature. The mapping and analysis of Tshwane's 2055 infrastructural vision concluded that although the vision is regarded as one of potential it in fact continues to facilitate this urban periphery condition defined by the block of Brown Street.

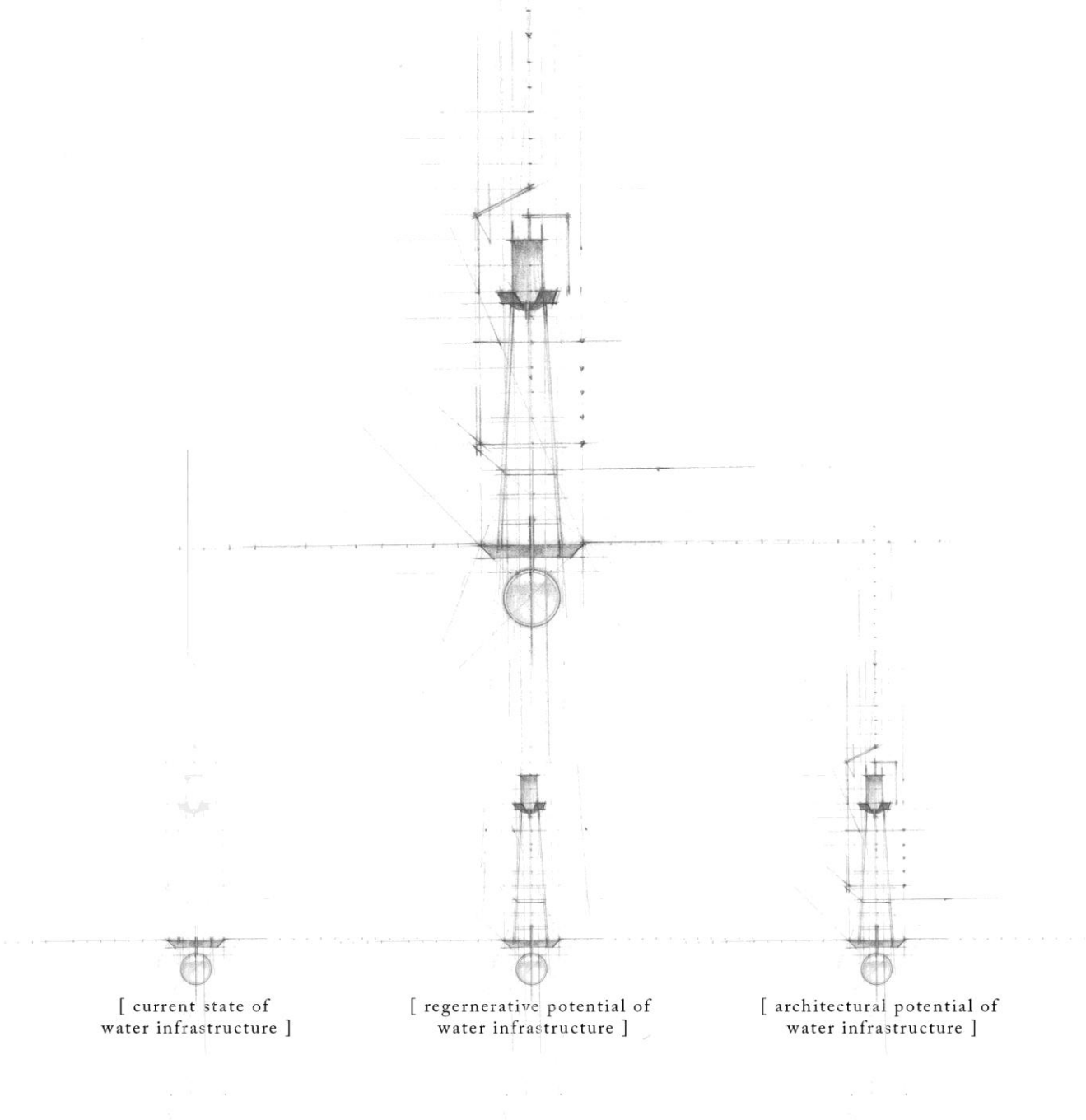

Figure 6.1 : Diagram illustrating the design concept development (Author, 2015).

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SUMMARY OF DESIGN INFORMANTS

6.1.1 [site potentials]

The design of the Urban [infra]Structure intended for the block of Brown Street is based on existing urban, precinct and site potentials. These potentials are, in order of scale, the urban synergy with the 'Re Kgabisa' inner city framework; the social capital present within the North-Eastern periphery stemming from the informal transport hub; resultant commercial activity; remains of vacant buildings on Brown Street; and the site's geographical location within the orthogonal layout of the CBD, which allows for conditions ideal for inner-city water harvesting. All these potentials offer physical informants for direct and tangible design responses.

6.1.2 [program potentials]

The programmatic potential of the project is realized through an in-depth understanding and unlocking of existing on-site and contextual potentials, as stated above (7.1.1). The programs selected are based on their potential to contribute to a regenerative infrastructure.

6.1.3 [theoretical potentials]

6.1.3.1 The Urban Periphery Condition

Based on the theoretical and philosophical underpinning discussed in Chapter 3, the periphery condition is one which denies itself (North-Eastern quadrant of the Pretoria CBD) legitimacy. This denial is due to the fact that there is a continual desire toward the centre; the historic core of the city. In contrast to the core, which is considered to be the most central, public, dense and intense area, the peripheral zone should provide the most FLEXIBILITY but also needs to be most RESPONSIVE to its surrounds (Urban Hub Design Toolkit, 2013: 13). The primary role of the periphery is to mediate between the Heart and Corridor Zones of the surrounds. Being less dense than the centre, this zone should encourage residents in the surrounding areas to move into the hub and spaces that accommodate existing urban operators who cannot be accommodated in the more intensely developed zones (Urban Hub Design Toolkit, 2013: 13).

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Departing from the periphery's state of dependency, Koolhaas suggests a Generic City; an ideal situation where the periphery becomes an independent entity "liberated from the captivity of the centre" (Koolhaas, 2005: 16). The generic city is no longer part of the destructive cycle of dependency. The success of this urban strategy is based on the fact that the Generic City is one free of identity (as identity roots from the historic core). Pretoria, however, is not only comprised of the generic; it also forms part of a '100% specific city' in its projection of its African identity. Public space in the generic city model is generally found as public squares. As Pretoria lacks public infrastructure, public spaces are found within the streetscape. This lack of public infrastructure in the North-Eastern periphery has resulted in 'insurgent' activity; the informal appropriation of the "in-between" spaces of its fabric.Therefore, Koolhaas (2005: 16) proposes the concept of the 200% city, where the city is both 100% generic and 100% specific.

6.1.3.2 Entopic Decay

Entropy, a term based on the 2nd law of thermodynamics, describes the natural tendency of matter to fall into a state disorder. The same law is applied by Lebbeus Woods in which theory concerning "*Inevitable Architecture*", in which the inevitability of decay is considered to be the future condition of all materials and therefore, architecture. Architecture as a material entity is dependent on the energies associated with occupancy; in essence, maintenance. It is this very principle that has led to the decay of Brown Street's fabric. It is not only the vacancy of buildings but also the obstruction of public access that here cause the absence of architecture's human component.

Therefore, to design for decay is to "include with the design a degree of complexity, even of contradiction embodied in the simultaneous processes of growth and decay of our buildings that heightens and intensifies our humanity" (Woods, 2012). It is the manifestation of entropy that is communicated in the layering of change over time. Entropy is evidence of the presence of nature in time. This designed complexity is a continuation of the entropic flow; "ruins melt and merge into new structures, to get a marvellous energetic juxtaposition occurring, with accident a large part of the whole process" (Smithson, 1973).

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6.1.3.3 Regenerative Architecture

Stemming from the idea that decay is considered a natural phenomenon and should therefore inherently exist in harmony with nature and its natural process, architecture should engage the natural world as a medium for and generator of the design. Regenerative architecture "utilizes the living and natural systems that exist on site" that become the "building blocks" for the architecture. It has two focuses; it is an architecture that focuses on conservation and performance through a focused reduction on the environmental impacts of a building. This focus relates closely to the intentions of sustainability. "It is an architecture that embraces the environment and uses the millions of years of engineering and evolution as the foundation for a regenerative structure" (Littman, 2009: 2). It is based on the premise that everything we build has the potential to integrate the natural world as an equal partner in architecture.

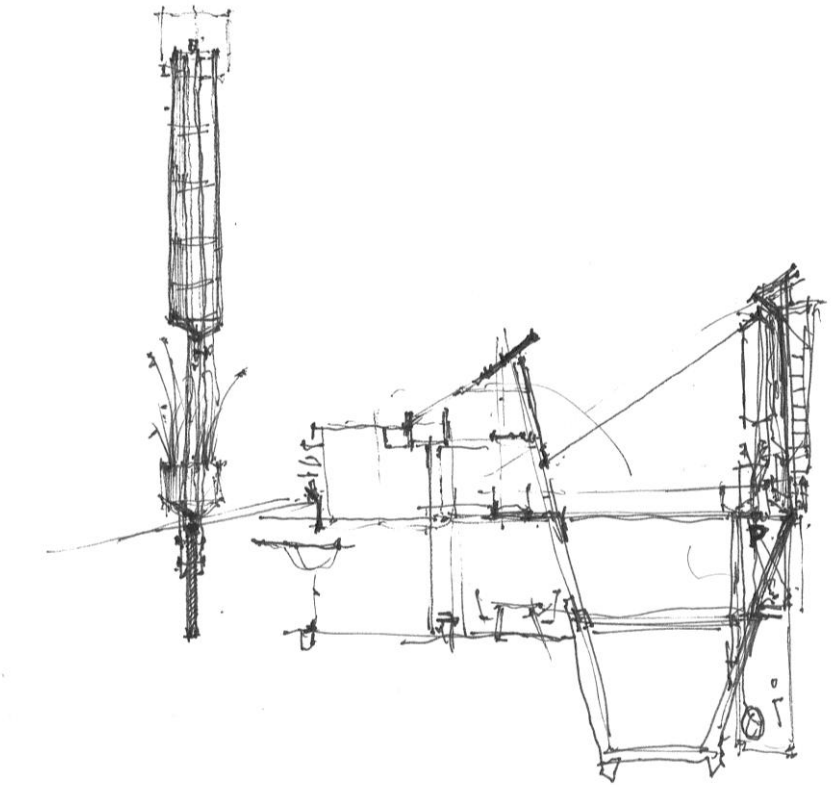

Figure 6.2 : Sketch diagram illustrating conceptual section iteration (Author, 2015).

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CONCEPT

6.1.3.4 Rethinking Infrastructure

Contemporary cities are required to maintain a flexible organization. The enables them to absorb a continuous spatial reformation without losing their specificity and centrality (Delalex, 2006: 51). Specificity and centrality are both essential in an urban environment such as Pretoria, which thrives on identity. In synthesising theoretical premises, the architecture required in this peripheral context is to take on many roles. Firstly, it is to be flexible; not only in its ability to adapt to the ever-changing nature of identity, but also to the expected changes in its context. Secondly, it has to be sustainable in that it is free of its dependency. Lastly, and most importantly, is to be regenerative; it must prioritize the natural world as the catalyst for rehabilitation of the urban.

If this architecture is to regenerate, architects must incorporate a certain complexity of the real in their design. They must thus redirect their interest toward questions of scale, use, movement, flow and exchange; so moving toward an infrastructural design. Infrastructure not only has the ability to act directly on the city but it is also the most direct way to address human needs (Seewang, 2013: 2). Infrastructure therefore acts as the agent between the social component and the architecture that it accommodates (Banham, 1965: 79). Infrastructure should then form part of this process; mediating between the questions and their architectural responses. As architects reclaim their original tools, they should relate architecture to material practices, such as ecology and engineering, which are concerned with the conception and transformation of large scale assemblages over time (Delalex, 2006: 54).

The concept of an [infra]structure becomes the medium by which the city block of Brown Street is transformed. The transformation of the city block is necessitated by a persisting condition of urban decay. The identification of the site's latent internal and external infrastructural potentials enable transformation in addition to the site's internal and external resources, forming a system of interdependent components within the envisioned [infra]structure.

[infra] : Latin for "below" & theoretical principles of expanding.

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Urban [infra]Structure

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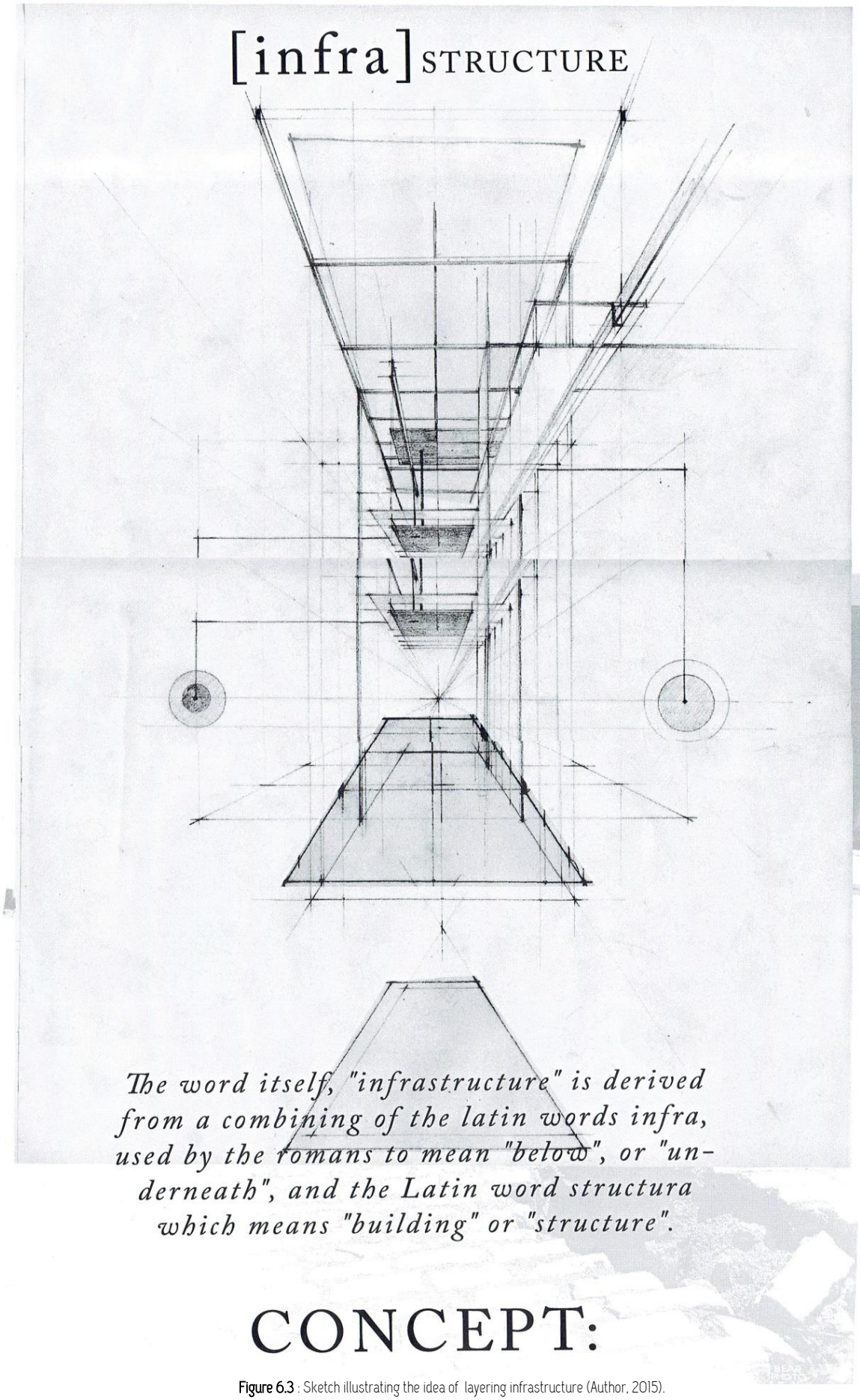

Figure 6.3 : Sketch illustrating the idea of layering infrastructure (Author, 2015).

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6.2 DESIGN

6.2.1 [background]

In Chapter 7 the proposed [infra]structure of Brown Street is explained within the parameters of seven main design generators. These design generators influenced the process of decision making throughout the development stages of the design progression. The generators address design concerns regarding the urban, precinct and site analyses, building program, environmental aspects, site-based influences and, most importantly, the way in which the creating of an [infra]structure leads to the design of architecture.

6.2.2 [theoretical Premise]

Within the context of Brown Street, this dissertation explores an architecture of infrastructure. The systematic manifestation of infrastructure within the degenerative "in-between" spaces of the city block will result in the creation of a regenerative environment capable of rehabilitating not only the city block itself but also its dilapidated context. The design strategy for this dissertation is to develop the zones of the site which have not only been most affected by the degenerative nature of the site but also the transformation of the in-between spaces which led to the decay of the surrounding fabric.

6.2.3 [Brown Street as Service Core]

Anticipating that the rehabilitation of the city's urban periphery will lead to investment in and development of the block of Brown Street, an investigation is made into the possible nature of the regenerative infrastructure. Remembering the role of infrastructure as "the basic physical and organizational structures needed for the operation of society" as well as considering the , it was seen fit to initiate the design process with the creation of a *'service core'*. The service core is a distinctive feature. It provides: structural solidity as well as room for elevators, toilets, and other amenities that contribute to the main network for utility services, power and data. The service core influences many aspects of the design of buildings, such as those concerning structure, access and even shape.

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The service core is defined as the *"distinctive feature that plays an important role in the success and sustainability of the whole"* (Trabucco, 2010; 1). Investigation into possible site locations and relevant design potentials of the intended [infra]structure maniphested within three stages **(see figure 6.3)** illustrated as:

A. "inserting" B. "contextualizing" C. "feeding"

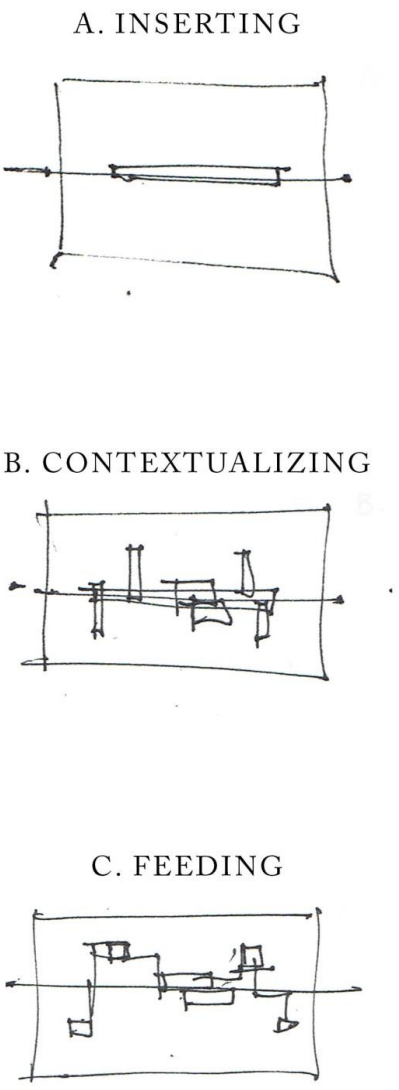

Figure 6.3 : Sketch diagrams illustrating site location of proposed 'service core' within the block of Brown Street (Author, 2015).

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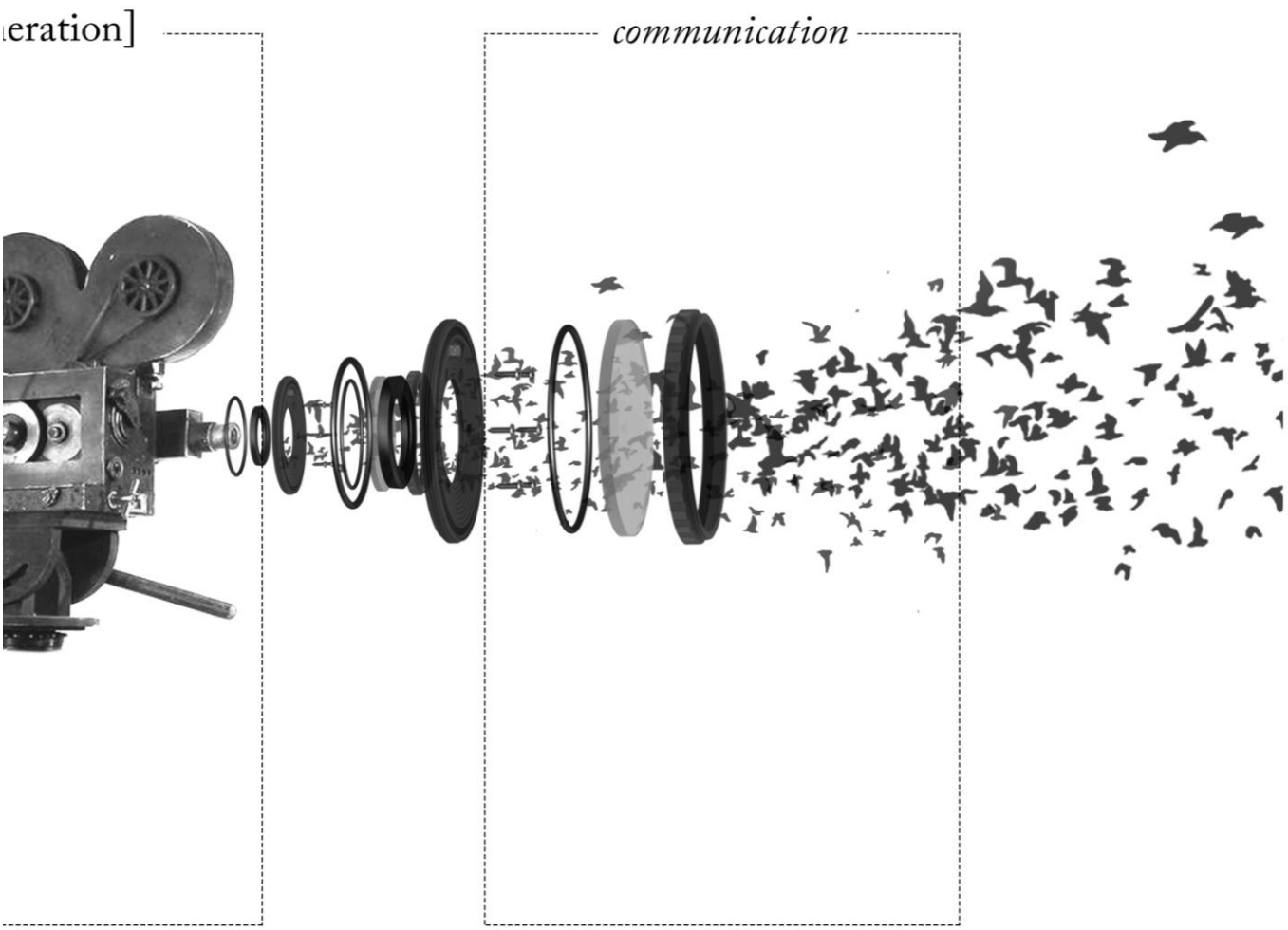
RUCTURE



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6.3.1 INSERTING

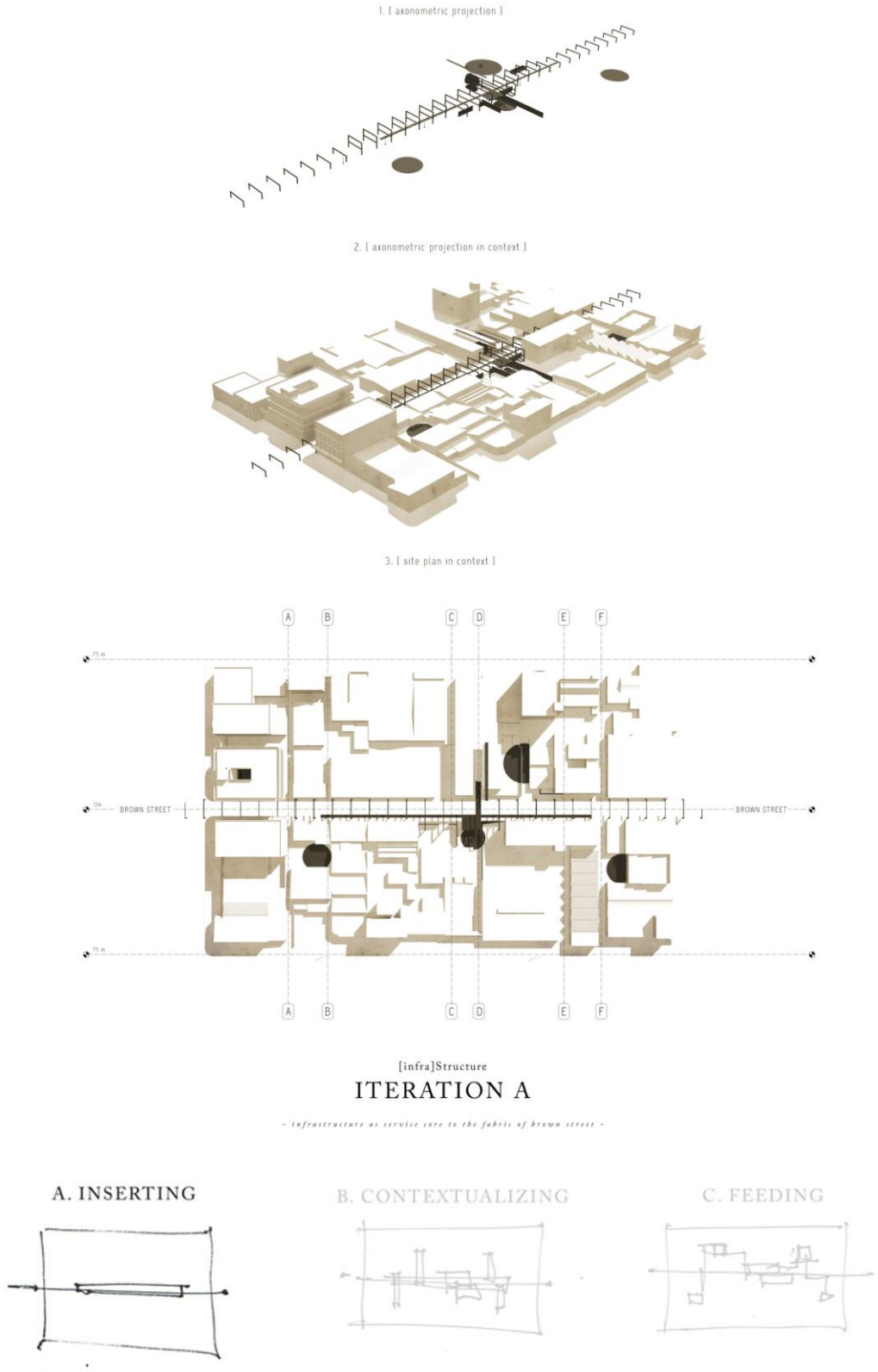

Figure 6.4 : Diagram illustrating the INSERTING of [infra]structure (Author, 2015).

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7.3.2 CONTEXTUALIZATION

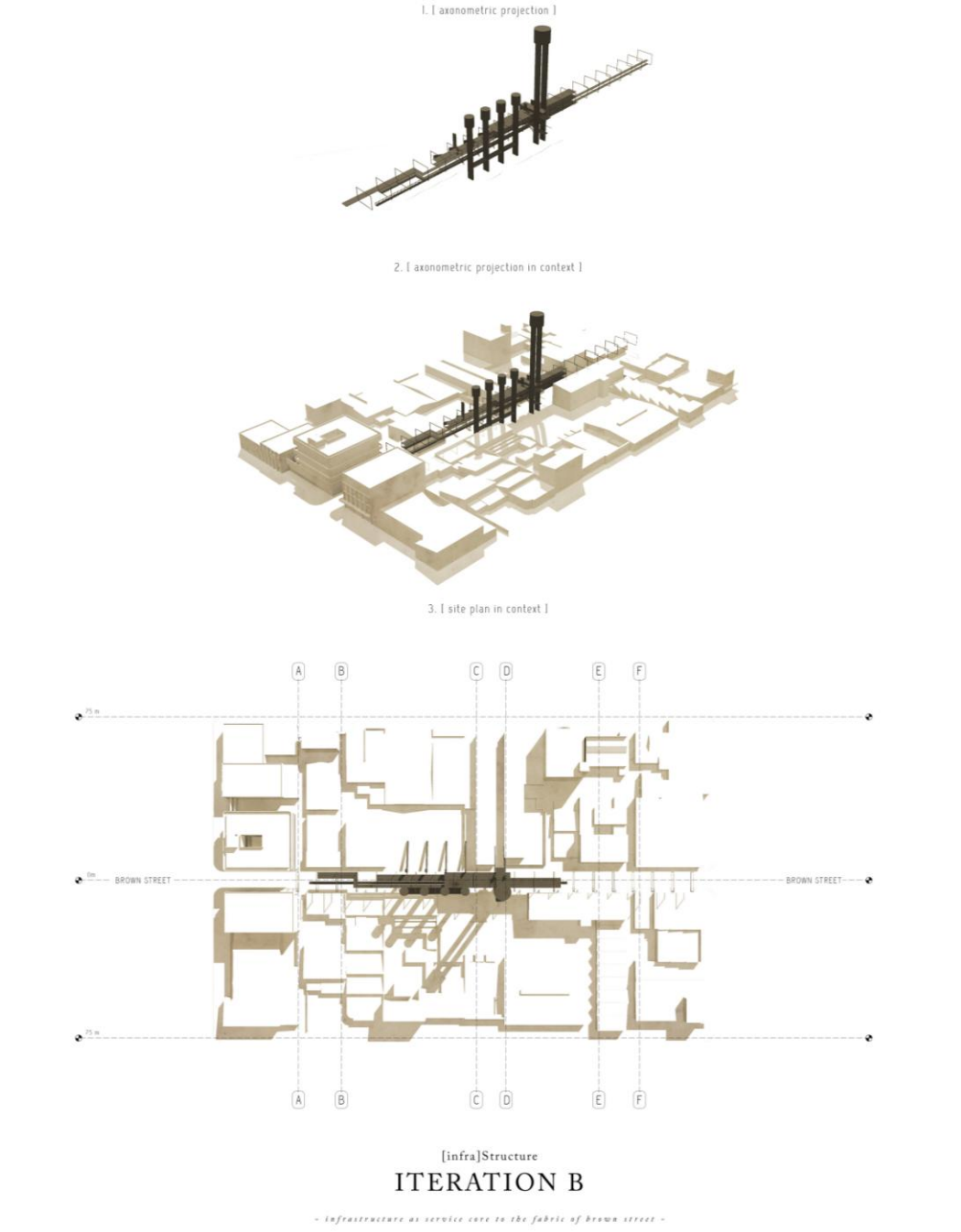

Figure 6.5 : Diagram illustrating the CONTEXTUALIZING of [infra]structure (Author, 2015).

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7.3.3 FEEDING

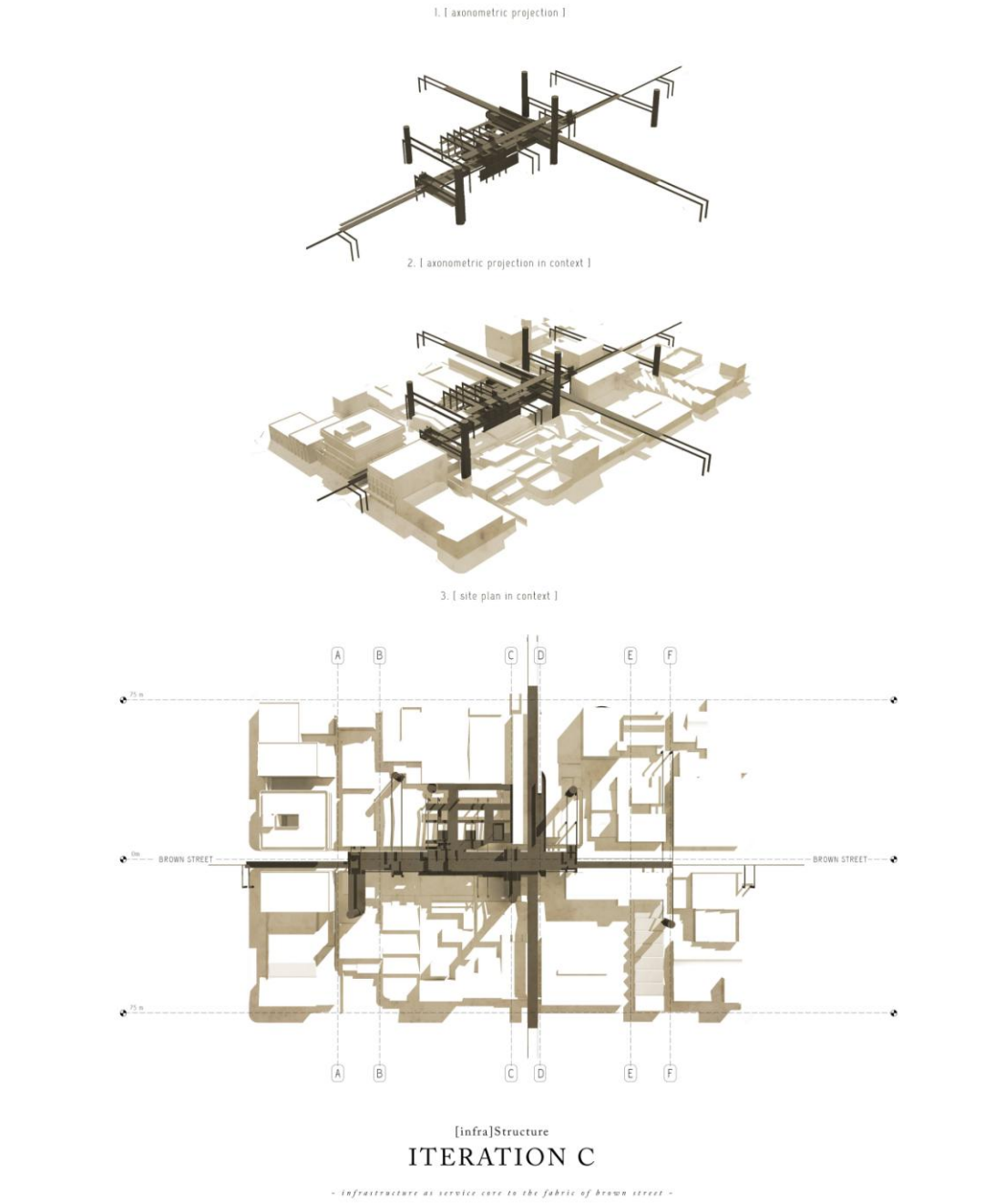

Figure 6.6 : Diagram illustrating the proposed [infra]structure FEEDING off of Brown Street fabric (Author, 2015).

