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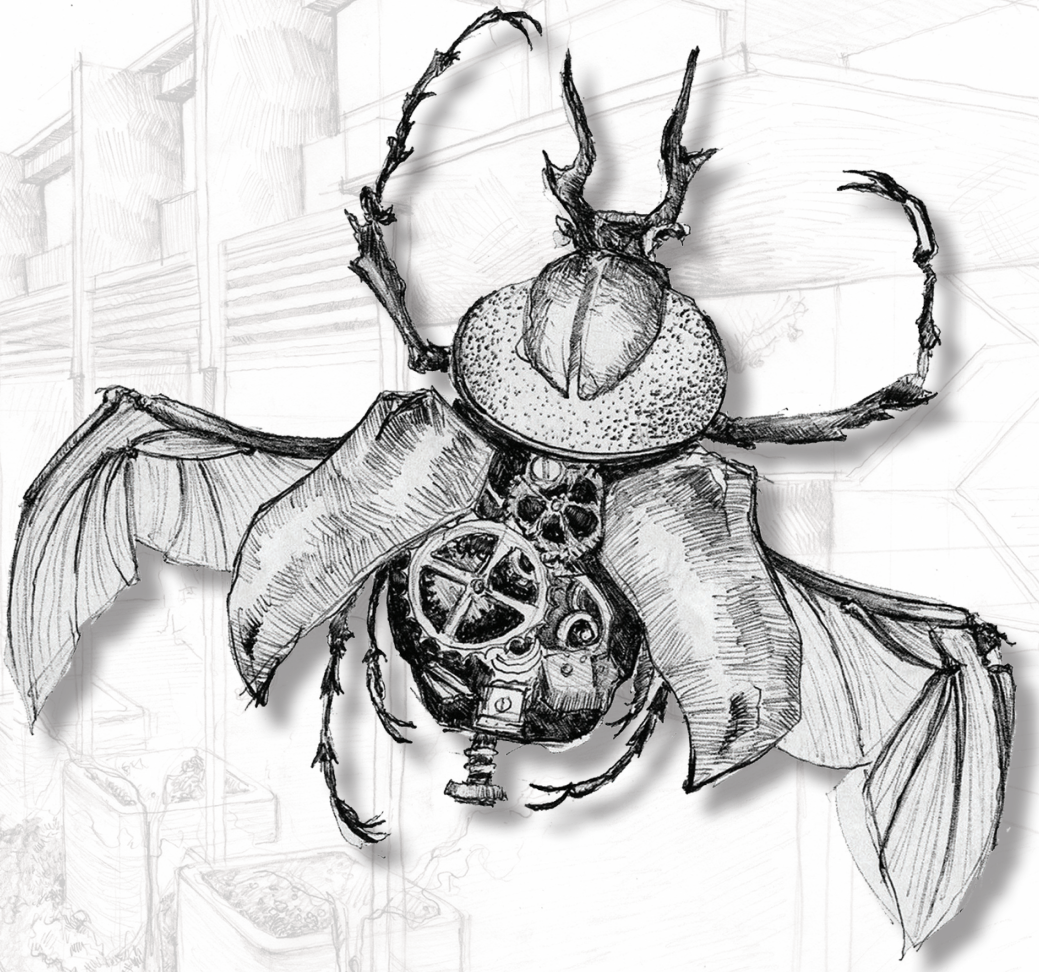
A Food Culture Intervention in Marabastad



Rishaad Ismail Vally
2013

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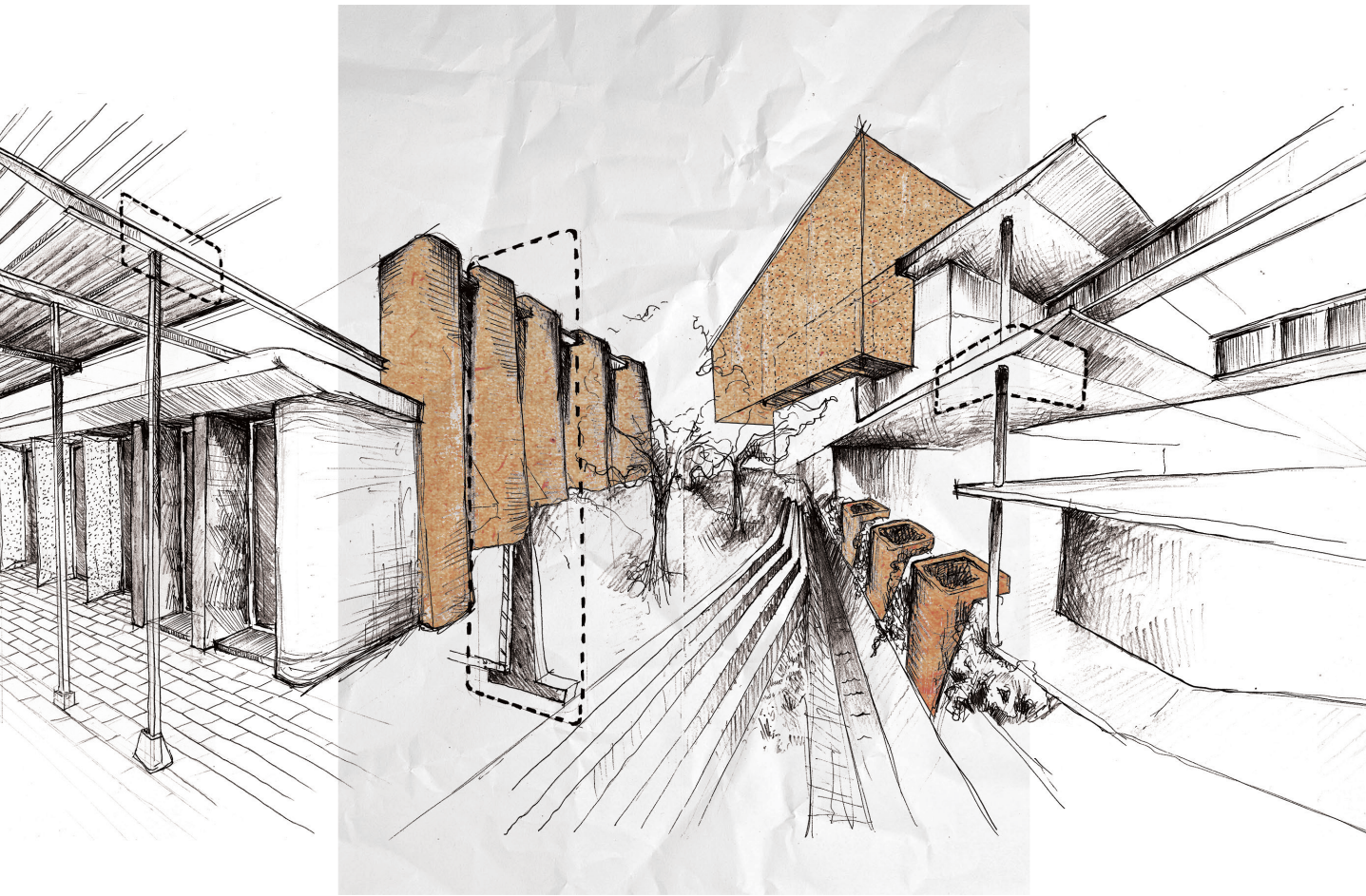

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Arthur Barker
Study Leader
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Submitted inpartial fulfilment of the requirements
for the degree of
Magister in Architecture (Professional)

Faculty of Engineering, Built Environment and
Information Technology
University of Pretoria, Department of Architecture
October 2013

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Abstract

This dissertation will investigate the role that architecture can play in the influencing of an existing food culture through the introduction of insect consumption (entomophagy). This alternative food source will be used to illustrate a more sustainable agricultural practice.

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Contents

Chapter One - Identifying the Issue.....6

Defines food culture and outlines problems identified in the current global food culture trends. Illustrates the limitations incurred in the current trends and proposes entomophagy as a progressive alternative in food culture.

Chapter Two - Perception.....20

Defines the limitations that human perception places on insect consumption. Summarizes an understanding of human disgust and proposes to combat phobias through the use of various cognitive and behavioural theories. Describes the role architecture can play in the implementation of these theories.

Chapter Three - The Context 26

Defines and motivates the site choice and context of Marabastad. Depicts a brief history of the township and its transition into its current condition as a nodal interchange of Pretoria.

Chapter Four - Marabastad Group Framework 42

Identifies challenges and pertinent issues within Marabastad. The group proposes objectives and solutions for the precinct in a large scale framework and highlights a focus area on which all issues can be addressed.

Chapter Five - The Exisitng Food Culture.....68

Defines the important influences and defining attributes of the Marabastad food culture. Explores the role of informal trade and public ritual.

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Chapter Six - The Programme.....80
Defines the role of the project in the greater scheme of the Marabastad food culture. Outlines specific programmatic requirements in terms of the insect production premise.

Chapter Seven - Design Informants and Concept 96
Identifies and elaborates on major design informants and synthesizes a conceptual framework on which design decisions are to be based.

Chapter Eight - Precedents 106
Outlines precedents that were identified through elements pertaining to the design informants. Summarizes relevance of each precedent in line with conceptual approach.

Chapter Nine - Design Development 116
Describes the design approach and highlights major elements on which the design is based. Explains major design decisions in terms of form and spatial organisation.

Chapter Ten - Technical Resolution 136
Outlines the technical approach, tectonic concept and materiality. Describes the building systems and their implications. Concludes with the project synthesis.

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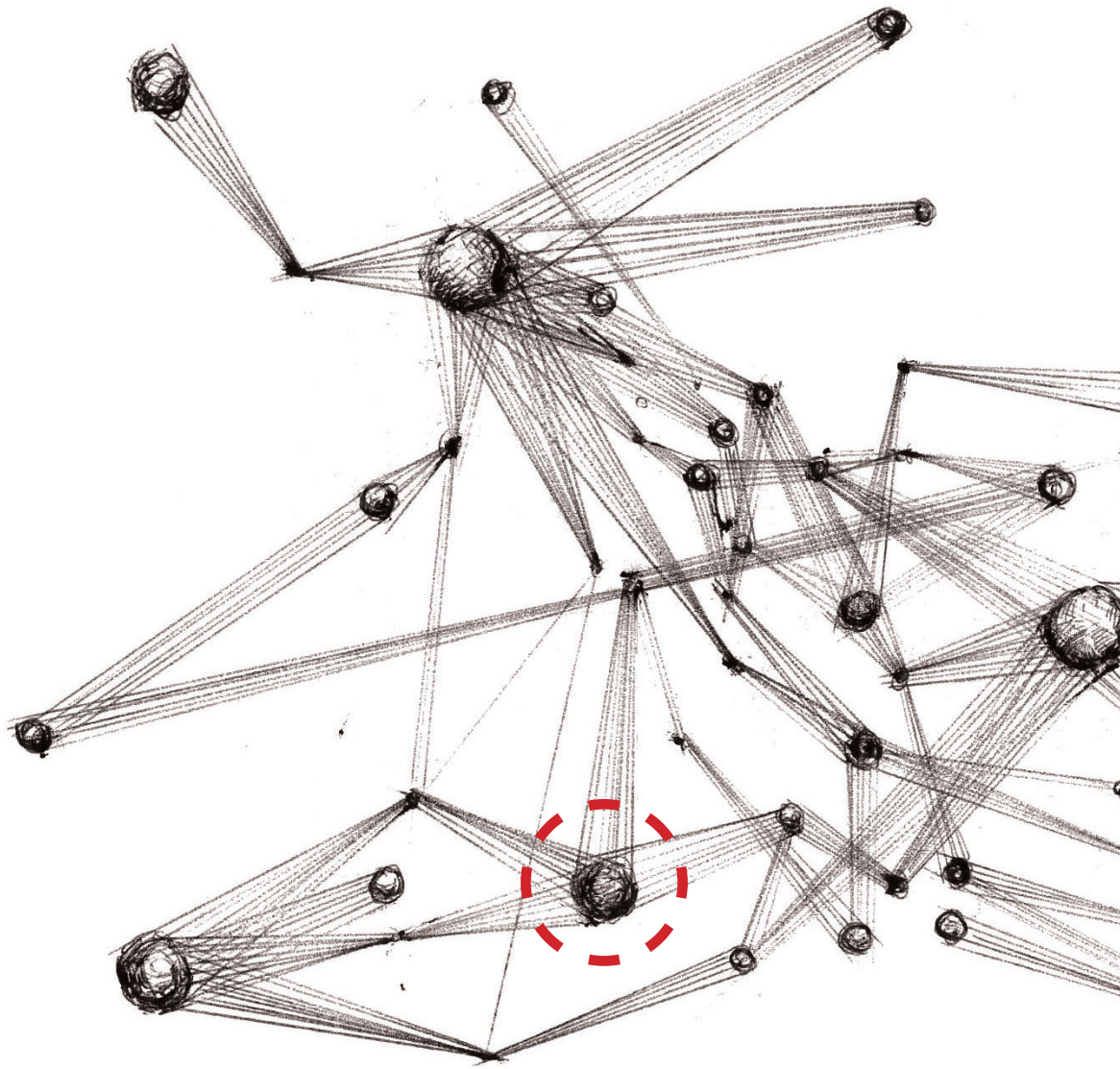
Chapter One

Identifying the Issue



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Introduction

In the book The Spell of the Sensuous, phenomenologist David Abram concludes that we have to move towards a "more sustainable prospect of a regionally diverse and interdependent web of largely self-sufficient communities a multiplicity of technologically sophisticated, vernacular cultures tuned to the structure and pulse of particular places." If this network of interdependent communities began to develop, the communities themselves would become, to a large degree, more independent and in turn more resilient. A network of independent pockets means a better chance of 'survival' for the greater whole as opposed to a series of communities reliant on a single system, which would expose all the communities to threats affecting that system. (Abram 1997, 272-273)

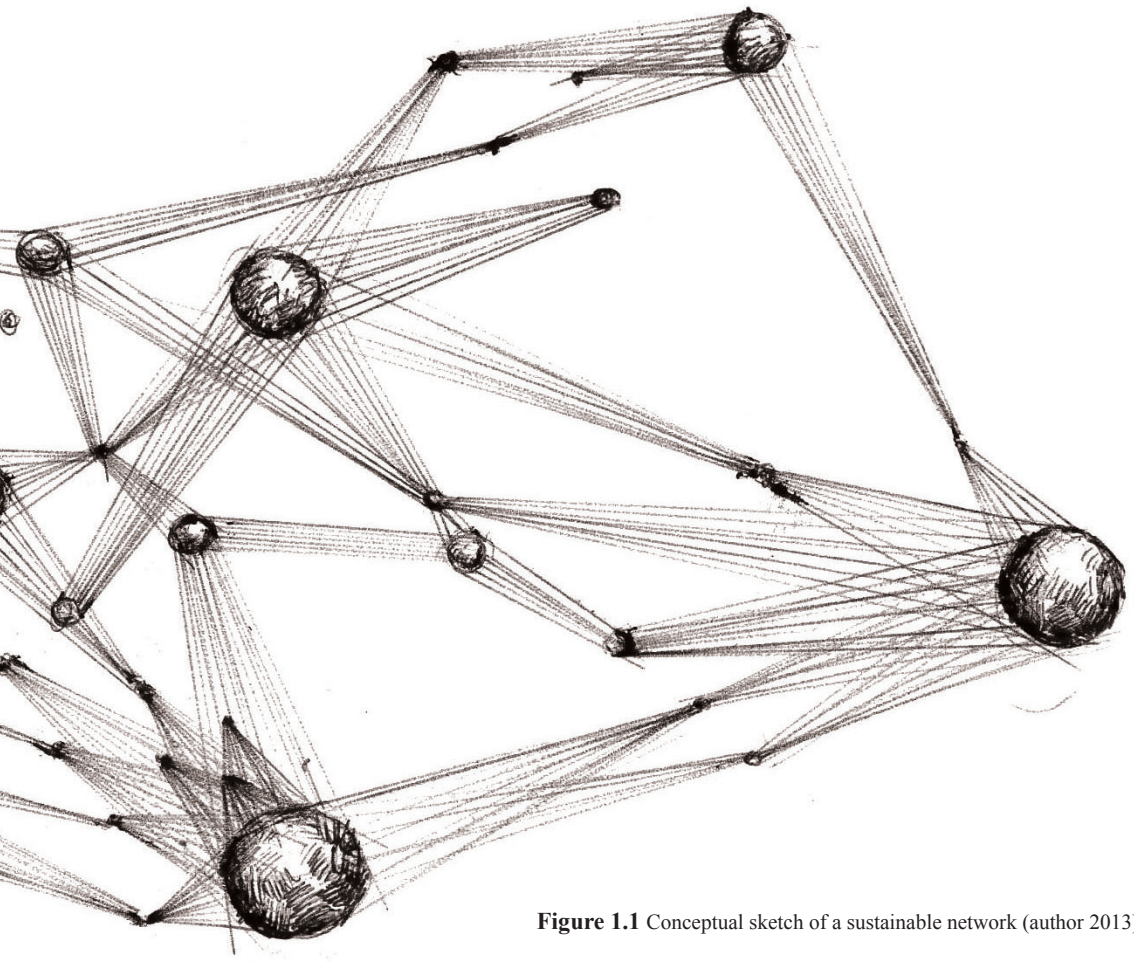

Figure 1.1 Conceptual sketch of a sustainable network (author 2013)

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The issue

Food culture is defined as food as it relates to its context within rituals of production, distribution and consumption.

If we maintain our current trends in food culture and agricultural practices it will be unsustainable and unrealistic to produce food for the current projections of population growth. There is a larger pressure for societies to obtain proper food distribution systems and food security. We have adopted a western diet that includes many processed nutrients and a large proportion of meat. A diet to which our current biological genome has not evolved and in turn has negative health implications. Agriculture and the rearing of livestock are putting immense pressure on the world's resources in terms of greenhouse gases, land use, energy-use, water consumption and deforestation. The production of food has become an industrial process that excludes the consumer from the process undermining the ability of consumers to make informed decisions about their respective food sources. Our food production, distribution systems and more importantly our food sources need to change.

Current food source models propose urban agriculture, vertical farming, new production methods and streamlining distribution systems. The global food culture needs to become more resilient, experimenting and adopting alternate food sources and food production methods. (Food and Agriculture Organization of the United Nations 2002).

There are many solutions and combinations of which can address the highlighted issue. This dissertation looks specifically at insects as an alternate food source and the role architecture can play in its introduction

Entomophagy (the practice of insect consumption by people) can aid in the changing our food culture into a more sustainable one; creating resilient communities through community involvement and a closer proximity to food production.