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THE [infa]STRUCTURE

[Arial view of proposed regenerative infrastructure]

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6.4 INSLUA

6.4.1 [urban components : the city block]

In *Urban Components*, Leon Krier criticises the historical tendency to the centralization of function (economic and cultural power) as this results in larger and large city blocks, which eventually attains larger and larger building programs. It causes the overstressing of city centres.

The city of Pretoria has been formalized and has developed from an agrarian origin (Bell & Lane 1905:12). The natural boundaries of the city contained its development and have to a large extent formed the city's urban identity (Jordaan, 1989: 26). The morphing of these elements saw the city transform into what is has become today. Analysis of Pretoria's urban development reveals that what is today known as the completely urbanized Central Business District, was once the residential surrounds of the town centre, Church Square.

The rigid *cardo-decumanus* grid in conjunction with the residential origin of the city has resulted in oversized city blocks. These impede pedestrian movement in and around the urban environment. Consequently, as the city grew, so did the development of the vibrant mid-block arcades (Le Roux, 1991: 32). This added a distractive layer to the city's spatial identity and urban environment. However, as the city of Pretoria expands, so does the need for public space.

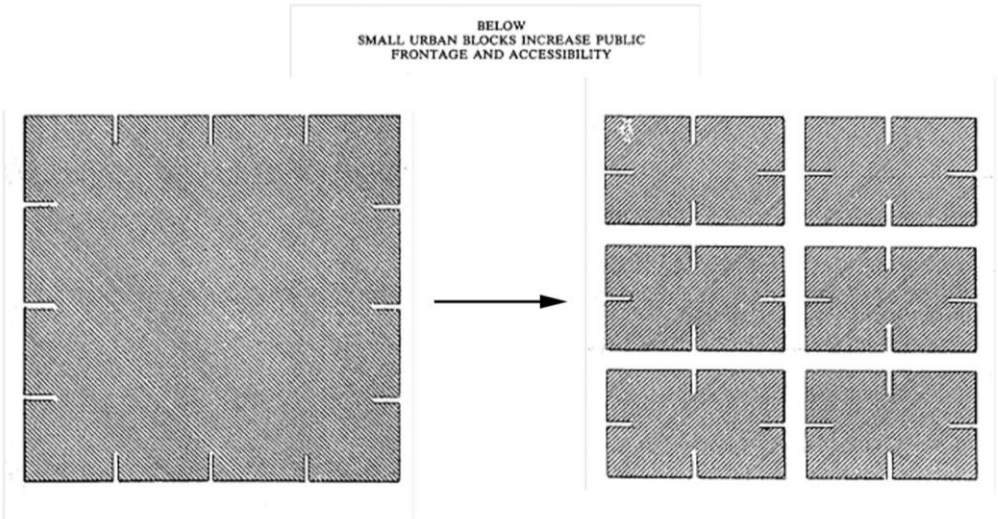

Figure 6.5 : Diagram illustrating the feeding off of Brown Street fabric (Author, 2015).

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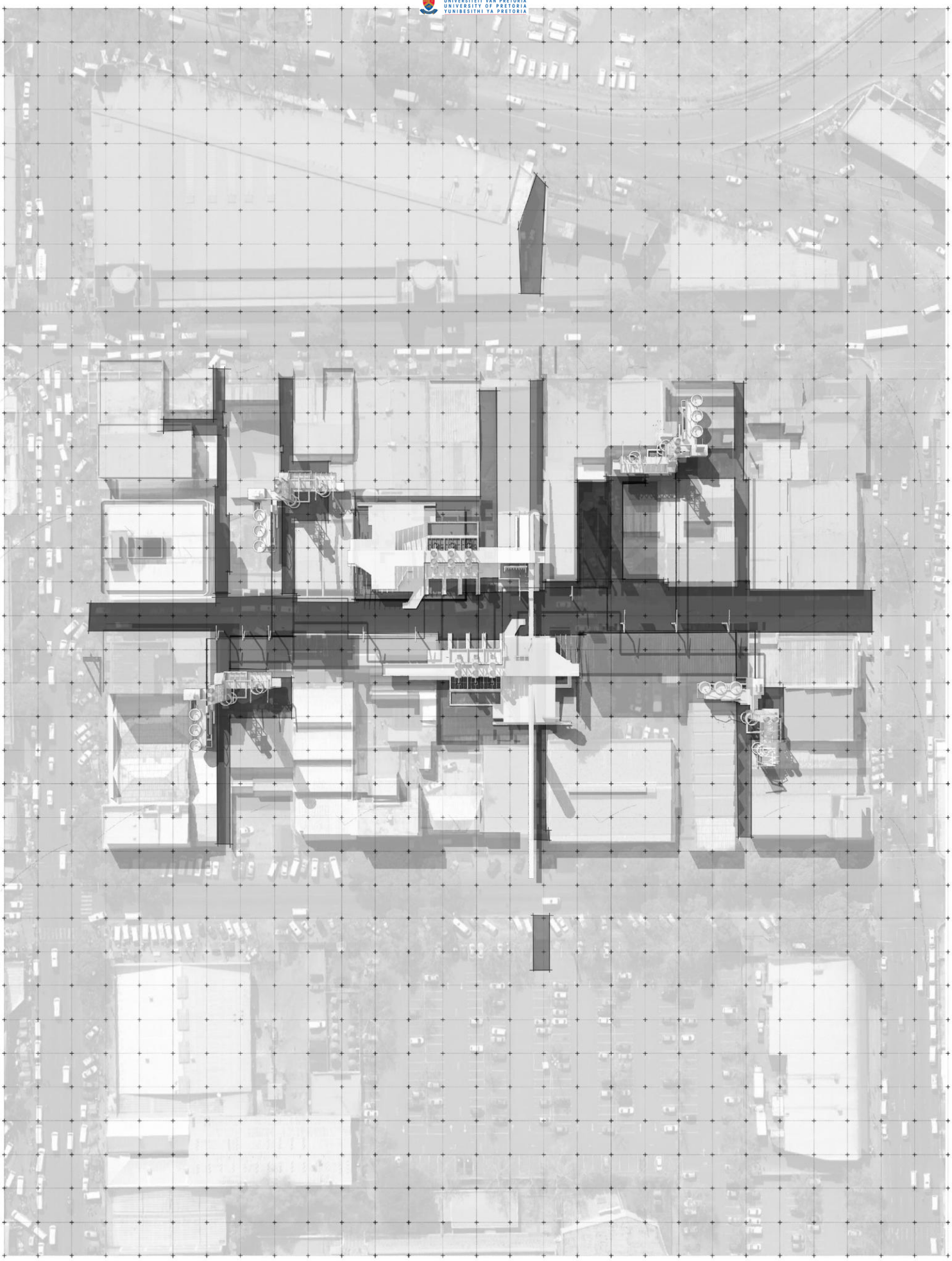

[i n f a] S T R U C T U R E

[Arial view of proposed regenerative infrastructure]

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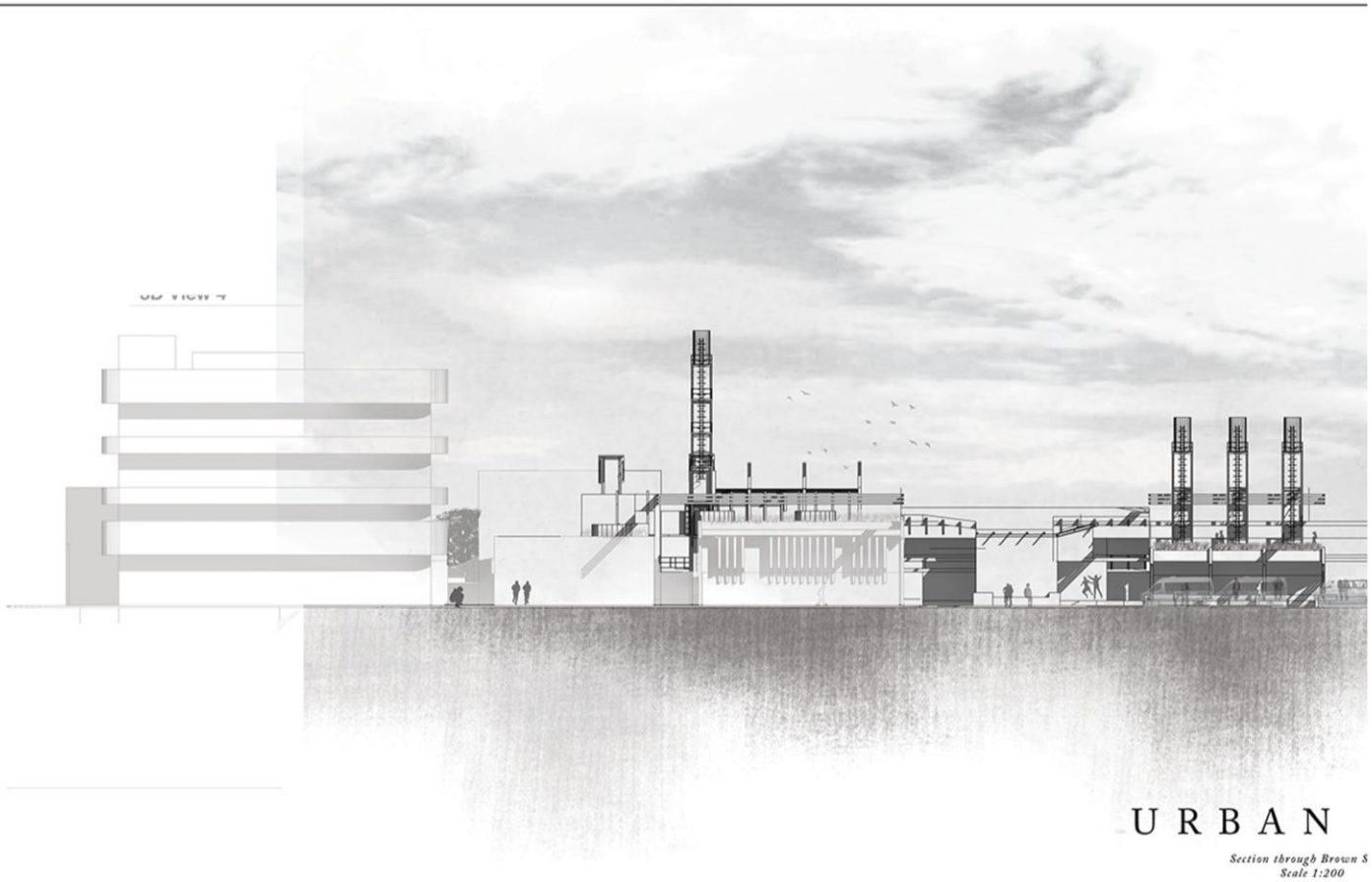

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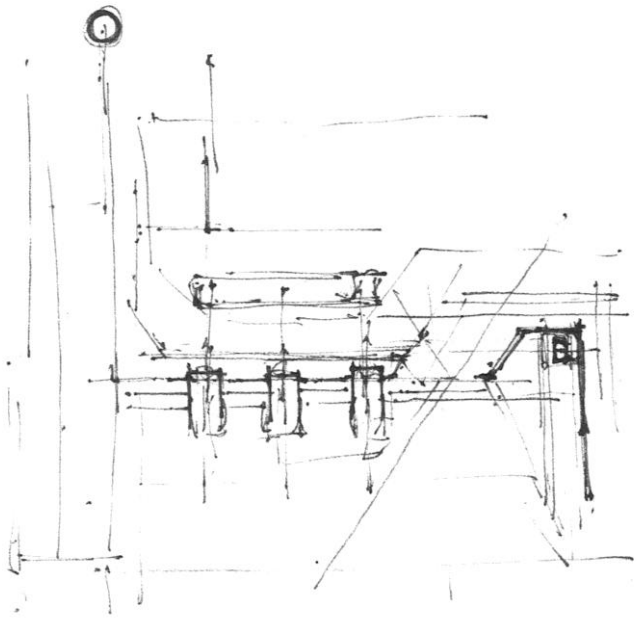

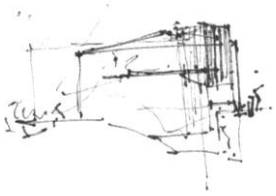

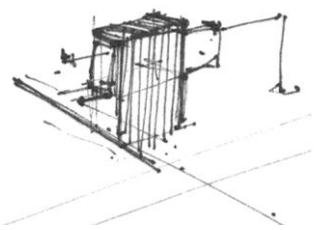

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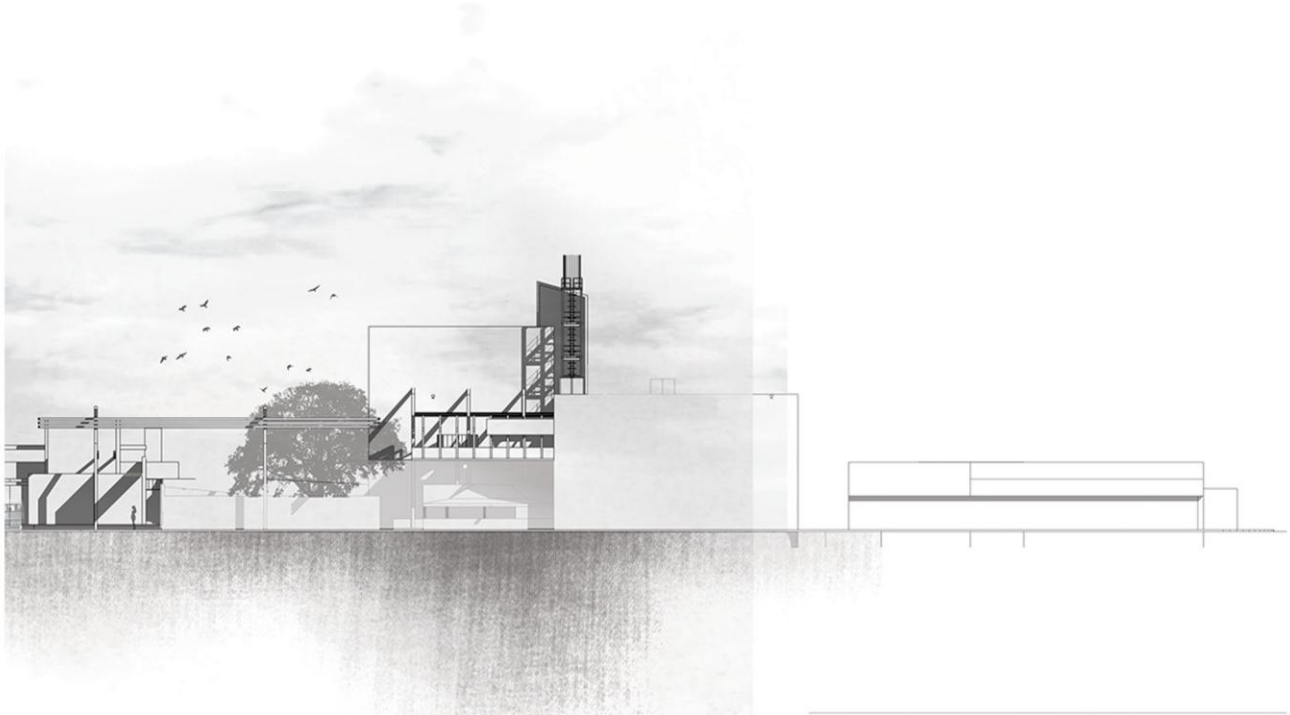

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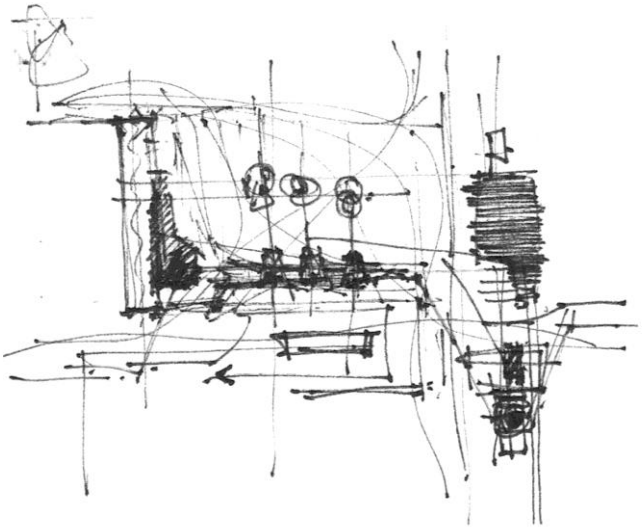

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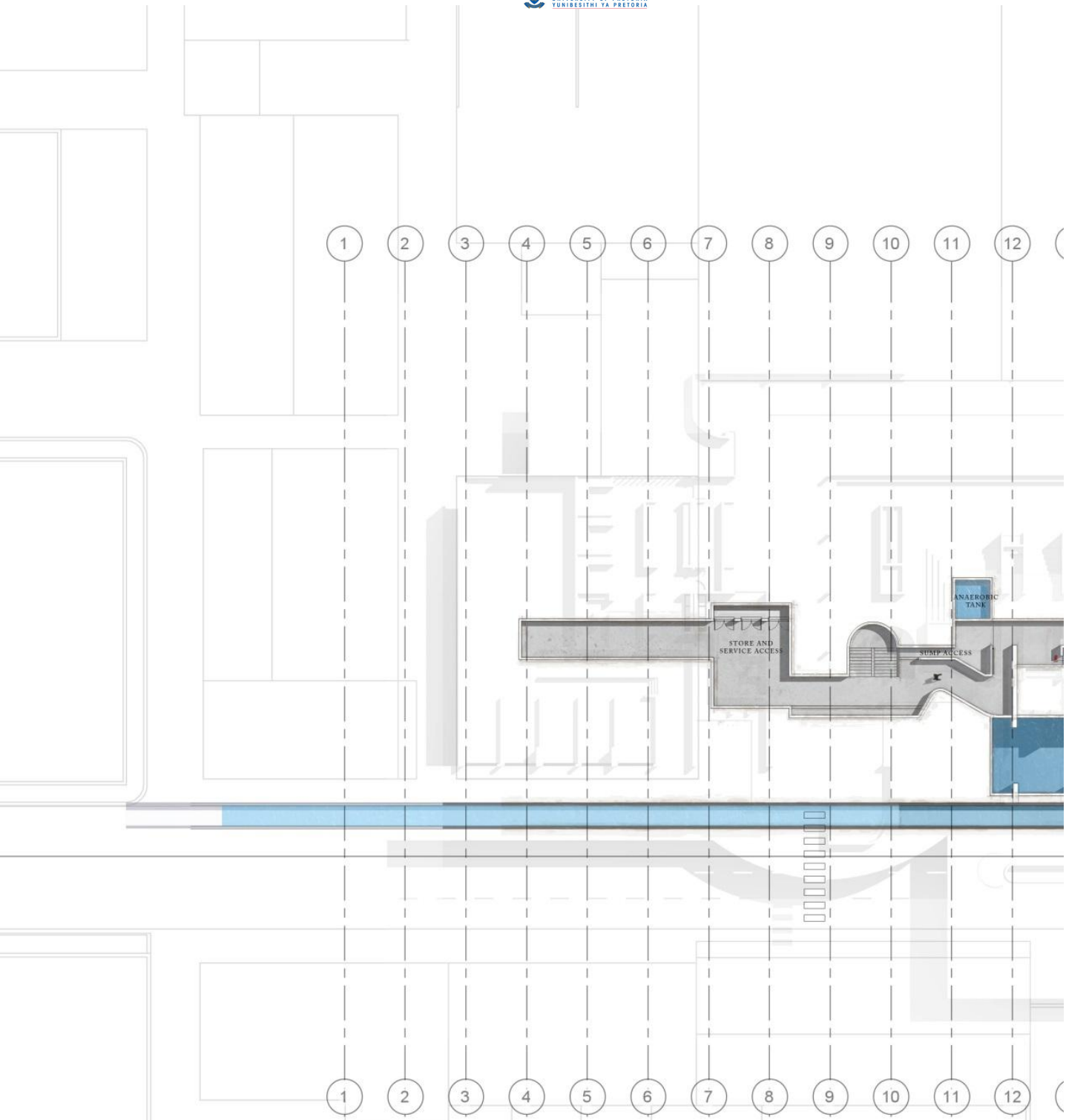

BASEMENT FLOOR

Scale 1:200

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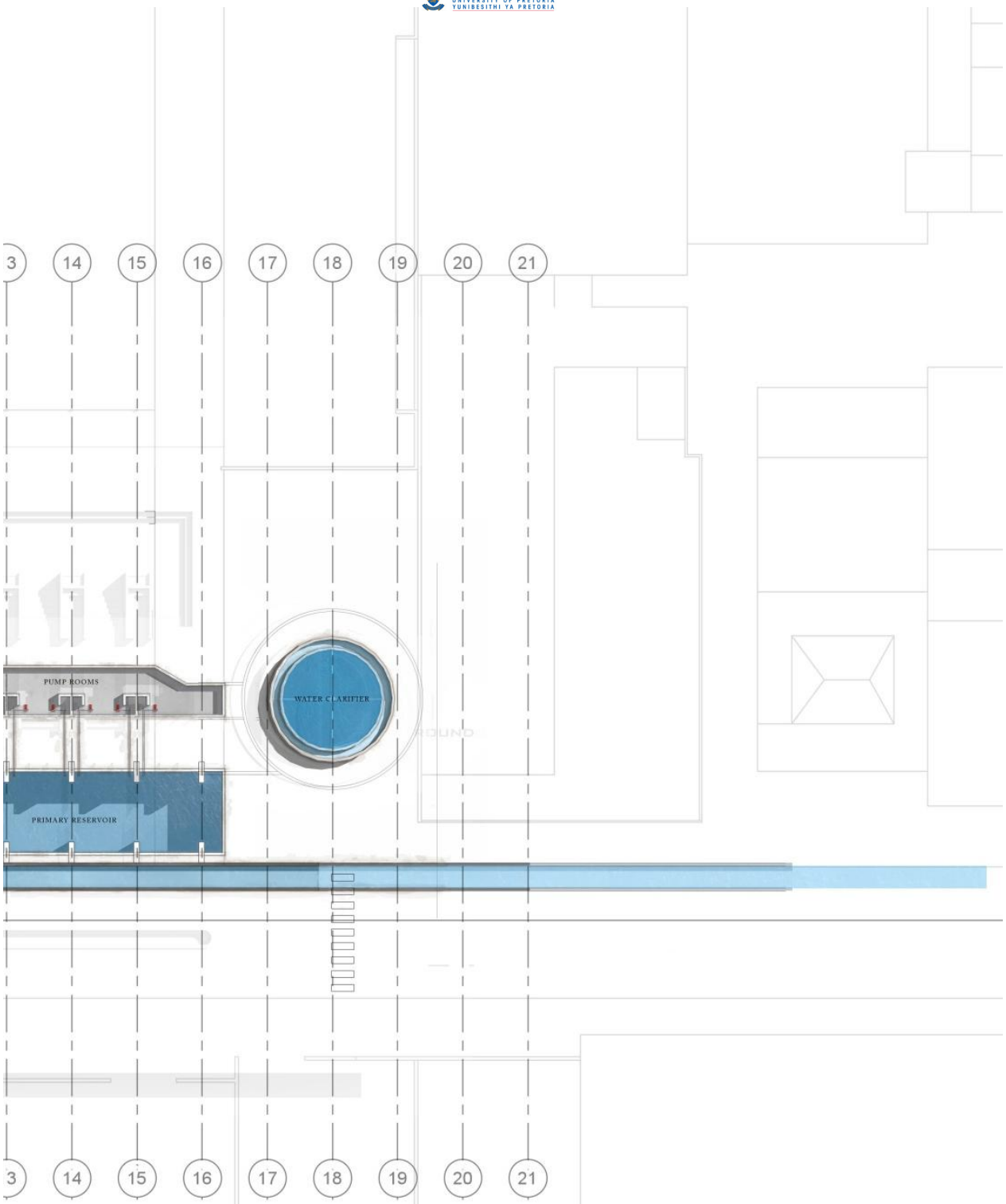

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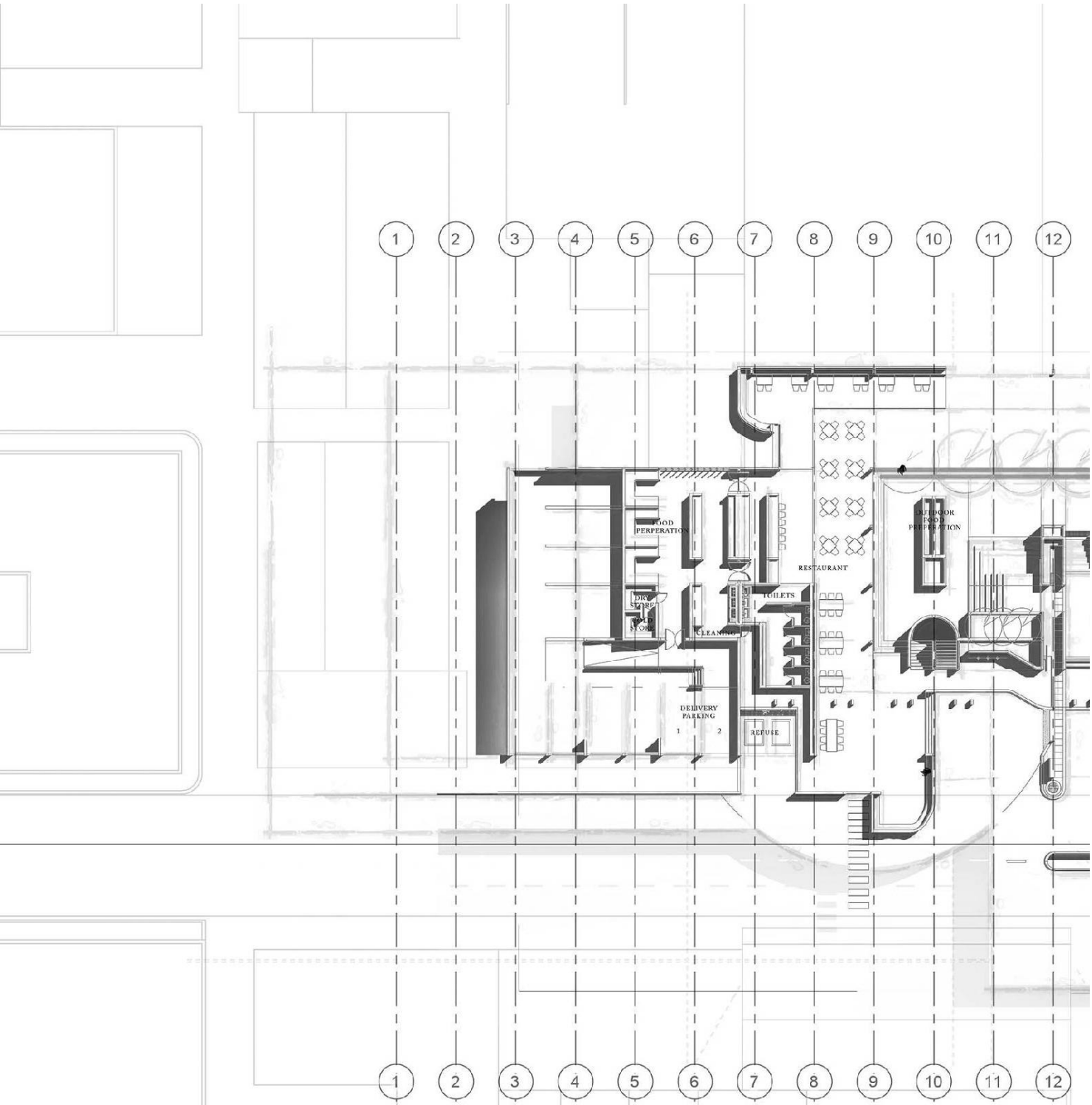

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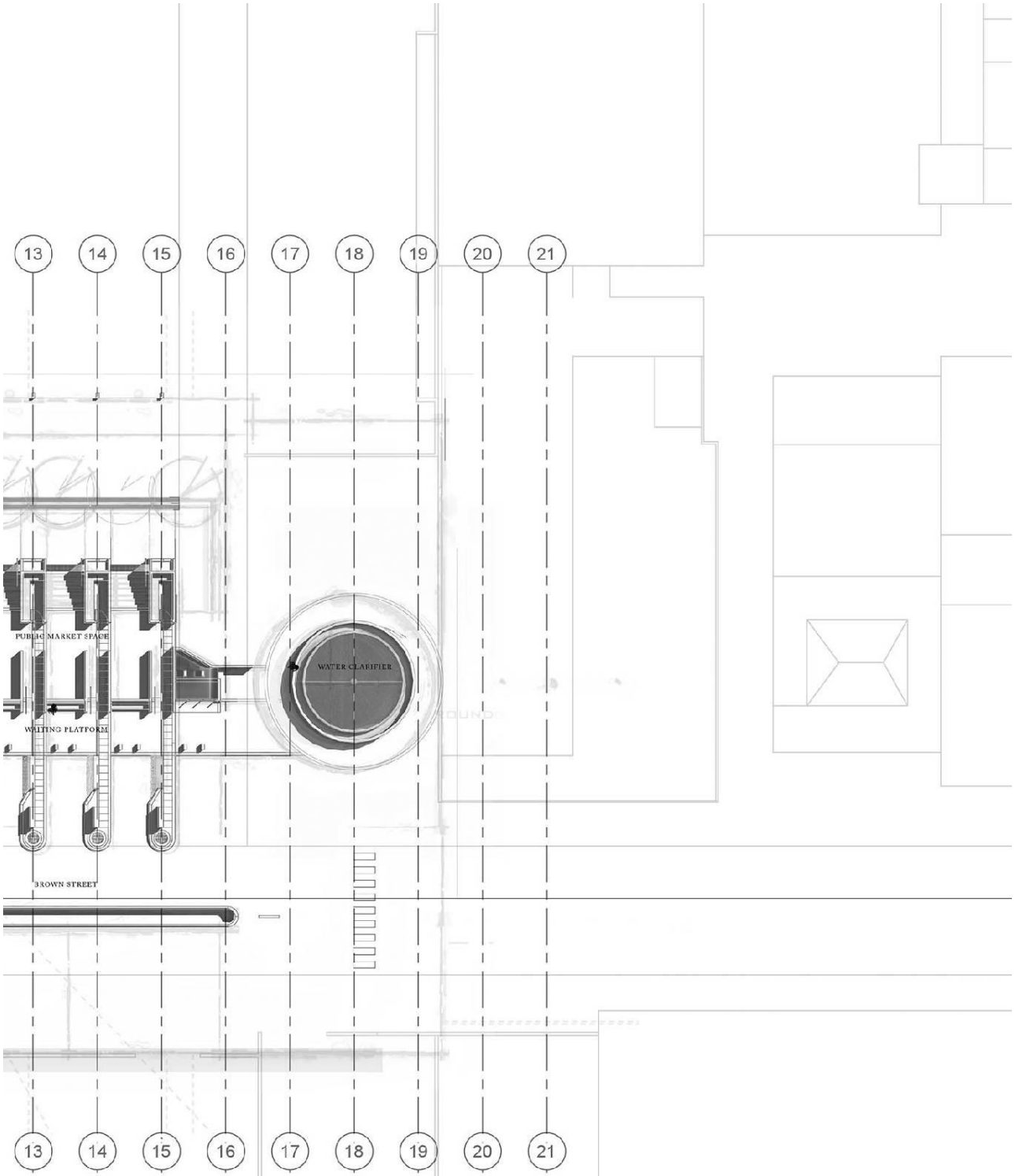

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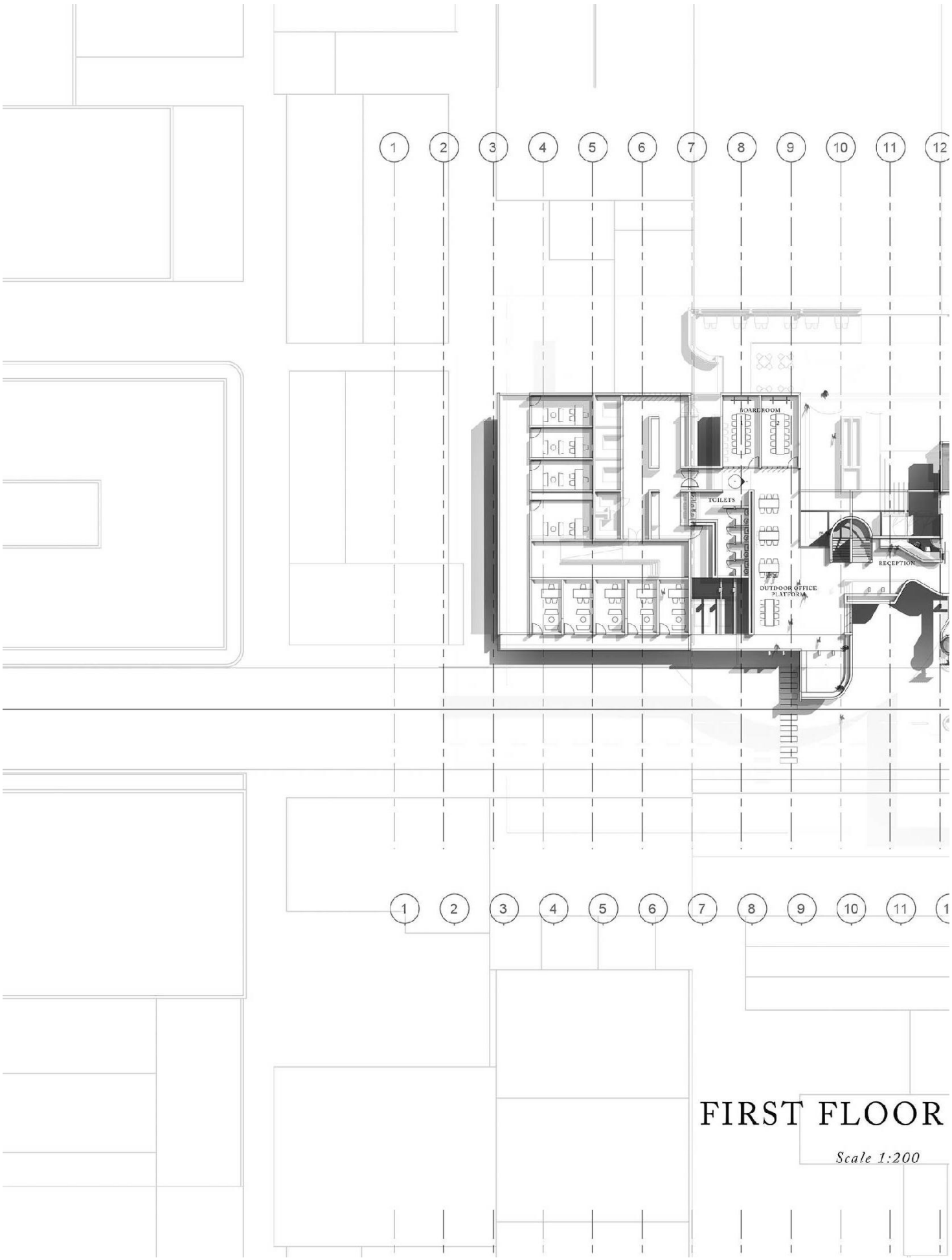

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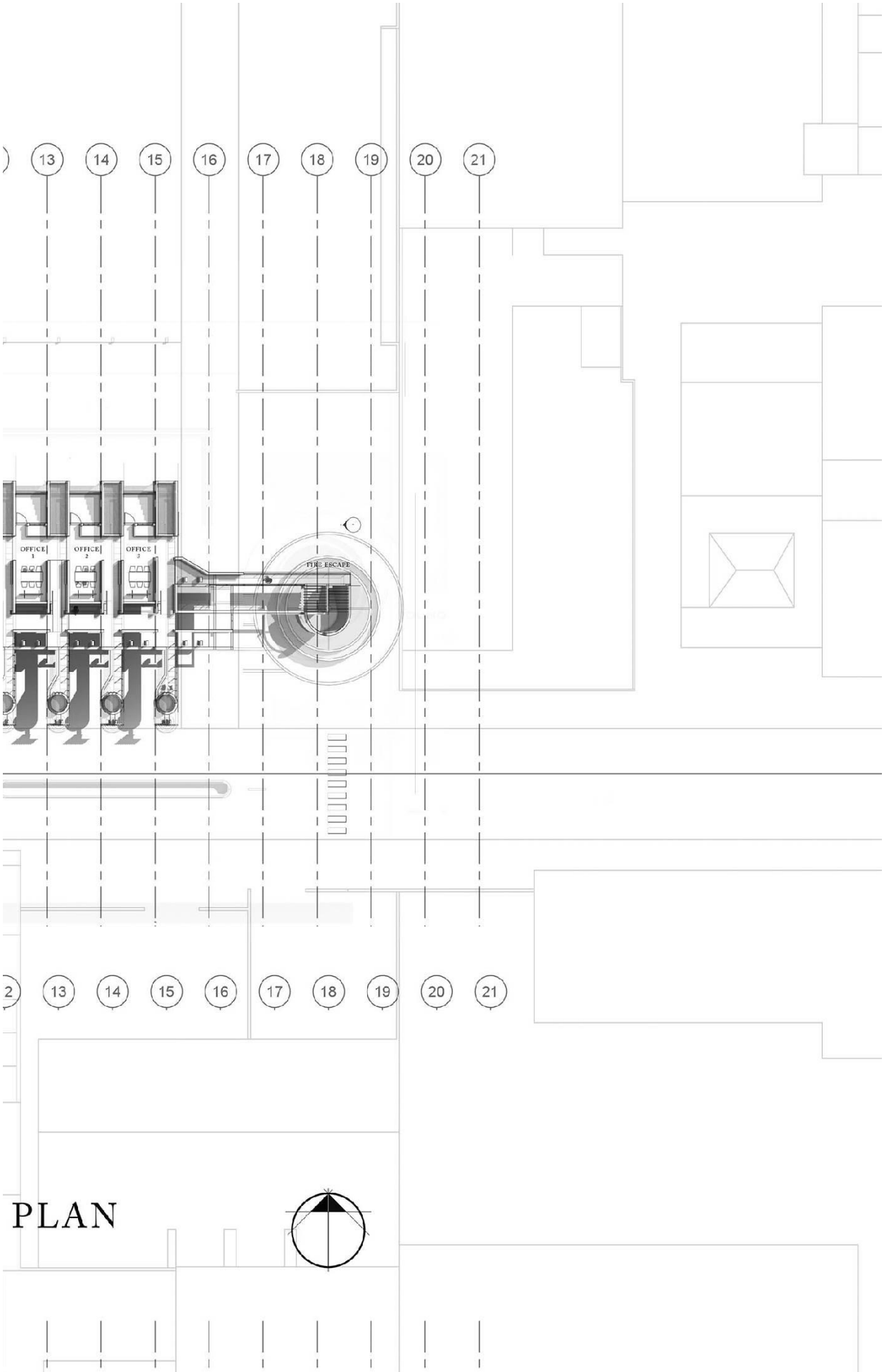

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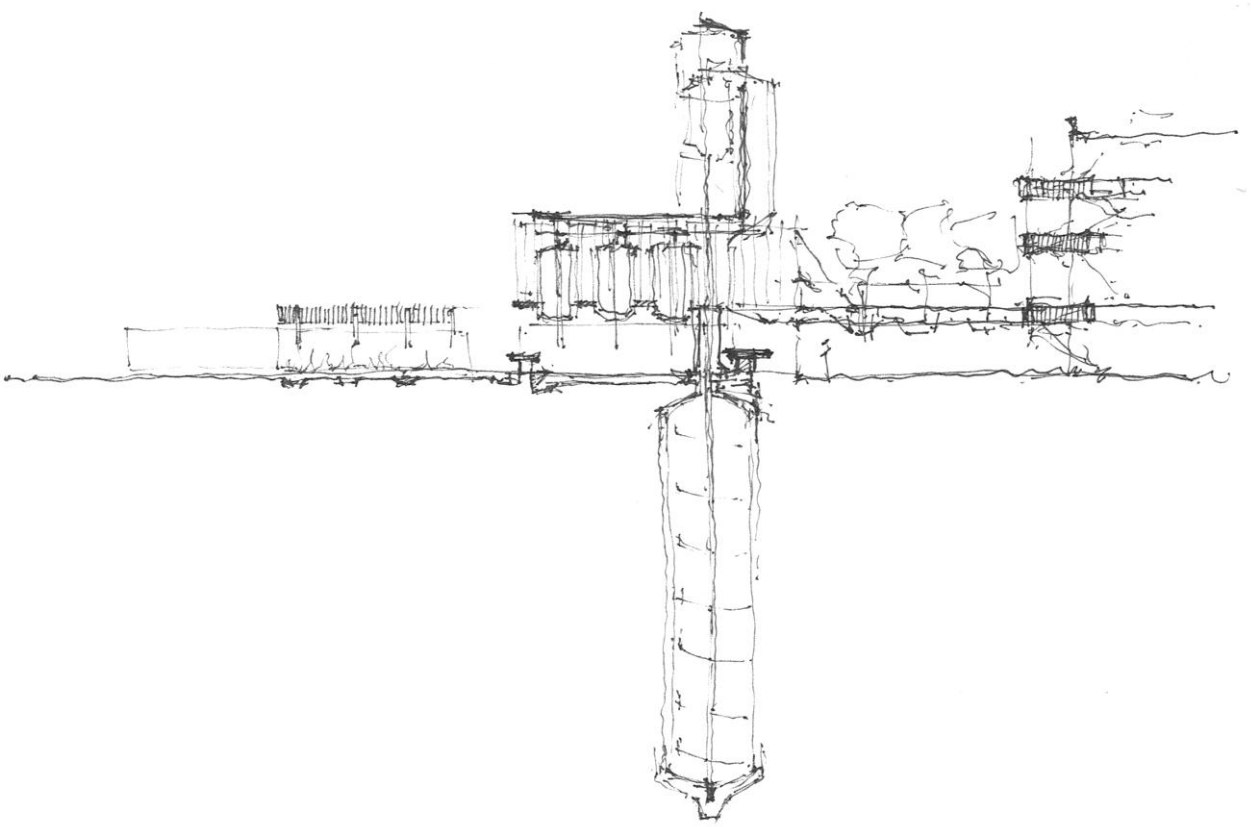

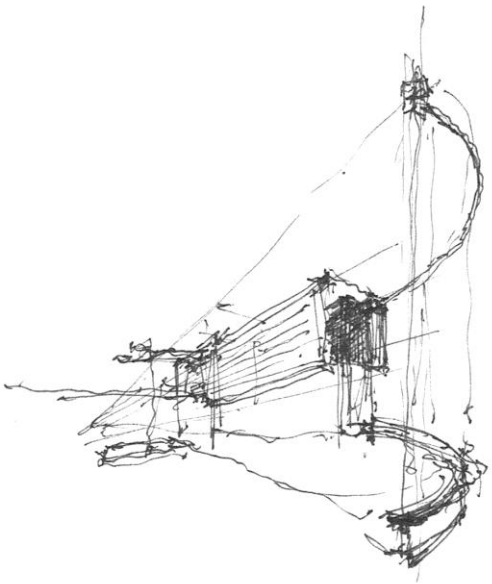

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01

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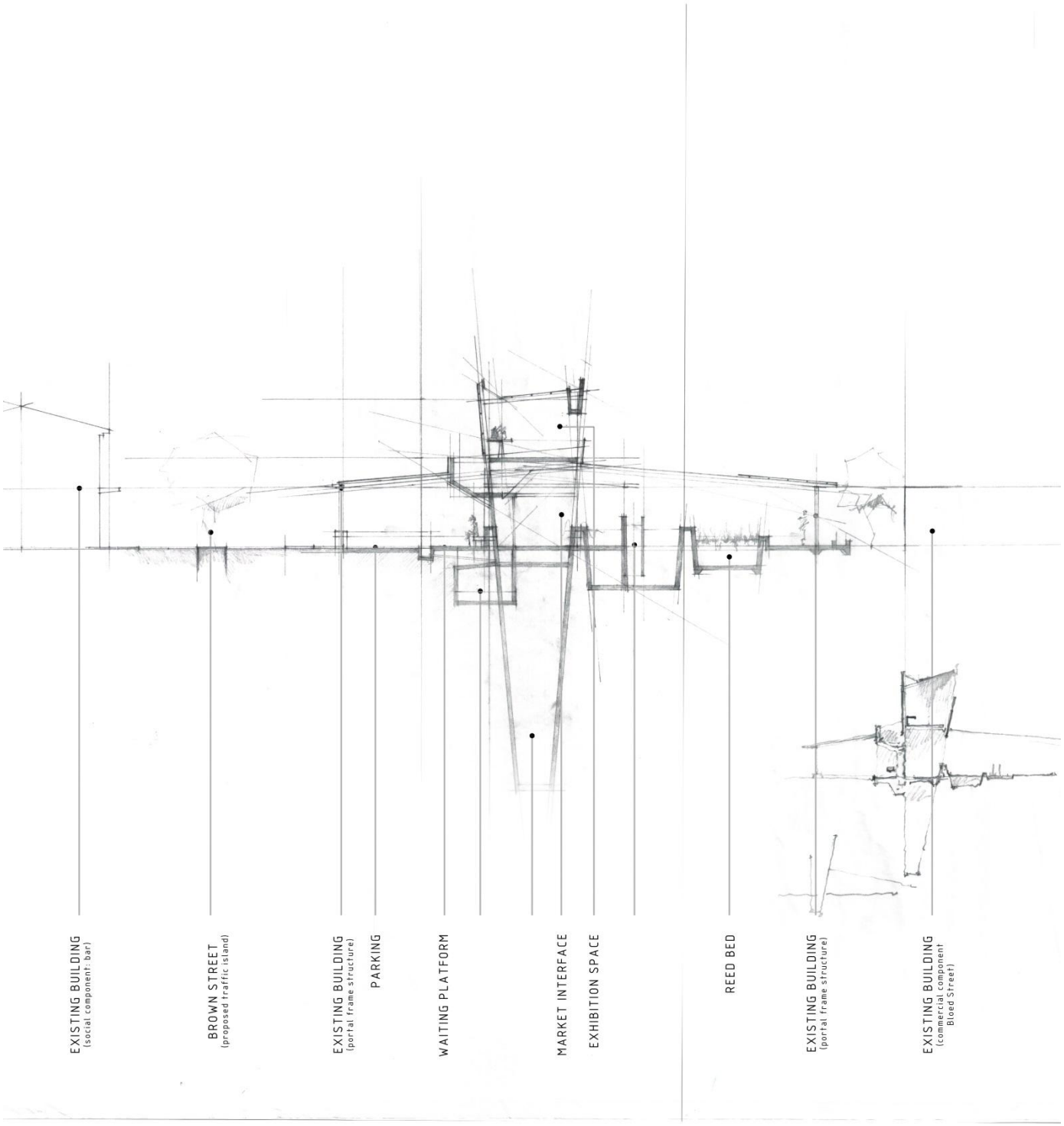

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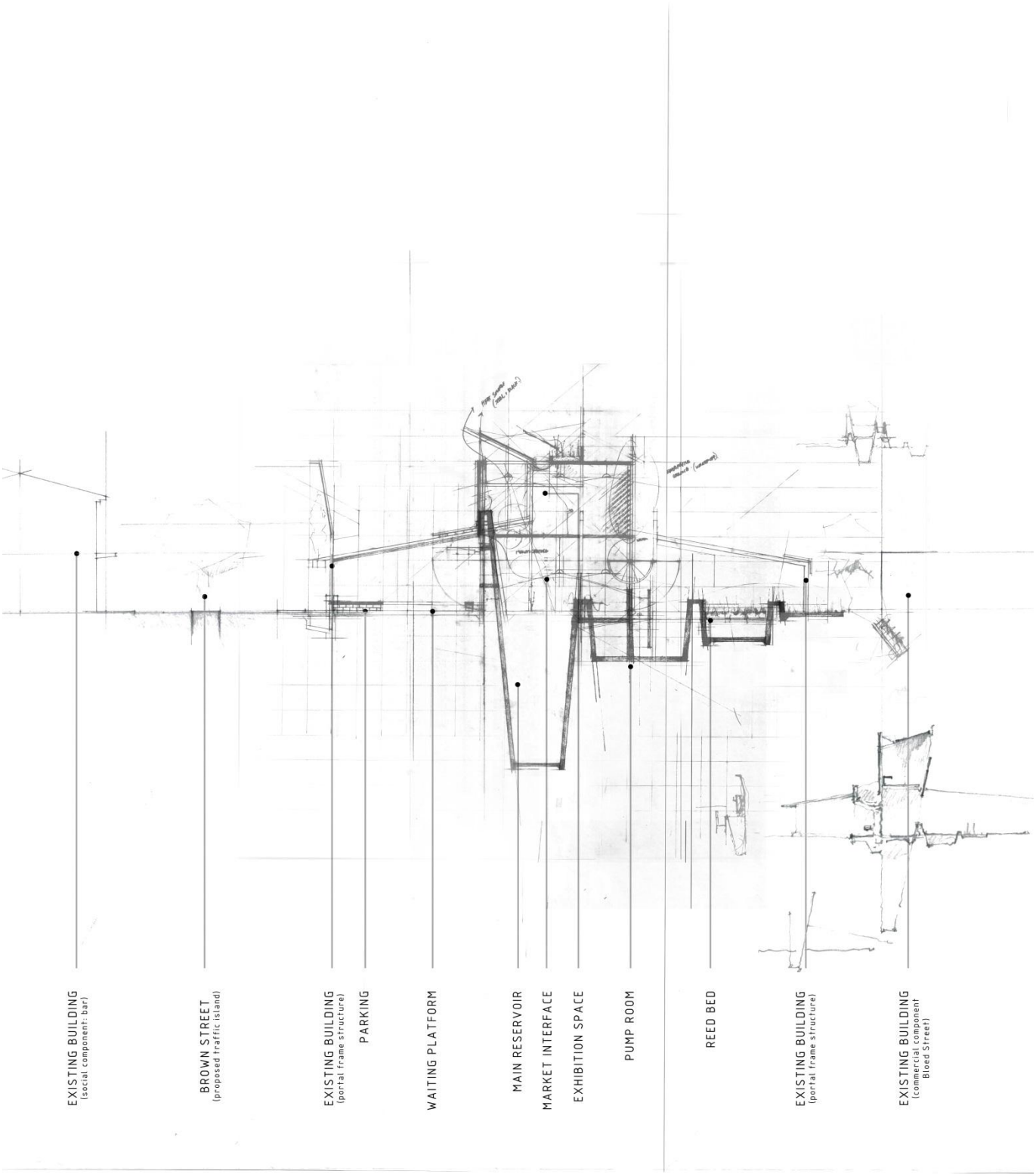

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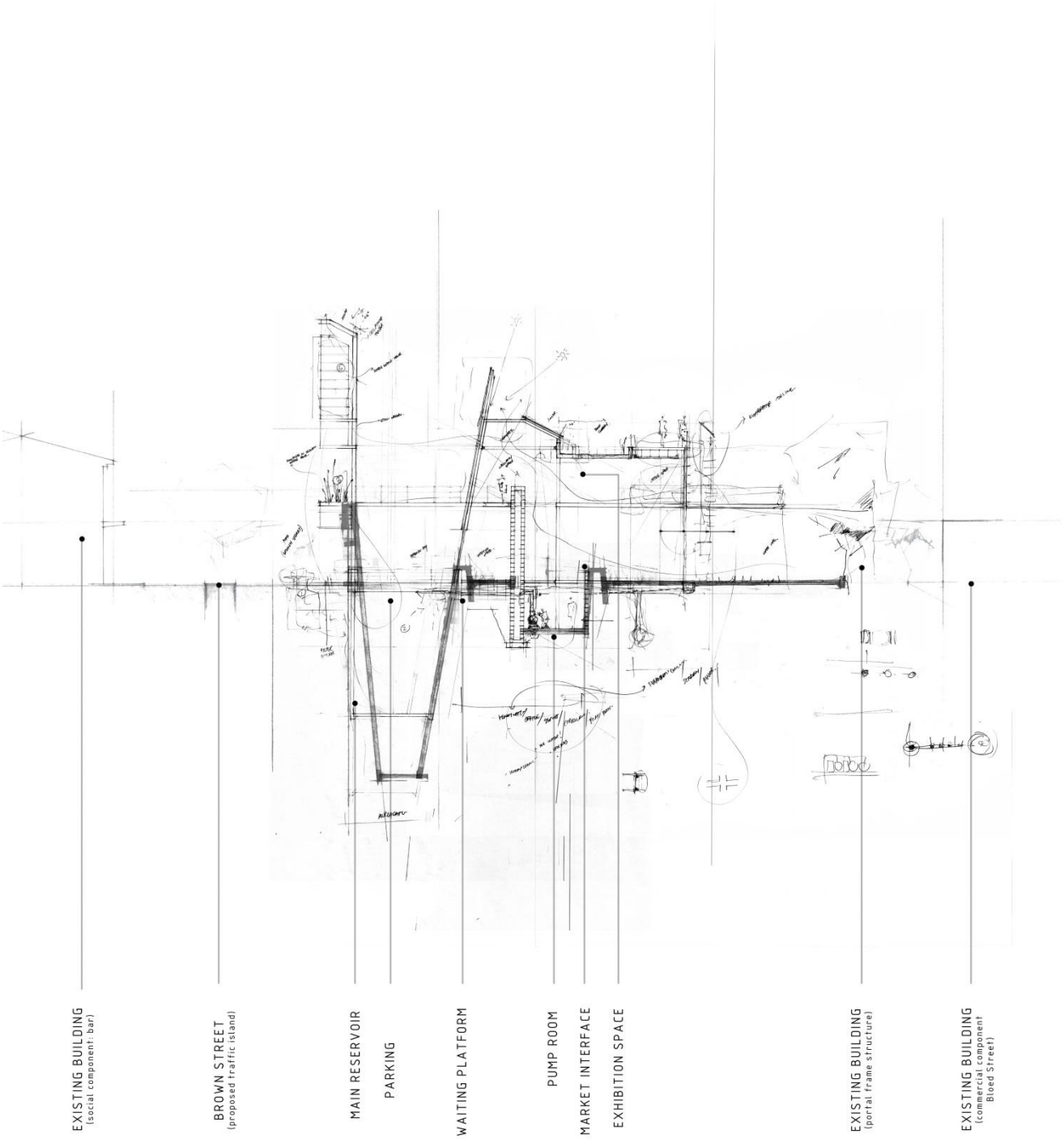

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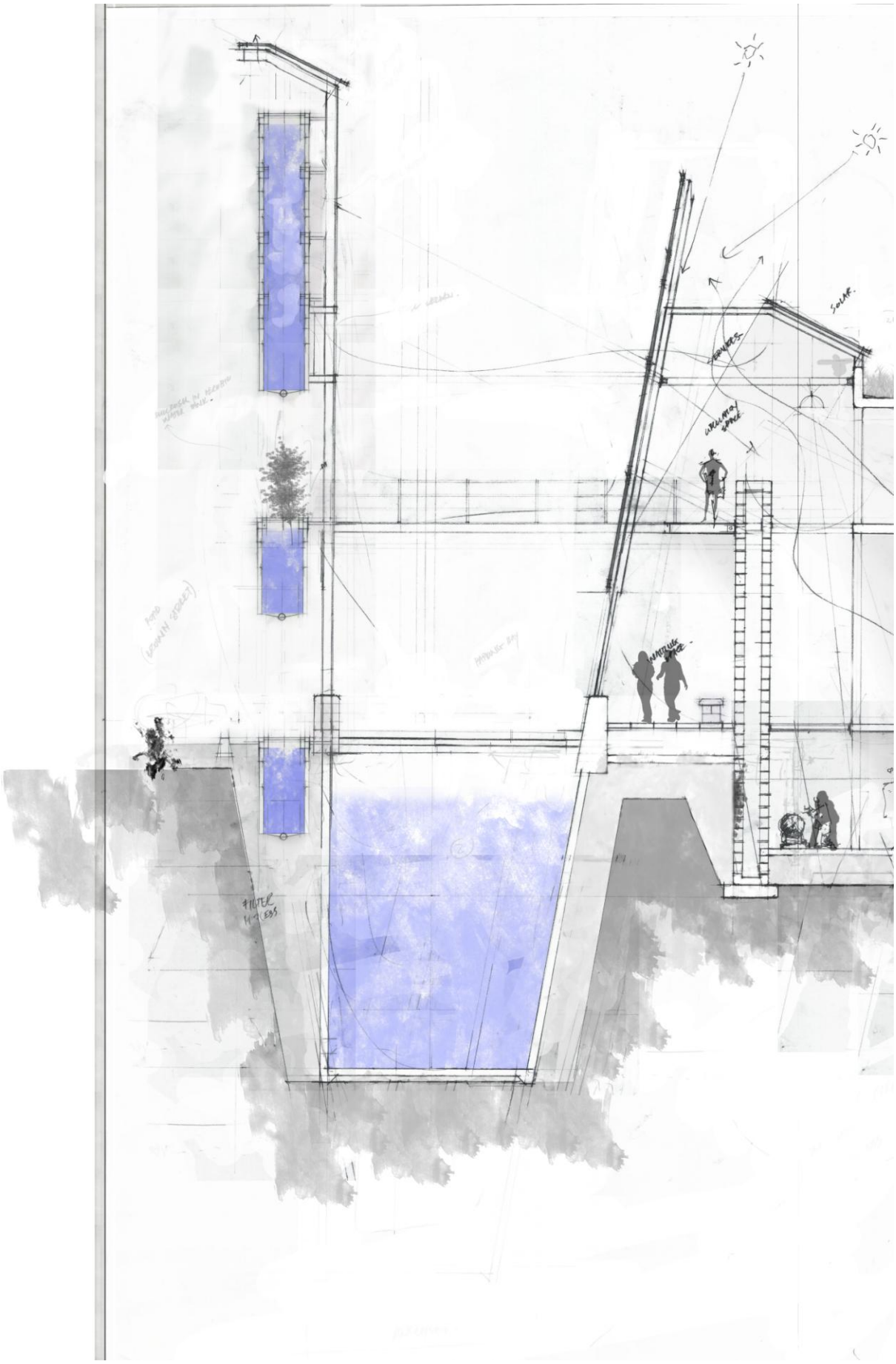

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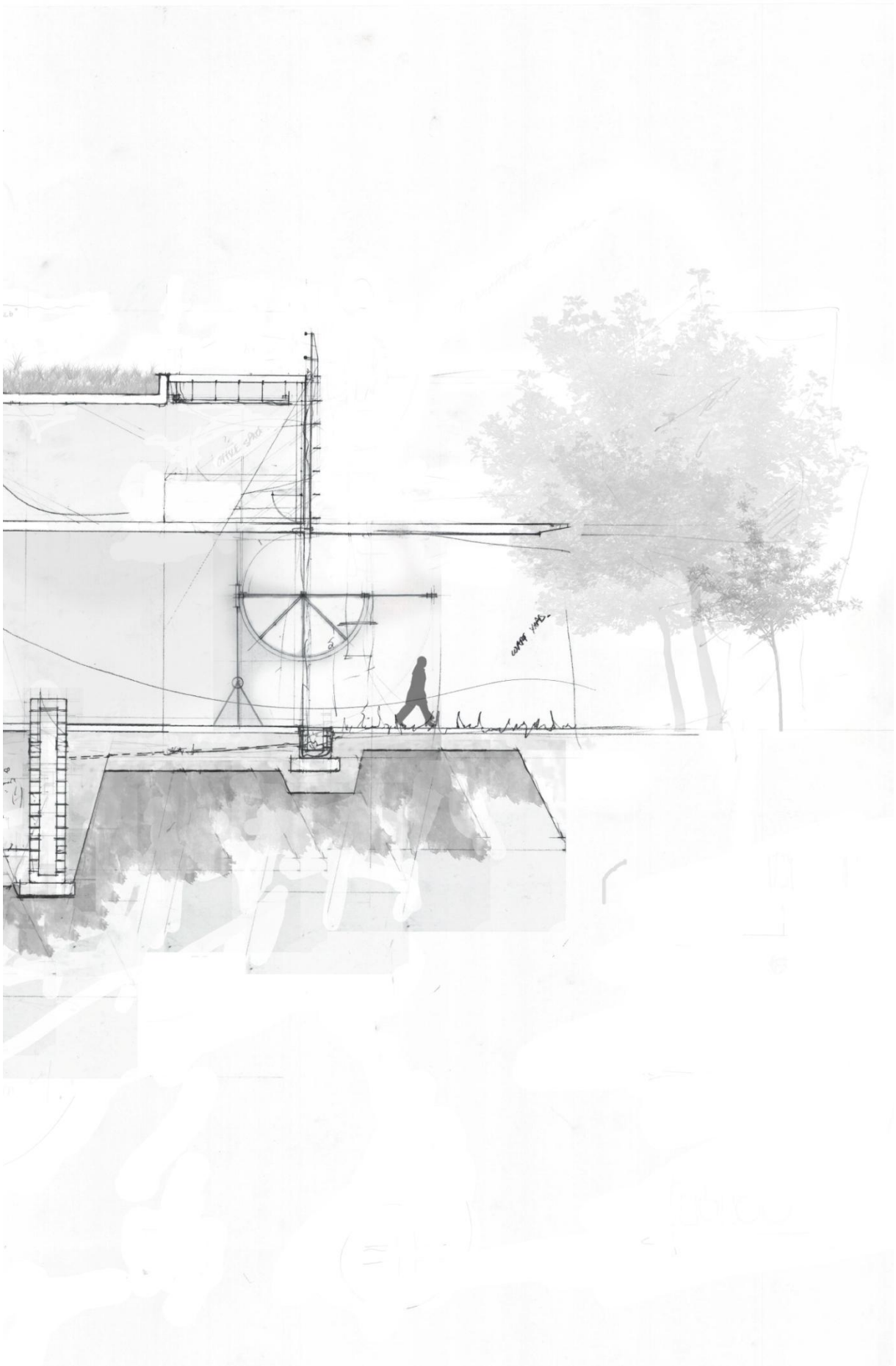

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07

[technical investigation]

urban decay as a result of neglected infrastructure

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The following chapter focuses on the technical resolution of the design based on the theoretical and programmatic requirements within the context of Brown Street.

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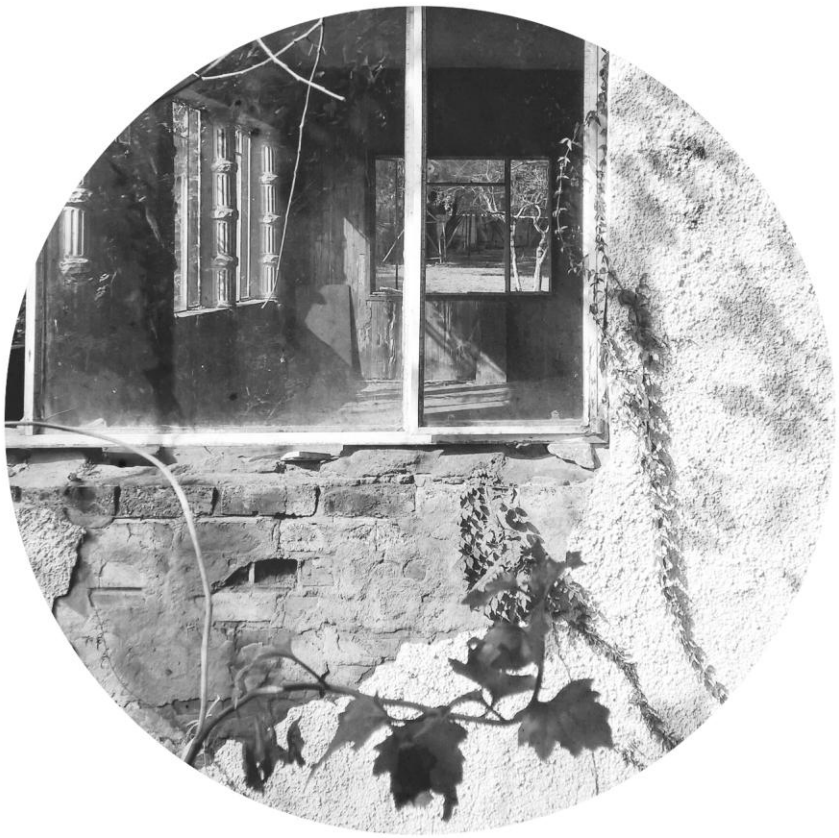

Entropy

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Figure 7.1 : Street View showing the stereotomic character of existing fabric within the block of Brown Street (Google Street View, 2015).