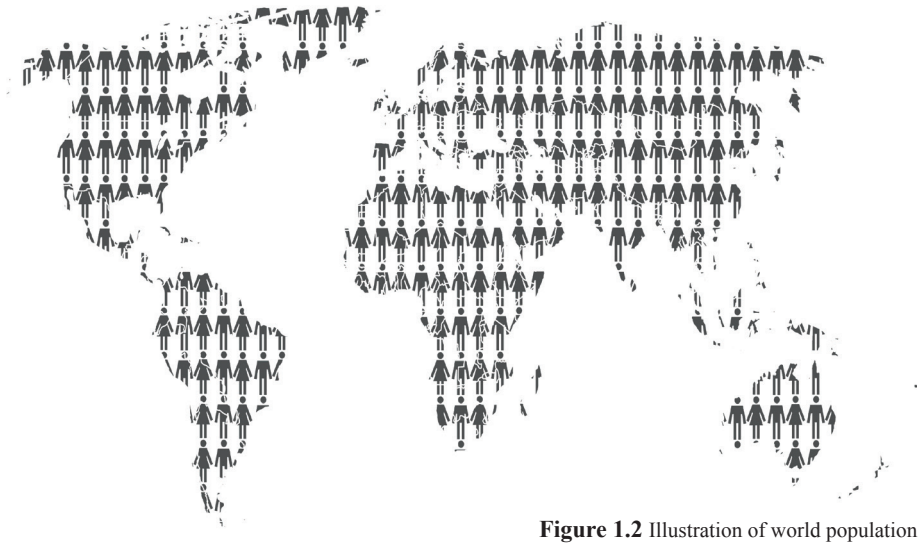

Figure 1.2 Illustration of world population (author 2013)

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Figure 1.3 Current global food culture (author 2013) adapted from: http://www.head-held-high.org/category/blog

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Contributing Issues

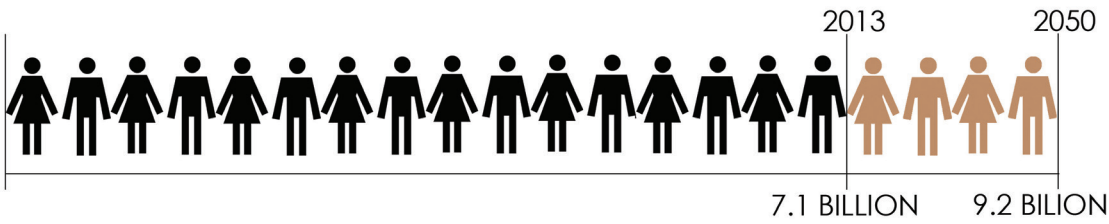

Figure 1.4 World population projection (author 2013)

Food security

Food security as defined by the United Nations (UN) and the Food and Agricultural Organisation (FAO) of the UN as follows, "Food security exists when all people at all times, have sufficient and economic access to sufficient, safe and nutritious food to meet their dietary needs and preferences for a healthy and active lifestyle". Food security can also be seen as a blanket covering the diverse systems involved in food production. Secure production of food means that it is done through sustainable means and therefore can continue to do so for an indefinite period of time. According to the FAO new food source models aim to create resilient communities which can become independent and are closely associated and involved in the production of their own food. An adequate amount of quality food is being produced to satisfy the needs of every person on the planet. The problem is the food supply systems that are in place; unreliable long distance export and import systems decrease the feasibility of food secure communities. (Food and Agriculture Organization of the United Nations 2002)

Land-use

A major problem with our agricultural systems is the mass use of land; according to an article written by James Owen in National Geographic; a mapping exercise and census study done by Centre for Sustainability and the Global Environment (SAGE) showed that 40% of the world's land mass is being used for agriculture and more than 50% of that agricultural land is used to rear livestock, however 30% of all grain that is cultivated, is for livestock consumption; therefore livestock farming effectively contributes to over 26% of land usage globally. The misuse of exploitable land and deforestation is a major contributor to the breakdown of eco-systemic processes and global warming respectively. Another problem created by having food production removed from the proximity of which it is consumed is of course the transportation implications it incurs. Importing food from various locations consumes vast amounts of energy via the burning of fossil fuels and in the end the consumer has no idea where the food comes from or what buying locally actually means, this then supports the inadequacies of the system and perpetuates the cycle. (Owen 2005)

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Figure 1.5 Land-use implications of agriculture and livestock (author 2013)

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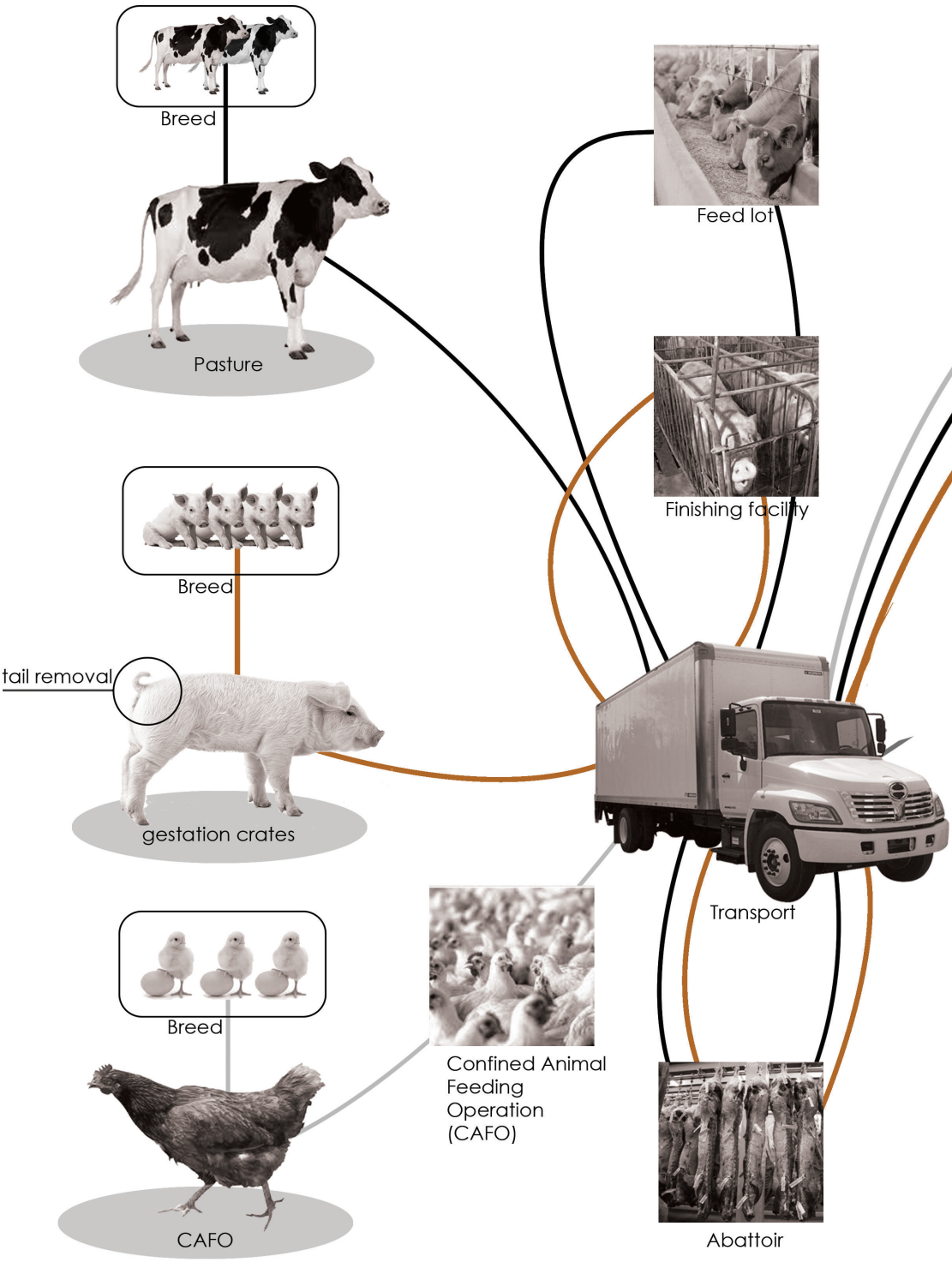

Figure 1.6 Transport associated with the current food culture and implications incurred with the diminishing relationship with the consumer (author 2013)

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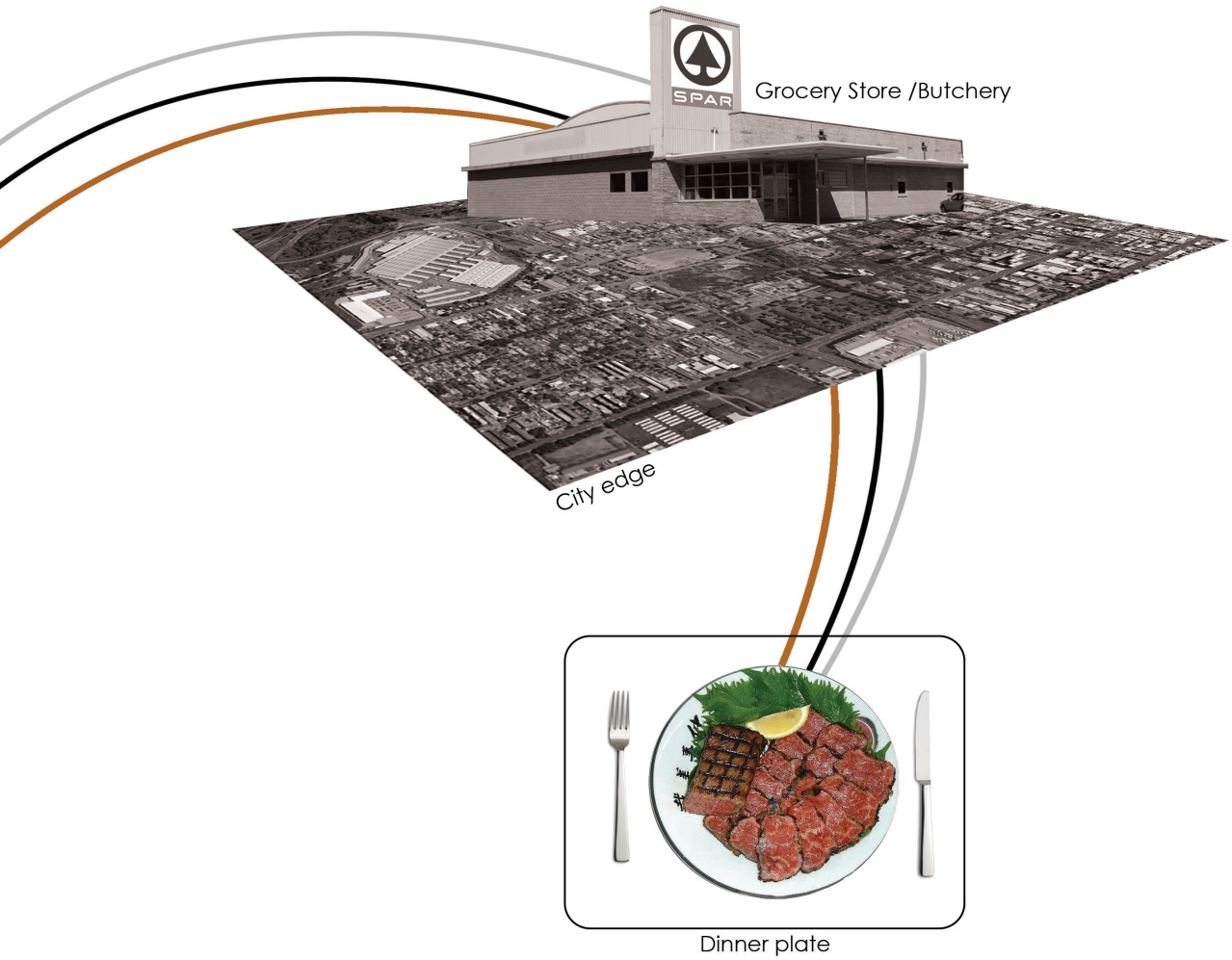

Consumer Relationship

The advent of the industrial revolution mechanised many processes, removing the labourer from many of these processes, this in turn allowed for the processes to be removed from the cities, placing them on the outskirts. The premise of production being excluded from the city had a major influence on agriculture, being viewed as an industrial process, agriculture occurs beyond the boundaries of the city; where large expanses of land can be obtained for a cheaper price. This causes a multitude of problems; the production of food is removed from the consumer, this diminishes the relationship the consumer once had with their respective source of food, the consumer is then unable to make informed decisions on food in terms of quality assurance, its source and the conditions under which it was “produced”. The decisions that are now made by consumers on their respective food choices are based on information that is fed to them through marketing strategies and packaging. The relationship between customer and food has now been diminished to a sticker on a bottle.

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Adoption of the western diet



Figure 1.7 Illustration of western diet in Africa (author 2013) adapted from: http://lori-palooza.blogspot.com/2011/01/fatty-fatty-two-by-four-cant-fit.html

Before the development and implementation of agriculture and animal husbandry, the diet of a hominid would have been comprised mainly of wild plant and animal food. A large proportion of the food culture would have included the gathering and consumption of insects accoring to world renowned paleo-dietician, Loren Cordain, a professor at Colorado State University. The agricultural revolution brought with it a domestication of various plants and animal species; the nutritional characteristics of the foods began to change. At first the change was minimal but began to morph rapidly with the advent of the industrial revolution where many food processing procedures developed. The hominid genome has had very little evolutionary experience with these rapid changes. Cordain furhter indicates that 72.1% of all energy consumed in the contemporary western diet comes from a menu that pre-agricultural hominids were not exposed to. Many dieticians attribute chronic diseases to our current diets for which our bodies have not evolved to digest. The western diet includes a large amount of protein attained from higher meat consumption; studies conducted by the UN indicate that African countries are trending in the adoption of western diets. As from 1997 there has been an increase of 40% in the slaughtering of cattle for human consumption in South Africa. (Cordain, O'Keefe Jr 2004)

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Insects versus Livestock

In an article written by CNN's journalist Richard Galant, it was estimated that within the next 40 years the world will need an increase of 70% in food production. We have to ask the question; where will this food come from? Entomophagy, the consumption of insects, has been a practice for our species since our evolution into our current state. Insects are a suitable source of nutrients as they are high in protein, vitamin B, minerals such as iron and zinc and low in saturated fat. Insects are much easier to cultivate than traditional macro-livestock e.g. cows, pigs and chickens. The cultivation process also has a much lighter ecological impact on the environment. Insects demand less energy, less land, less water and because of their cold blooded nature are more efficient in converting food into biomass. Less energy is used in converting the food into heat energy than occurs within mammals. Insects are far more abundant than mammals considering that 80% of all animal species in the world walk on six legs. The results of the comparison between traditional livestock and insect rearing are so astonishing it is a wonder that insects are not already part of our daily consumption. (Galant 2010)

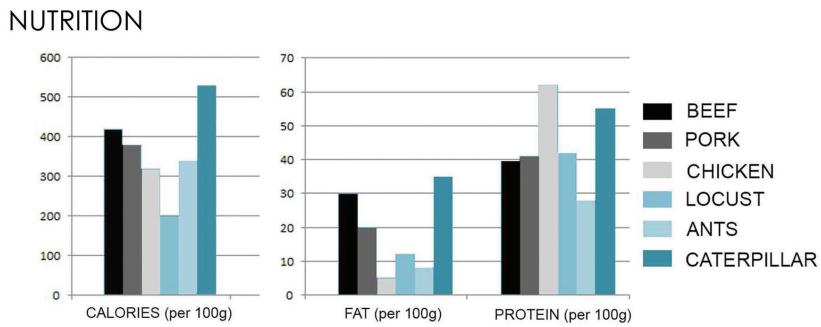

Figure 1.8 Nutritional comparison between livestock and insects production (author 2013)

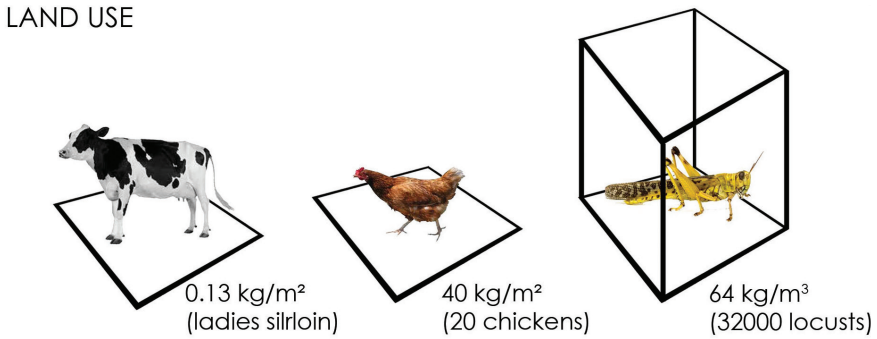

Figure 1.9 Land use comparison between livestock and locusts production (author 2013)

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Insects versus Macro-livestock

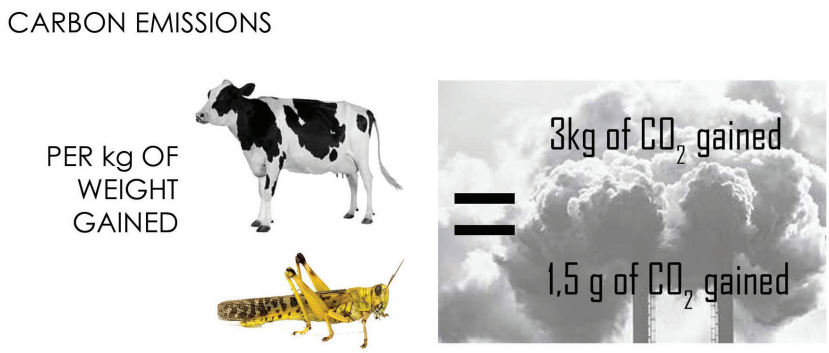

Figure 1.10 Carbon footprint comparison between beef and locust production (author 2013)

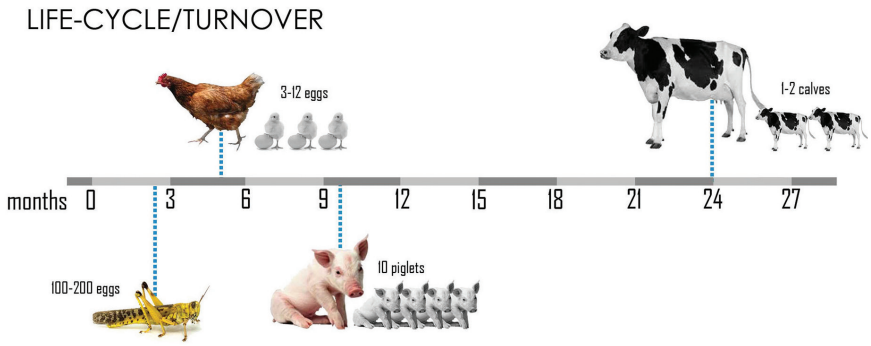

Figure 1.11 Lifecycle comparison between livestock and locusts (author 2013)

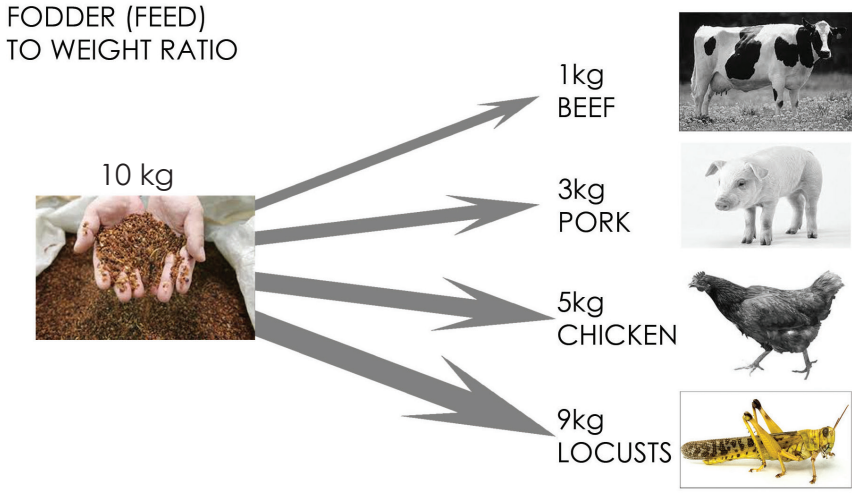

Figure 1.12 Feed to weight ratio comparison between livestock and locusts (author 2013)

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Conclusion

Cities need to change to incorporate food production and local distribution within their limits. Food production processes need to be in closer proximity to where it is bought and consumed. The premise of long distance exportation and importation is unsustainable. We need to look critically at the food we are eating and the systems that are involved in getting that food onto our plates. Awareness needs to be created about what it means to consume and buy locally produced foods. We need to amend the relationship that once existed between food source and consumer.