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THEORETICAL ARGUMENT

[architecture as infrastructure]

The structural investigation of the proposed urban [infra]structure focuses of the theoretical premise of Gottfired Semper (1803-1879). The theoretical premise explores the tectonic relationship of architectural materiality. In his book entitles "Die Vier Elemente der Baukunst" (Four Elements of Architecture), the German architect argues that architectural composition can be divided into two distinct opposites: the stereotomic and the tectonic. The stereotomic relating to solidity and the tectonic defines dematerialization (1995: 3).

As most appropriate to the design intentions, the distinction between the two element of stereotomic and tectonic is best defined by Kenneth Frampton (1990: 518). Frampton states that the inherent opposites in architectural materiality forms cosmological opposites to each other, where the stereotomic mass symbolizes earth and the tectonic, the sky. IT is argued by ..... that the way in which these two elements, the stereotomic of the earth and dematerialisation of the tectonic, constitutes the essence of construction.

Rooting from this, as previously discussed in chapter 7, the decaying fabric of brown street forms the tectonic of the site while the very unarticulated ground plan acts as the stereotomic. It is within this theoretical premise that the relationship between ground and sky. the tectonic and the stereotomic is explored.

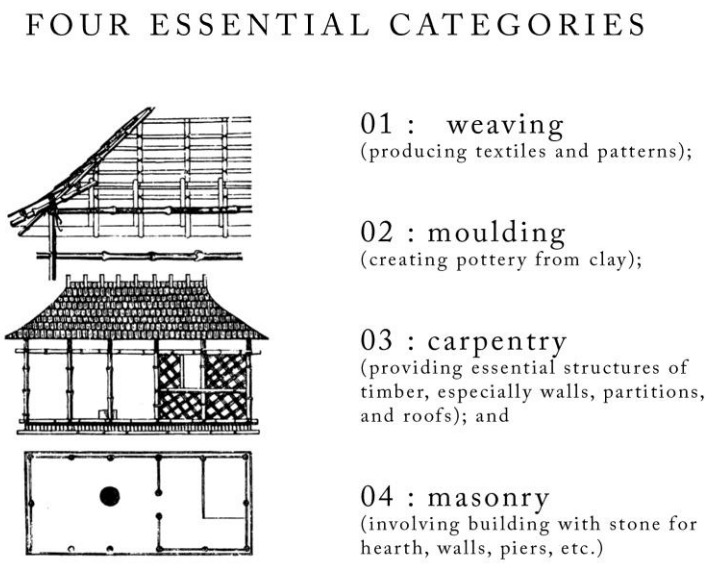

Figure 8.2 : Drawing illustration of Gottfrield Semper's Four Elements of Architecture (Semper, 1851).

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Figure 8.3 : Photo illustration of entropy in architecture (Author, 2015).

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[technical concept]

Vittorio Gregotti (1983, 8) states that "... Through the concept of the site and the principle of settlement, the environment becomes[on the contrary] the essence of architectural production. From this vantage point, new principles and methods can be seen for design. Principles and methods that give precedence to the sitting in a specific area. This is an act of knowledge of the context that comes out of its architectural modification."

The development of the technical concept roots from the investigation which explores the relationship between the two main structural concepts of stereotomic and tectonic, specifically the poetics which emerge from the way in these two opposing architectural elements meet. The proposed architecture also expresses this relationship in the way in which infrastructure and architecture are accommodated simultaneously, how infrastructure and architecture are expressed through the way the in which each component is assigned an aesthetic role. The role of stereotomic as consistent through time and the role of the tectonic as adaptable and the flexible. The materiality of existing buildings within the context of Brown Street demonstrate an aesthetic dimension to these roles. The process of entropic decay communicated in the layering of change over time.

ROLES

STEREOTOMIC (EARTH) = CONSISTANCY

TECTONIC (FABRIC) = CHANGE AND DECAY

MATERIALITY

TECTONIC (FABRIC) = CHANGE AND DECAY : ROOF SHEETING

STEREOTOMIC (EARTH) = MASSING : BRICK ON CONCRETE BASE

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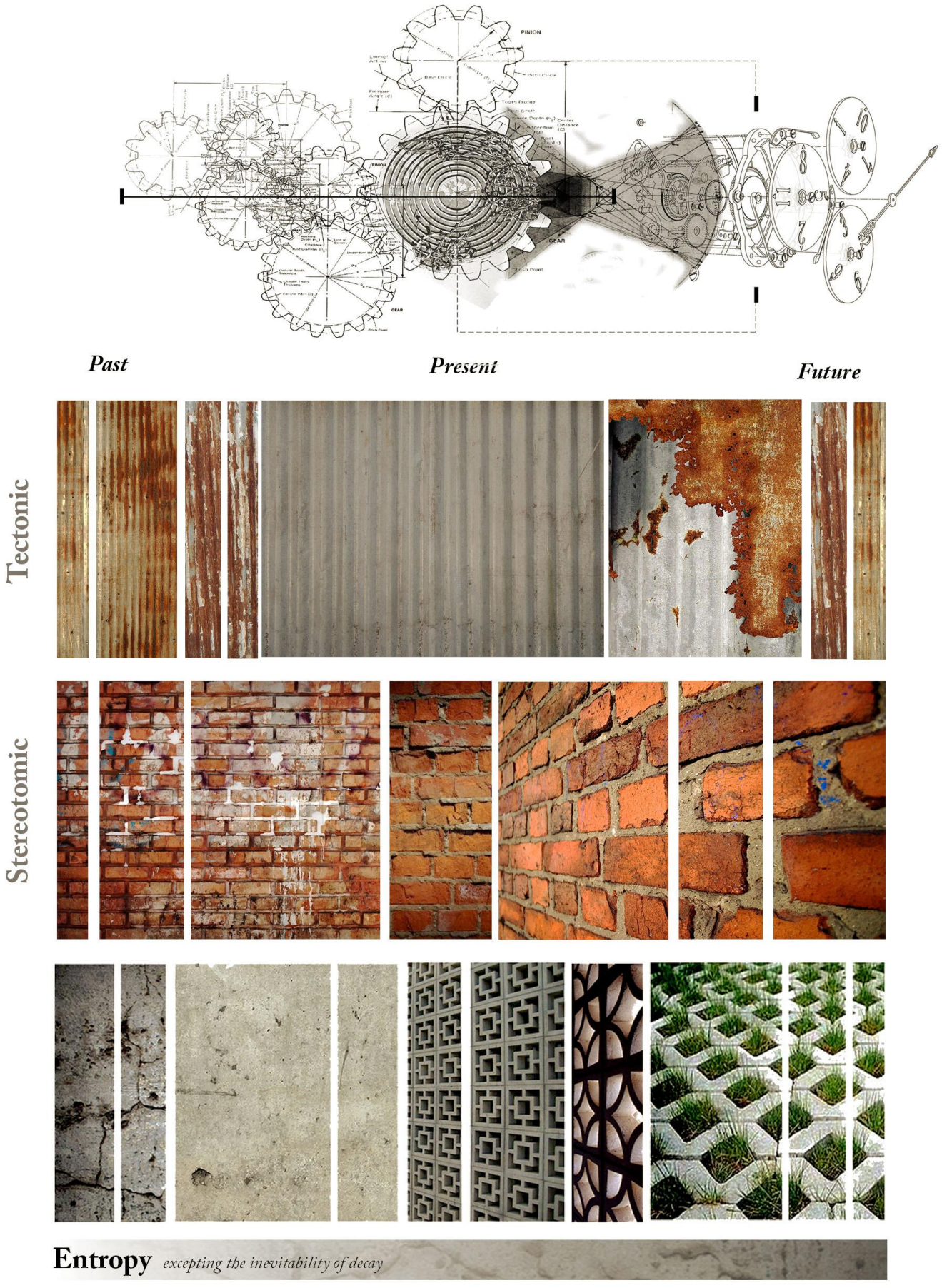

Figure 8.4 : Illustration of entropy in proposed materiality of the Urban [infra]Structure (Author, 2015).

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[infra] : latin for "below". Origin- Expand

Following on from this argument is that, that which is contained within the ' earth' demonstrates a similar permanence and consistency. As stated in chapter #, the infrastructure of water has through its faithful supply remained the one consistent element throughput the development of the city due to it being accommodated below ground in the form of furrows and storm water channels. The etymology of the word, referring to the current and conventional nature of water infrastructure within the urban environment was being 'below' surface. However, such a condition offers little opportunity for not only the unveiling of waters regenerative potentials but also of the infrastructure's potential in becoming spatially included within an architecture.

Therefore, because on the submerged nature of the existing infrastructure (storm water channels) within the earth, it is represented as part of the stereotomic landscaping component of the architecture. The proposed infrastructure addresses this poetic relationship by displaying how the existing stereotomic of the site is manipulated in such a way as to set in place a series of architectural potentials. The ground plane is manipulated in such a way as to accommodate for the engineered requirements of the wastewater treatment system, as well as becomes the substructure of the proposed fabric.

The second structural concept rooting from the theoretical argument of architectures entropic inevitability, through its process of decay. The proposed materiality and detailing is design to anticipate, not only for change but also for the process of decay. The resolution of this concept saw the hierarchical allocating of materiality to the various functions of the infrastructure relating to either permanency of temporality. The permanence of infrastructure versus the temporality of which is contained within "inevitable architecture". In this way the architecture will express, through its tectonic, the inevitability of decay as well as the permanence of which is associated with the need for infrastructure. "Unlike conventional architecture, they are not an end in themselves but encourage the continual necessity for change" (Price, 1996).

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PLANS AND CIRCULATION

- private, public and servicing -

As an anticipatory architecture, the proposed [infra]structure of Brown Street functions as a series of superimposed buildings which, similar to Cedric Price's *Magnets*, would through the way in which the building is designed, generate new kinds of access, views, sanctuary, safety and delight. Designed to overload underused or misused sites , the buildings are both pragmatic and polmatic in the way that they turn space to the public advantage. The approach to planning is both theoretically and contextually, contain the need to be flexible.

The padestrianization of North-South service alley throughout the length of Brown Street results in the fragmentation of the building fabric as to "provide amenities and stimulate new patterns of public movement" as well as due to periodic padestrianization of the entire city block, these transformed alley ways serve as routes between the recycling workshops and the central core of the [infra]structure (Price, 1996). It is through the integration of existing and new circulation routes that Brown Street will be re-inhabited and thus rehabilitated. It is in through this re-inhabitation that the site potentials are not only realized but celebrated by the way it which the [infra]structure prioritizes the expanding of existing and not the introduction of the new.

[public circulation]

In the design, public circulation is not reduced to a predetermined route, instead the individual is allowed to experience the and discovery the site on his/her own terms. The visitor may either enter the building at the main water tower or stairs set out between the offices / workshops. In both cases the individual will experience the various components of the water treatment process or depending on the occasion, become part of the recycling process.

[private circulation]

Private circulation is incorporated into the design of the building by means of a privatized corridors and series of bridges which allow access to office as with the core or to workshops within recycling plants. These circulation routes function in accordance with the required flows of the infrastructures such as the process of water treatment. Private vehicle access is provided to the Western perimeters of the building. These private access points relate to functions of refuse and waste collection, delivery of supplies, and servicing.

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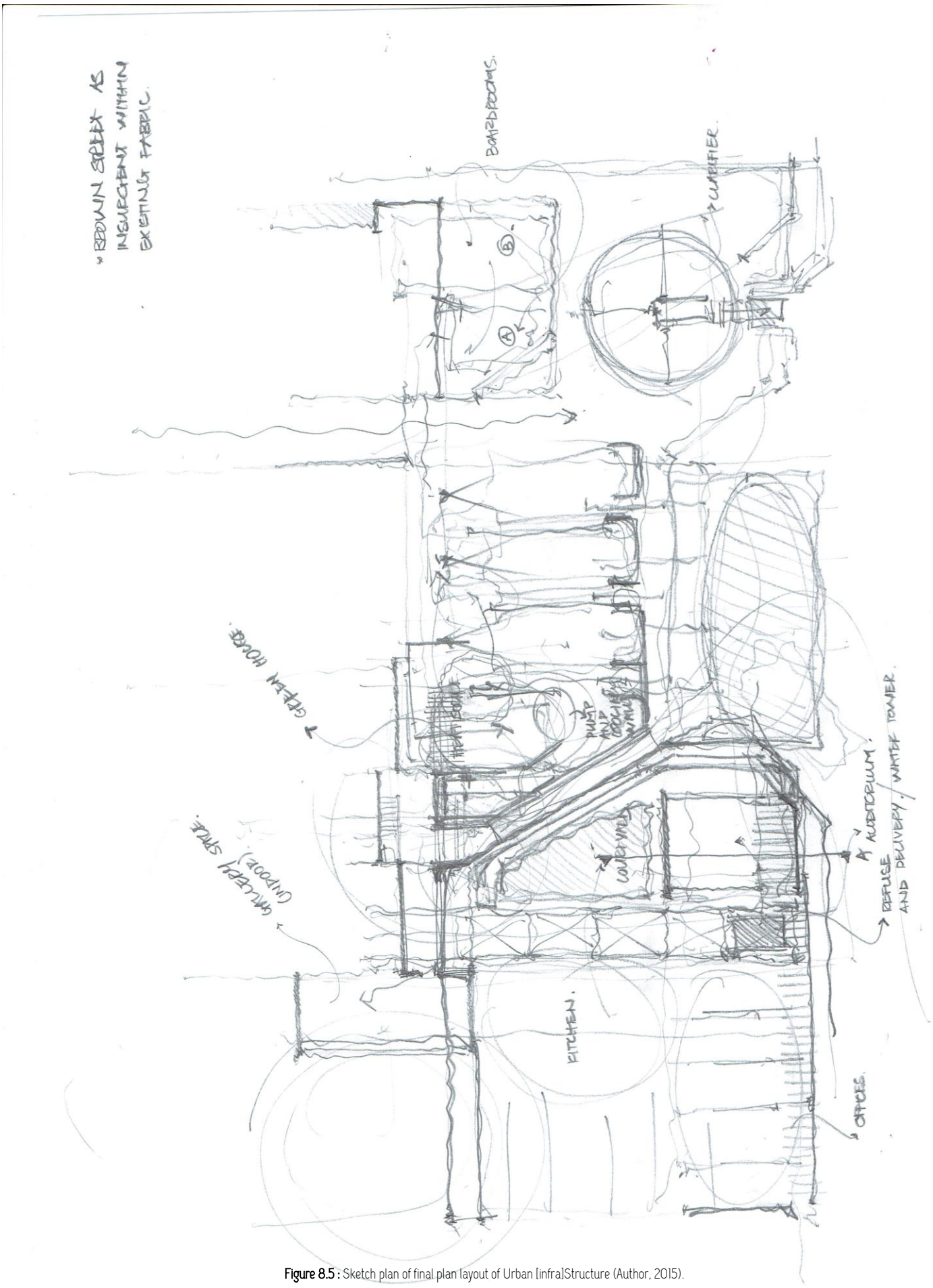

Figure 8.5 : Sketch plan of final plan layout of Urban [infra]Structure (Author, 2015).

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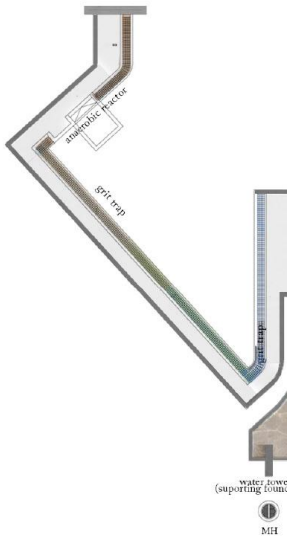

Brow

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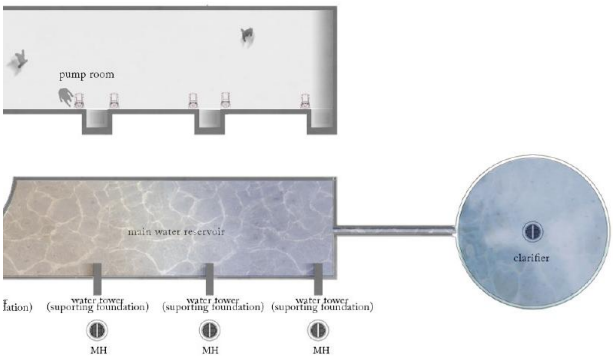

n Street

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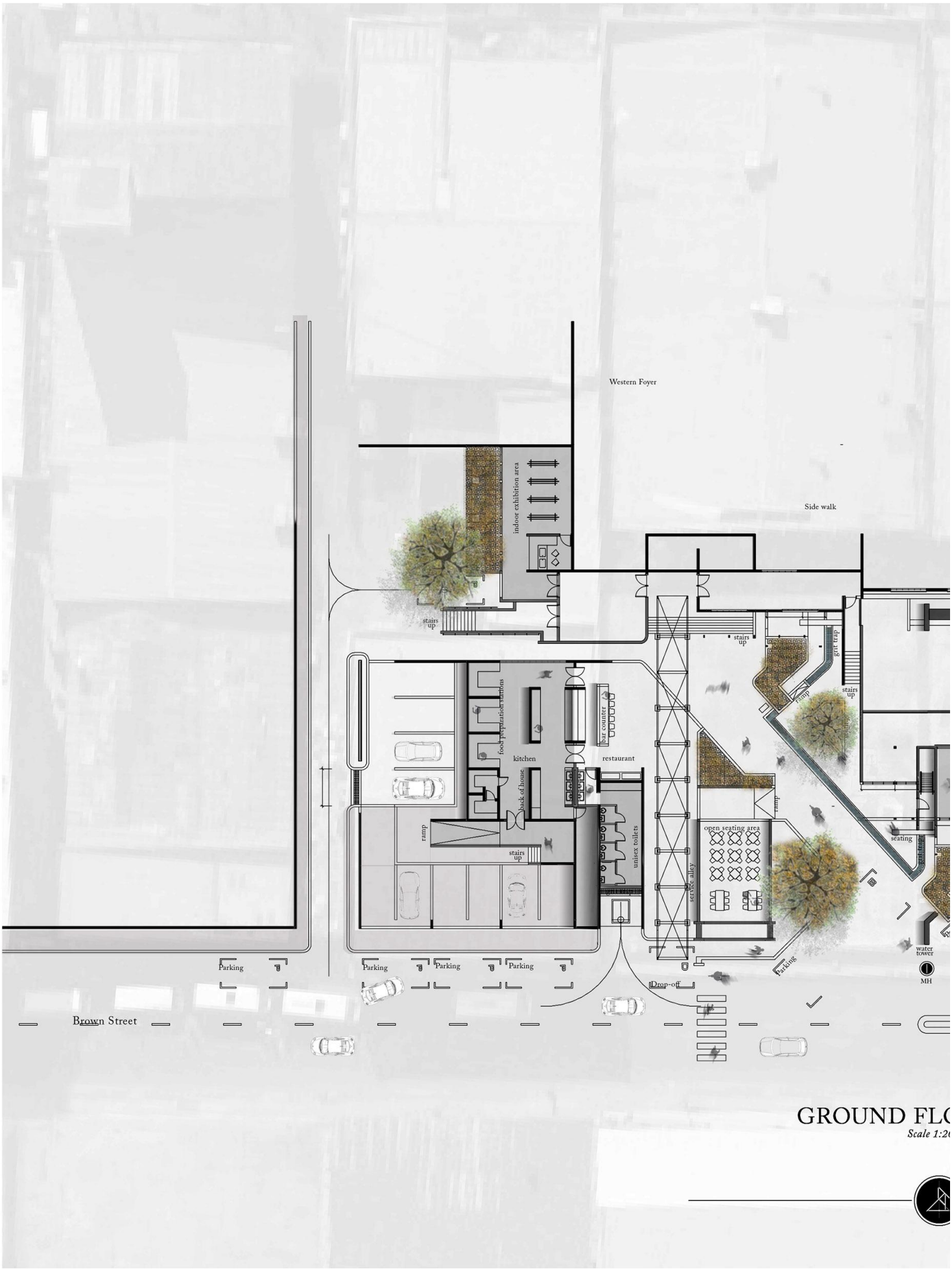

GROUND FL
Scale 1:2

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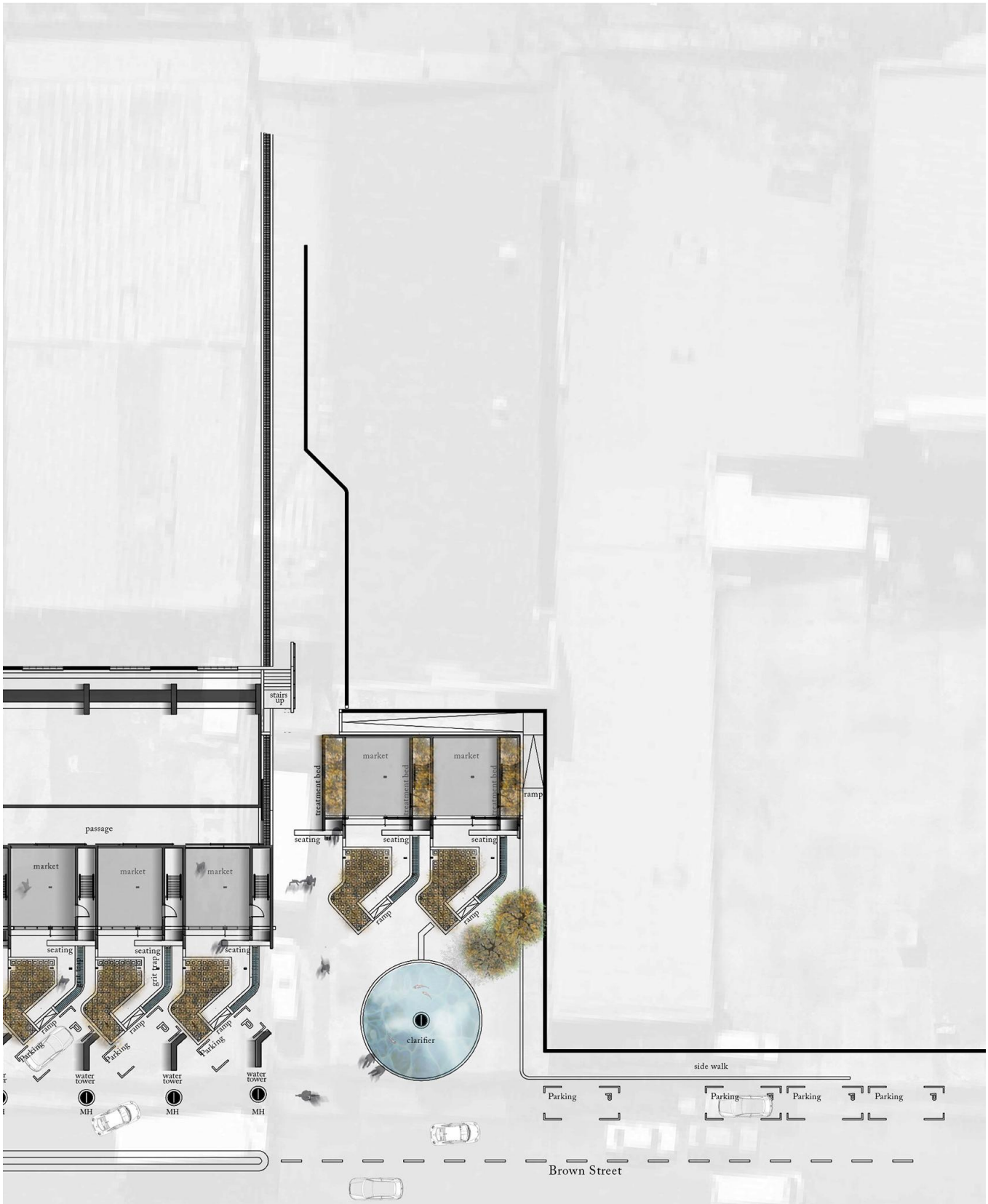

LOOR PLAN
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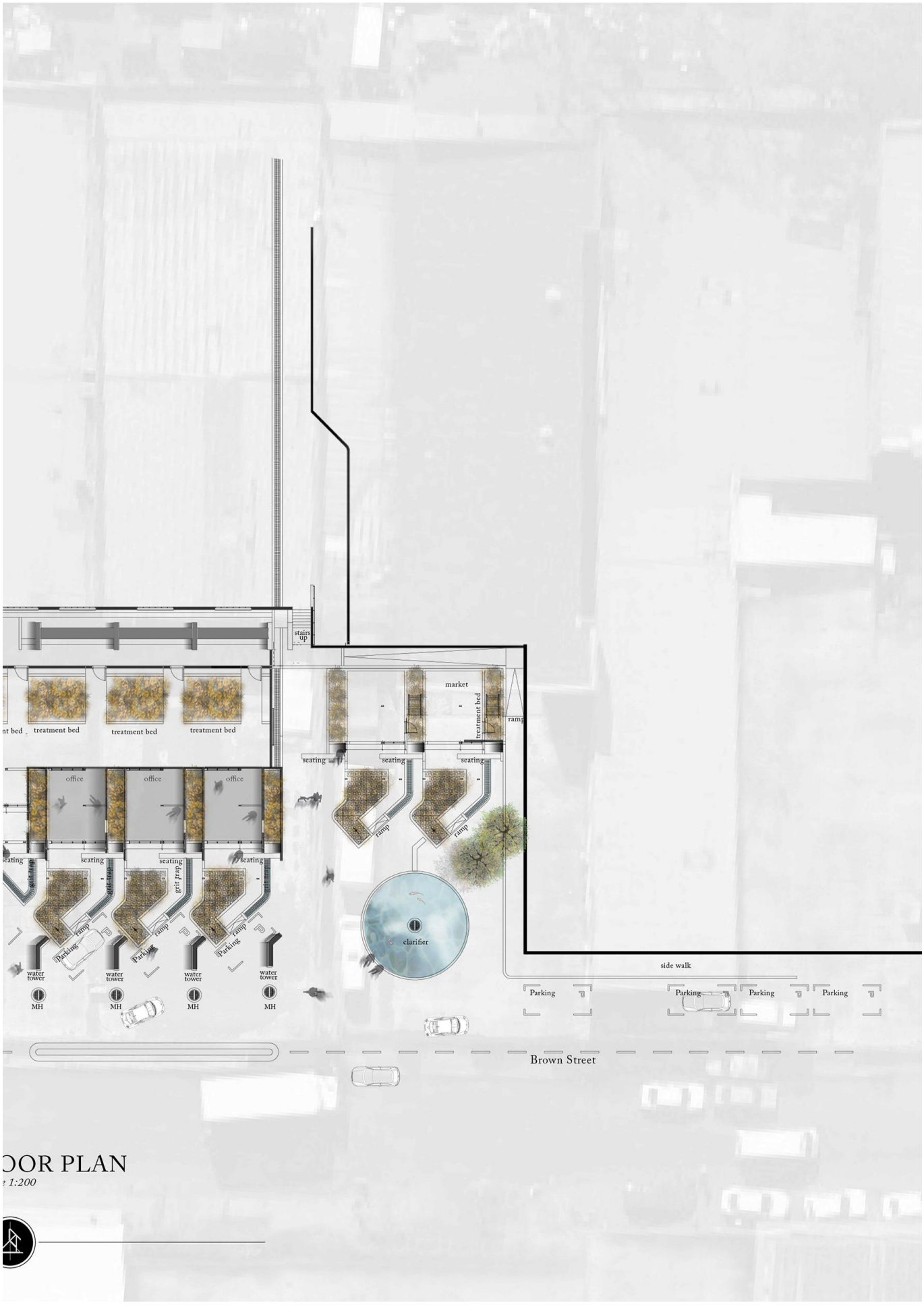

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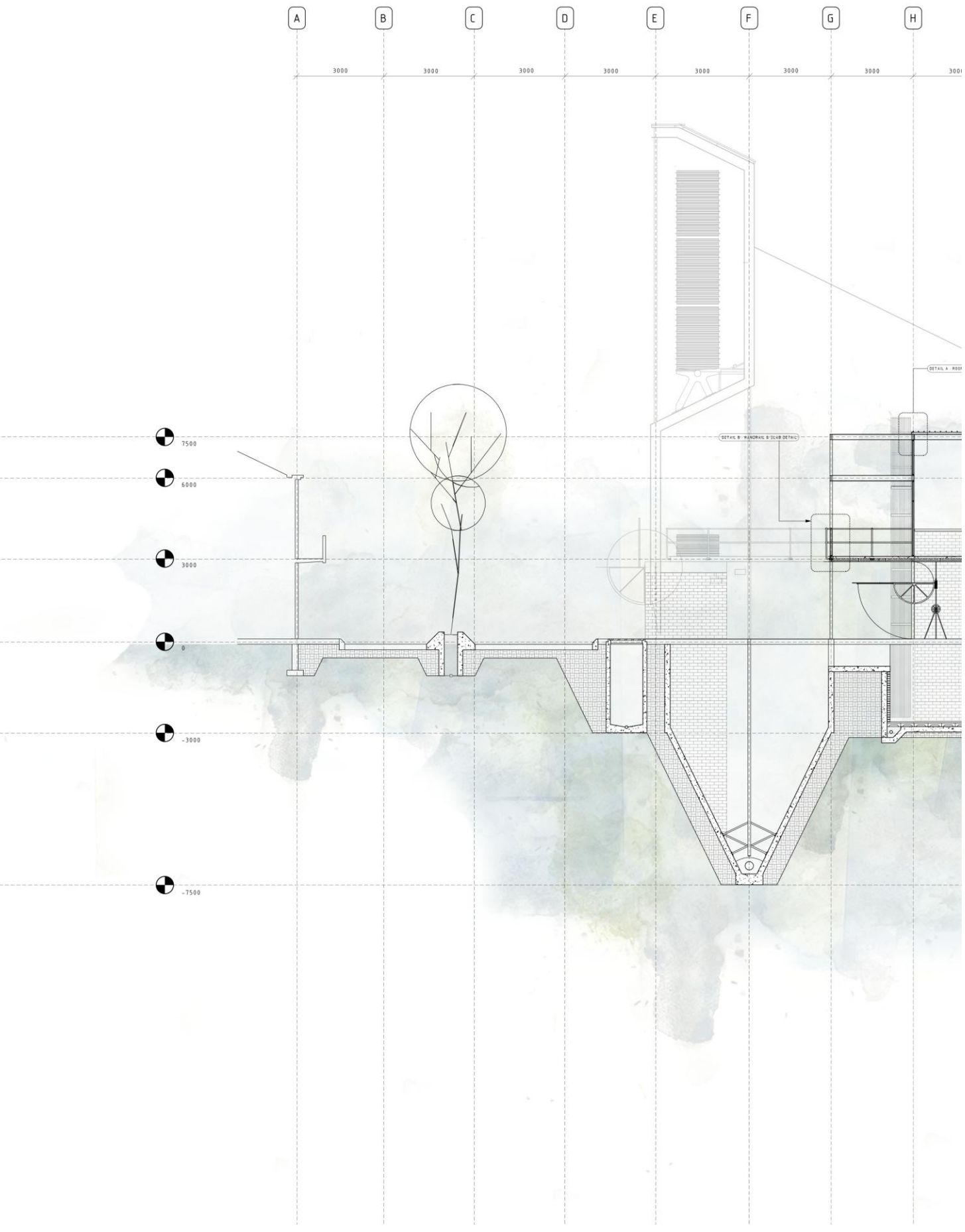

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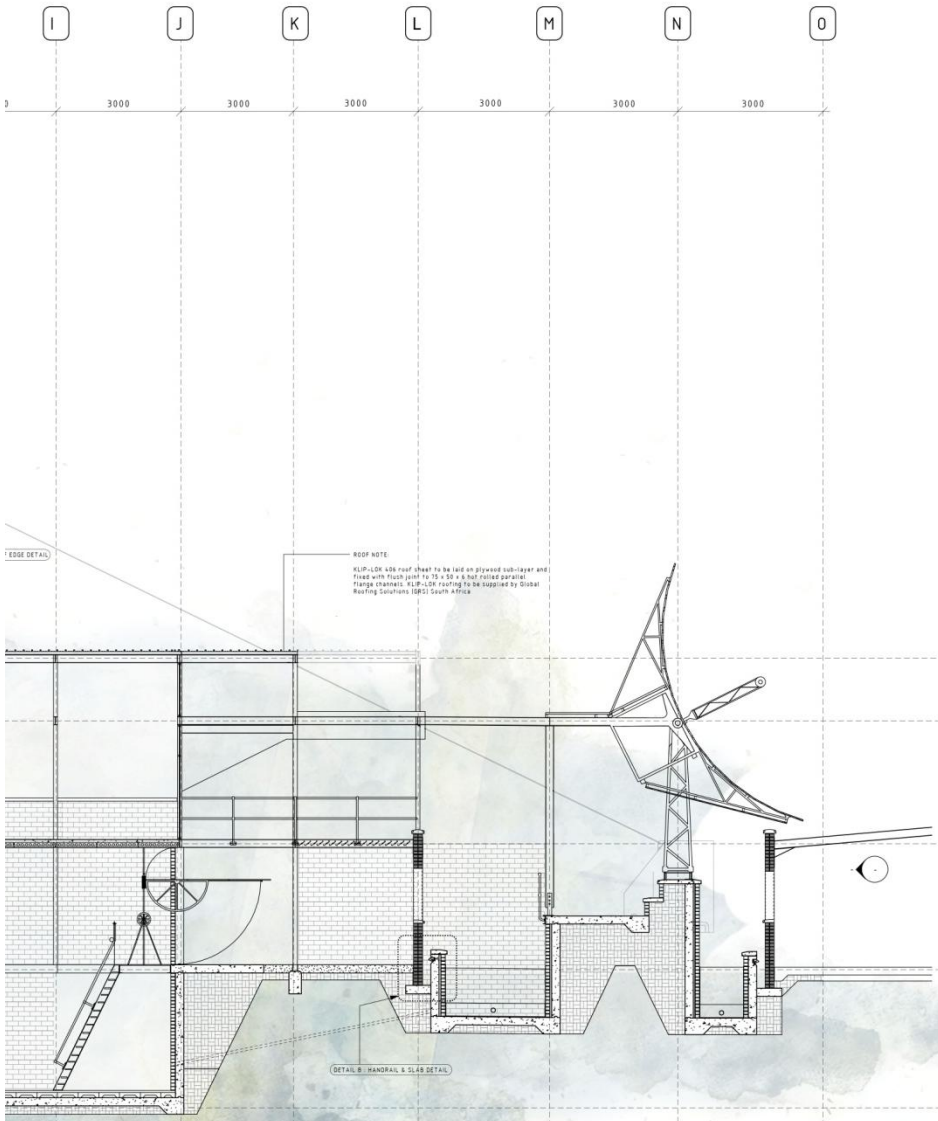

SECTION A – A

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Infrastructure

WATER

The Third and Forth circulation routes deal with the distribution of wastewater throughout the treatment process as well as the recycling of scrap metal throughout the workshops. From the point at which the untreated water forms a threshold toward Brown Street in the form of parking bays, the water is gravitated in parallel from South to North through the site, linking designed spaces throughout the treatment stages. The integration of water treatment and circulation strengthens the experiential quality in terms of a sensory experience. The sound of water circulating from tanks to tank as well as the aesthetic appeal of the vegetation.

8.5

[structural systems]

- sequence of [infra]structure construction -

The structural system of the proposal Urban [infra]Structure is discussed below as three interdependent structural entities which constitute the buildings syntax, namely substructure, superstructure and layered skins. (reference / quote)

8.5.1 Substructure

This construction element does not only support the lateral imposed loads of the superstructure, it also serves as the newly proposed ground plane. The substructure introduces a level change of up to 3 meters allowing for a ..... connection to existing buildings on site. The stereotomic nature of the substructure, deliberately contrasting with the existing construction typology Brown Street, and is to be read as a manipulation of the existing ground plan in order to access the potentials of that which is contained within. It also allows for the poetic integration between existing as stereotomic and the new as tectonic which is to be perceived as an addition. The substructure therefore forms the supporting foundation of the tectonic which contains a series of multi-programmable spaces including a basement which acts as a central pump room for the wastewater treatment system.

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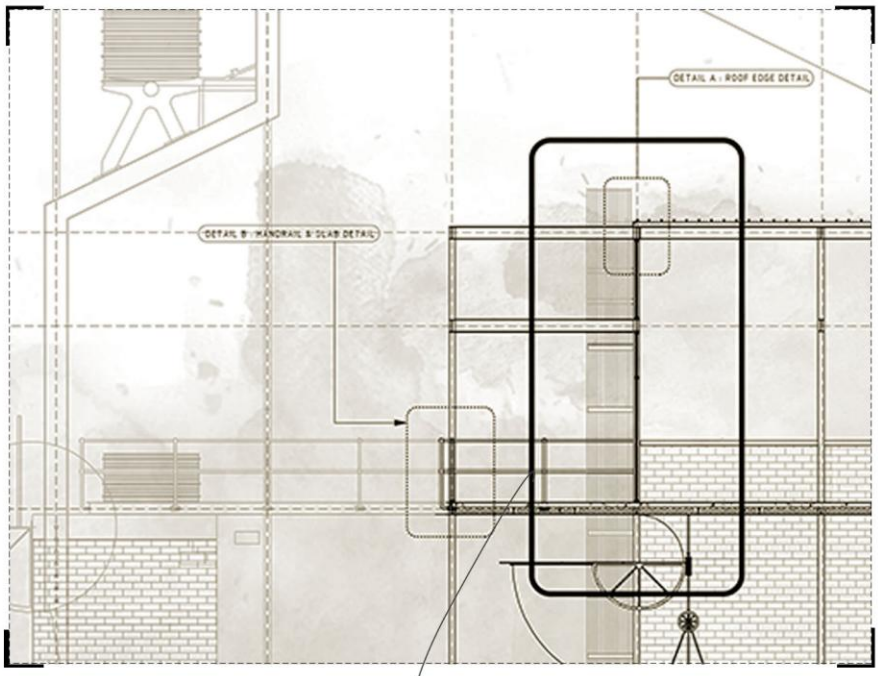
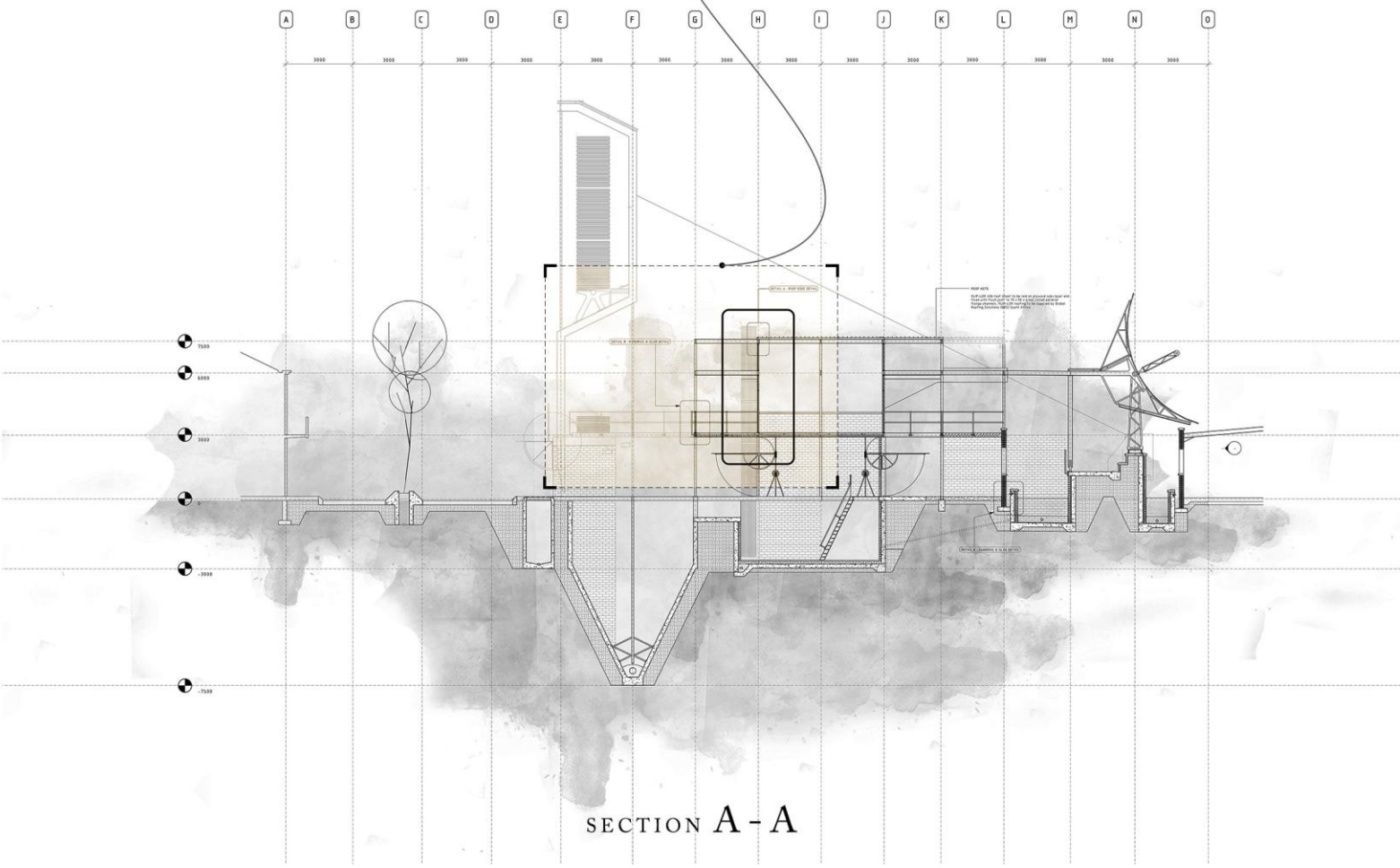


PERSPECTIVE DETAIL



SECTION A - A

Figure 7.6 : callout of section indicating the selected TECONTIC illustrated in the follow development. (Author, 2015).

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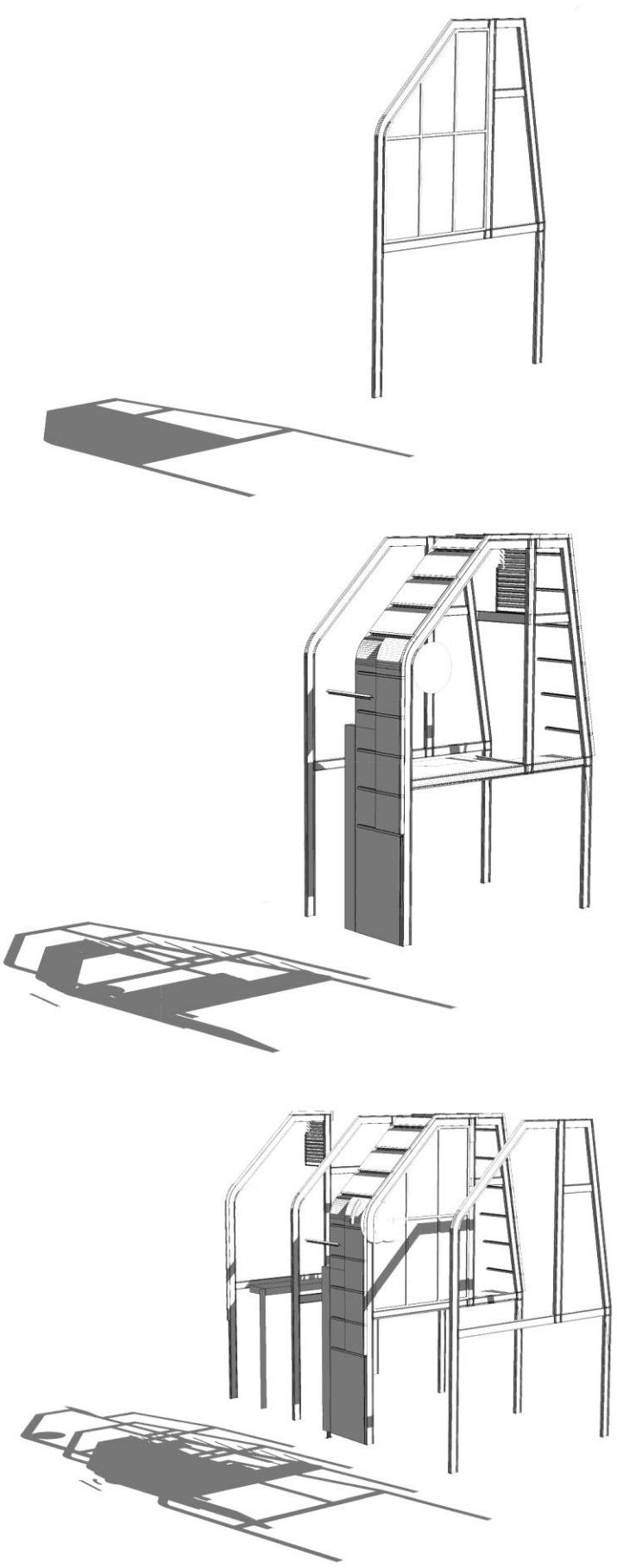

Figure 7.7 : TECONTIC development (Author, 2015).

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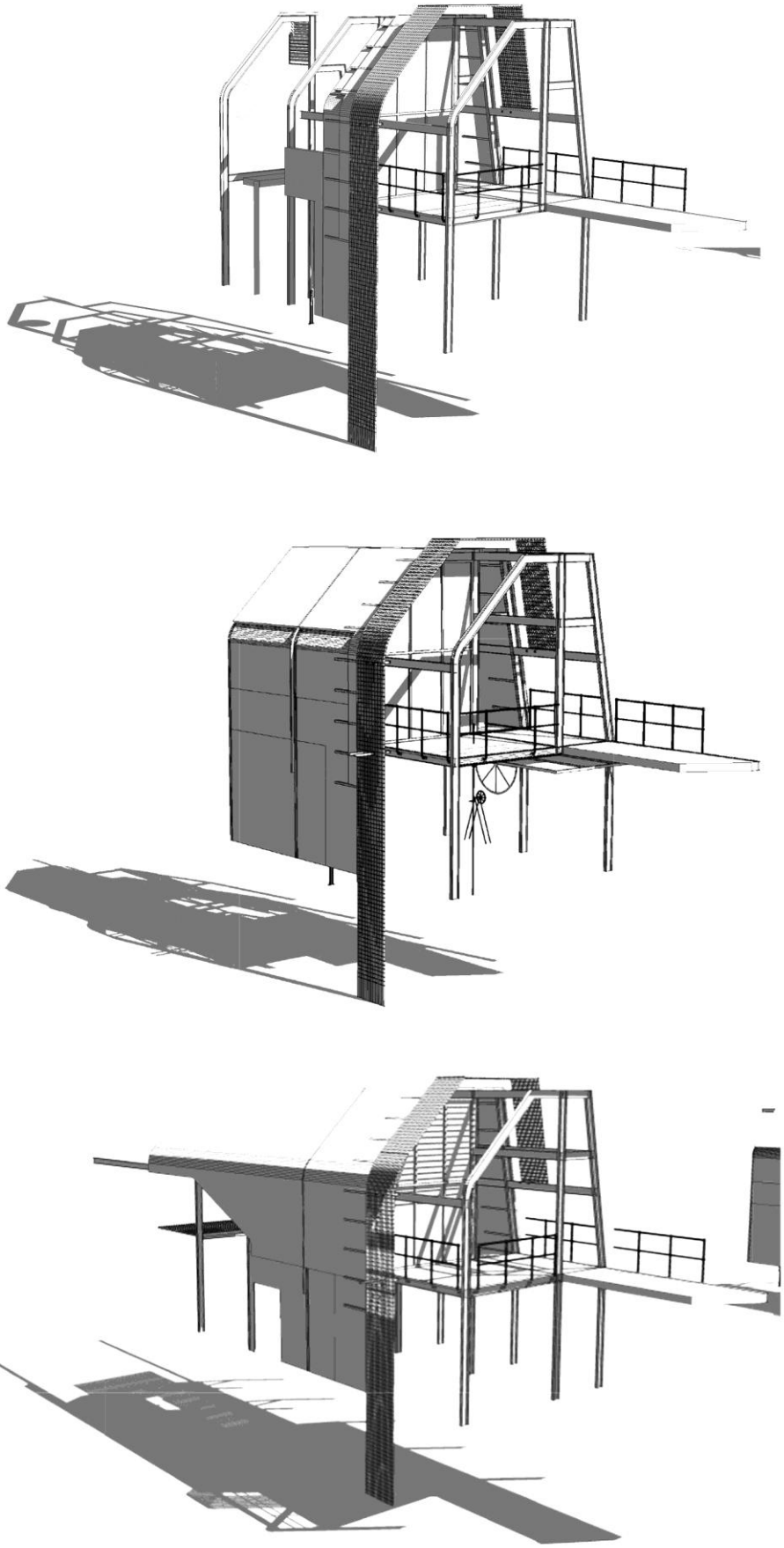

Figure 7.8 : TECONTIC development (Author, 2015).

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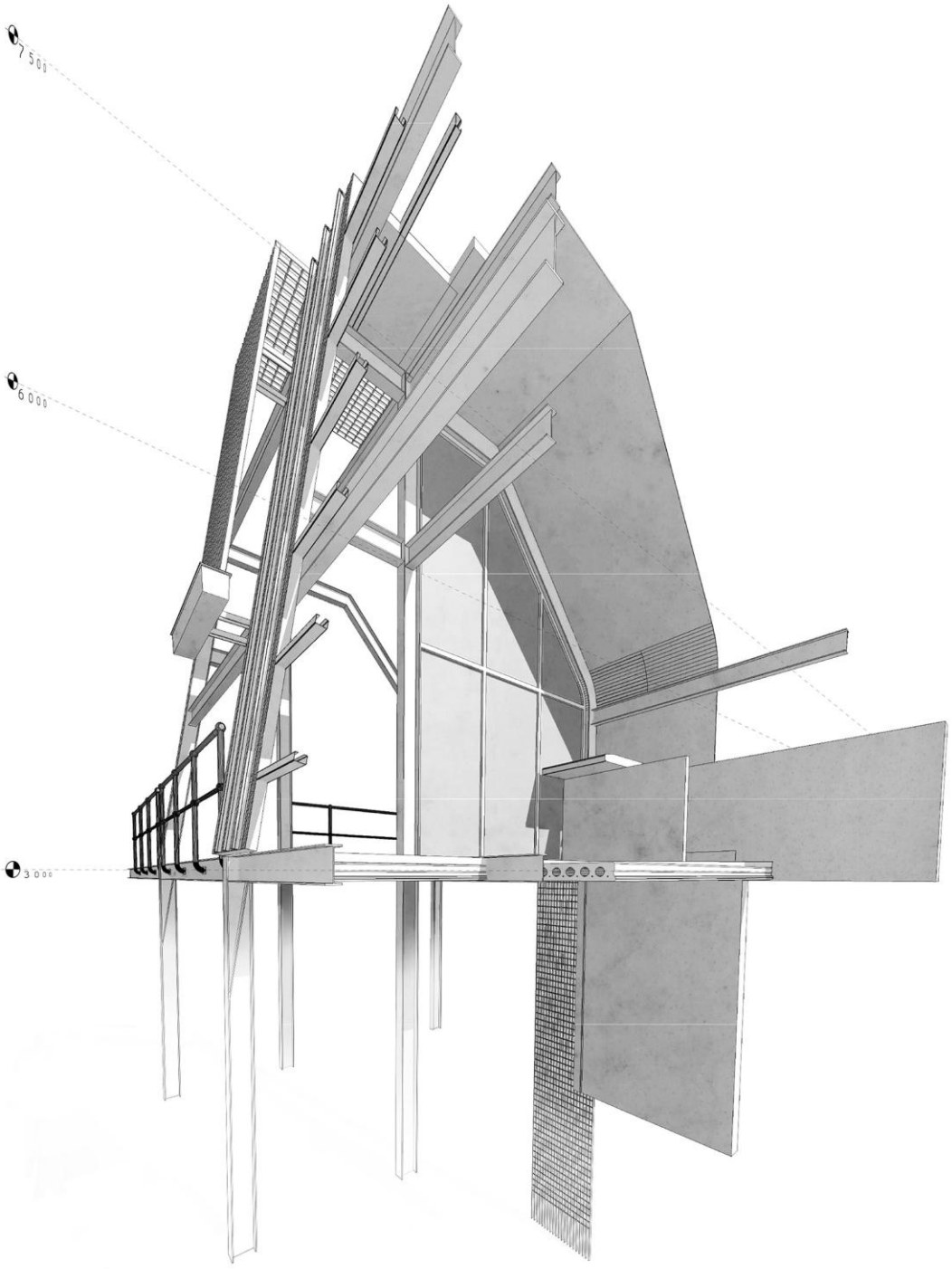
07|2

[tectonic materiality]

The proposed architecture also expresses this relationship in the way in which infrastructure and architecture are accommodated simultaneously, how infrastructure and architecture are expressed through the way the in which each component is assigned an aesthetic role. The role of stereotomic as consistent through time and the role of the tectonic as adaptable and the flexible. The materiality of existing buildings within the context of Brown Street demonstrate an aesthetic dimension to these roles.



Office / Workshop / Green House Tectonic clay Rendering

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07|3

[tectonic materiality]

The proposed architecture also expresses this relationship in the way in which infrastructure and architecture are accommodated simultaneously, how infrastructure and architecture are expressed through the way the in which each component is assigned an aesthetic role. The role of stereotomic as consistent through time and the role of the tectonic as adaptable and the flexible. The materiality of existing buildings within the context of Brown Street demonstrate an aesthetic dimension to these roles.

"The process of entropic decay communicated in the layering of change over time"

(Woods, 2012)

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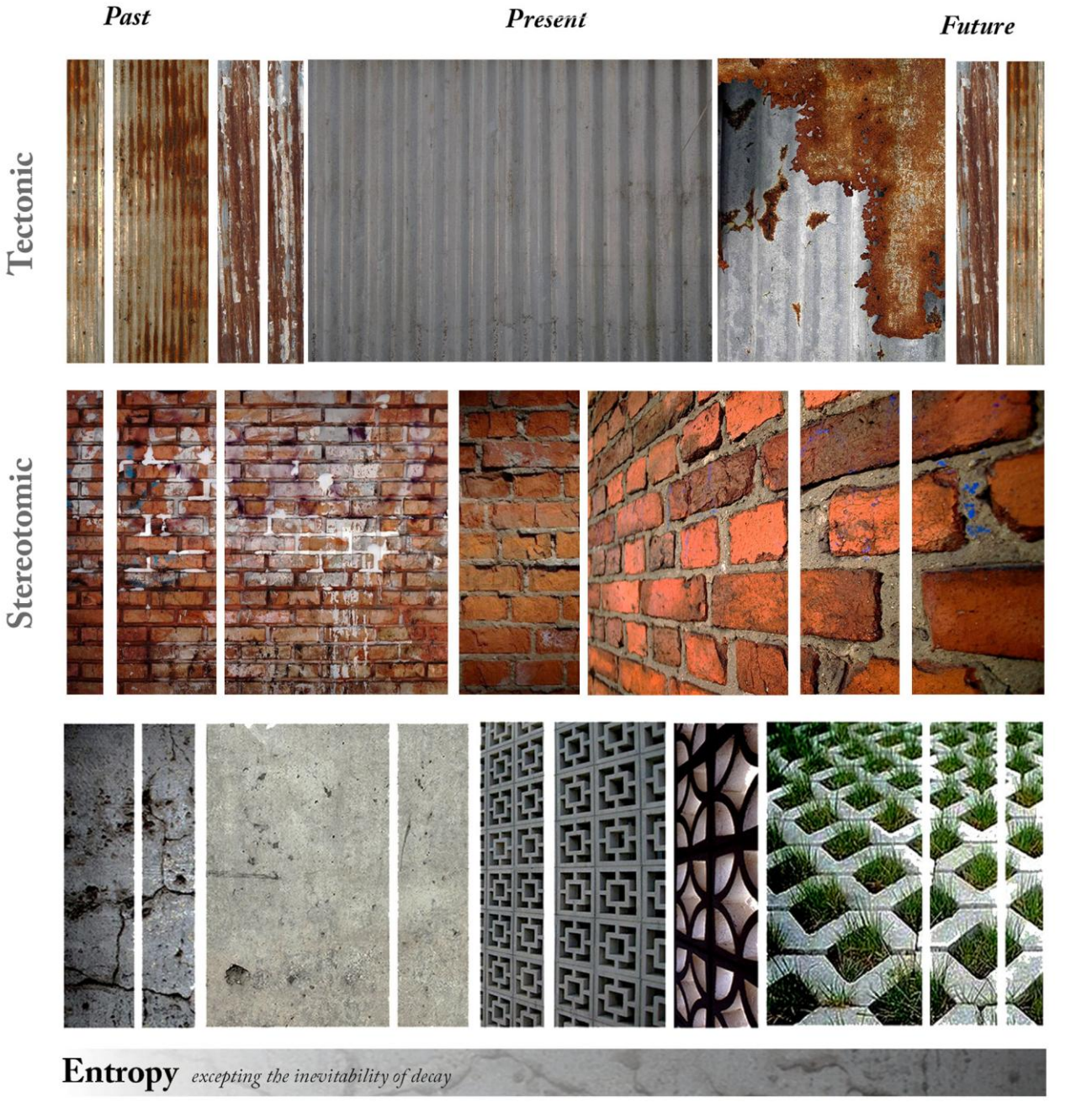

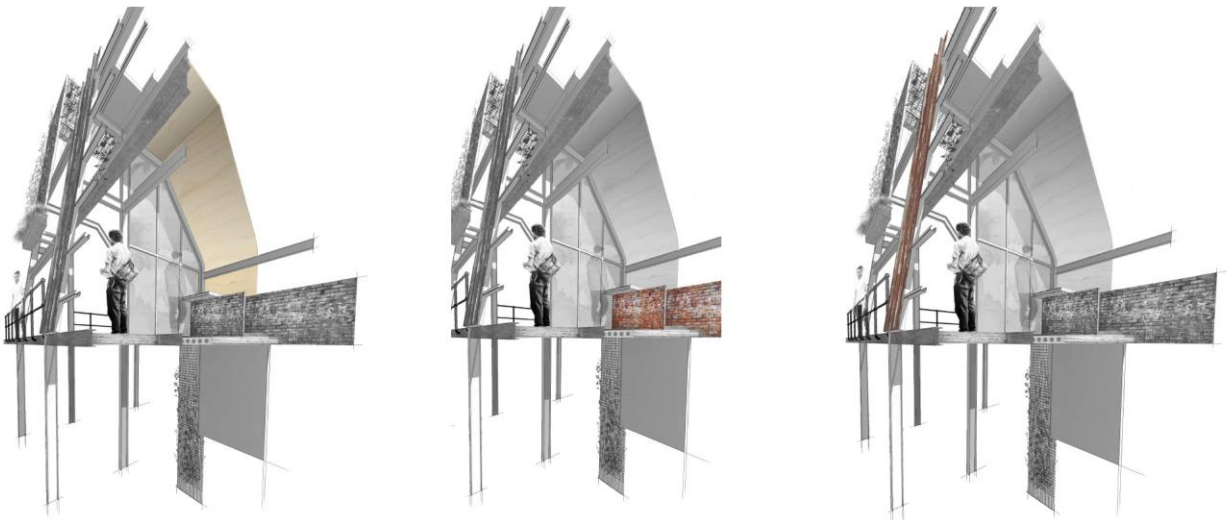

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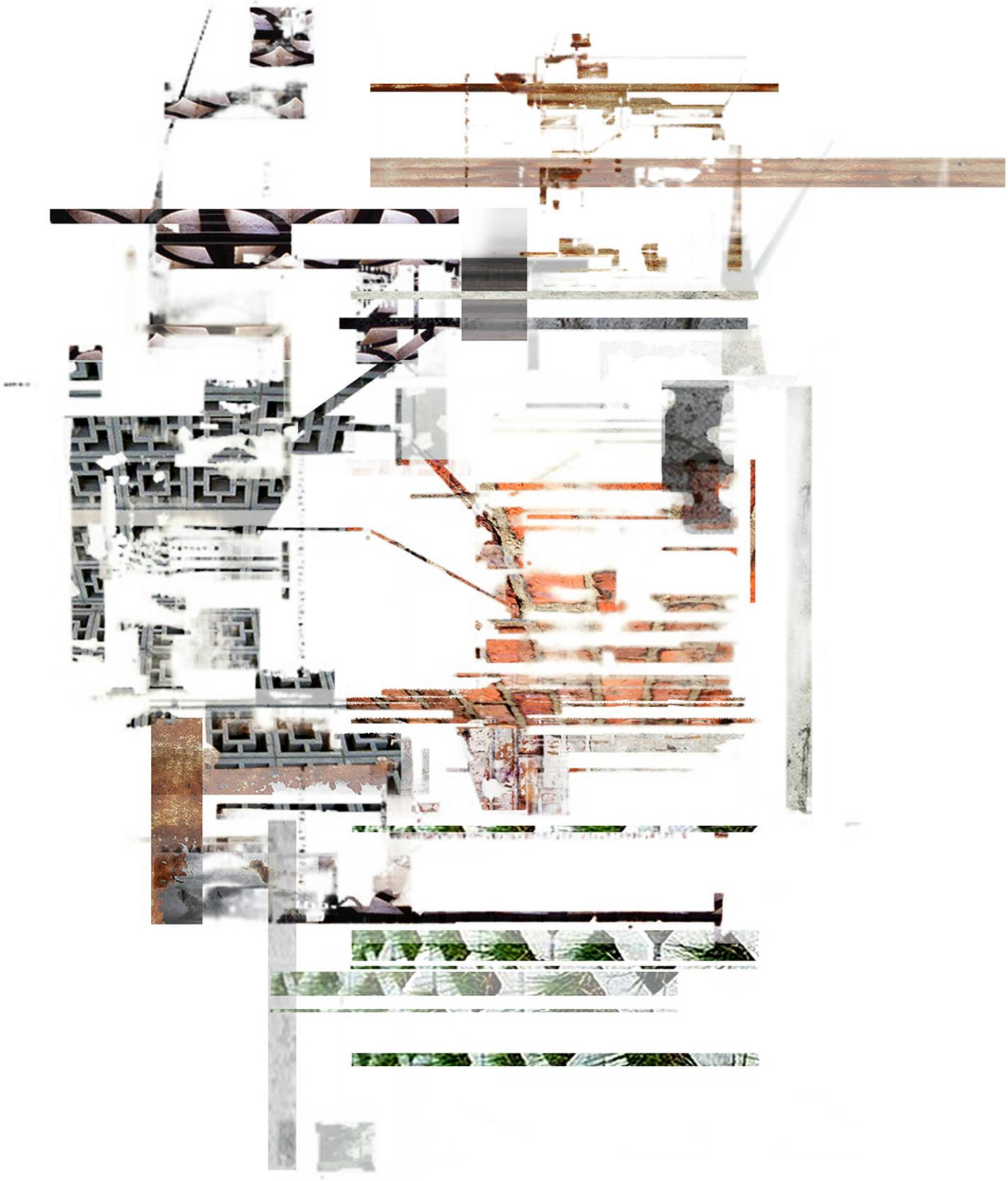
MATERIALITY