By adopting entomophagy back into our food culture and the production of insects within the boundaries of our city, we can address many dietary and ecological issues. The first step in influencing the food culture is to create a demand for it; a sub problem within insect consumption is the element of human disgust that is created through a misconception. Through gradual introduction into the everyday ritual and diet the perception of insect consumption can change. Influencing the perception can then inaugurate influences to the food culture on a larger scale. This can be done through the implementation of entomophagy as an alternative food culture intrinsic to its context. Mediation needs to occur between an existing food culture and a new food culture. The dissertation focuses predominantly within this transitional zone of mediation, perception and influence.

The potential site will require a vibrant pedestrianized community with intrinsic tight knit rituals. There should be a high rate of energy and movement, where the population is highly accessible making the area appropriate for the aims and objectives of the project.

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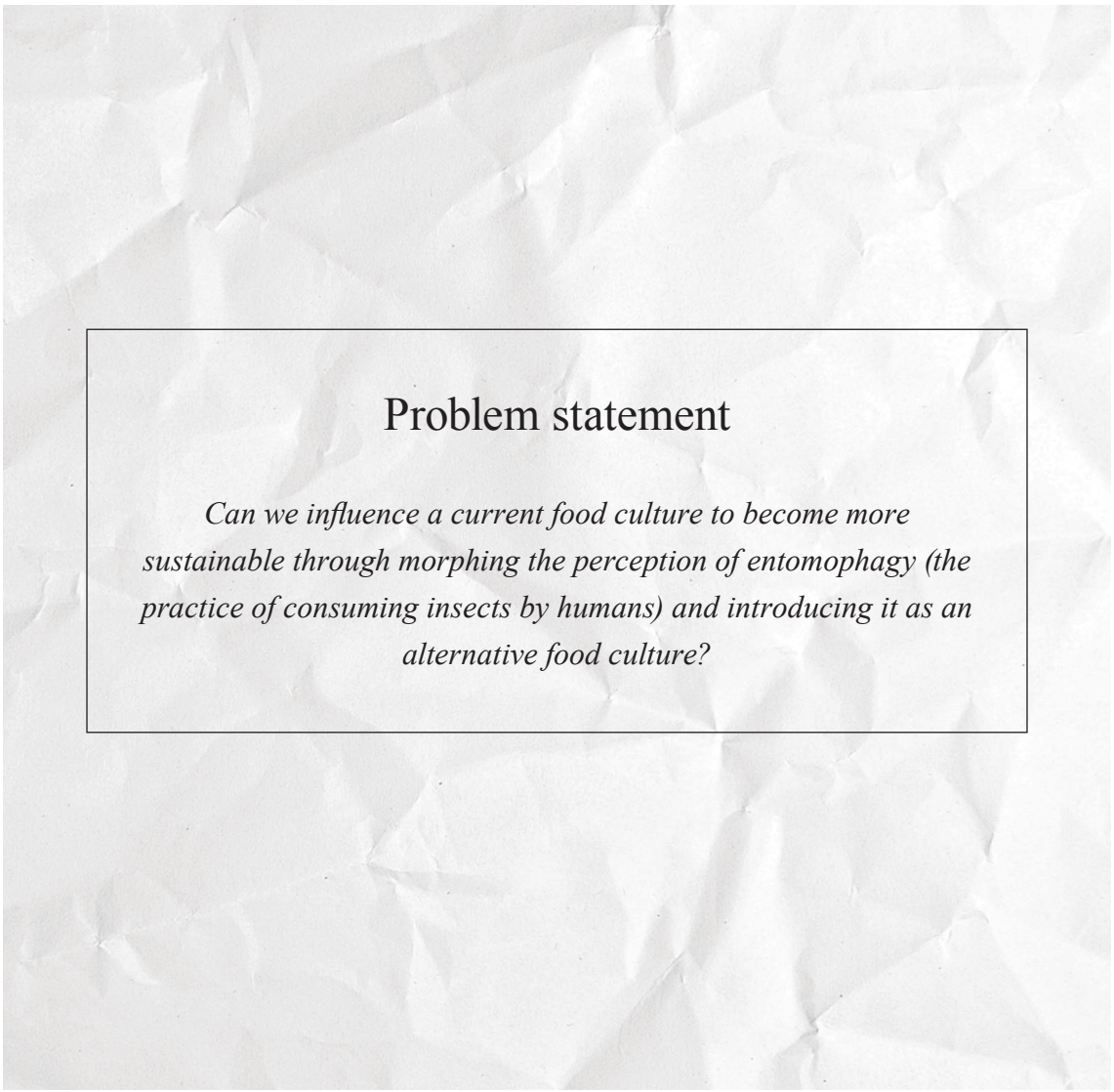

Figure 1.13 Problem statement (author 2013)

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Figure 1.14 The seductive consumption of an insect (author 2013) adapted from: http://www.bbc.co.uk/blogs/food/2011/03/why-not-eat-insects.shtml

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Chapter Two

Perception

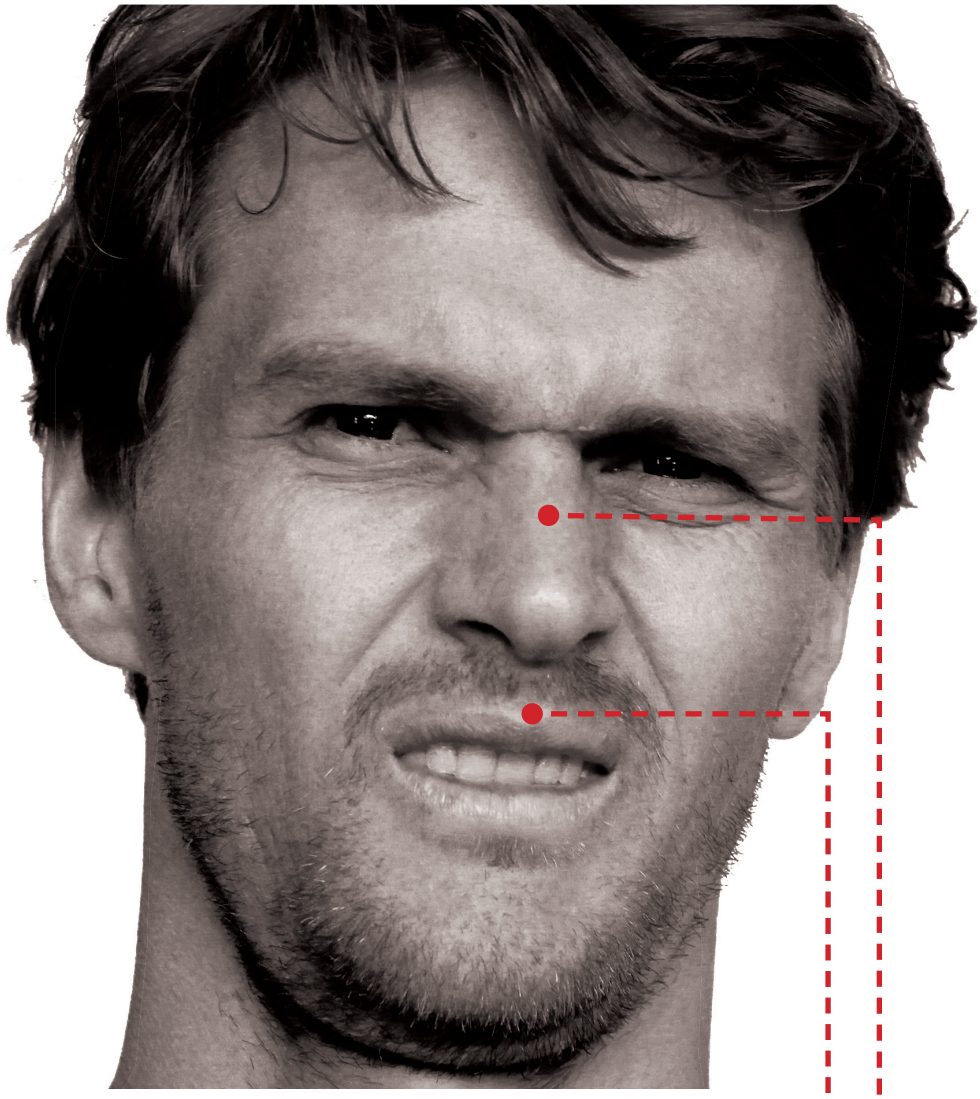

Figure 2.1 Expression of disgust (author 2013)

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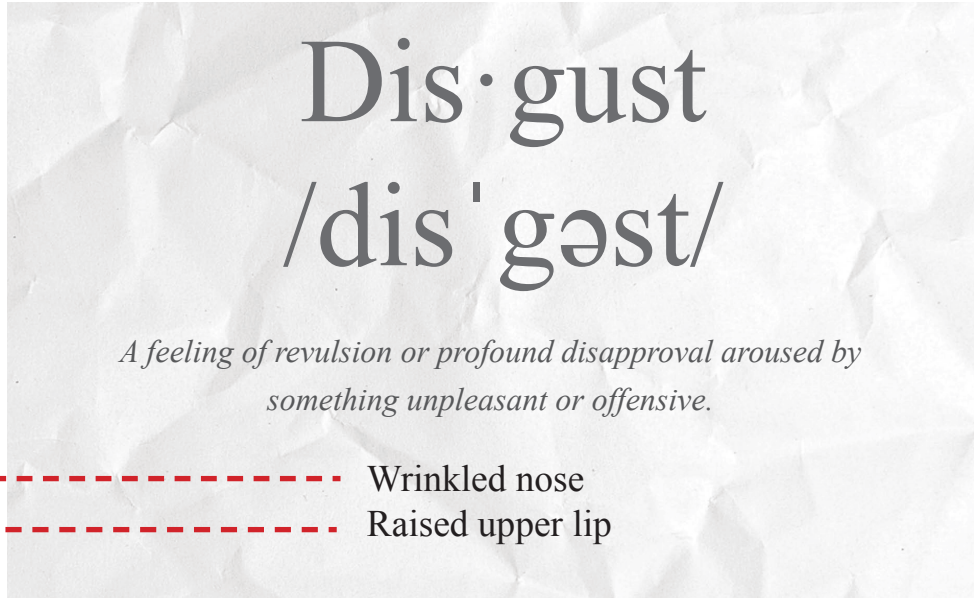
Introduction

One of the major difficulties with the proposal of entomophagy is dealing with the factor of human disgust. Most people pull their faces in disgust at the mere thought of touching an earthworm let alone eating one. Disgust is a natural emotion or impulse that is ingrained in us instinctually to help us avoid dangerous substances. However the response is based on perceptible dangers that we adapt to from societal queues.

According to Joshua M Tybur, assistant professor of social and organisation psychology at VU University Amsterdam; disgust is a heterogeneous emotion that elicits a response to varied acts and situations. Tybur outlines the emotional response into three functional domains of human disgust:

- The pathogen disgust, this motivates the avoidance of micro-organisms, (rotting material, diseased or infected wounds, ingestion of contaminated food etc.)
- The sexual disgust, this response motivates the avoidance of “dangerous” sexual partners (incest, pornography etc.)
- Moral disgust, this motivates people to avoid breaking the moral norms of society (stealing, lying etc.).

Emotion researchers define disgust as one of the basic human emotions with a universal facial expression as well as physiological symptoms such as excess salivation nausea and vomiting. These responses are generally believed to be linked to basic instincts for individual survival. The prospect of insect consumption subconsciously triggers the pathogen disgust response; this pertains to the perception of insects being dirty and bacteria carrying. This perception cultivates a phobia which inhibits people from the accepting the alternative food source.(Tybur, Lieberman et al. 2009)



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Neo-Phobia Treatment

The disgust and fear response elicited from insects can be considered a neophobia; neophobia is defined as a tendency to fear or dislike new things. It is referred to as a phobia because the fear is irrational and illogical. According to the UN food and agricultural organisation there are 1900 edible insects in the world, hundreds of which are already part of the diet in many countries and the rate of disease contraction from insect consumption is negligible. The majority of diseases carried by insects cannot transfer to mammals. The chances of disease contraction due to the consumption of beef, pork or chicken is much higher as they offer warm blooded systems in which transferrable diseases can be carried. Additively insects formed a large part of our diet in the generations prior to animal husbandry. The fear of insect consumption is therefore unfounded. So why is it that this phobia is so commonly accepted as normal behaviour? (Food and Agriculture Organization of the United Nations 2002)

It is difficult to track where or when the “phobia” of insect consumption originated, though the further exploration into what perpetuates a phobia can aid in the disintegration of its communal momentum. Phobias were originally thought to be hereditary and genetically intrinsic to an individual’s psychological profile. However recent research shows that most phobias are in fact learnt. Fear and avoidance are inherited through social queues that can be picked up subconsciously and manifest into phobias. This stems from an evolutionary tool utilized by many communities of species to ensure survival. Younger or new members of a community could learn the avoidance of identified poisonous foods and dangerous animals etc. This tool has now had an adverse effect on our food culture, the social queues that are being passed on to each coming generation has been tainted by the perpetuating western diet, the societal norms that we are conforming to dictate that insects are unsafe and unhealthy to eat. This instils a squeamish attitude and a negative perception towards the advantageous food source. (Comer 2005)

This dissertation will explore how we can go about changing the perceptions and behavioural patterns of a society to be more accommodating to change.

In a paper titled Psychopathy and treatment of specific phobias written by Davey, Graham C.L different phobias are incurred by different aetiologies or triggers. Graham outlines the most successful forms of treatment for specific phobias as a range of exposure therapies, this includes flooding (head on confrontation), counterconditioning (is an associative type of conditioning) and systematic desensitization (this includes multiple levels of gradual exposure). Gradual exposure in combination with systematic desensitisation is the least confrontational approaches and it has a wider range of application specifically when dealing with a large sample group of people. These therapies are to be subsidized with combined principles of classical conditioning and behavioural therapies to become even more effective. (Davey 2007)

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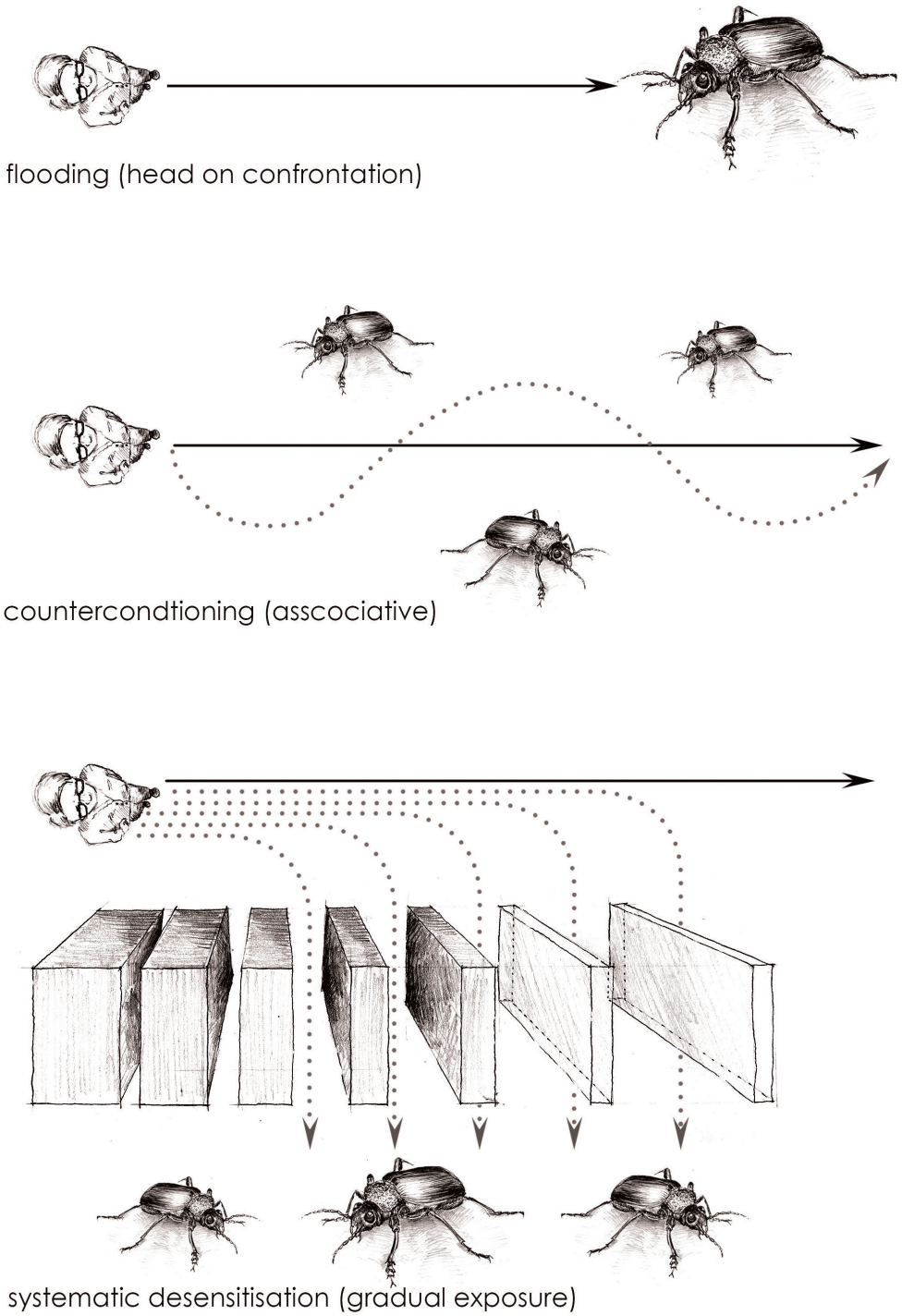

Figure 2.2 Phobia treatment: contemporary exposure therapies (author 2013)

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Conditioning and Cognitive Theory

Classical conditioning is a tool discovered and developed by a Russian Nobel Prize winner Ivan Petrovich Pavlov, famous for the concept of conditioned reflex. In 1901 Pavlov developed this concept through the examination of salivation rates in dogs. He would ring a bell (established as a neutral stimulus) and subsequently present the dog with food. The dog eventually came to associate food with the sound of the bell and concordantly would salivate upon hearing it. This classical conditioning principle was internalised by psychologists in the western world and expanded on; just over a decade later psychologists J.B. Watson and B.F. Skinner elaborated on the findings and developed the theory of behaviourism; which stated that in operant conditioning, behaviour that is reinforced continues, while behaviour that is punished or not reinforced is eventually stopped.

This thought process developed and spawned a new take on the influences on human behaviour, resulting in the development in cognitive theory. This theory focuses on an individual's thoughts, where the responses of the person are determined by the internal context of the person and their subsequent views or perceptions of the outside world. With cognitive theory it is important to change a person's thoughts and beliefs in order to influence behaviour. A variant of this theory is social cognitive theory, this examines the influential effect that others have on individual behaviour. The principles state that learning does not only occur in an individual's personal experience but can occur in the observation of others. This theory re-iterates the fact that many phobias can be learnt through societal observation. It stands to reason that phobias can then be treated or unlearnt in a similar fashion.

Modern cognitive-behaviourism also incorporates elements of feeling-based learning theories, such as rational-emotive theory. According to these principles, we are complex human beings whose responses are based on a constant interaction between our thoughts, feelings and behaviour. It is necessary to address all of these components in order to successfully change our reactions and or perceptions. We can say that the Pavlovian dog was conditioned to associate a positive reflex with the trigger of a neutral stimulus. (Powell 2001) (Dombeck 2006)

Similarly we can trigger a society to associate a positive reflex towards insects with a positive stimulus.

To change the perception there needs to be a near constant counter conditioning that works at relating the consumption of insects as a positive behaviour. This constant conditioning can be achieved by connecting to daily rituals performed by a society to make exposure to the new food source a common and constant occurrence. Looking at an area where the population is highly pedestrianized and accessible will make the project feasible due to a high exposure rate. The programme of the intervention will therefore rely on the context of the area's food culture while a pertinent understanding of the context will need to be achieved. The architecture becomes the physical interface through which the programme can be understood, it is a pinnacle point through which the premise will be confronted. Using systematic desensitisation and gradual exposure the community can be conditioned into associating entomophagy with a positive experience created by space.

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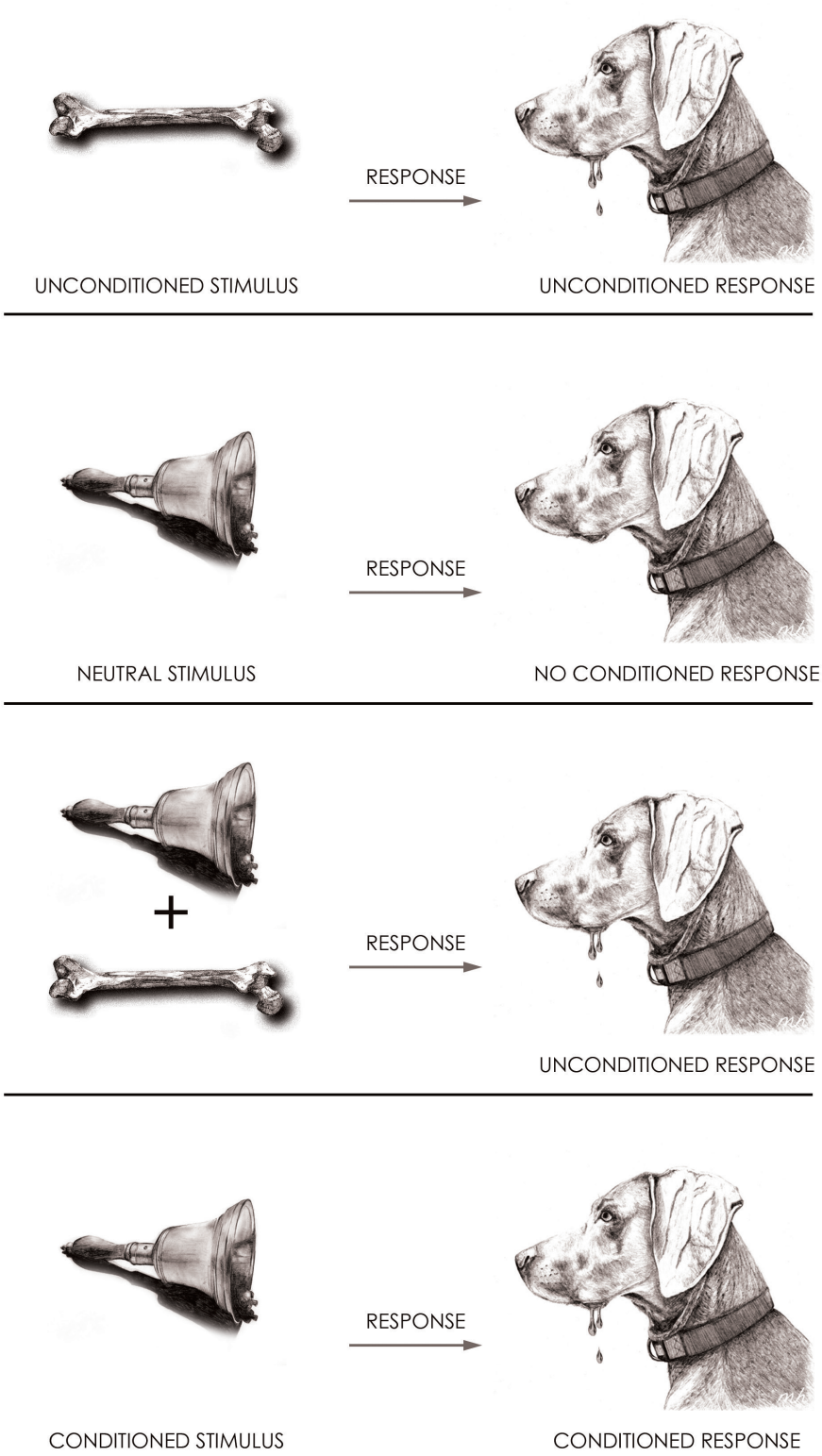

Figure 2.3 Pavlovian dog, the basis of all cognitive theory (author 2013)

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Chapter Three

The Context

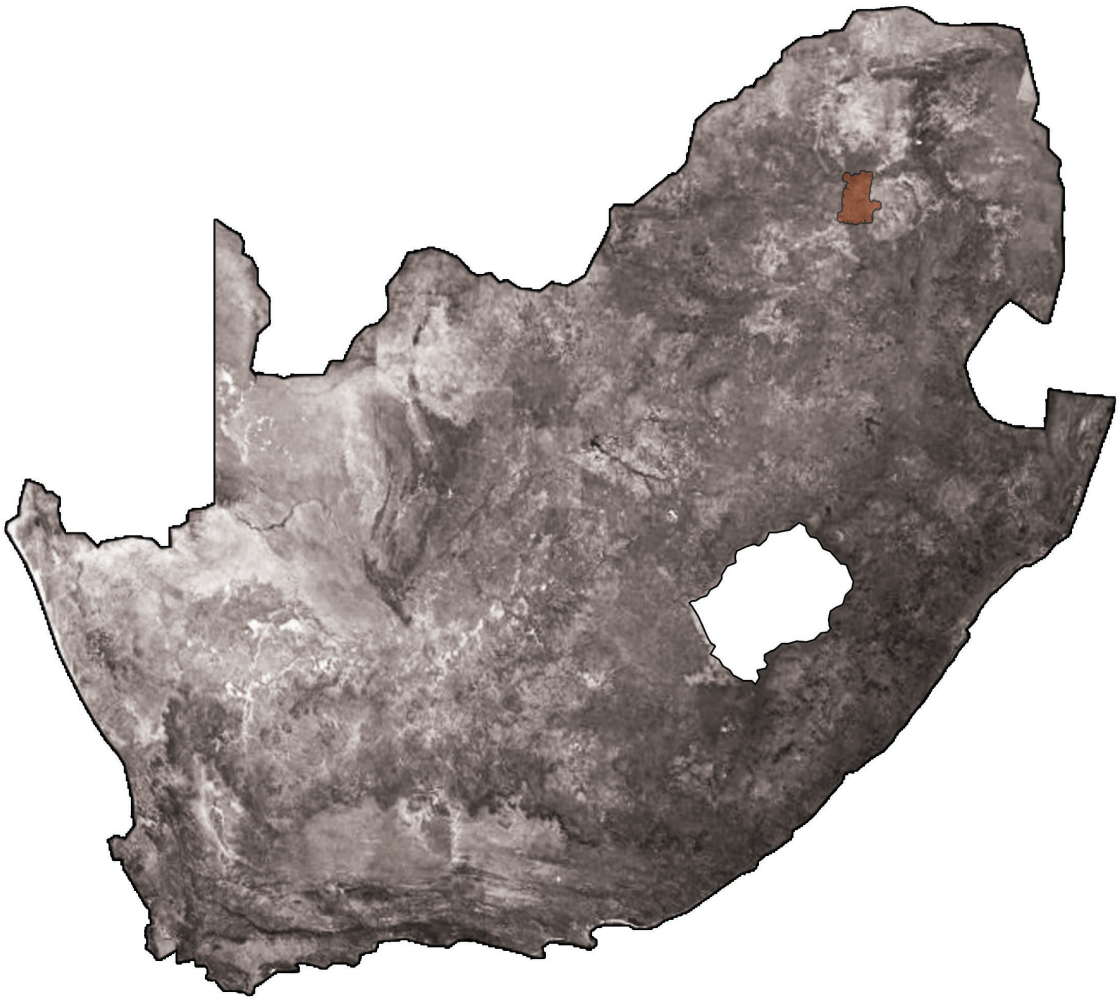

Figure 3.1 Aerial photograph of South Africa highlighting the City of Tshwane (author 2013) *adapted from: Google earth*

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Figure 3.2 Aerial photograph of the City of Tshwane highlighting Pretoria central (author 2013) adapted from: Google earth



Figure 3.3 Aerial photograph highlighting the township of Marabastad in relation to Pretoria Central Business District (CBD) (author 2013) *adapted from: Google earth*

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Marabastad

The choice of the site or laboratory in which to mitigate and influence a current food culture is pertinent to the success of the project. Upon investigation Marabastad, an existing township 2km from Pretoria Central Business District (CBD), was determined to be a suitable area. Marabstad has attractive characteristics in terms of the food culture premise. It is a highly energetic and pedestrianized precinct making the community members and their respective rituals easy to access. The township had undergone much turmoil within the previous apartheid regime; suffering evictions, racial relocations and demolitions. Despite all of these trials the township remains rife with trade energy; the people that belong to the community are opportunistic and adaptable, holding on to rituals of the past and exploiting opportunities of the present. There is also an existing niche market of insect consumption within Marabastad. These characteristics create a prime potential onto which a food culture of entomophagy can infiltrate.



Figure 3.4 Informal food stand selling dried mopane worms (author 2013)



Figure 3.5 Abandoned mosque on Boom Street (author 2013)



Figure 3.6 Typical pedestrian treatment (author 2013)



Figure 3.7 View of the Steenhovenspruit from Bloed Street (author 2013)

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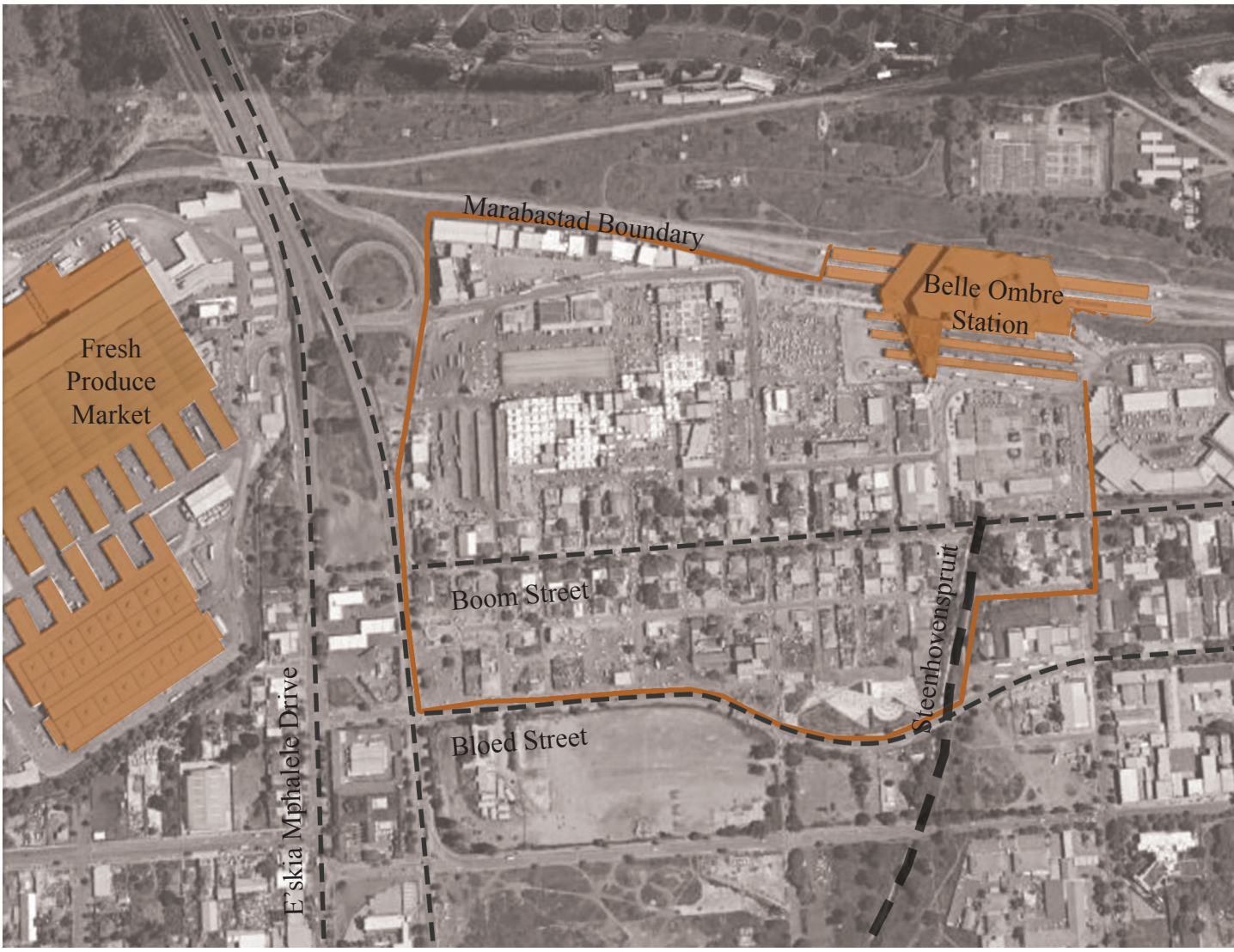

Figure 3.8 Aerial photograph of existing Marabastad indicating major streets and places (author 2013) *adapted from: Google earth*

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A Brief History

The township of Marabastad was established in 1888 at the village of Maraba, on the Apies River, just below the Daspoort ridge. It began as small trading node inhabited by predominantly Indian traders. Marabastad then became the designated area for the coolie (Indian) location (1892), Cape Coloured (coloureds) location (1893) and a native African location (blacks), there was also a small population of Chinese settlers who were attracted by the trade potential Marabastad offered. (Clark 2009)

The area was home to a multitude of ethnicities, nationalities, cultures and religions. This generated a diverse mixed use community. It contained many of the good urban design characteristics we now strive for; the community was predominantly pedestrian, there were strong community relationships, products and foods were produced locally to feed a local economy. The dream however was short lived; evictions and demolitions started as early as 1912 when the older village of Marabastad, in the North, was evacuated and cleared to make way for the Daspoort sewage farm. The Schoolplaats evictions occurred in 1934 when the slum clearance act came into play. In 1948 the National party came into power, so followed the group areas act of 1950; and so began the end of the racial harmony,

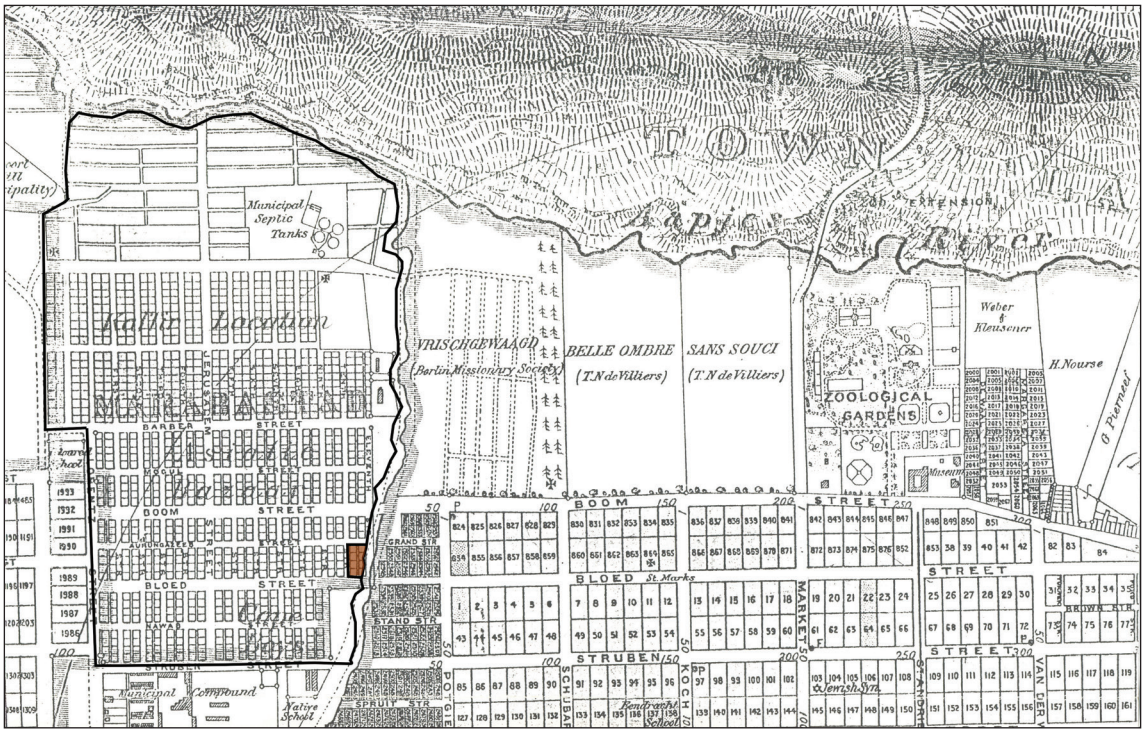

Figure 3.9 Historical map indicating the footprint of Marabastad and potential site location (author 2013) *adapted from: Pretoria City Council circa 1913*

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this act enforced the segregation of the different races into demarcated townships around Pretoria. Black people were relocated to Attredgville, Shoshanguwe and Mamelodi. Coloured people were re-located to Eersterust and Indian people to Laudium. This relocation process concluded in 1976 when the Asiatic bazaar was rezoned to no longer include a residential component. The eviction of this large proportion of the population allowed for the demolition of the southern residential fabric of Marabastad to occur. Belle Ombre train station was built in 1988 to act as major transport link to bring in the large labour forces to work in the inner city that were now relocated to outside the city. The flux of energy in and out of the city through the Belle Ombre station has kept the energy levels of Marabastad high enough for the precinct to survive. (Clark 2009)



Figure 3.10 Historical photo capturing the fabric of Marabastad (Aziz Tayob Partnership)

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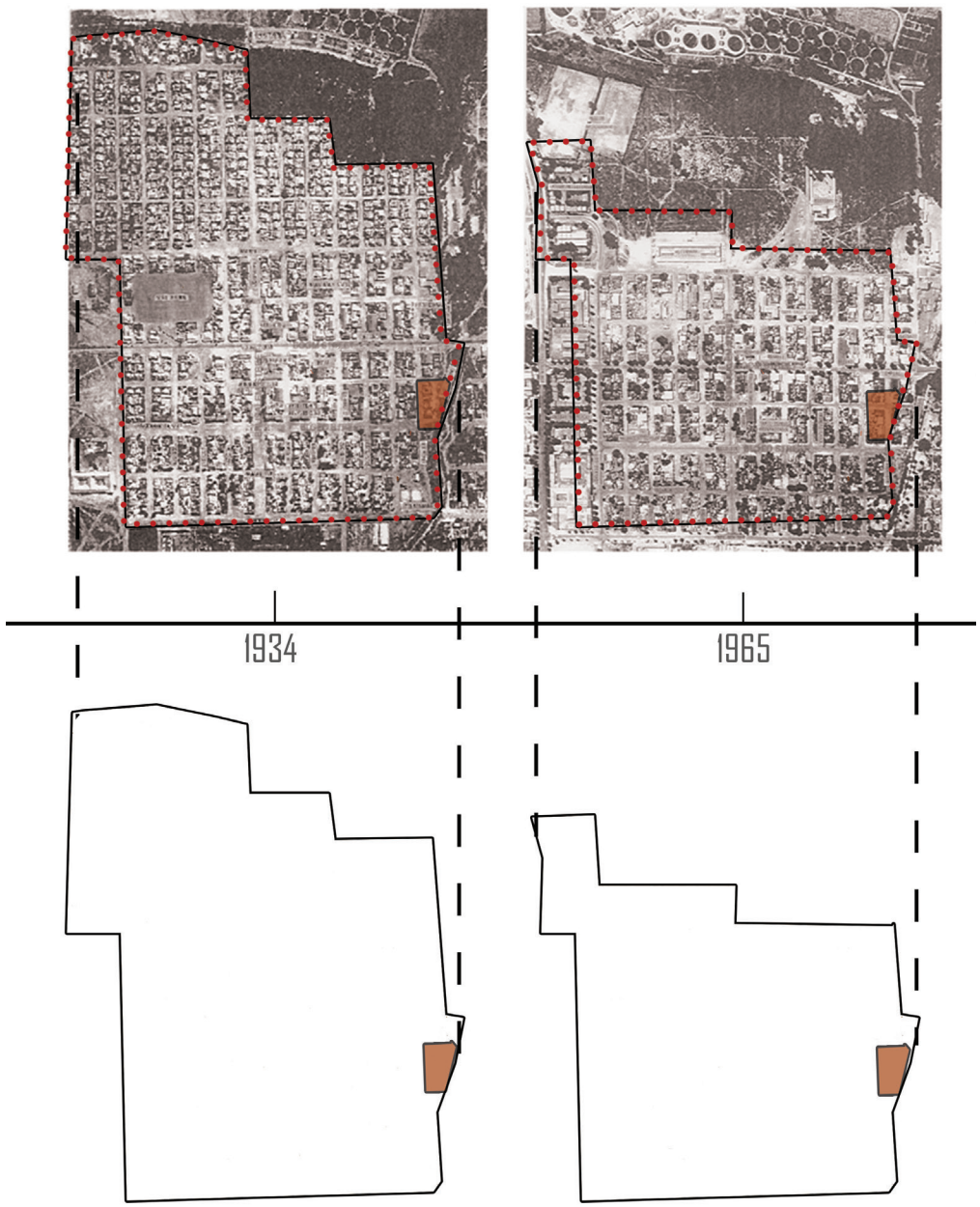
Footprint Development