STEREOTOMIC (EARTH) = MASSING : BRICK ON CONCRETE BASE
TECTONIC (FABRIC) = CHANGE AND DECAY : IBR ROOF SHEETING



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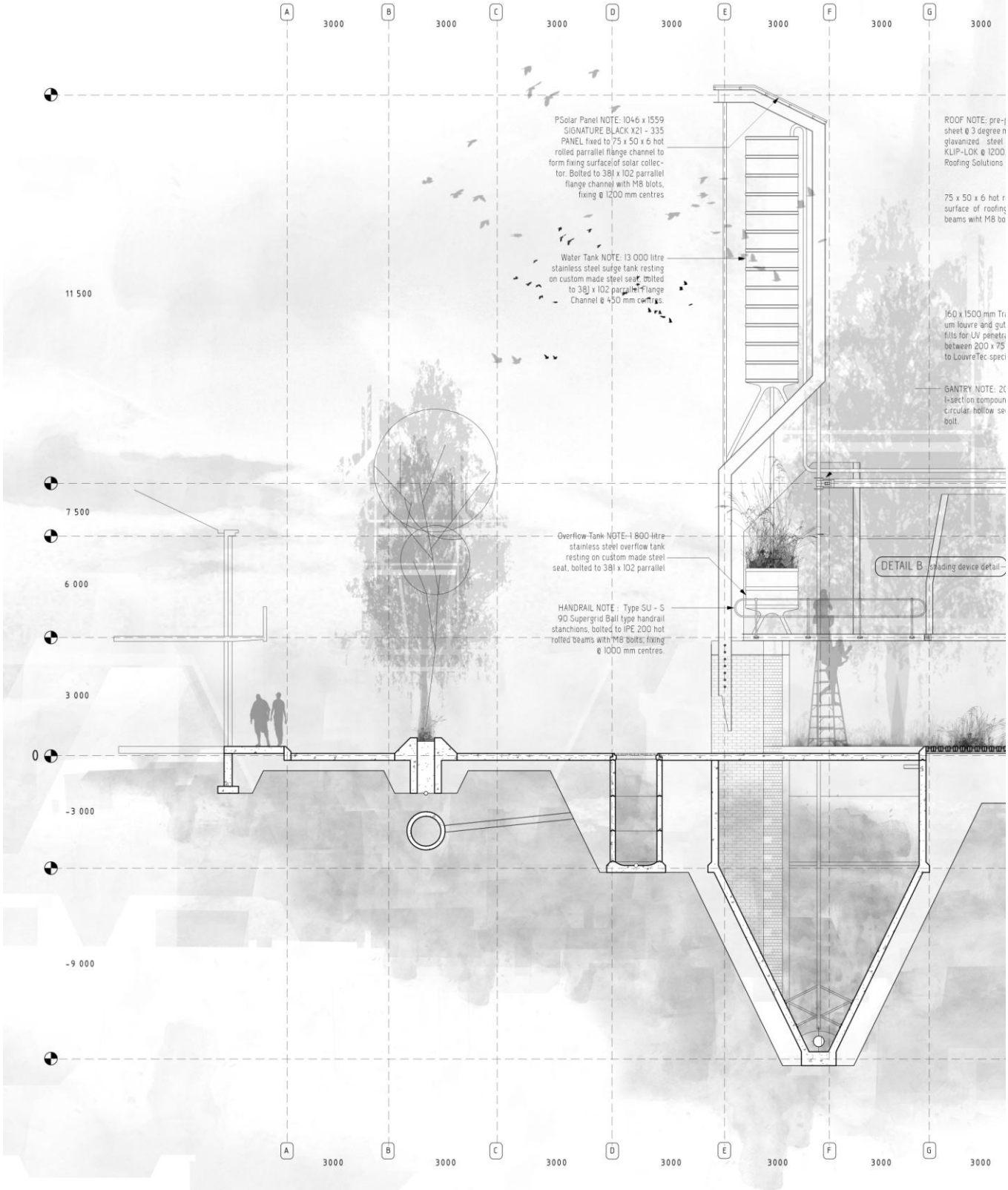

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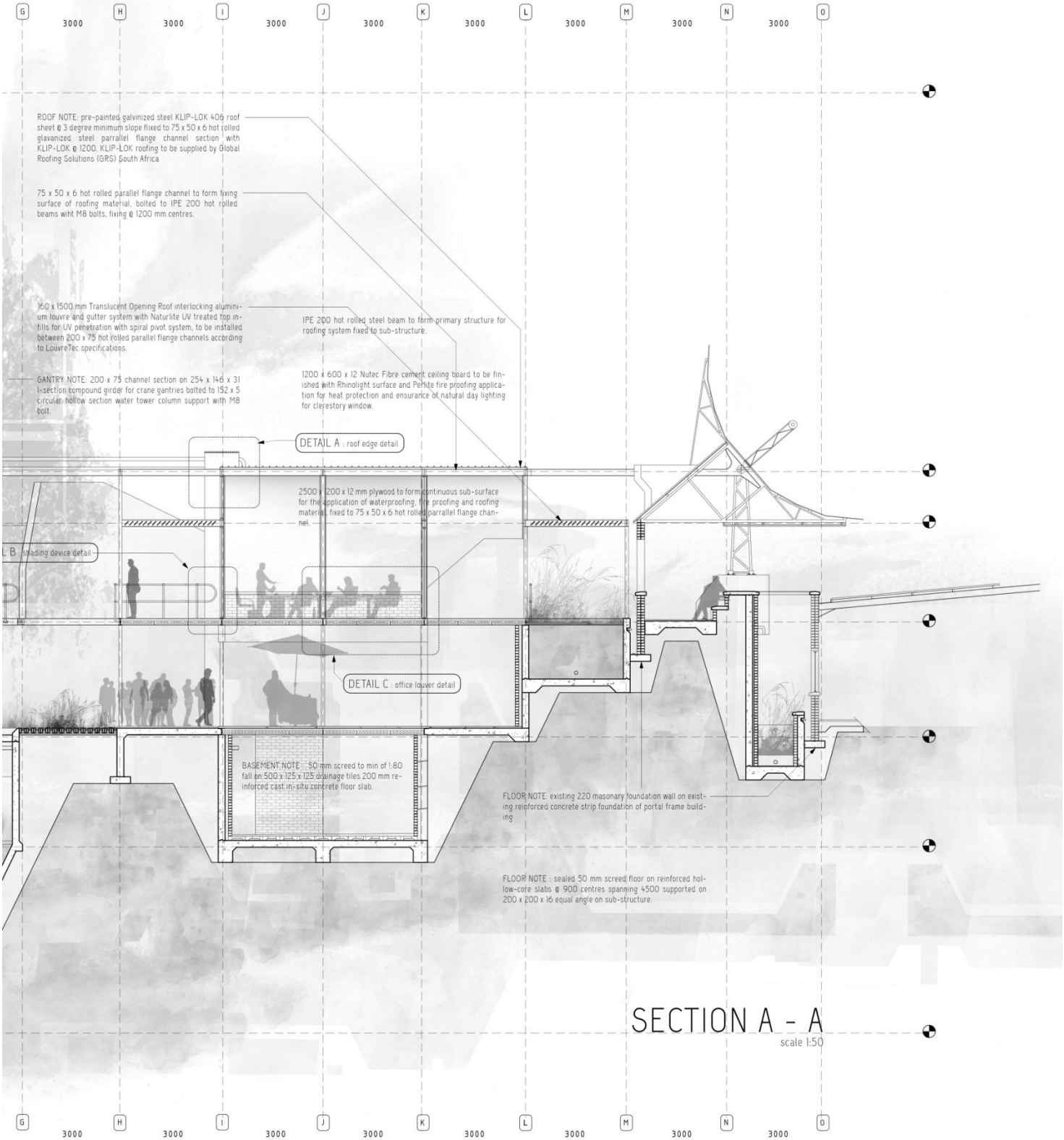

SECTION A - A

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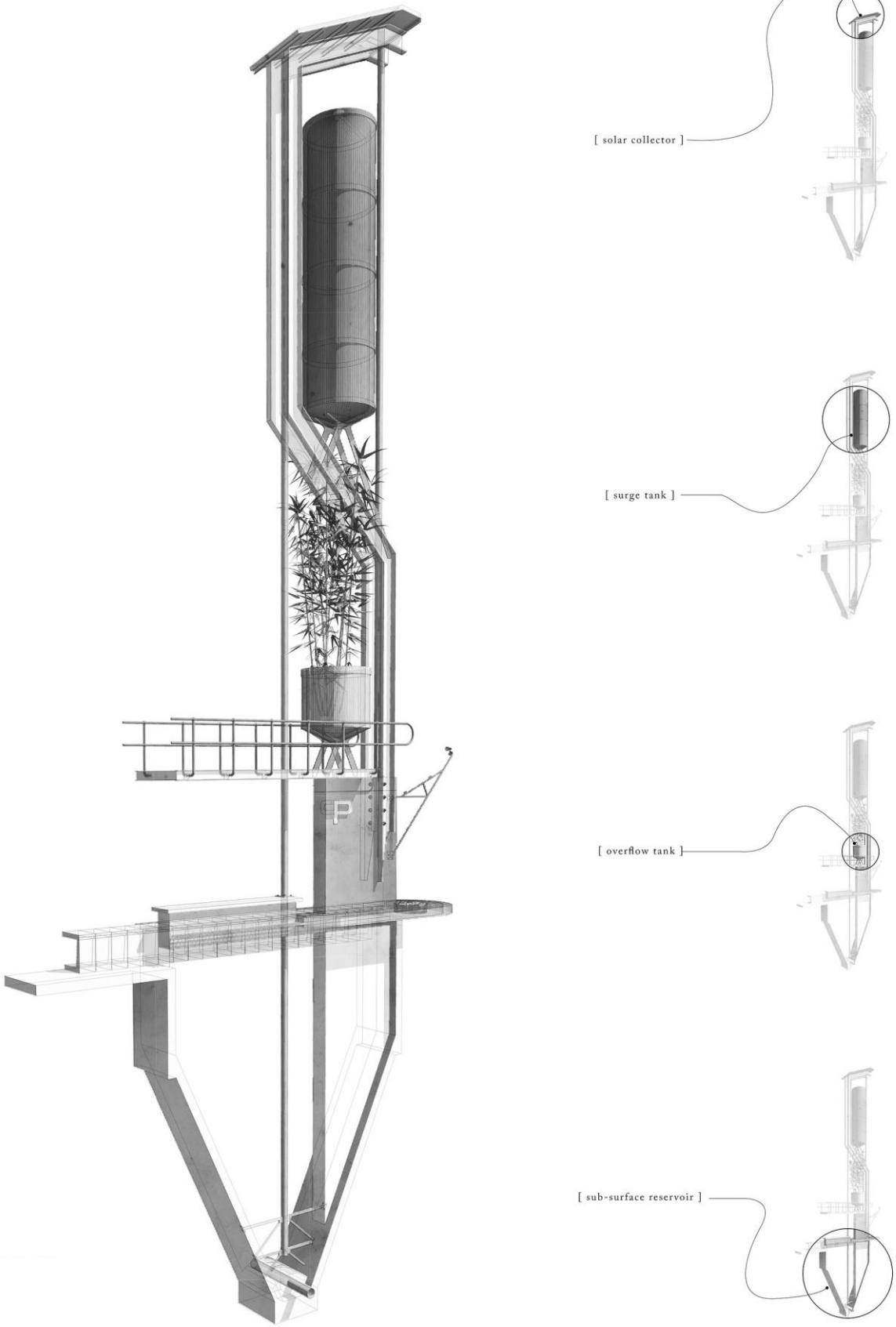

BROWN STREET [infra]STRUCTURE

- surge and overflow tanks as component of sub-surface water reservoir -

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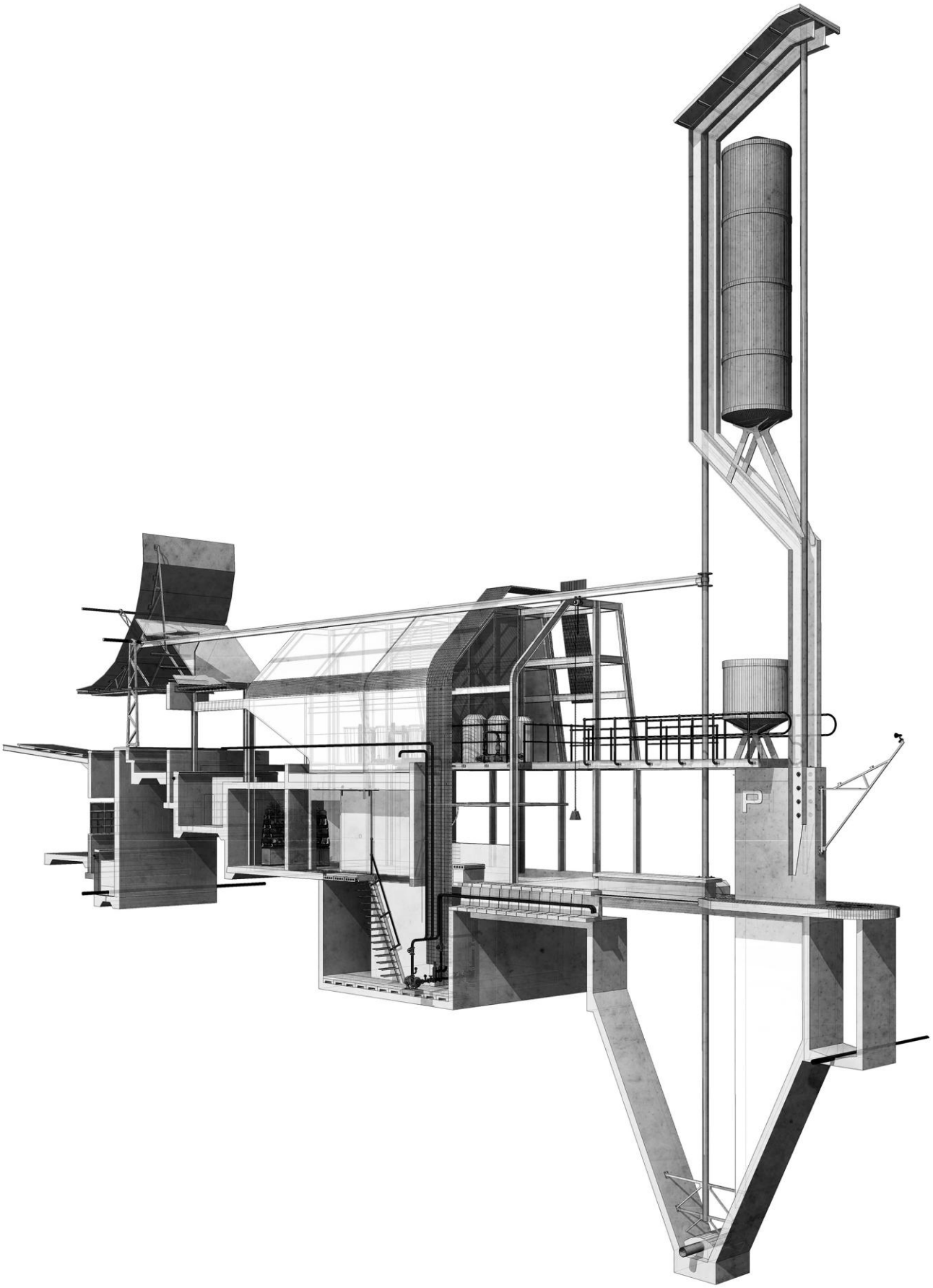

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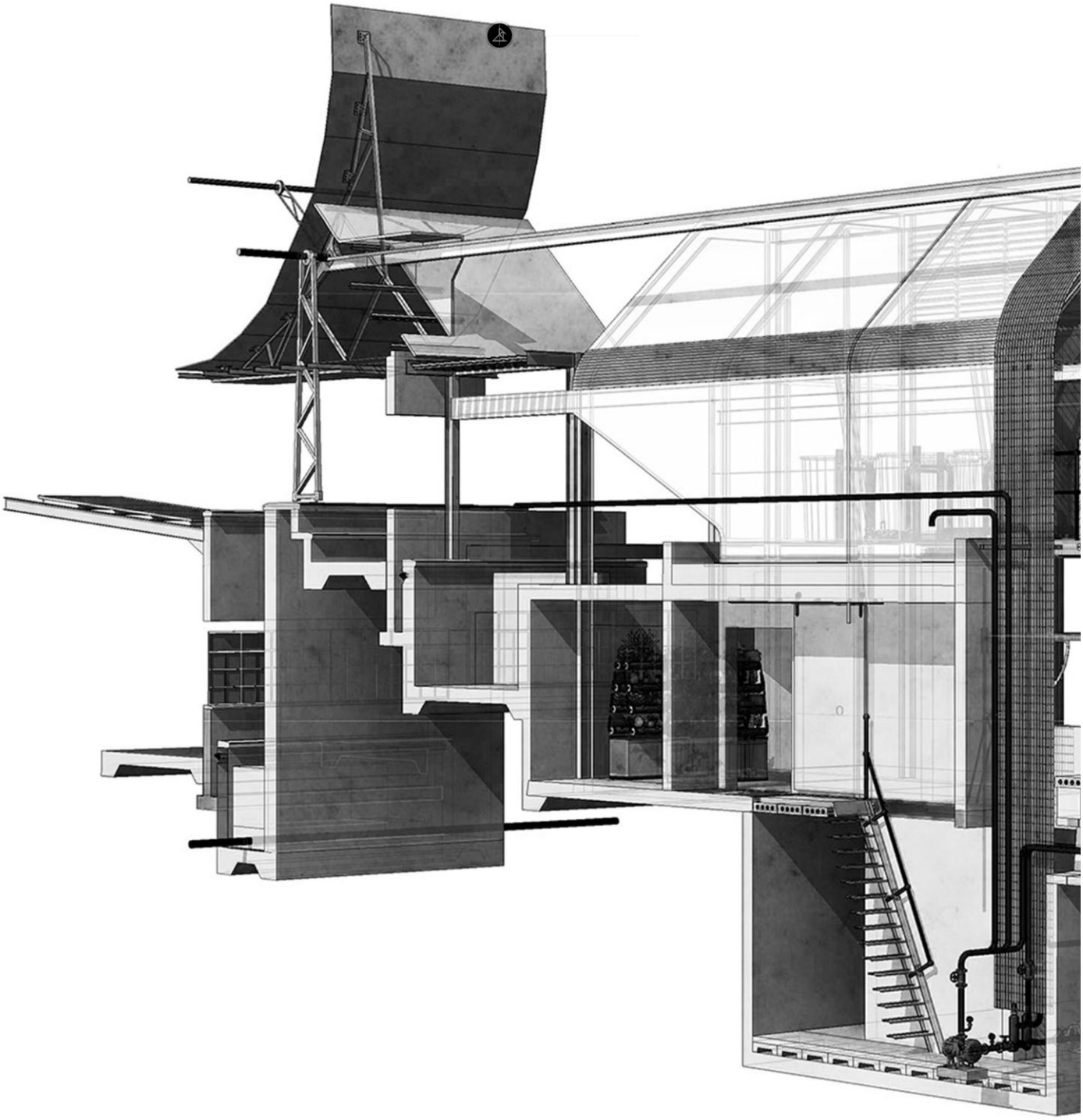
U R B A N [i n f r a] S T R U C T U R E

- sectional perspective -



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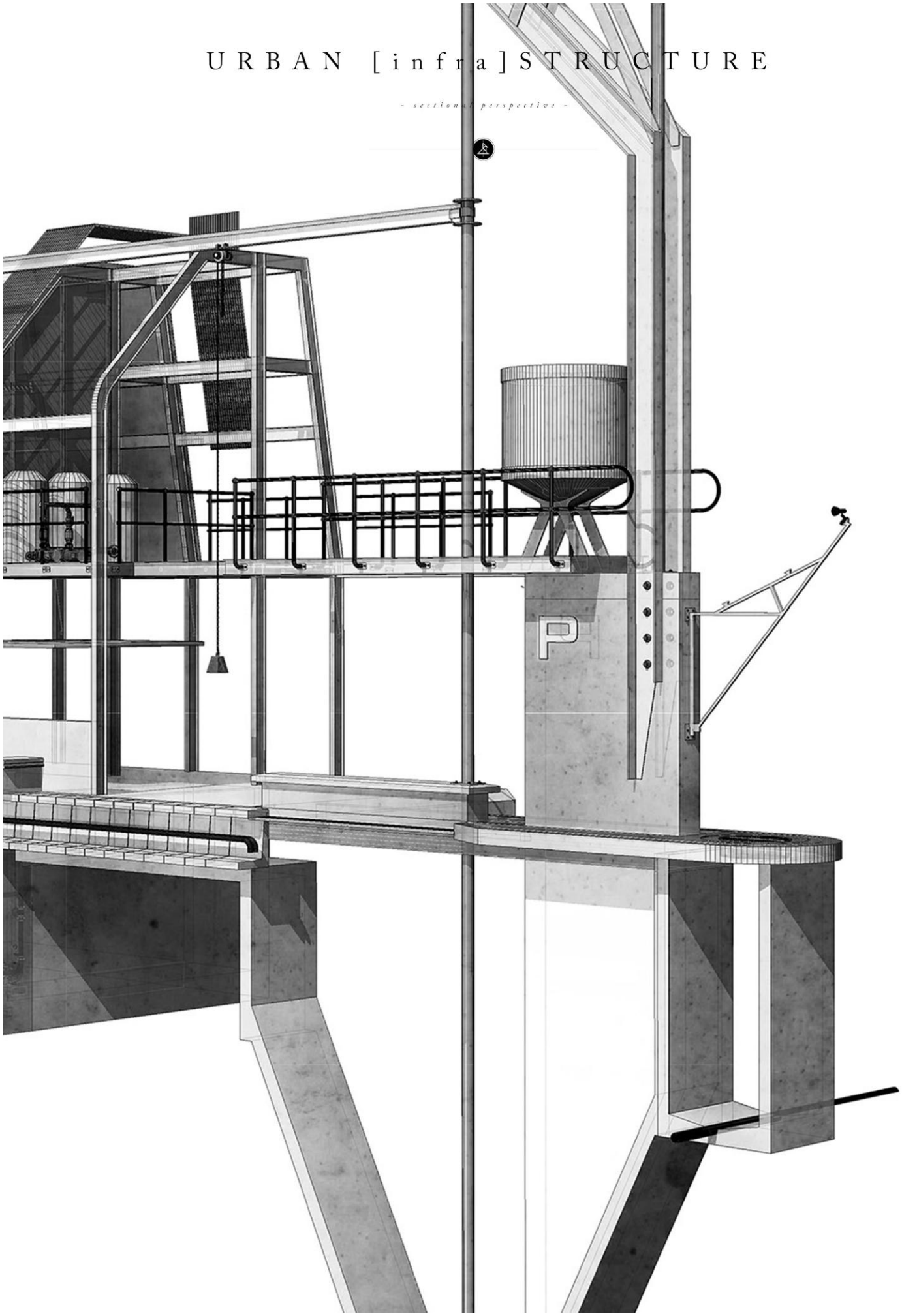
U R B A N [i n f r a] S T R U C T U R E

- sectional perspective -



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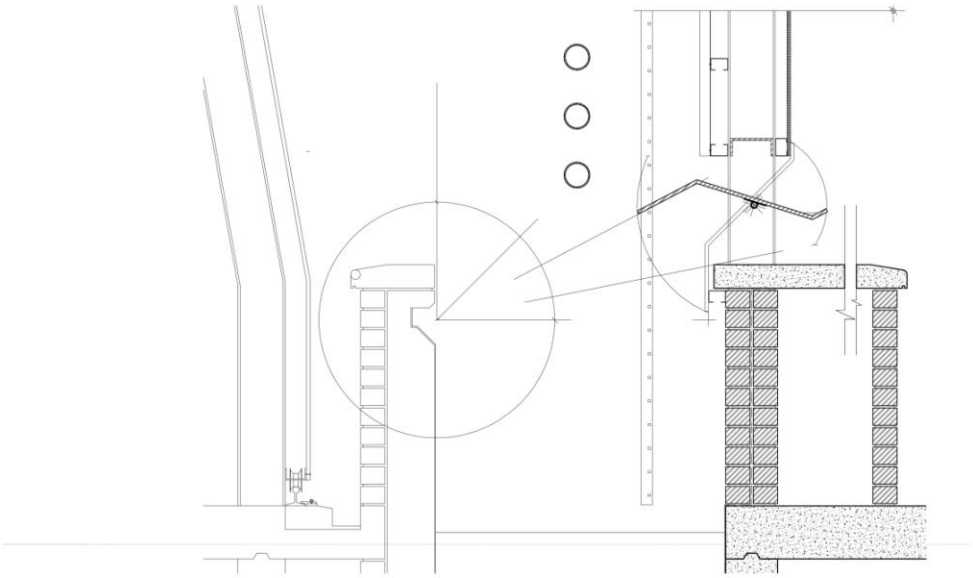
STEREOTOMIC AND TECTONIC

- POETIC design of FUNCTIONAL components -



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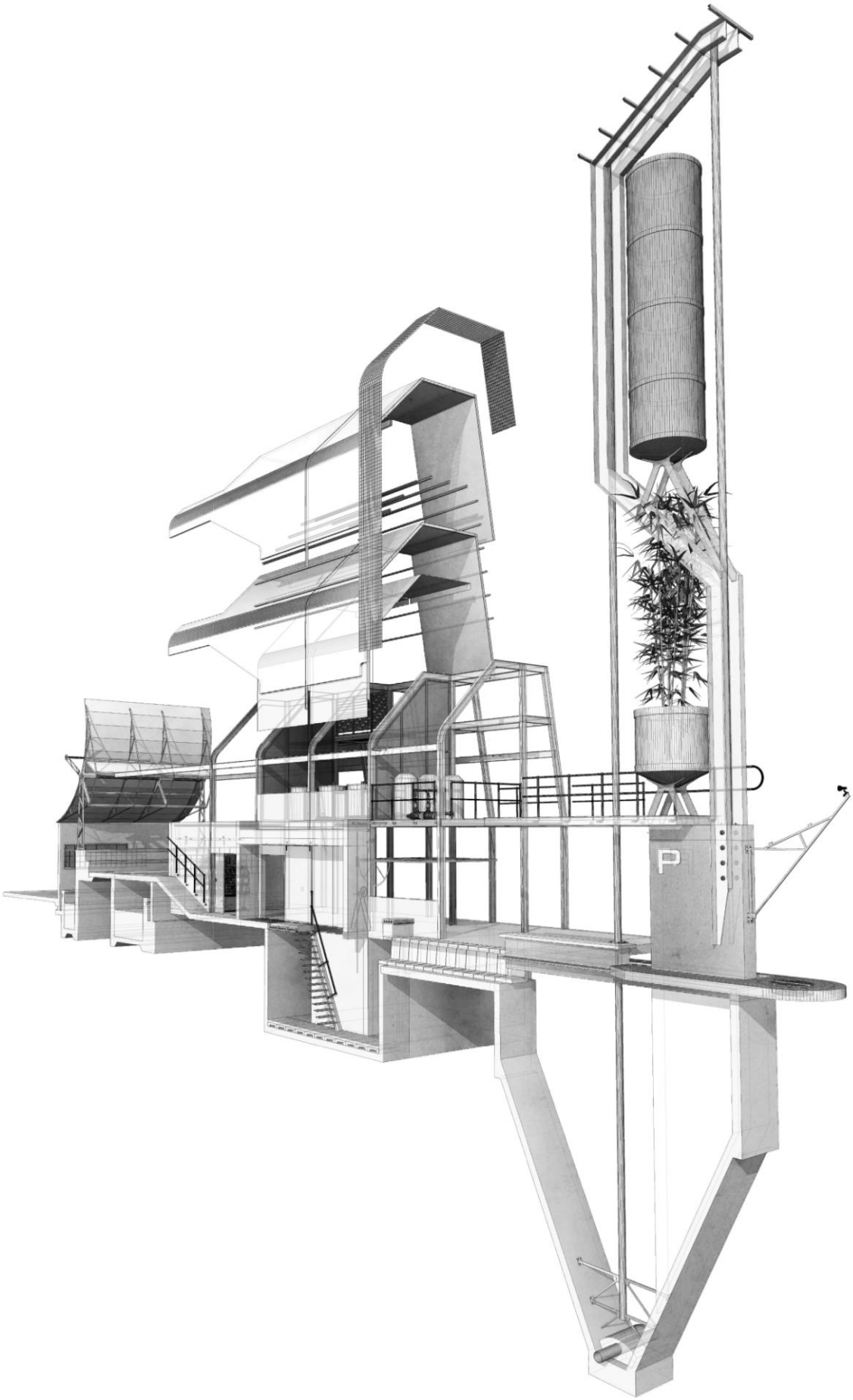
URBAN [infra] STRUCTURE

- exploded tectonic -



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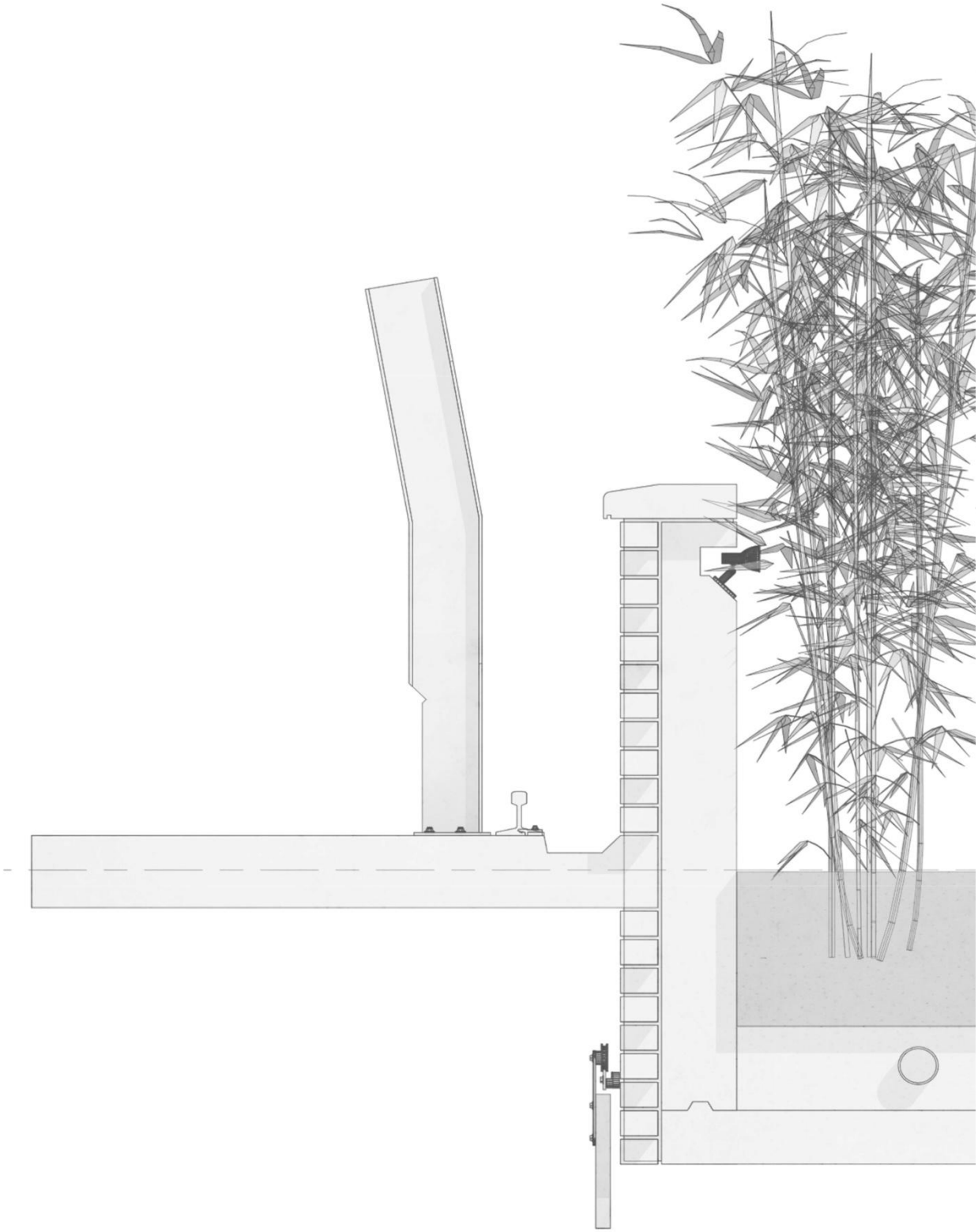

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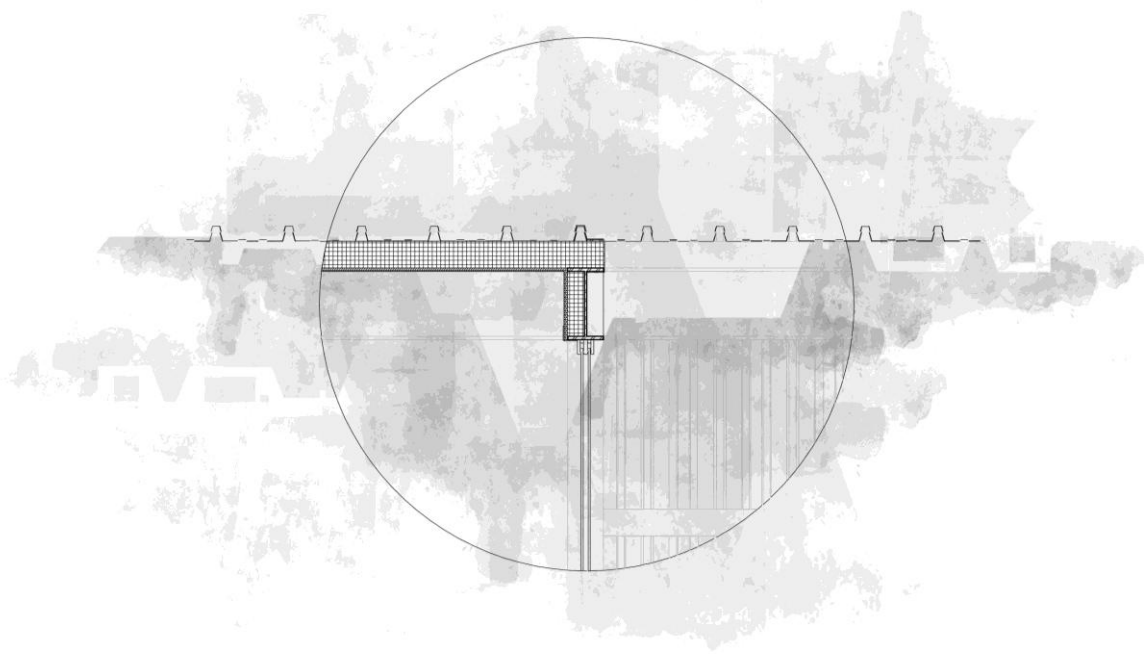

Figure 8.31: DETAIL A: DETAIL illumination of (TECTONIC) ROOF DETAIL. (Author, 2015).