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"The Community Development Act of 1966 stunted all development in the area for three decades. The result is a suburb degraded into slum conditions, with inadequate services and disintergrated community life"

-Aziz Tayob Partnership, 2002:24

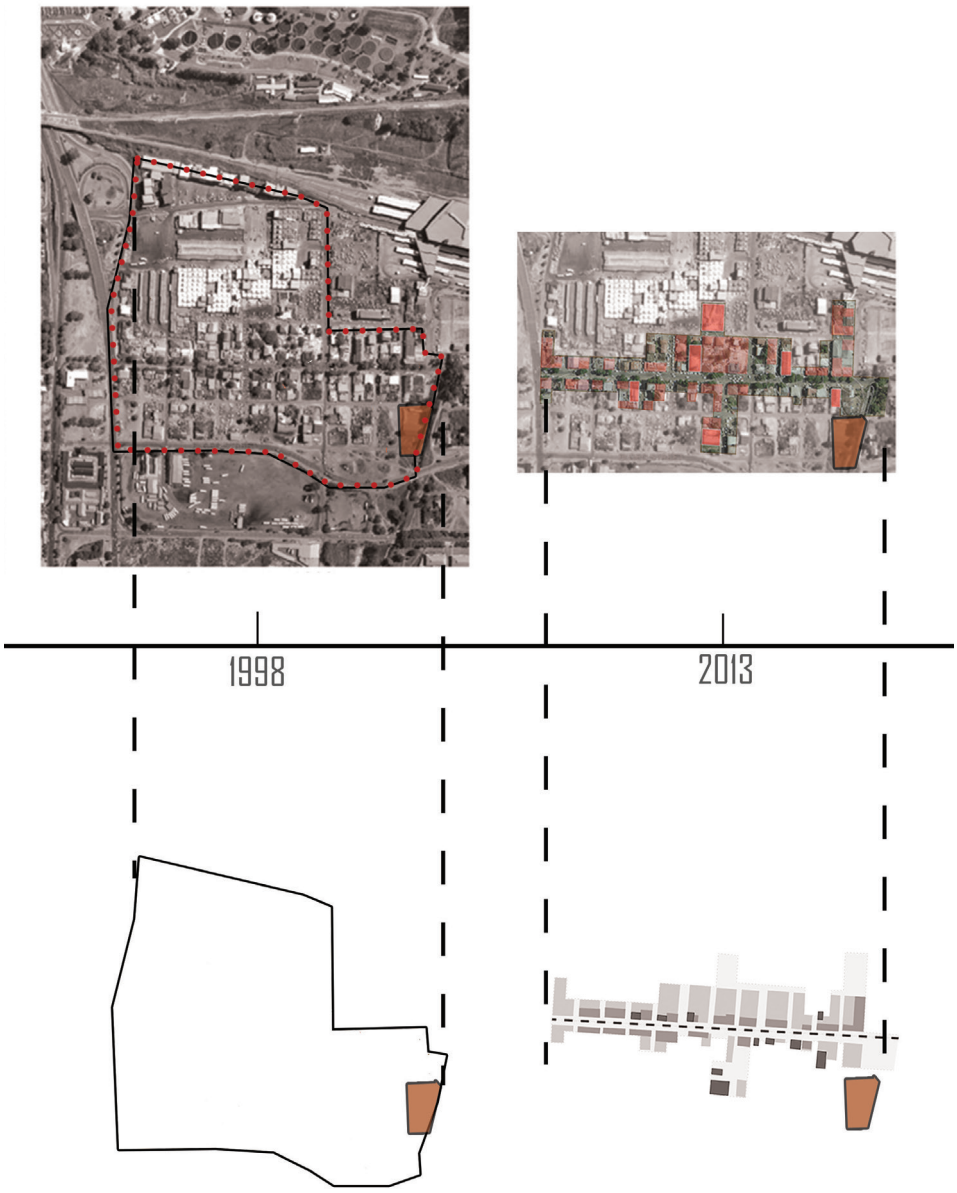

Figure 3.11 Marabastad Footprint development over time (author 2013)

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Experiencing Marabastad

A better understanding of the historical context was attained through a discussion with the author's parents; Fareed Vally (a previous resident of Marabastad) and Bonnie Vally (a frequent visitor of Marabastad)

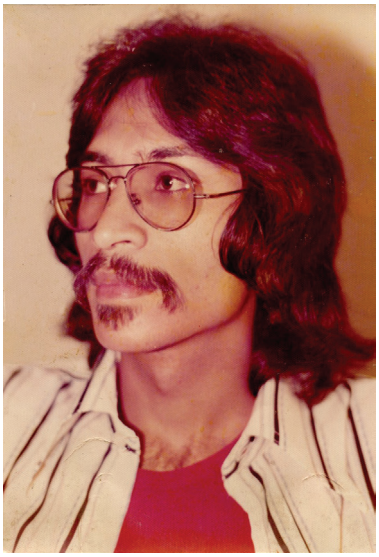

Figure 3.12 Photograpgh of Fareed Vally circa 1970 (author 2013)

Fareed Vally

Fareed Vally a previous resident of Marabastad address 363 6th Street borne 1955 and moved out of Marabastad to Laudium in 1973. "We lived on the street, although we each had our respective house, which was only where you slept. Even when it was dinner time, it was whoevers house was closest, "what's for ciaos?" we would ask."

A planning exercise was done with each of the interviewees respectively. Fareed Vally described and sketched the plan of his house as well as the spacial arrangement of the block as it related to the adjacent block where his closest cousin Sabir Sulliman resided. The residential units housed various members of extended families and friends creating unconventional family types where differentiations between friends and family are dissolved. These tightly knit relationships influenced the arrangement of the private living units. The units were often connected through organically formed communal corridors and spaces within each residential block. There formed a very distinct layering in thresholds between what is public, communal, semi-private and private. The level of exposure to the different levels of privacy was dependent on the involvement of the participants with the surrounding residents. In the figure 3.13 we can see the private areas branching off the communal spaces. The large open space was used for an open air movie night once a week, members of the community that participated in those evenings could use the space as a walk through during the day. Movements created spontaneous interactions and developed relationships.

These tightly knit living conditions influenced the manner in which eating rituals were played out, cooking often became a communal affair, ingredients were sourced from various households; vegetable patches of semi subsistent farms in gardens provided fresh produce, eggs layed in backyard chicken coops. Large pots of rice and potatoes flavoured with traditional Indian spices were made; feeding communal pockets of families. Meat was rare and only eaten on special occasions.

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*"We would often cause sh*t on Cowie Street, and run through that corridor, the arrah's (policemen from outside Marabastad) could never find us or catch us!"*

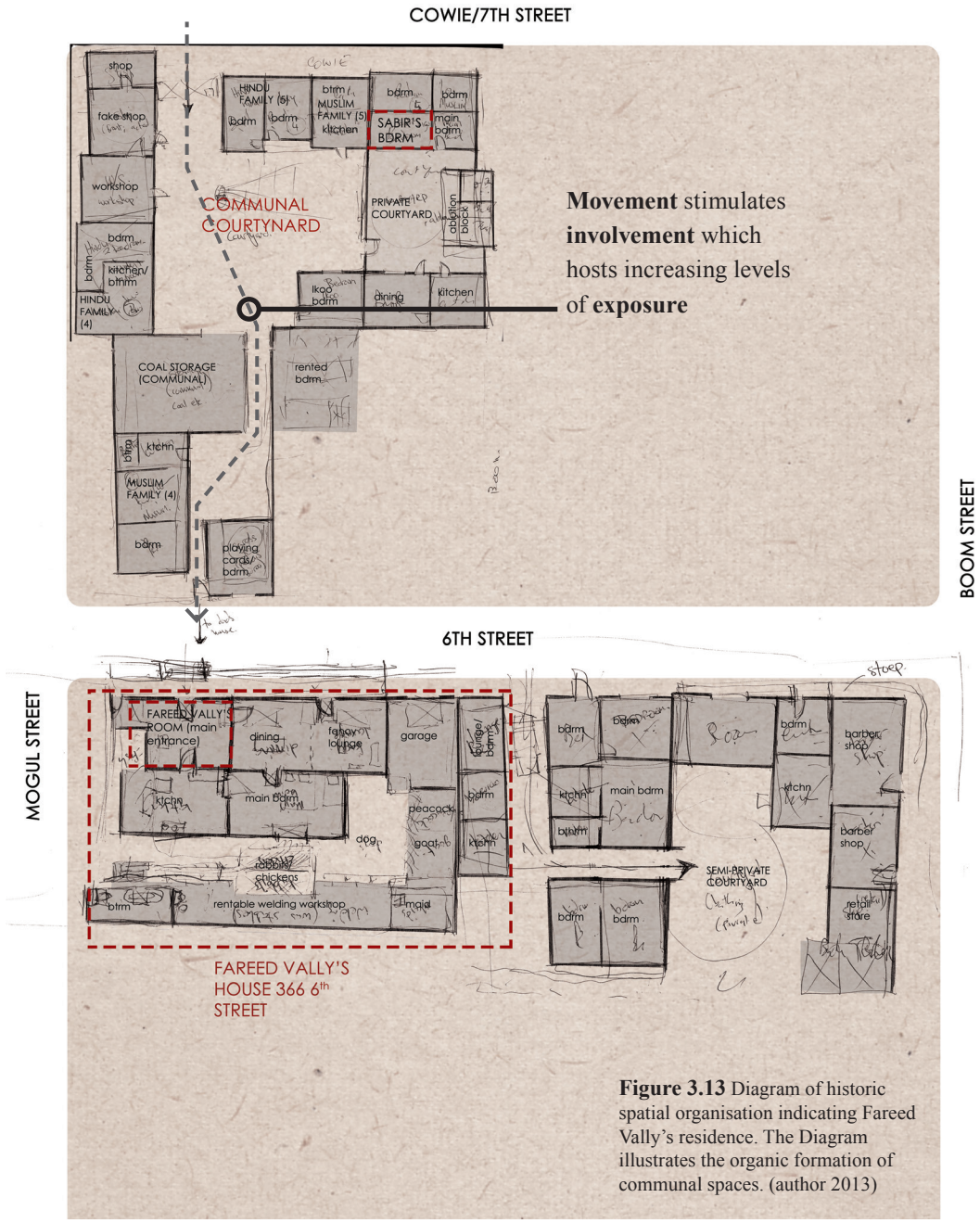

Figure 3.13 Diagram of historic spatial organisation indicating Fareed Vally's residence. The Diagram illustrates the organic formation of communal spaces. (author 2013)

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Experiencing Marabastad



Figure 3.14 Photograpgh of Bonnie Vally circa 1970 (author 2013)

Bonnie Vally

Bonnie Vally (the author's mother); a white woman borne in 1957. Of privileged race at the time Bonnie naively overlooked boundaries of segregation setup by the government. From the age of 9 and into her late twenties Bonnie frequently visited friends in the township of Marabastad.

Bonnie Vally, being a non-resident of Marabastad, encountered a completely different experience as a recurrent visitor to the precinct. Bonnie frequented a part Coloured part German and part oriental family that, due to their race, lived illegally in the township. This exposed her to the subversive nature or backyard living culture that existed in Marabastad. The family owned a haberdashery, selling a variety of curtains and materials. The private living space was accessed through an intricate and secretive journey. Behind the store was a storage room, it contained a false curtain that hid a blank wall, the purpose of which was to distract policemen from the real entrance. If one slid the fridge to the side it exposed a hole in the wall that lead to a dark hall and a small wooden staircase that seemed to lead to nothing more than the hay loft. Behind the first wall of hay bales resided the living space. This was utilised as both the communal space as well as sleeping quarters. The loft over looked the communal backyard that was shared with neighbours. This spatial arrangement created diffferent thresholds of privacy and layered levels of community involvement.

The food culture that Bonnie experienced in Marabastad was her introduction to Indian cuisine. Food was shared amongst large "families" in these small shared livng spaces and communal courtyards. The food consisted usually of curry and rice. They ate very little meat, only on special occasions and even then it was common practice to share a lamb chop between two or three people. The curries were bulked up with vegetables, tomatoes and potatoes.

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"I didn't play on the street, usually in the alley ways. I had to be hidden behind closed doors, or closed sheets as it were, at the time I didn't realise that I was being kept hidden, it only dawned on me later that it was because I was white I wasn't allowed to be seen."

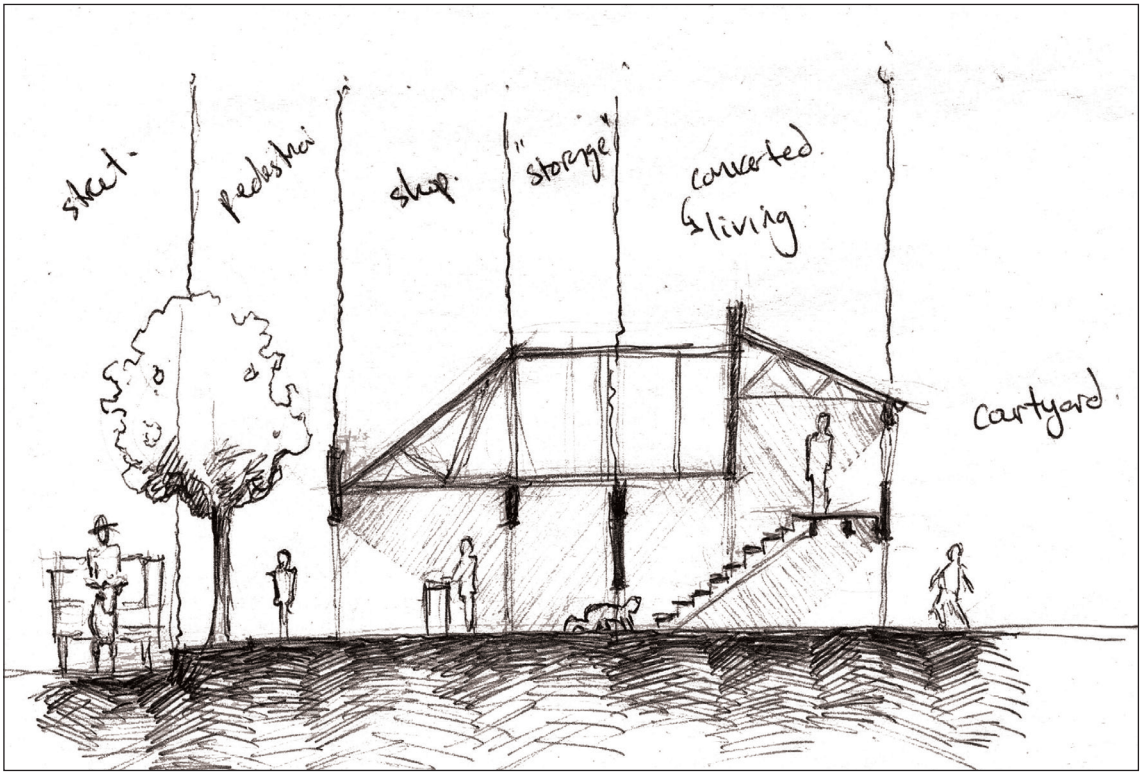

Figure 3.15 Section through shop and residential unit indicating layers of thresholds, a progression from public to private and the subversive culture experienced in historical Marabastad

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Existing Marabastad

The footprint of Marabastad has changed drastically over the years; the energy of the area now clings to the spine and trade energy of Boom Street and the market off 7th Street. There are many damaged structures, skeletal remains of a tortured past. Dusty vacant lots boarder its boundaries. The air is thick with the smell of charred garbage. The garbage remains uncollected, symbolic of a space overlooked by the City. Despite its pockets of desolation, the area is magnetic; a strong pulse of vibrancy exists, perhaps reminiscent of its unforgotten past. The energy that is created through spontaneous interactions on the street gives the area an original identity. The intimate and vibrant nature of Marabastad has a heritage that is worth preserving.

The demolitions and evictions that occurred in the precinct has destroyed the relationship and the physical linkages that Marabastad once had with the city, the connection between the coarse grained urban fabric of the CBD and the fine grained fabric of Marabastad is non-existent. Open spaces of land particularly along the Steenhovenspruit are treated as leftover spaces; becoming collectors of leftover debris and can be perceived as rubbish heaps.

Marabastad is now a portal to the city for a large community of commuters to the city. The Belle Ombre train station as well as the bus station acts as major inputs of pedestrian energy, this has created an intensive transportation node. The proximity and access to the adjacent highway has made the distribution of products to and from Marabastad seamless. The fresh produce market to the west of Marabastad also acts as a source of produce that feeds the area. Marabastad has become somewhat of a haven for small business owners, entrepreneurs and informal traders; all latched onto the rituals and flux of the energies of people moving in and out of the city.