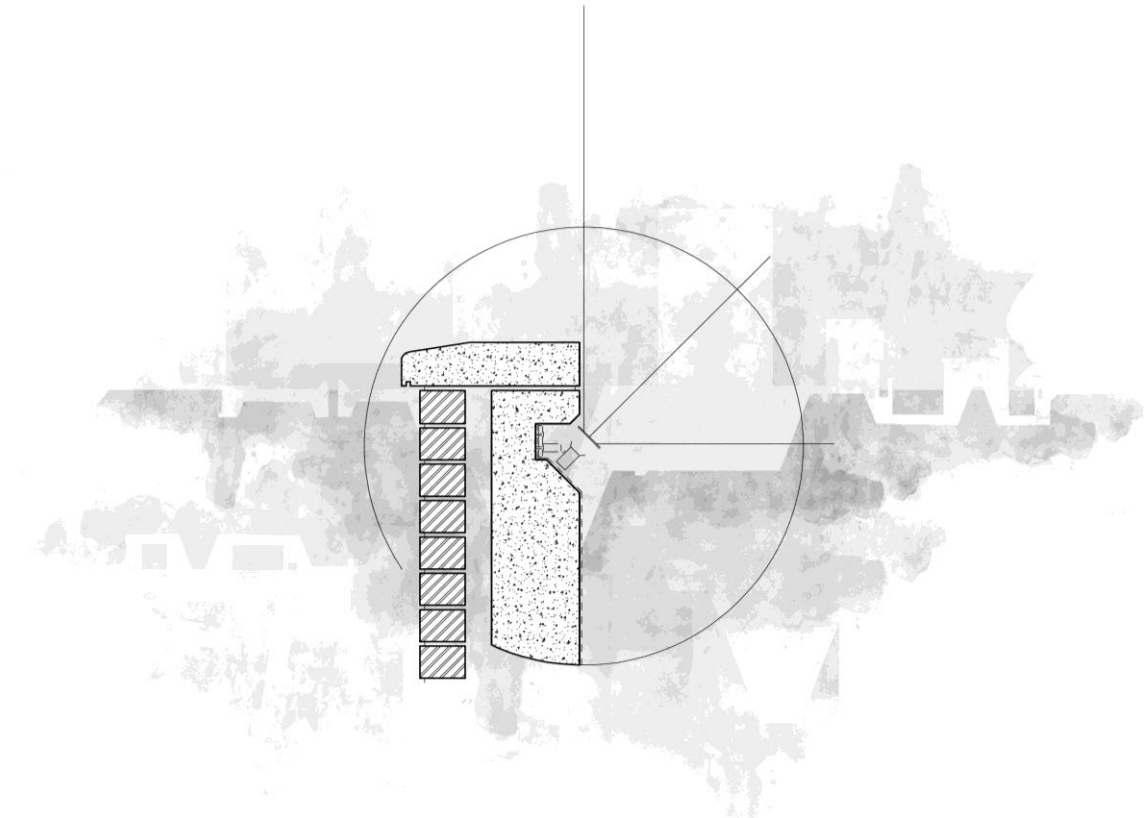

Figure 8.31: DETAIL B: DETAIL illumination of (STEREOTOMIC) water basin LIGHTING. (Author, 2015).

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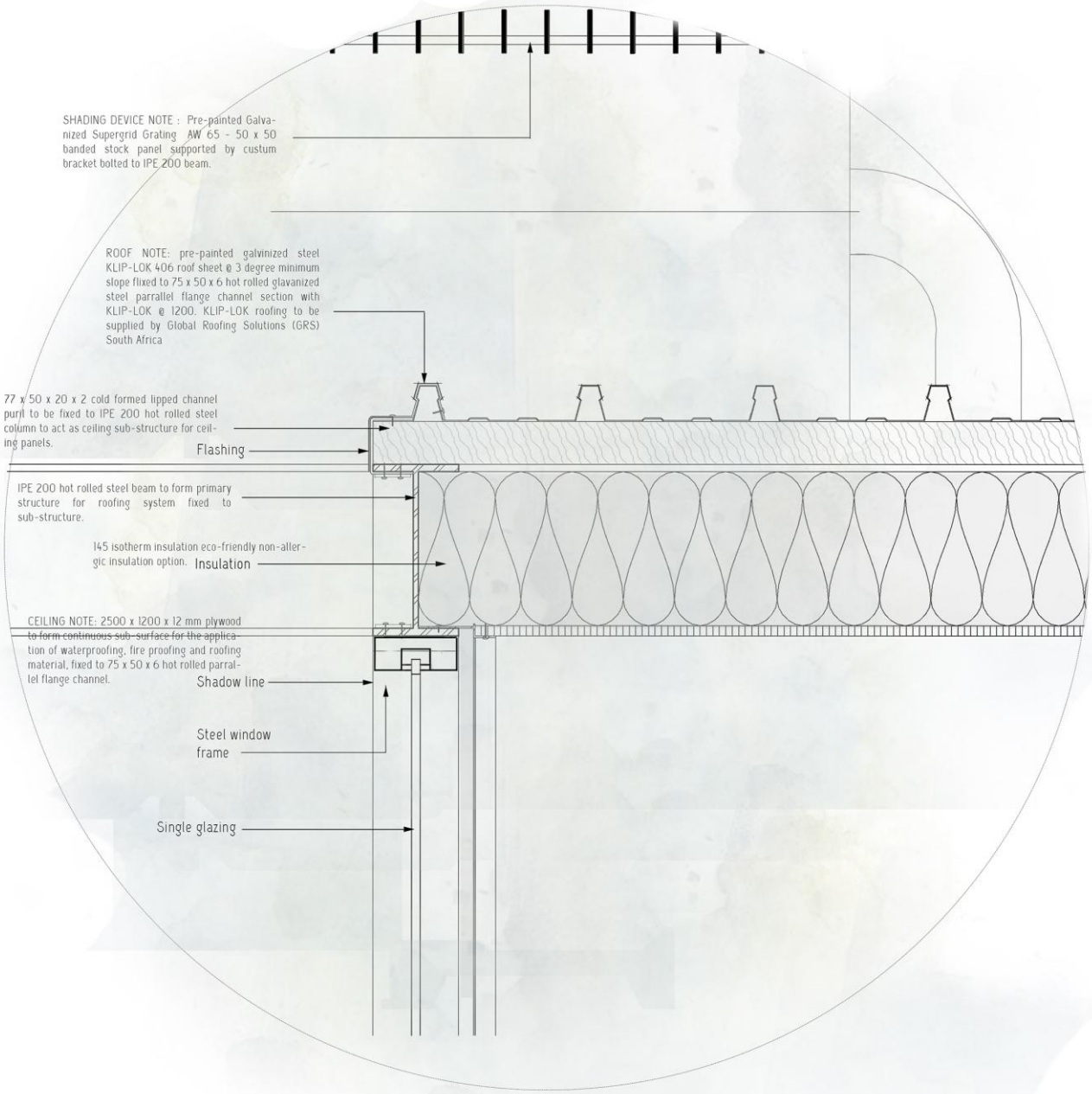

ROOF DETAIL

Scale 1:5

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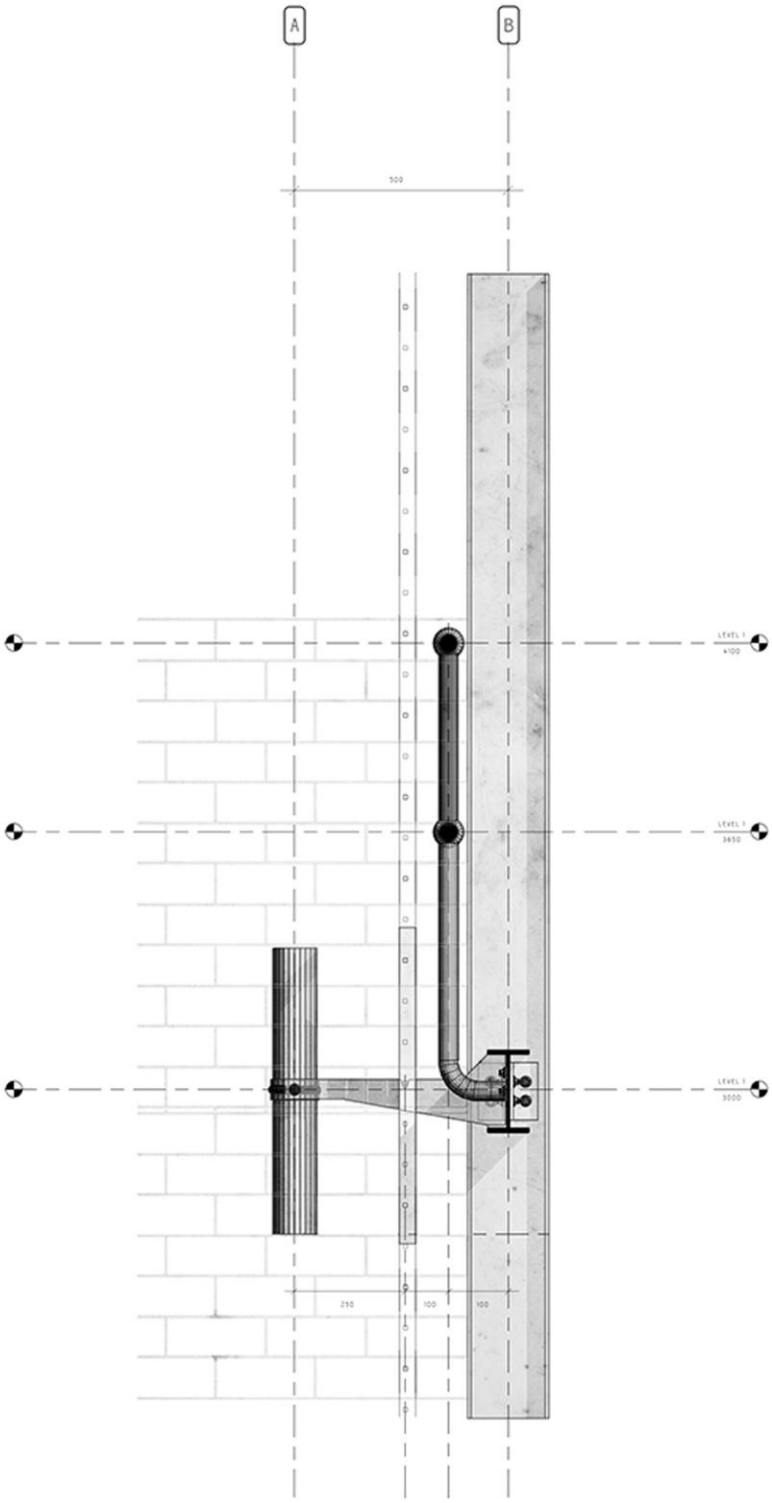
MENTIS GRATING SHADING DEVICE

- the design of regenerative components -



DETAIL B : VERTICAL SECTION

Scale 1 : 10

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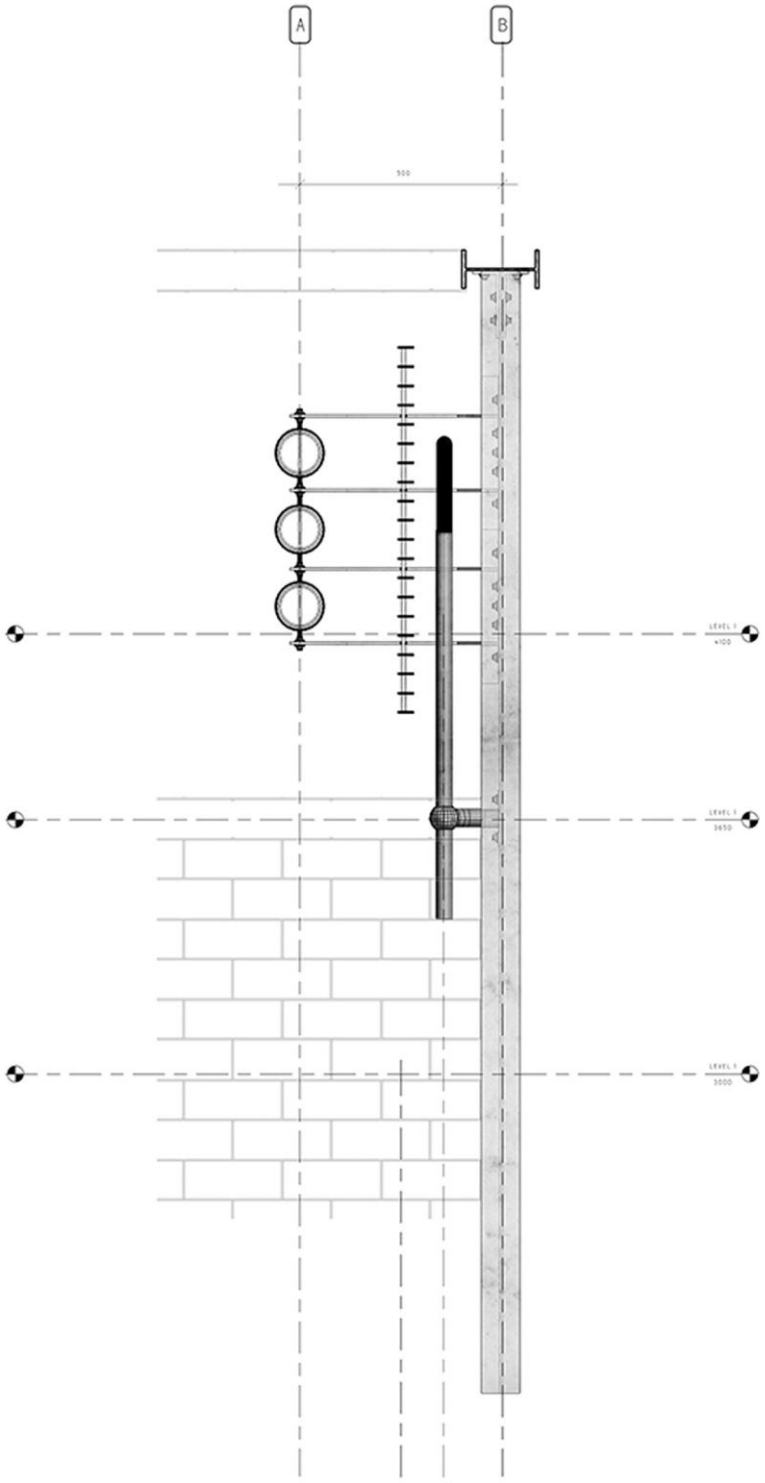
MENTIS GRATING SHADING DEVICE

- the design of regenerative components -



DETAIL B : HORIZONTAL SECTION

Scale 1 : 10

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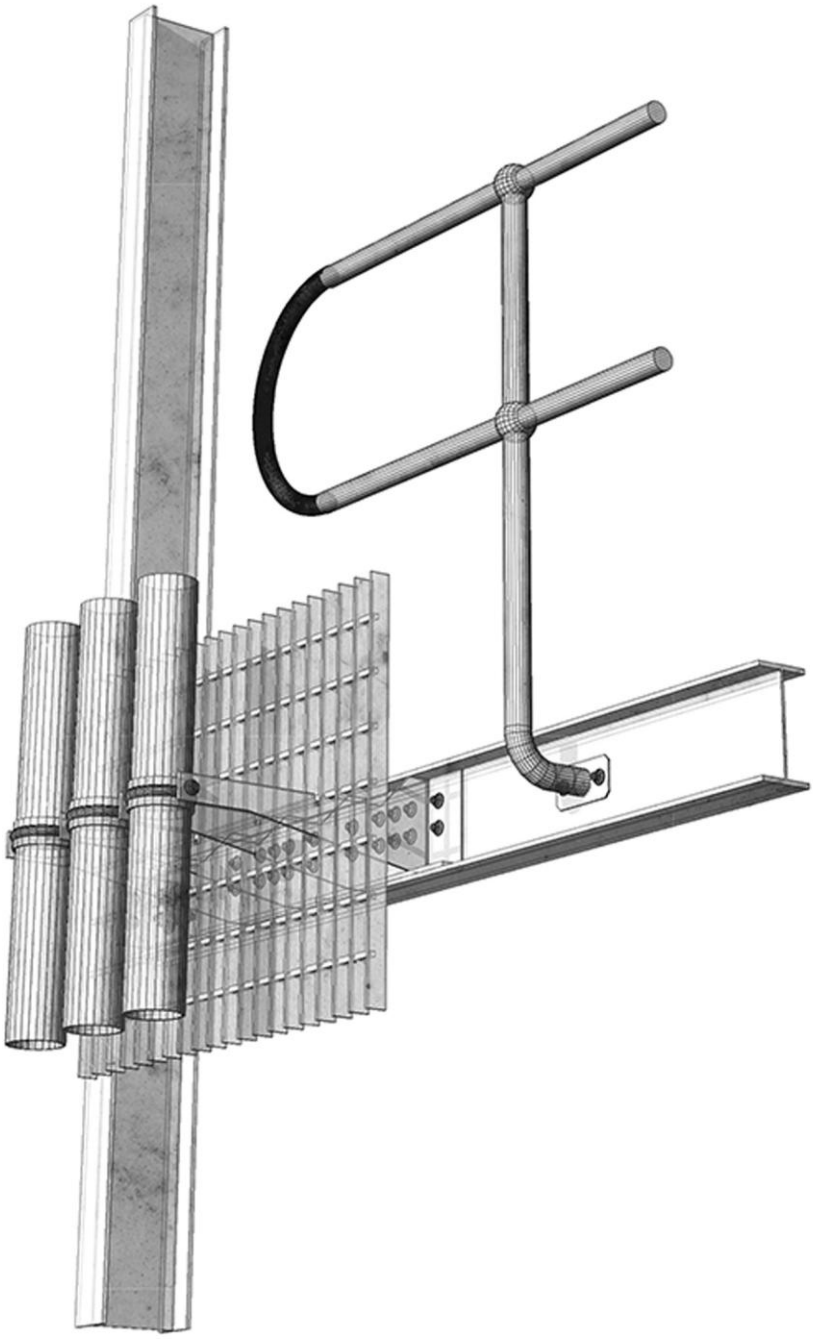
MENTIS GRATING SHADING DEVICE

- the design of regenerative components -



DETAIL B : PERSPECTIVE

Scale 1 : 10

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USER SIDEWALK WATER CHANNEL PERSPECTIVE

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USER GREEN HOUSE LOUVER DETAIL *PERSPECTIVE*

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07|7

[SBAT analysis]

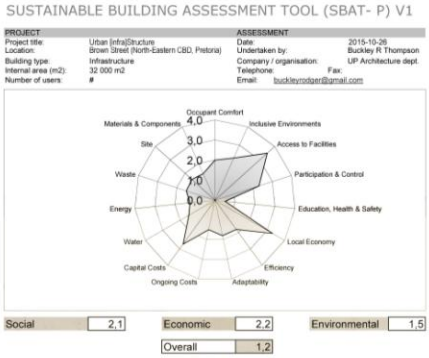
SBAT ANALYSIS

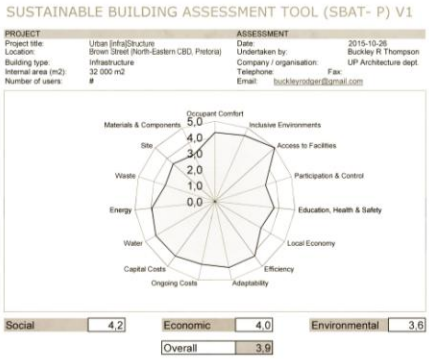
[A comparative study]

In order to compare the effect of the proposed infrastructure on the site in terms of sustainability the SBAT analysis tool was utilized. The diagrams illustrate this comparison. The study has made it evident that numerous social, economic and environmental issues have been improved by the proposed [infra]structure.

The areas that show the most improvement are capital costs, energy, waste, materials and components, occupant comfort, inclusive environments, participation and control. Improvements were successfully achieved by reusing salvaged and reclaimed structural components and raw materials available on site resulting from the demolition of non-contributively buildings.

By using appropriate natural ventilation strategies and environmental control, passive water heating and effective water management systems are the factors which contribute significantly to the im-





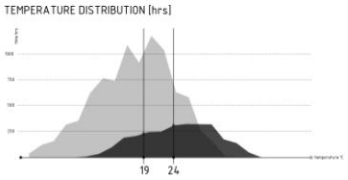
SBAT spreadsheet result comparison. Before(top) and After (below).

07|6

[Ecotect]

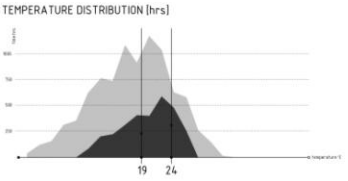
Office Component

A

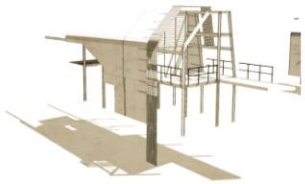


31%

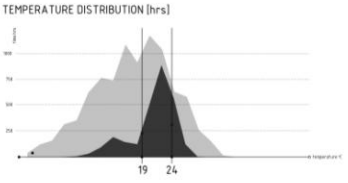
B



49%



C



74%

photographic illustration of center pompidou services and resultant space making

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CONCLUSION

In conclusion the initial intention of the creation of a machine resulted in the design of Urban [infra]Structure. Regenerative infrastructure which through the way in which it harvests and treats water, facilitates the creation of space. Therefore, the design of infrastructural architecture.

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RESULTS

[book]

CPD 810 : 80%

[design]

DPD 801 : 81%

[technical]

DIT 801 : 79%

YEAR AVERAGE:

80%

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- END -

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CHAPTER

08

[appendix]

urban decay as a result of neglected infrastructure

.

The chapter contains a photographic record of the final happenings of the MArch(PROF) year.

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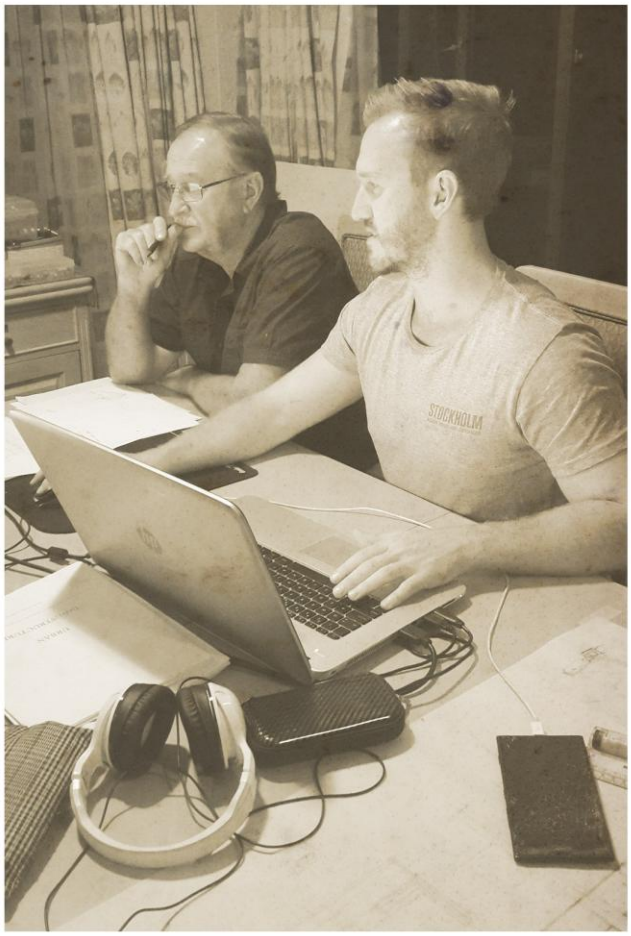
THE PROCESS

- photographic record of extensive working hours -



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THE HELP

- photographs of the "pre-crit" A TEAM -

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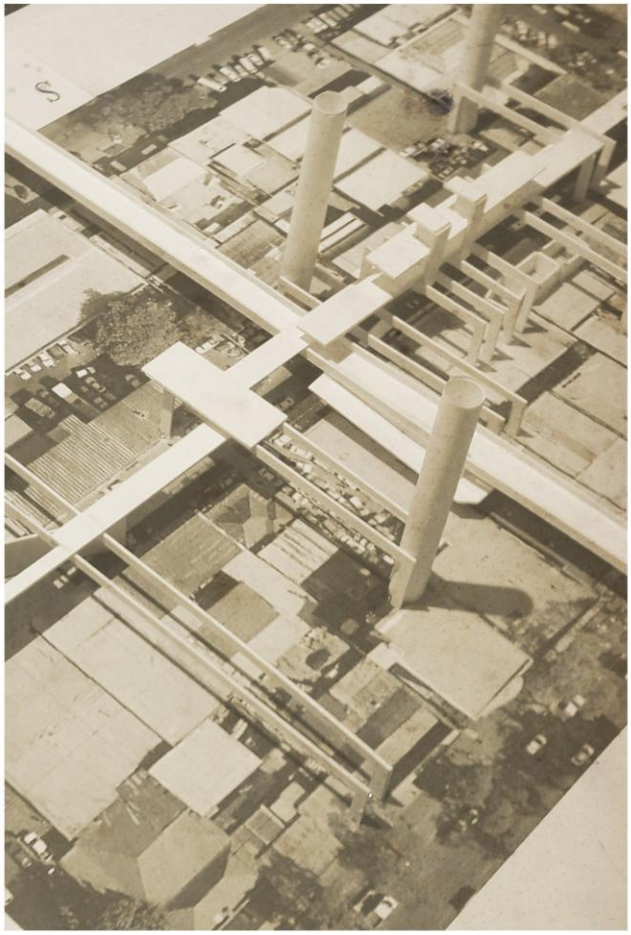
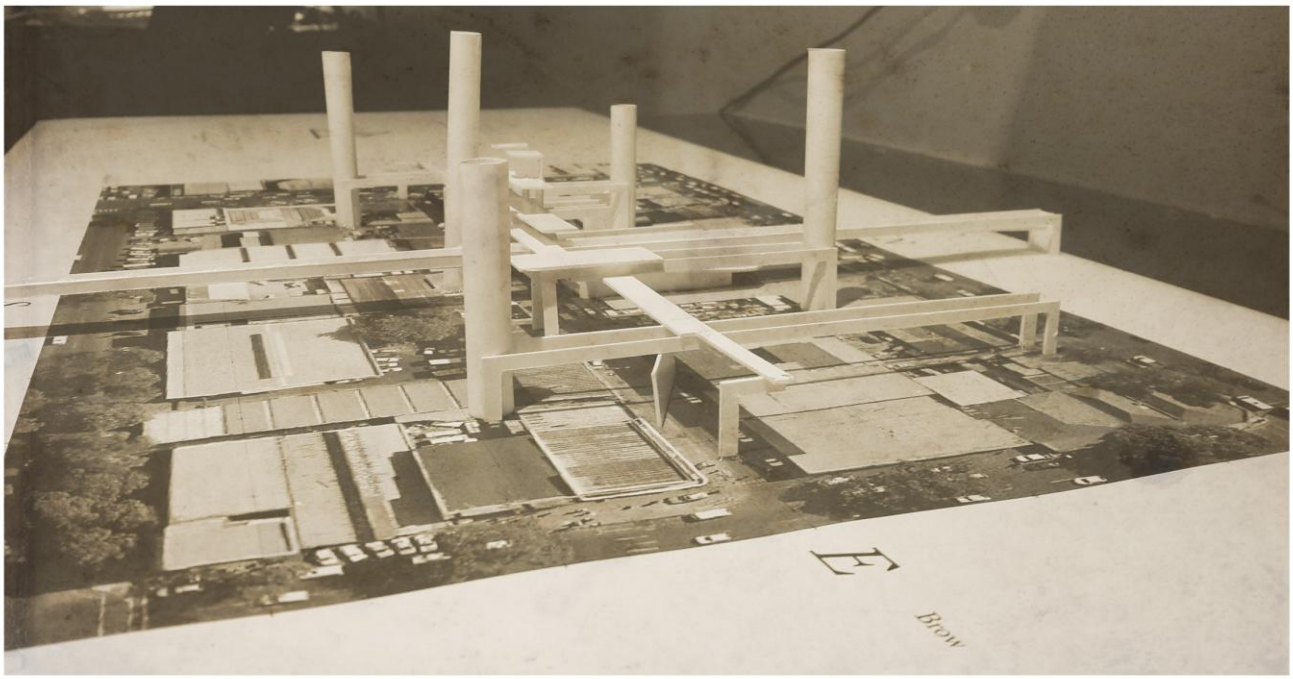
THE SERVICE CORE

- concept model within the context of Brown Street -





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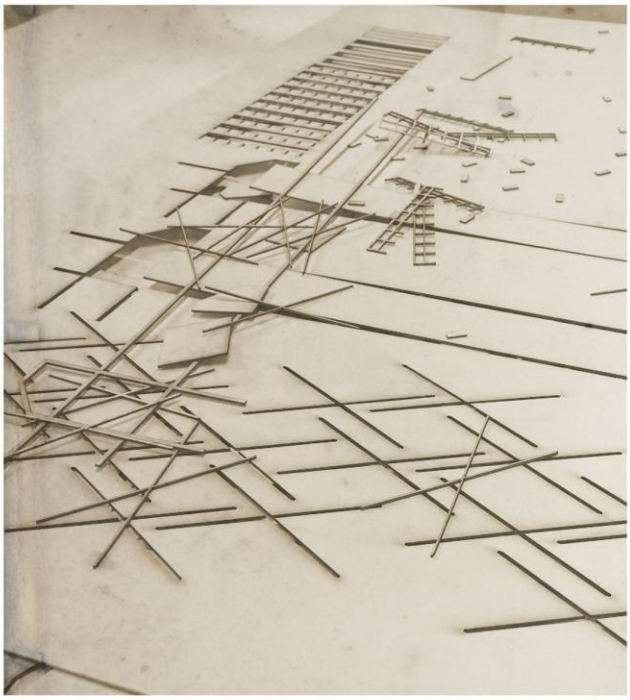
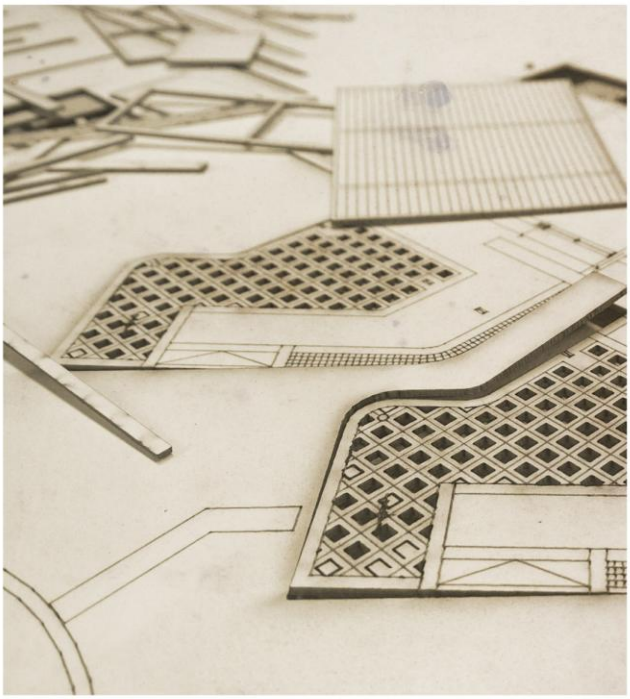
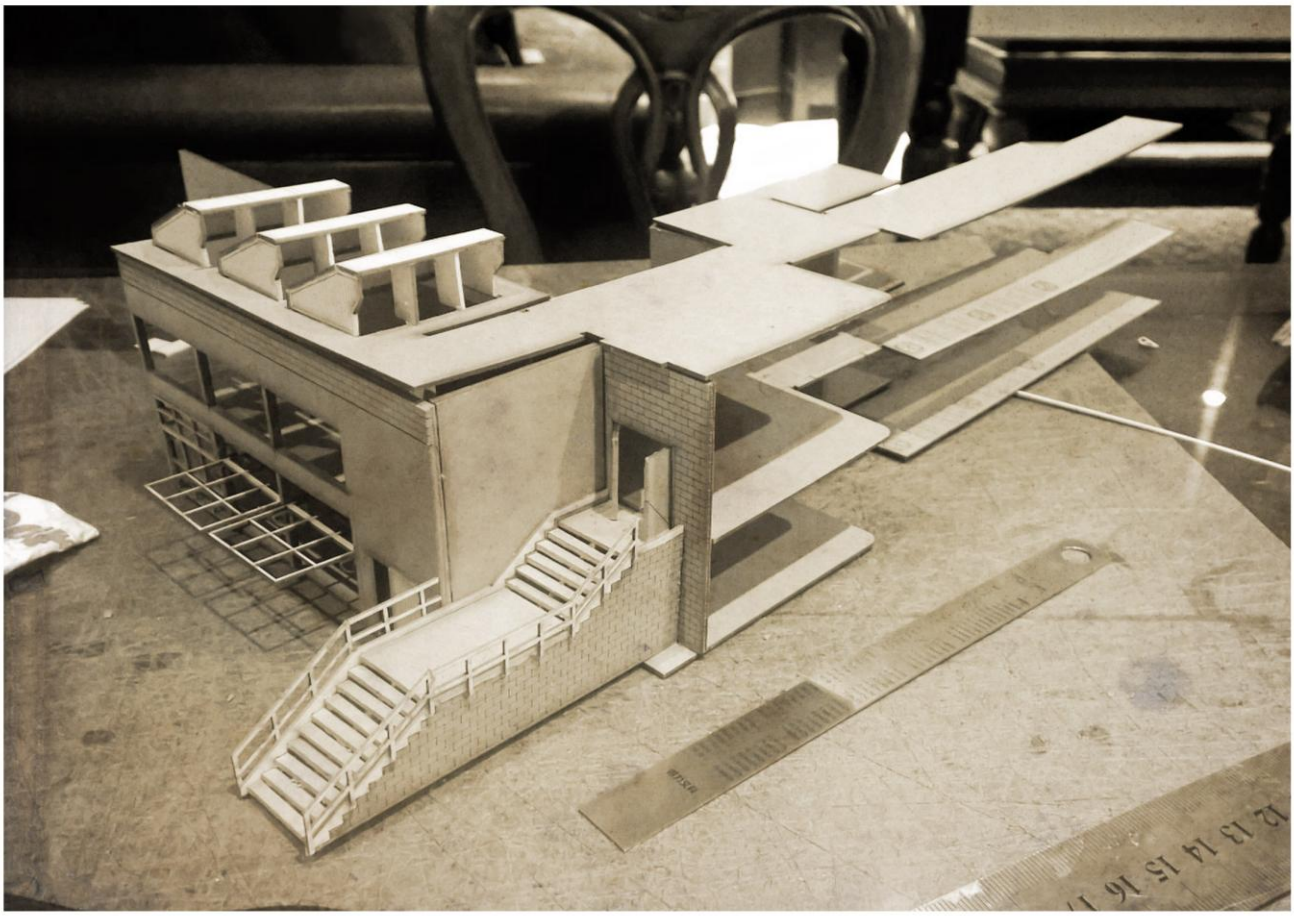
THE PIECES