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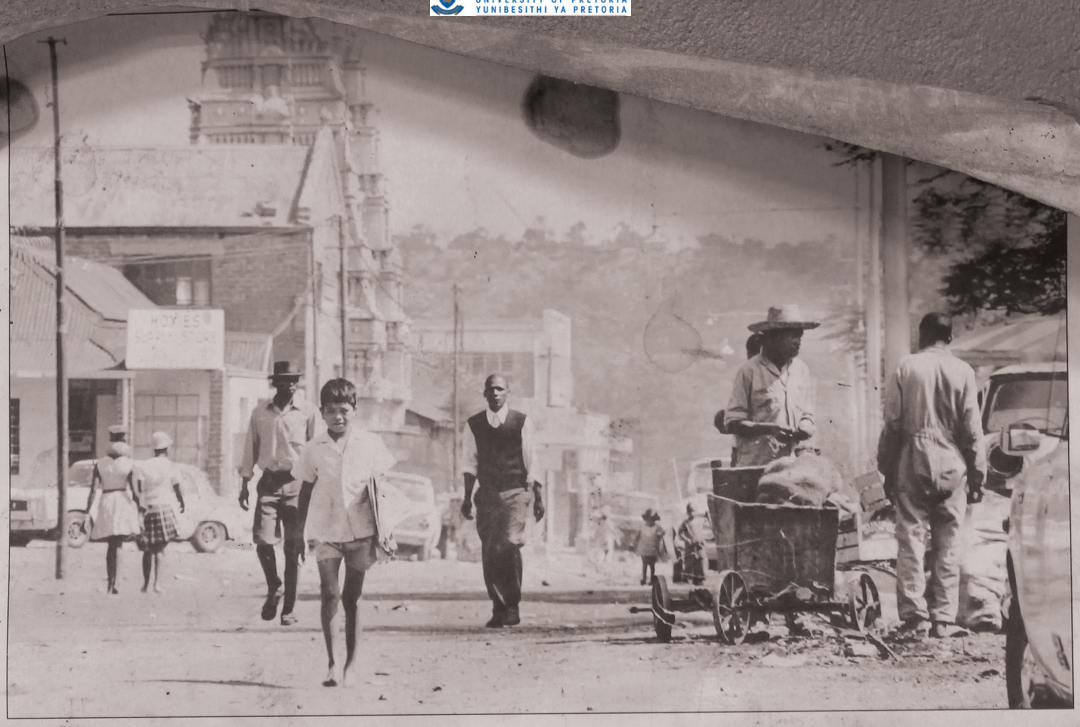

A Glimpse into Marabastad

ON SALE

Mohideen's Restaurant





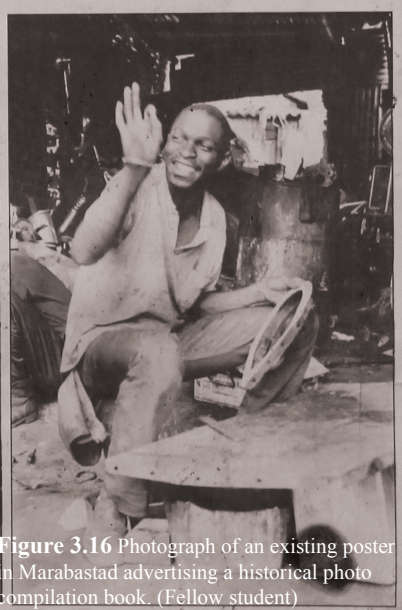

Figure 3.16 Photograph of an existing poster in Marabastad advertising a historical photo compilation book. (Fellow student)

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Figure 3.17 Photograph illustrating the contrasting economic statuses in the Marabastad precinct (photo by Jason Nel)

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Chapter Four

Marabastad Group Framework

Marabastad Group Vision

The group vision is to respect, protect and enhance the existing character and heritage of Marabastad, and to develop it into a unique centre of trade production and cultural activity.

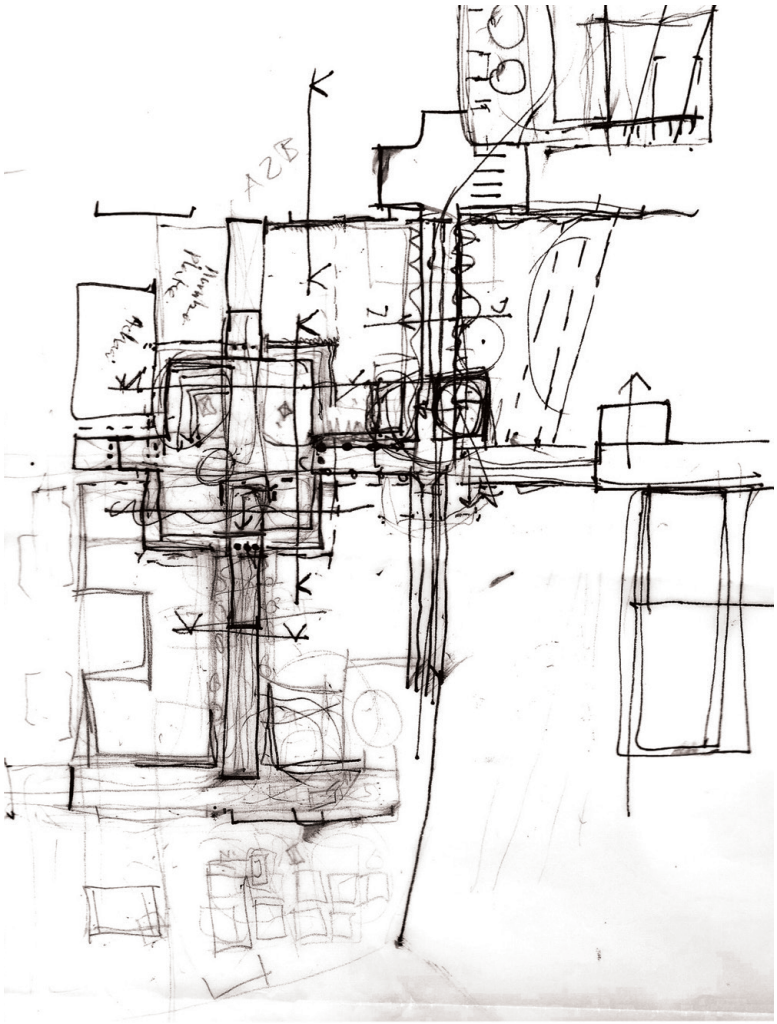

Figure 4.1 Conceptual sketch of framework (Marabastad group members 2013)

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Introduction

Marabastad has many social, economic and physical scars from a turbulent passed. Although it is now a fragmented community it remains resilient in its will to survive and adapt. Marabastad is one of the few remaining examples of our culturally rich and diverse townships that have played an important role in South African history. It now functions as a nodal interchange of transport, predominantly a portal to the inner city for a work force during the week and a centre of trade and retail during the weekend. Marabastad has a history and a present condition of production and opportunistic trade.

The objectives of the framework are to salvage the nature of the township with an adoption of a sensitive heritage preservation strategy. Natural systems also need to be re-invigorated. To fulfil eco-systemic processes they need to be reconnected.

Marabastad's relationship with the CBD needs to strengthened and become more accessible, to ensure a flow of movement and trade with other economic centres. The difference in scales between the urban fabric in Marabastad and the CBD isolates the precinct, this can be combatted through the introduction of new fabric with a mediating affect. This framework aims to re-introduce the residential component that Marabastad lost during its rezoning in 1976. This will act as the mediator and re-establish a social community and give the precinct a more diverse offering.

This needs to happen without hindering the progress of the precinct.



Figure 4.2 Conceptual sketch of framework vision (group member 2013)

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City of Tshwane Framework Synopsis

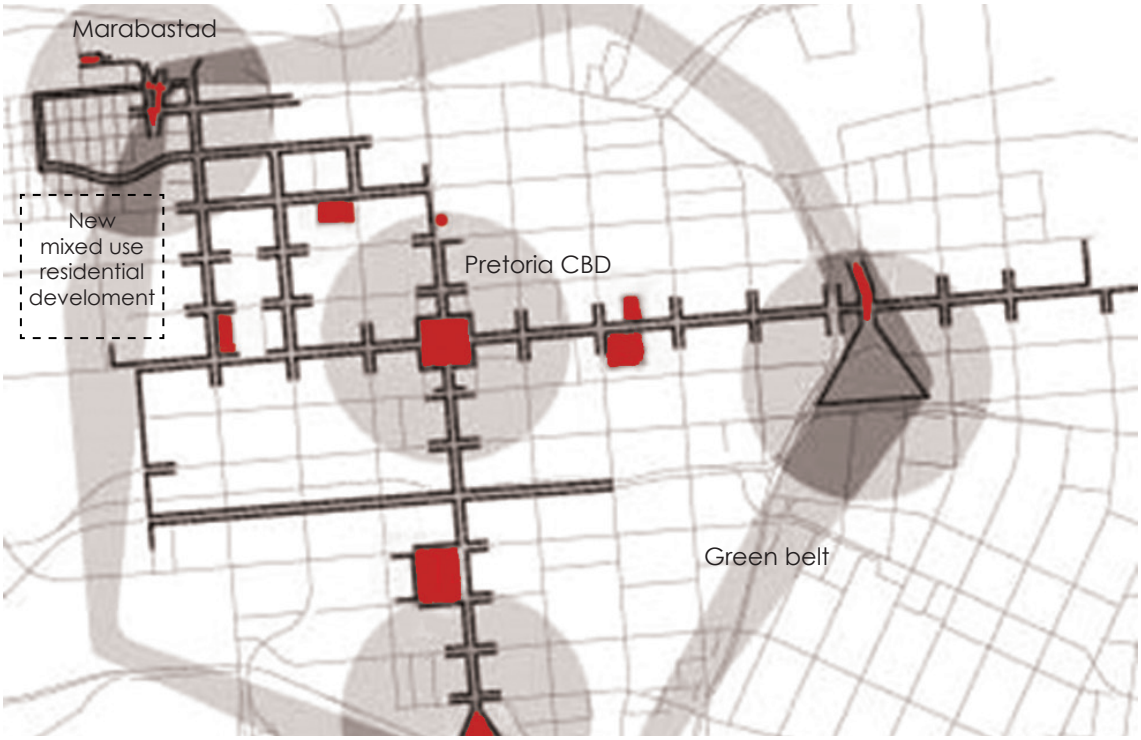

Figure 4.3 Diagram indicating important nodes, green belt and urban fabric densities (author 2013) *adapted form ARUP architects*

The architectural firm ARUP were commissioned to develop a framework for the City of Tshwane and an in-depth detailed strategy for further development in and around the central business district (CBD) of Pretoria. Their vision aimed to optimize existing infrastructure and identify strategic points of intervention where new large scale infrastructure could be implemented.

ARUP looked at the large scale transportation requirements to reconnect and optimize important links within the CBD. The amended transportation routes were used to link identified nodes within Pretoria that have the potential to be activated and have catalytic ripple effects activating supplementary parts of the city. They have identified Marabastad as one of these precincts with the potential for development. Proposing new medium to high density residential and mixed use zones.

Certain aspects of the ARUP framework that line up with the group's vision of Marabastad were utilized, enhanced and taken into further detail.

- Propose new medium to high residential and mixed-use zoning.
- Retain pedestrian quality of Marabastad into any new developments
- New bus rapid transit (BRT) stops to connect back to the CBD
- A green belt will be established around the CBD and along Steenhovenspruit

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Figure 4.4 Important nodes, and their potential to influence surroundings (author 2013) *adapted form ARUP architects*

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Heritage Approach and Coding

The precinct of Marabastad has political, cultural, architectural and historical heritage significance. This dissertation, in line with the group decisions, proposes that Boom Street be treated as a heritage zone. Although there are only a few buildings in the street that are older than 60 years and are protected by the National Heritage Act they have little architectural value on their own. Boom Street captures the essence of the nature of Marabastad. In terms of preserving the culture and ensuring that the memory of the precinct is retained, the fabric of Boom Street will be treated as a heritage artefact.



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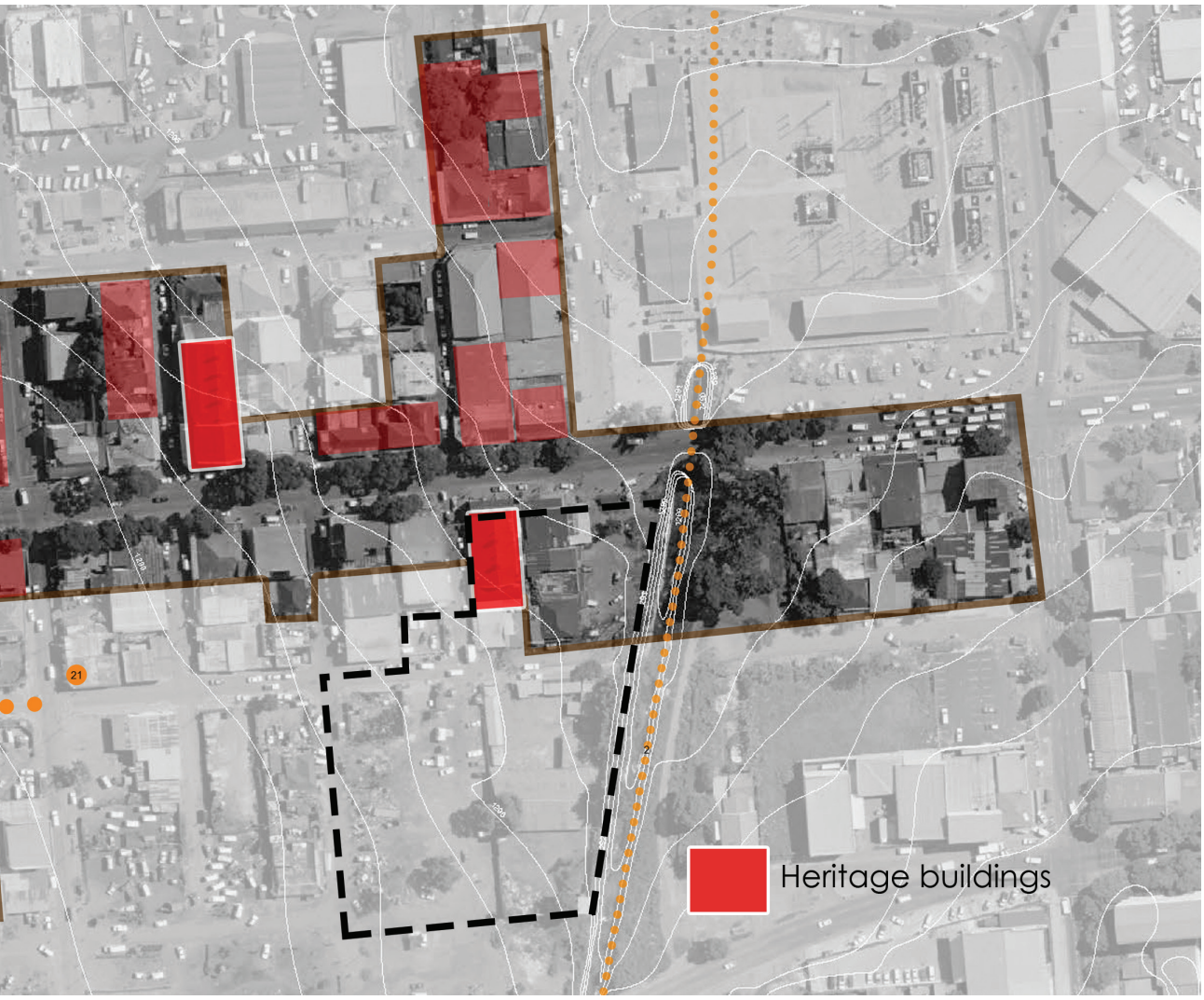

Figure 4.5 Diagram illustrating heritage buildings and Boom Street as a heritage artefact (group members 2013)

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Heritage Approach and Coding

In order to ensure the preservation of the nature of Marabastad and Boom Street in particular, the nature itself needed to be quantified. Elements that captured the essence of the streets character were identified and a coding was developed to protect these certain elements.

Coding systems are used when zoning is insufficient. Zoning applies to programme and density, coding goes into further detail and implies spatial quality that new structures must adhere to.

The group adopted a formal code for Marabastad that was developed by Gary White Architects. The objective of the coding is to retain the promotion of informal trade and pedestrian nature of the street. The class group added specifications in terms of how sidewalks are treated and buildings address the street through their edge conditions.

Important elements that the coding takes into account include:

- Vegetation spaces
- Sidewalk widths
- Building lines and encroachments with overhangs forming colonnades
- Building scales and signage
- Parking

These elements are allocated dimensions and parameters and describe a relationship that needs to be maintained in Boom Street.

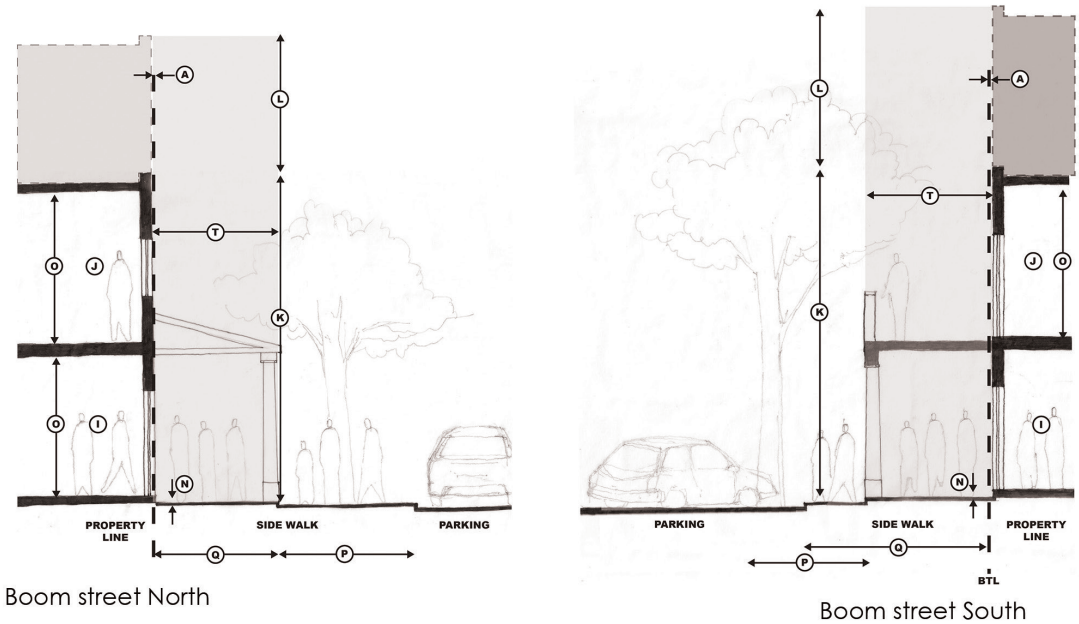

Figure 4.6 Coding parameters of Boom Street (group members 2013) *adapted from Gary White Architects*

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Figure 4.7 Coding parameters of Boom Street (group members 2013) *adapted from Gary White Architects*

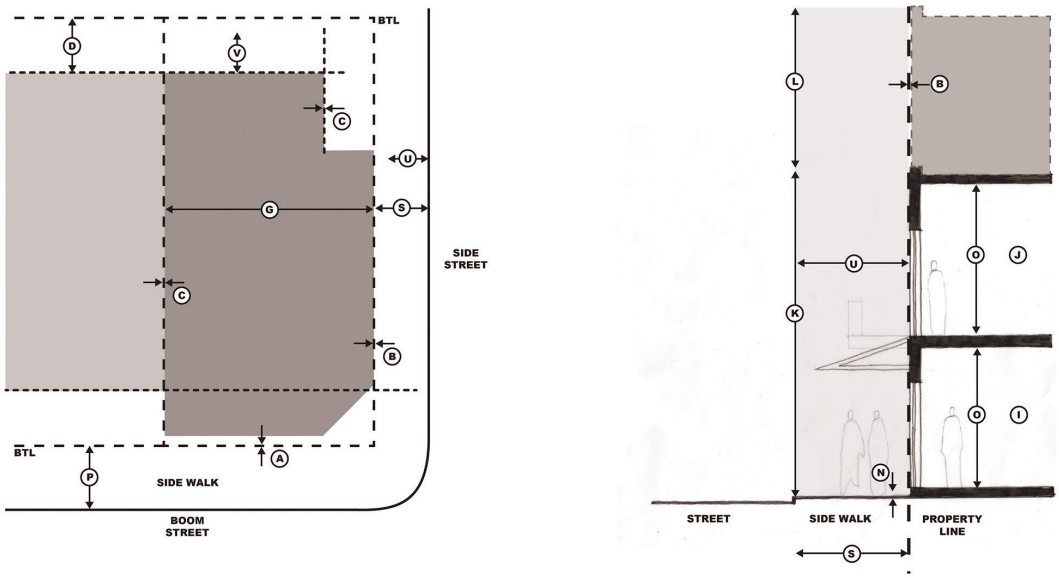

Figure 4.8 Coding parameters of Boom Street (group members 2013) *adapted from Gary White Architects*

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Framework Proposals

Linking with the CBD

After the demolitions and evictions Marabastad lost its primary residential components, this has had a negative effect on the precinct; restricting it to become almost exclusively reliant on trade and transport. The group proposes new medium to high residential and mixed use buildings to the South of Marabastad. This new development of buildings will help bridge the gap in scale between the coarse grained CBD and the fine grained urban fabric of Marabastad. The pedestrian quality of Marabastad will be retained throughout the newly zoned housing precincts. Pedestrian corridors will create breaks in the fabric, link public spaces and re-connect Marabastad with the CBD; these ladders will feed the retail, on the bottom levels of the 4-5 storey mixed use residential units, with energy.