- photographs of lazer cut model pieces -







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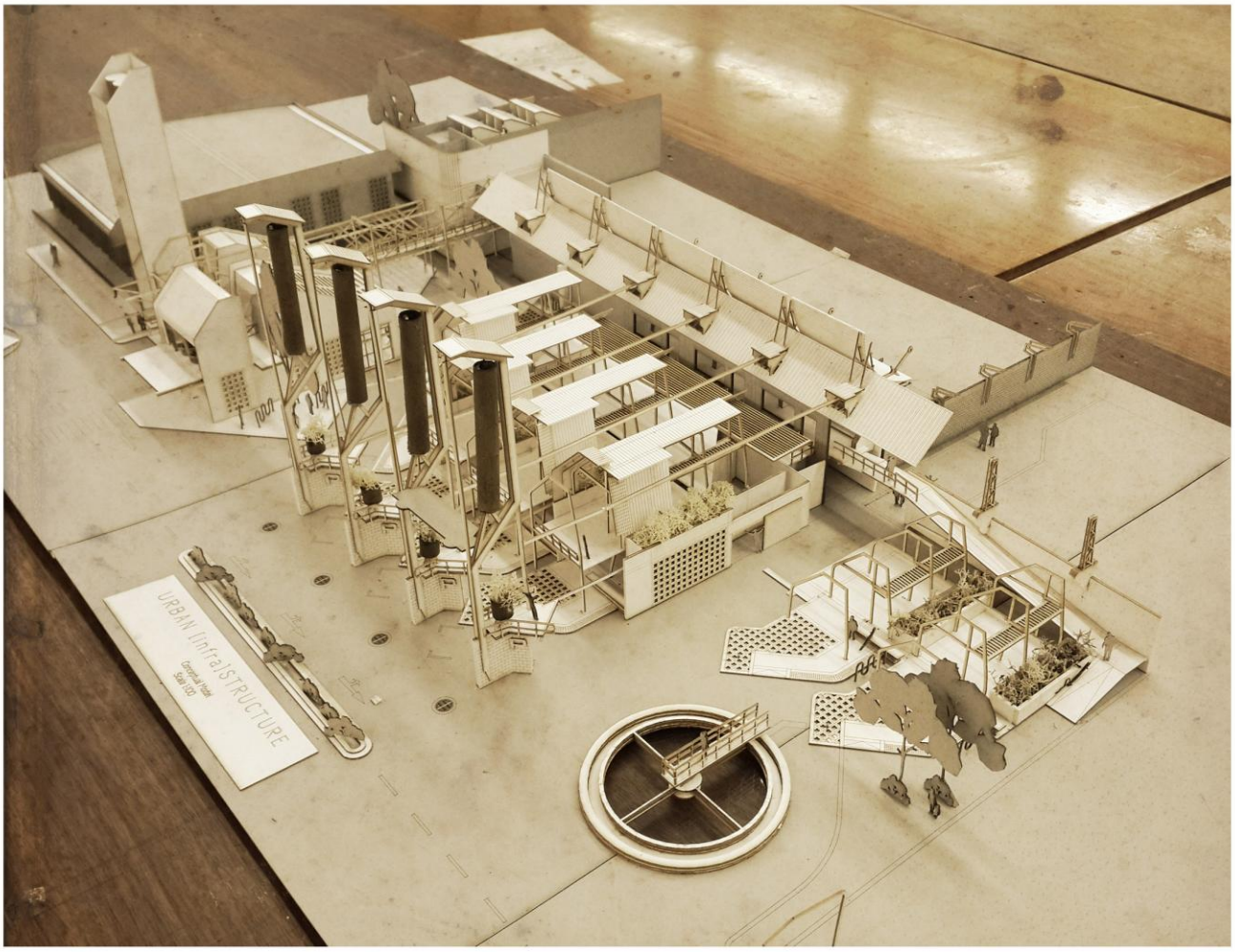
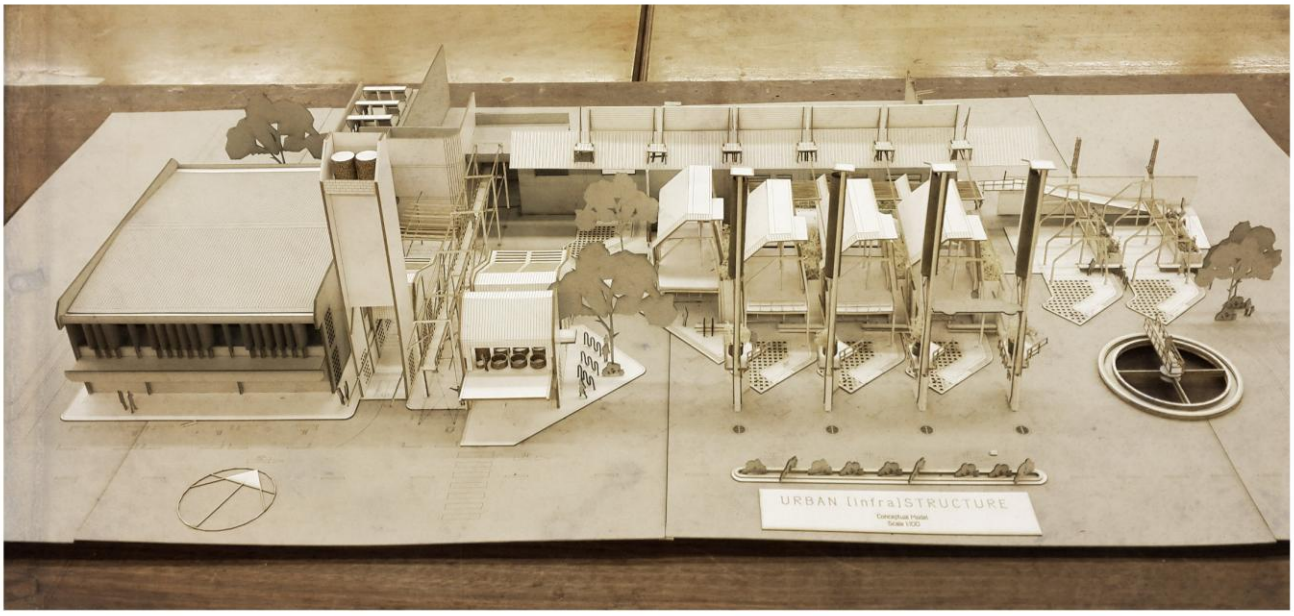
FINAL MODEL

- final model on Urban [infra]Structure -





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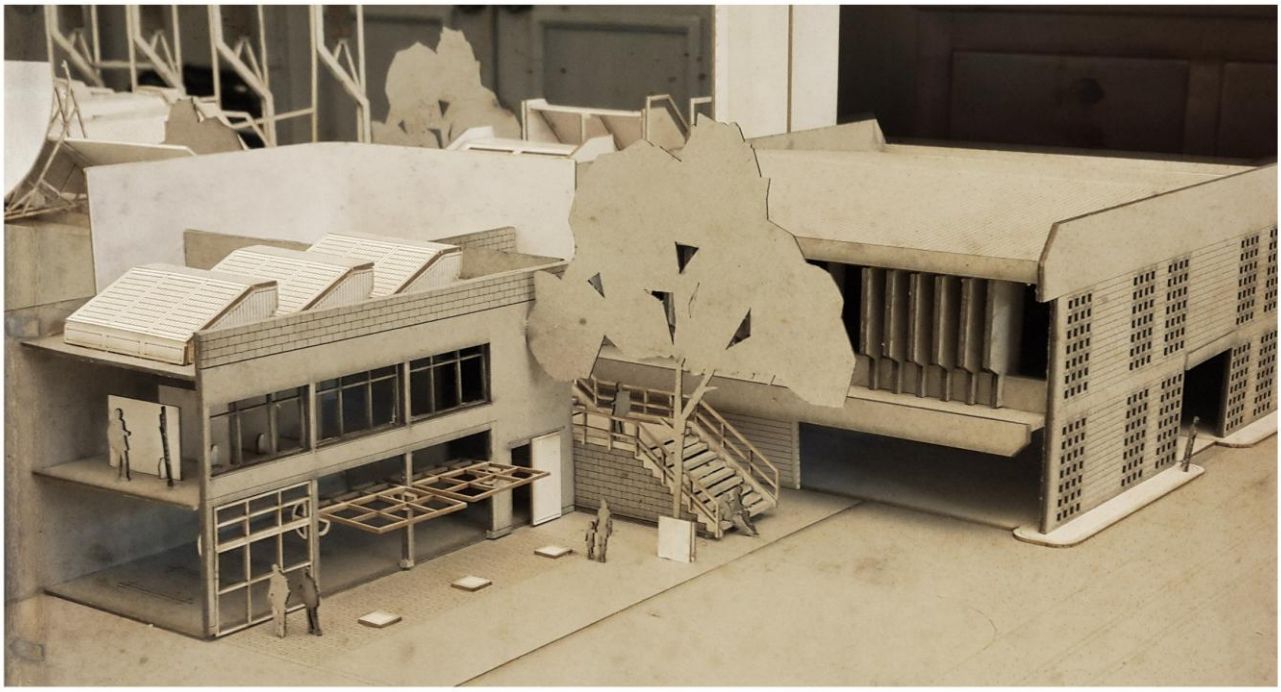
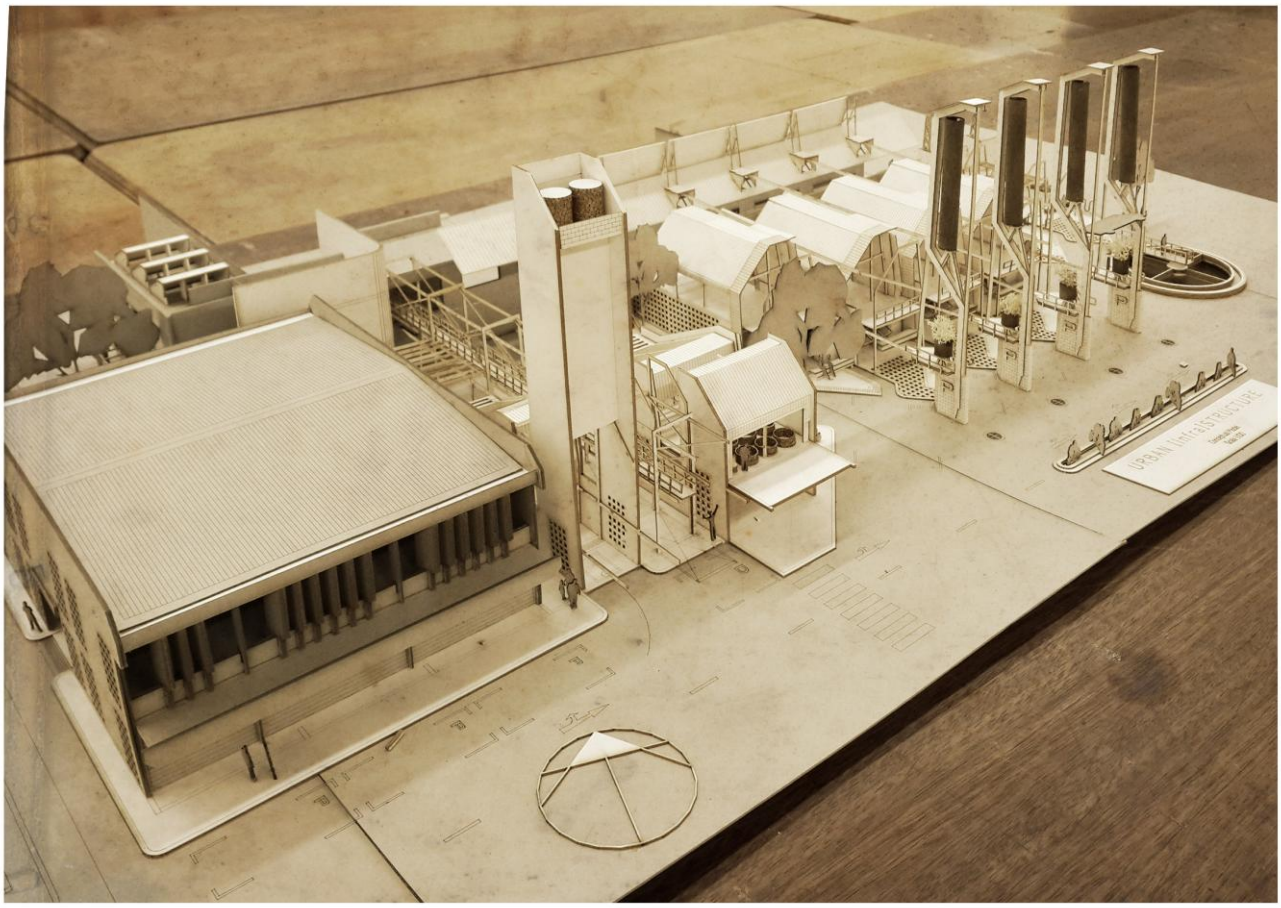
FINAL MODEL

- final model on Urban [infra]Structure -





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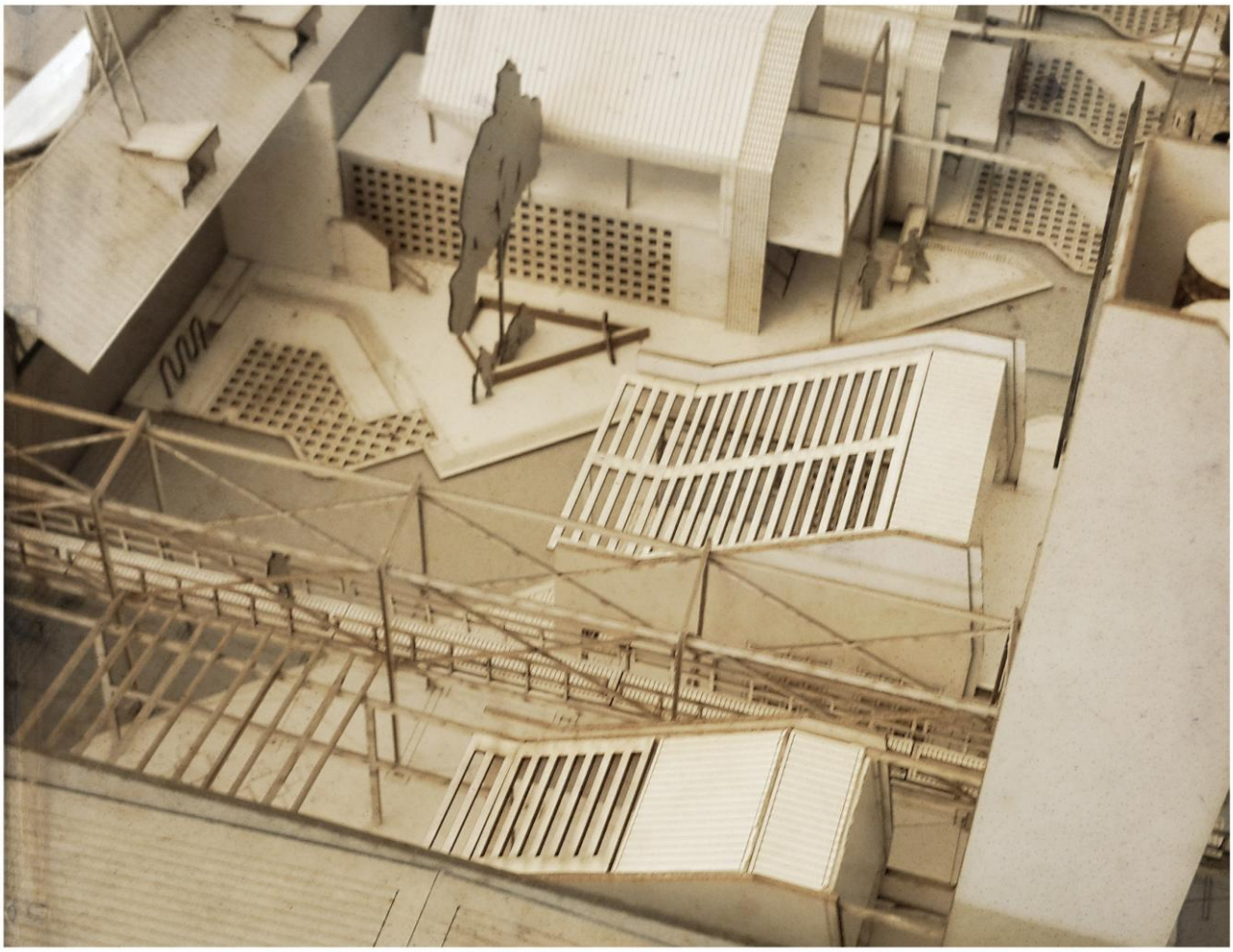
FINAL MODEL

- micro perspectives of Urban [infra]Structure model -



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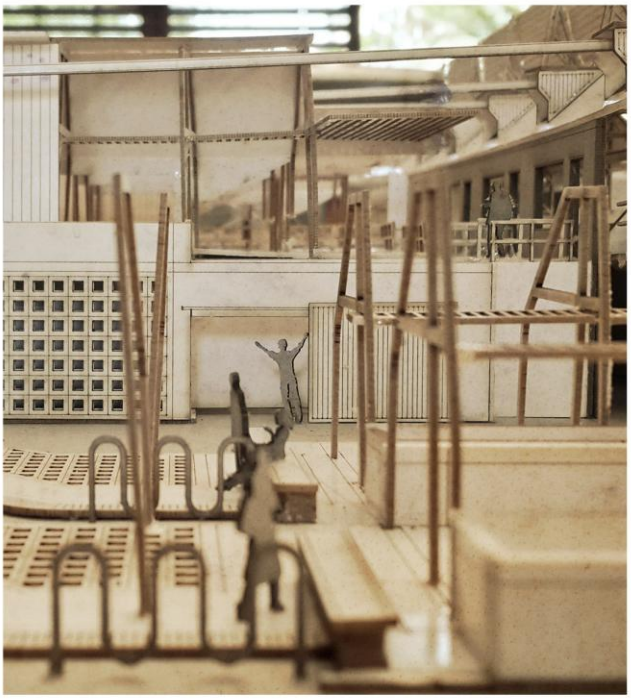
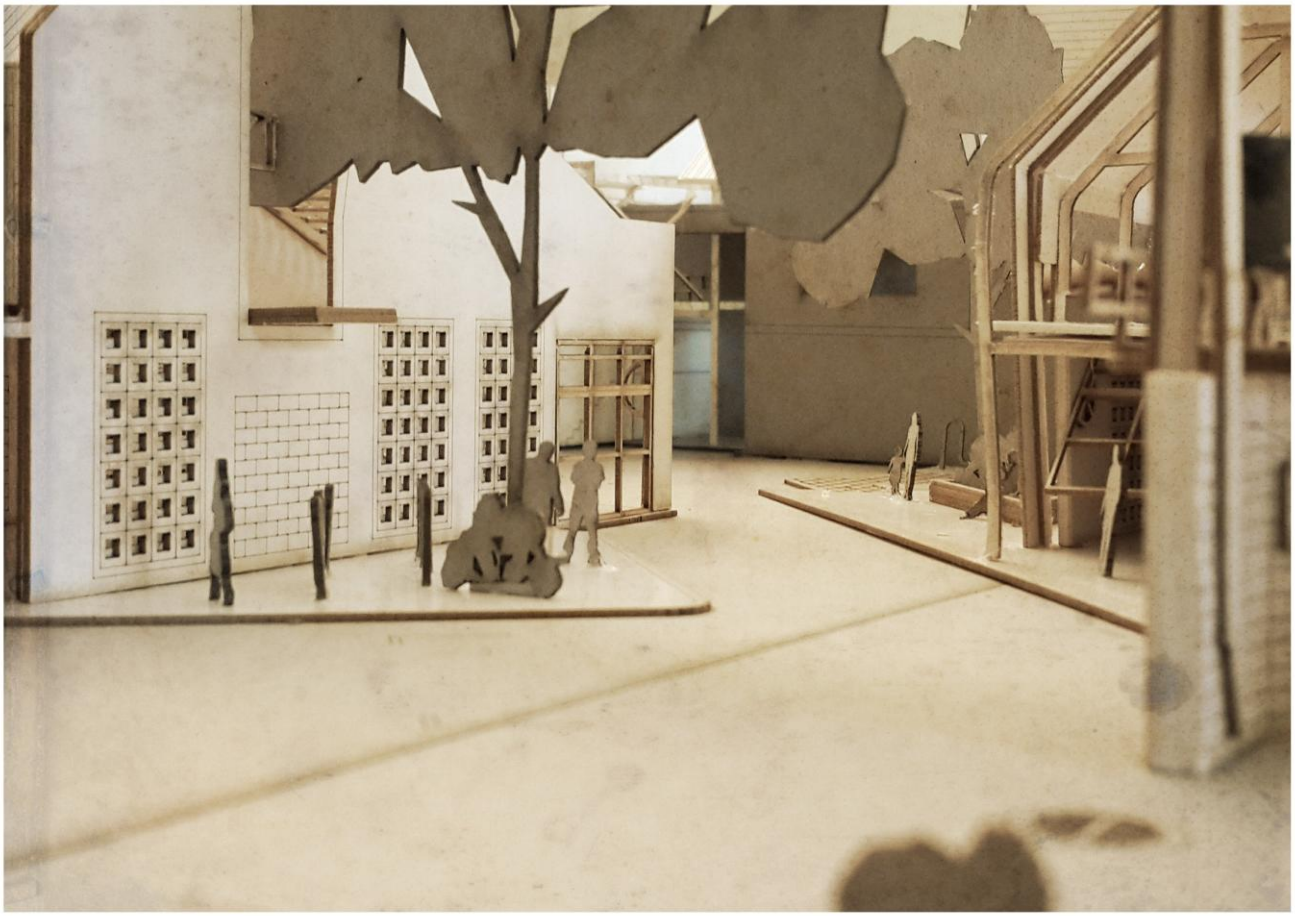
FINAL MODEL

- micro perspectives of Urban [infra]Structure -





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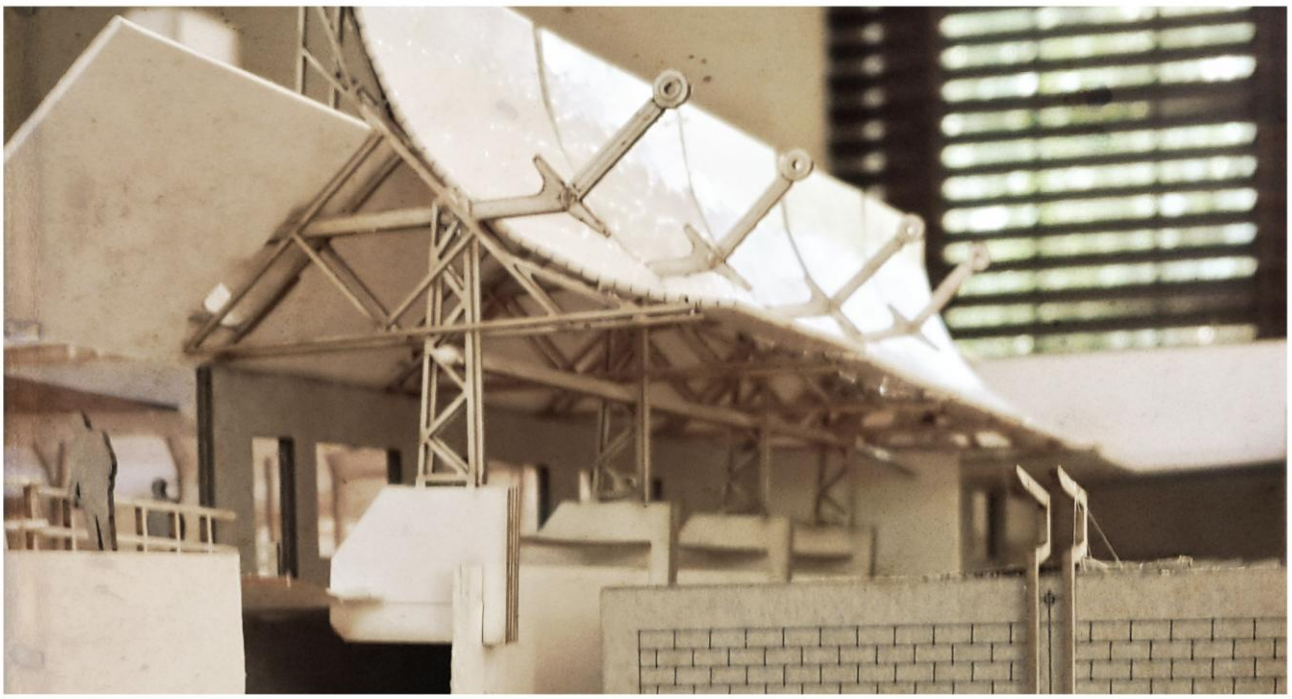
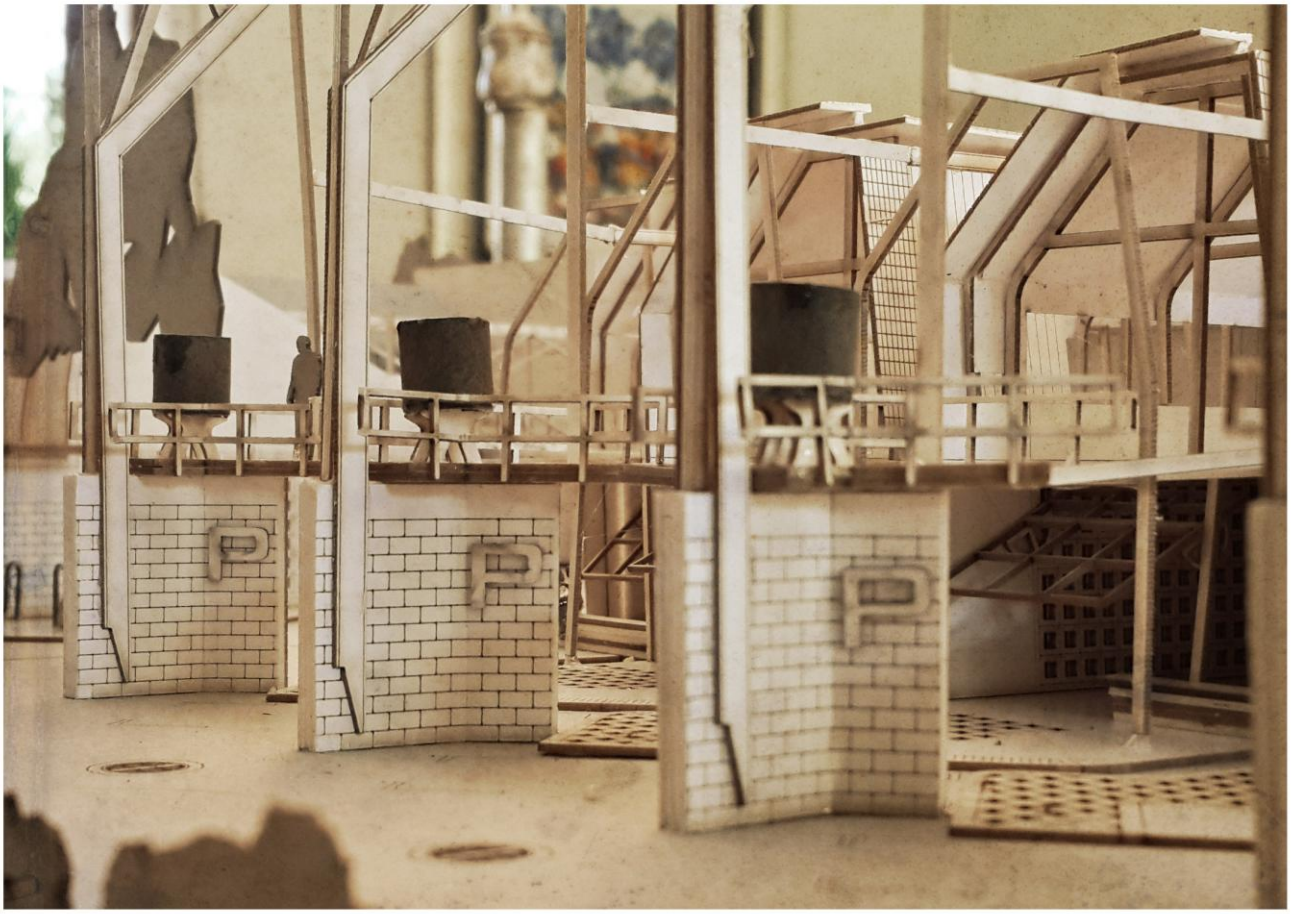
FINAL MODEL

- micro perspectives of Urban [infra]Structure -





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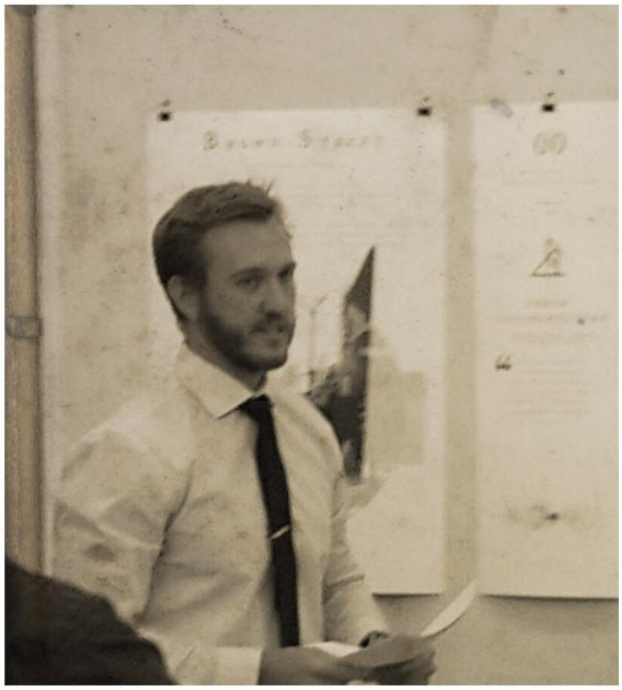
THE CRIT

- photographs of final crit November 2015 -



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C O R O B R I C K

- end of year exhibition and awards of M(Prof) final projects -

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Chapter 04

Chapter 05

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Chapter 06

Chapter 07

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