The Natural Systems

Pretoria has lost its connection to the natural systems that it is situated in. The rivers systems have all been channelized and most buildings turn their backs on the rivers. The edges become backyard unwanted and unkempt spaces. The group proposes a green belt that circles through the CBD connecting the river systems. Steenhovenspruit is to be naturalised up until Bloed Street. The channel edge between Bloed and Boom Street will be widened and stepped up in 1 metre increments using retaining walls. This will slow down the water in the rainy season and promote higher levels of infiltration.

The edges of the river will be programmed with a series of parks linking them up to create a pedestrian walkway from the CBD to the Marabastad precinct. The parks are intended for recreation/sport and leisure activities. It will be utilised by the residents of the proposed housing developments. This aims to re-establish a relationship with people and nature as well as reinvigorate lost ecological processes that become fragmented due to hard spaces slicing up green systems.

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Figure 4.9 Coding parameters of Boom Street (group members 2013) *adapted from Gary White Architects*

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Framework Proposals

Transport Systems

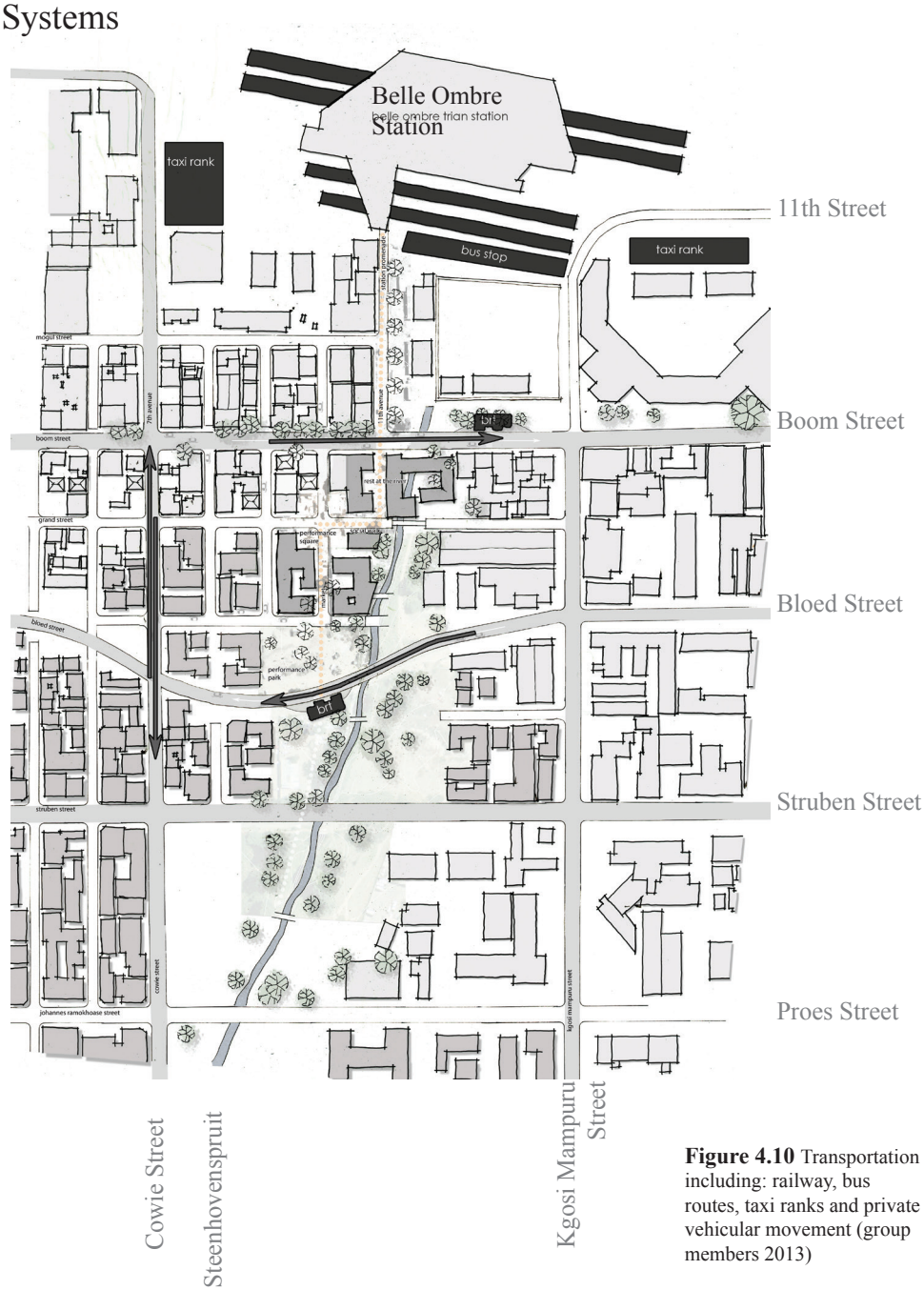

Figure 4.10 Transportation including: railway, bus routes, taxi ranks and private vehicular movement (group members 2013)

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Pedestrian Movement

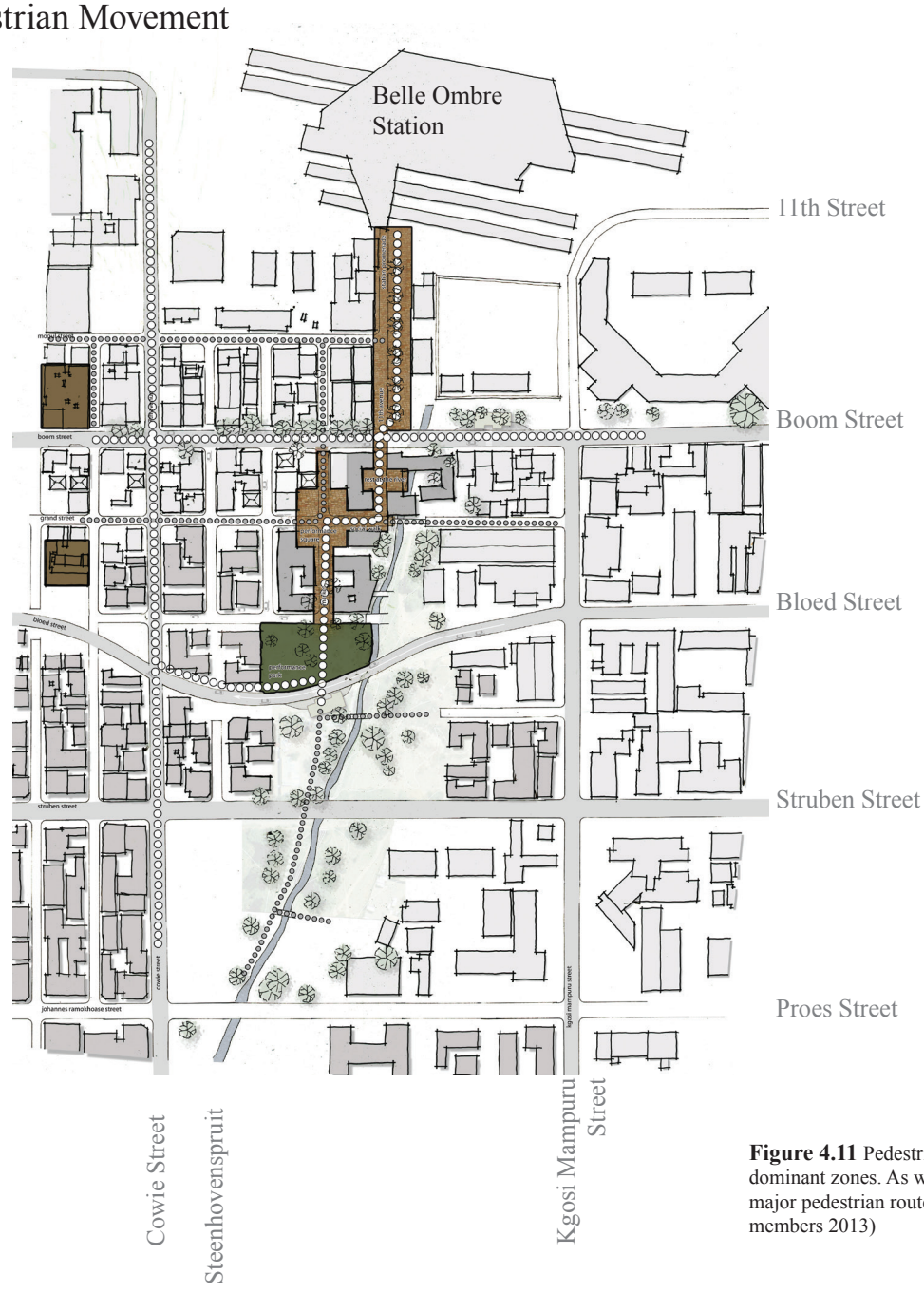

Figure 4.11 Pedestrian dominant zones. As well as major pedestrian routes (group members 2013)

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Framework Proposals

Building Programmes

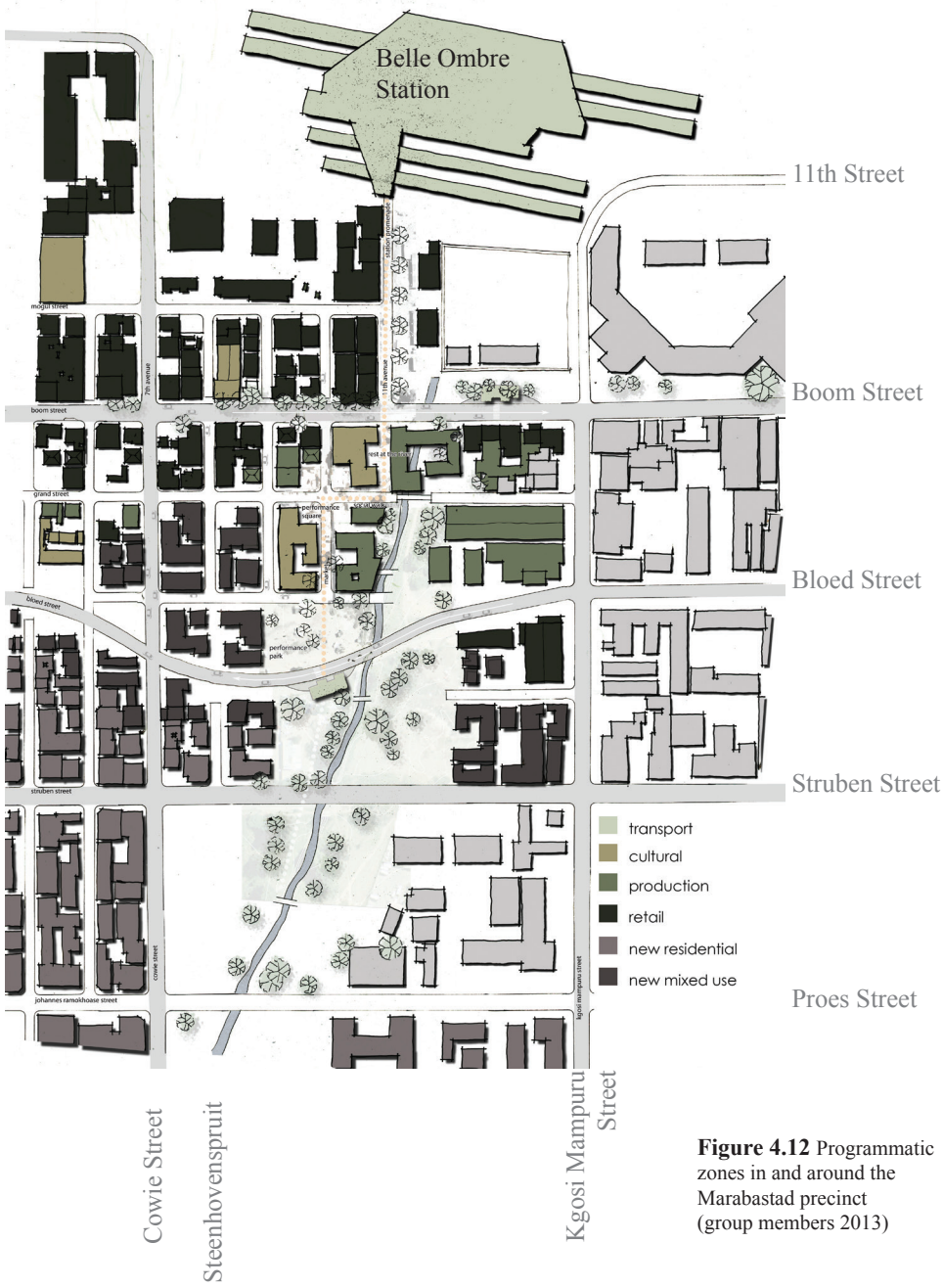

Figure 4.12 Programmatic zones in and around the Marabastad precinct (group members 2013)

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Natural Systems



Figure 4.13 Naturalised Steenhovenspruit with programmed edges, utilised by new residents (group members 2013)

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Group Focus Area

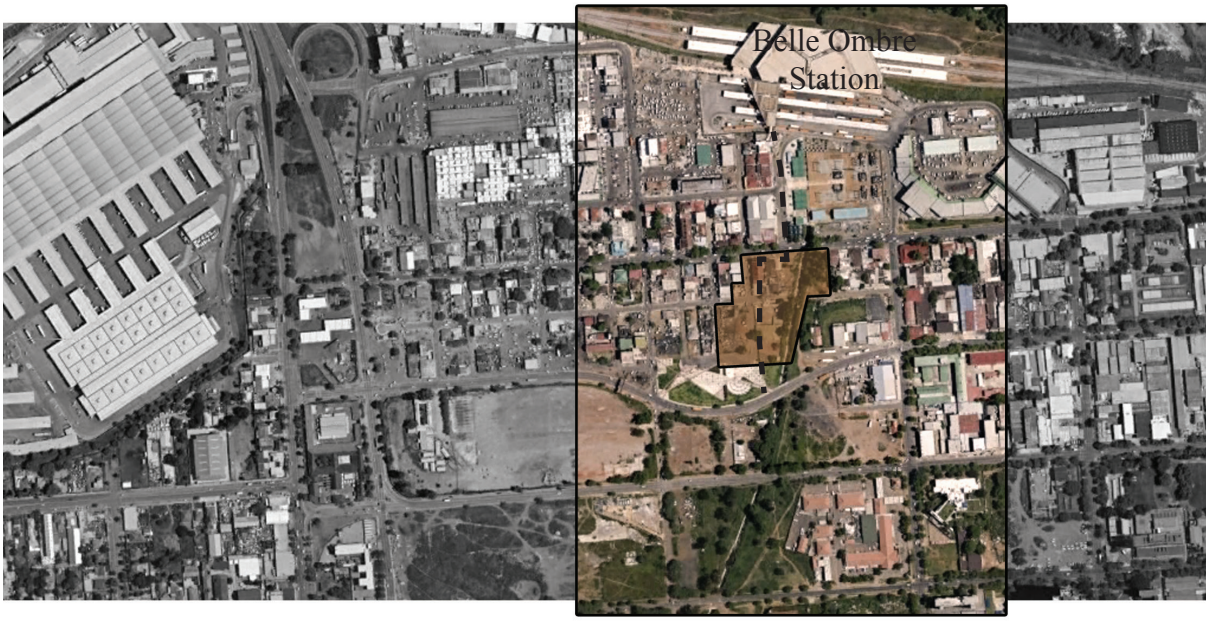

Figure 4.14 Aerial photograph indicating the focus area and pedestrian route to Belle Ombre (author 2013) *adapted from Google earth*

The group identified an area that lies on the cusp of the culmination of all the issues addressed in the framework. The focus area is part of a major pedestrian route that links to Belle Ombre station. It is on the south eastern boundary of the precinct along Steenhovenspruit, between major feeder routes; Boom Street and Bloed Street. It therefore has to address the threshold of the entrance and exit into and out of Marabastad. It also has to address the reintegration of natural systems and the relationship with Steenhovenspruit and become the threshold between the new residential developments to the south and the heritage precinct of Boom Street.

The focus area sits within the cross hairs of movement and on the brink between the heritage of old Marabastad and the culmination of the new. It has the potential to address and revive the layered history and existing fabric of Marabastad as well as being able to implement and introduce the new vision of Marabastad.

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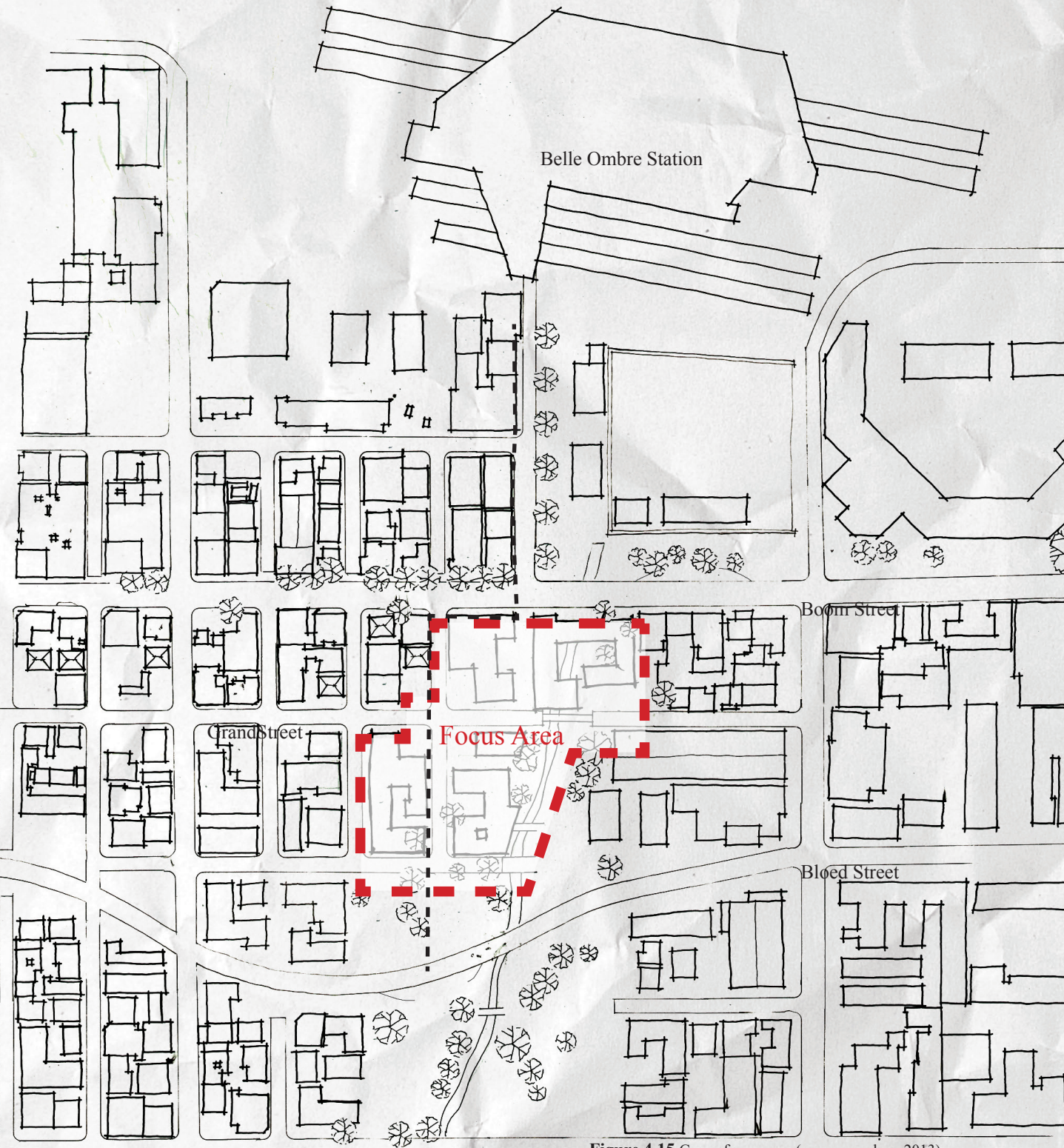

Figure 4.15 Group focus area (group members 2013)

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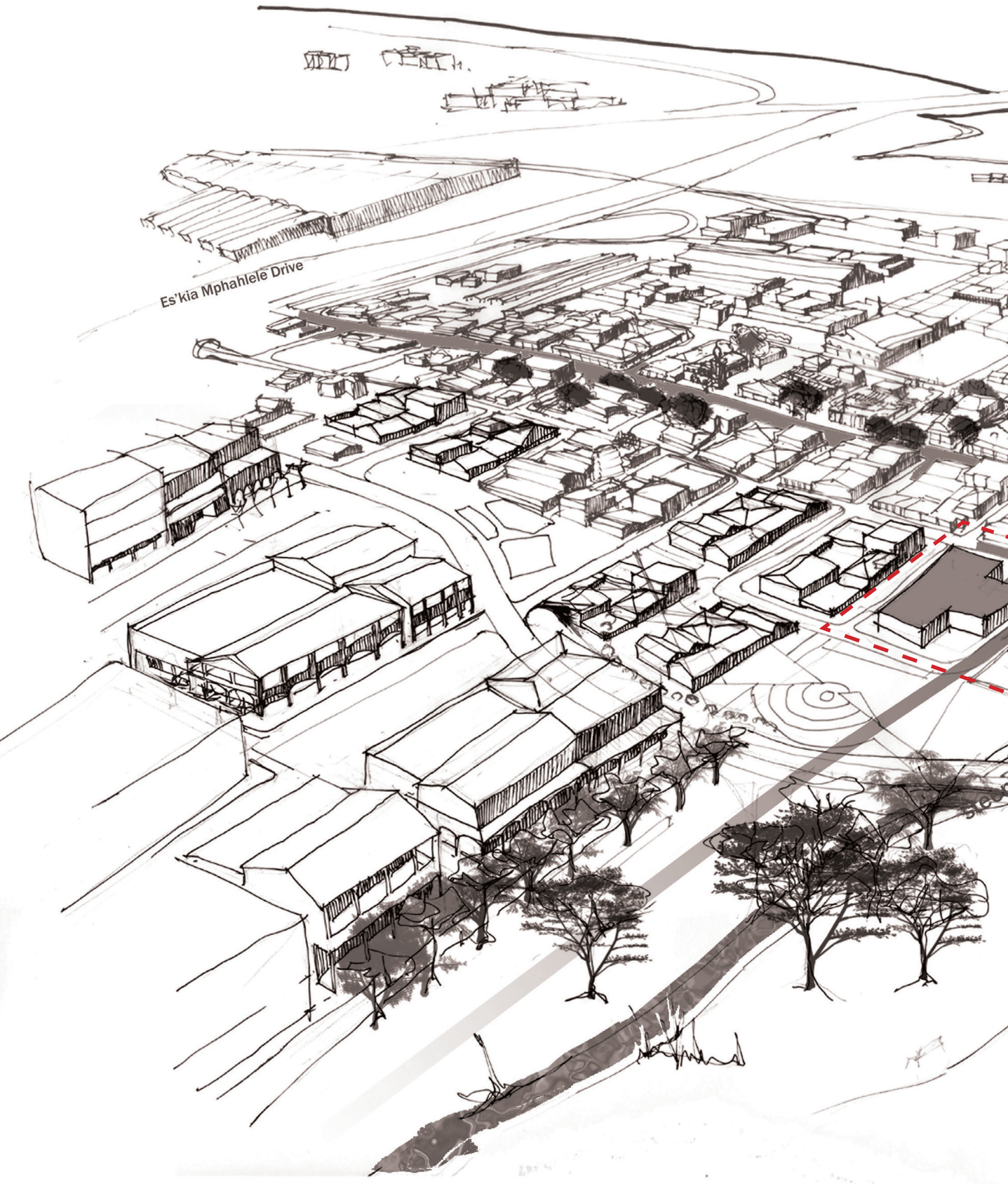

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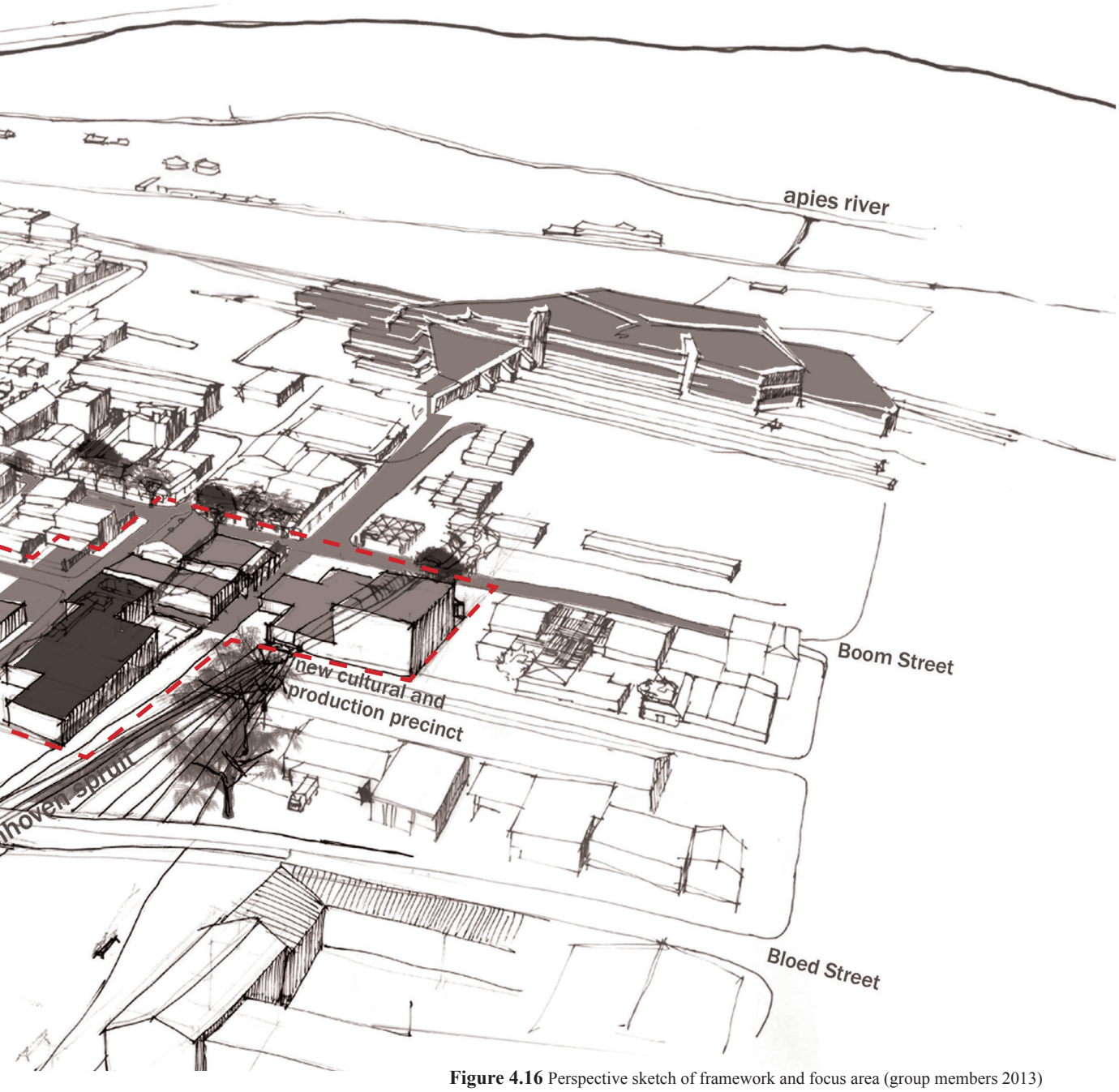

Figure 4.16 Perspective sketch of framework and focus area (group members 2013)

"This space attains a potentially charming character through the stream crossing it and the large established trees in the space. Until the area was cleaned up, this was a favoured hawking spot, given the large volumes of pedestrian traffic crossing the space from the station en route to the city centre" *(Aziz Tayob Partnership, 2002:244).*

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Programme Development

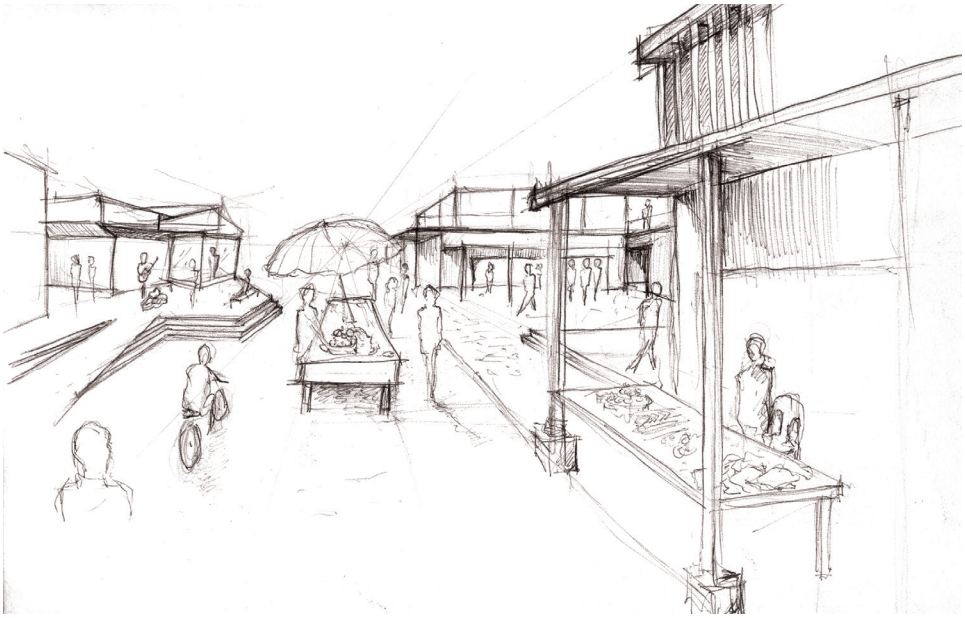

Figure 4.17 Conceptual sketch of market (author 2013)

The route between Belle Ombre station and the BRT station on Bloed Street will form a spine of energy that connects a series of public spaces around which the group proposes their individual interventions: the group members, their individual project titles and intentional programmes:

- Autobiography: an archival library with performance space (Dustin August)
- The liquid network: a micro-brewery (Marie Cronje)
- Creative Territories: music performance and recording studios (Allan Steyn)
- Ento-Morph: insectary, distribution centre and restaurant (Rishaad Vally)

The various interventions proposed by the group in Marabastad will interact and correspond to each other both tangibly and intangibly to create a cultural precinct of experiential public space and production.
The microbrewery will be collecting unsold fruit and vegetables from informal traders, this produce will be sorted into fresh/usable material and into decaying matter. The fresh material will be used as a sugar source for the brewing process as well as a food source for both the locusts and the mealworms. The decaying matter will be used in the insectary for the rearing of earthworms. The compost created from the rearing process will be utilised to grow vegetables which is in turn fed to the insects. Excess compost can also be returned to the brewery for the growing of hops and mushrooms. Excess fruit and vegetable waste will be fed to the anaerobic digester; this will produce bio-gas to be used by both the insectary and the microbrewery. The anaerobic digester will also be fed by other fresh produce wastage collected in the precinct. The microbrewery will produce spent grain as a secondary product; it will be used as a growing medium for the mealworms.

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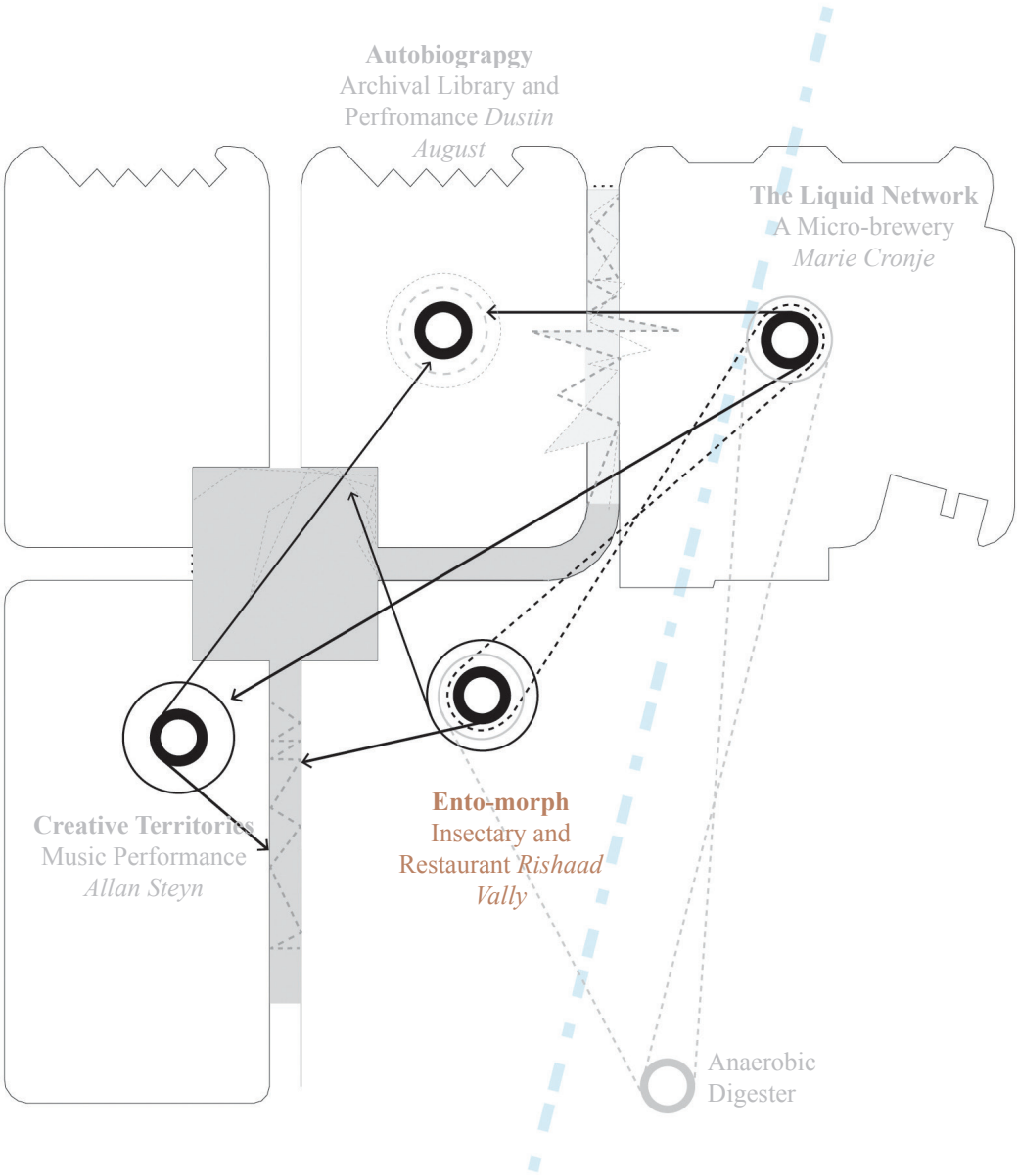

Figure 4.18 Diagram illustrating programmatic interactions between proposed interventions

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Physical Parameters of Focus Area

- 10th Street leading up from the BRT station will become a pedestrianized informal market place. The ground plane will be paved, extending on from the existing walkways. Trees in planter boxes will be provide shading as well as seating spaces. Street lights will intersperse between the trees lighting up the market space as well as providing electrical outlets for the informal traders.
- The market space terminates into Performance square; a pedestrianized public square. The edges of the square are activated by the buildings defining its parameters.
- Grand Street will extend to allow pedestrian access across the Steenhovenspruit and will be activated by the micro-brewery.
- 6th Street will be reconnected to 7th Street to ease traffic congestion and allow better access to the site. It will also provide parking along its edges to accommodate for the sites.
- The existing jazz square will be re-appropriated and halved in size; it will remain a green space and will be utilised as a park and spill out performance space it will be called Performance Park. The other half of the park will be zoned to accommodate for new mixed use residential units.
- 11th Street continues the route towards Belle Ombre Station. Between the museum and the microbrewery there will be a resting point with seating and shade provided. The Street will be used as a service route for the restaurant, however will retain its pedestrian dominance as service delivery is only a weekly occurrence.



Figure 4.19 Section A-A indicating spatial quality (group members 2013)



Figure 4.20 Section B-B indicating spatial quality (group members 2013)

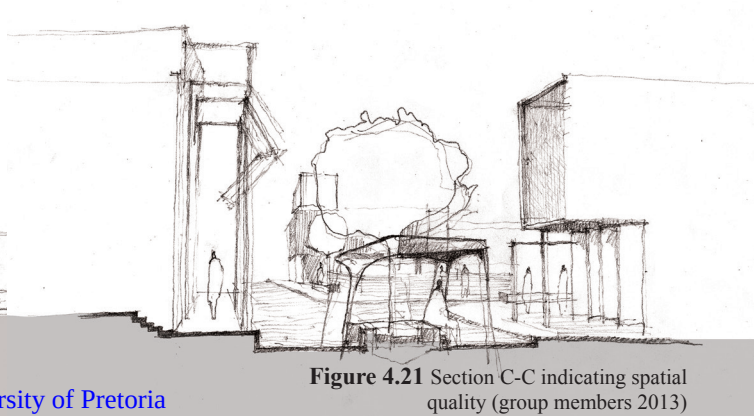

Figure 4.21 Section C-C indicating spatial quality (group members 2013)

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Figure 4.22 Physical parameters of the focus are (group members 2013)

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Cultural Precinct Experience

The insectary, music recording studios, the archival library and the existing achaar factory will share the edges of the performance square; the achaar factory will be converted to include a public interface in the form of a restaurant. The museum will be hosting performances and cultural events that will be viewed by the users within the square. the insectary restaurant will host a bar that connects to the square and to the microbrewery.

The market space will allow for sensory stimulation through the ambient music produced by the recording studios, the dappled lighting through the trees, and the culinary smells coming from the informal food traders and insectary restaurant connected to the square.

The insectary will bleed into the market through an informal trade distribution centre. This energy will continue on the pathway to Belle Ombre train station. The space between the library and the microbrewery will allow a resting point, where the smell of the baked goods can be experienced. Foods are sold and spaces to sit and eat are provided for. The cultural precinct will become a centre of vibrancy and experience where memories can be made and captured.



Figure 4.23 The tangible and intangible qualities expressed through proposed interventions (author 2013)

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Figure 4.24 Conceptual sketch of framework vision (group member 2013)

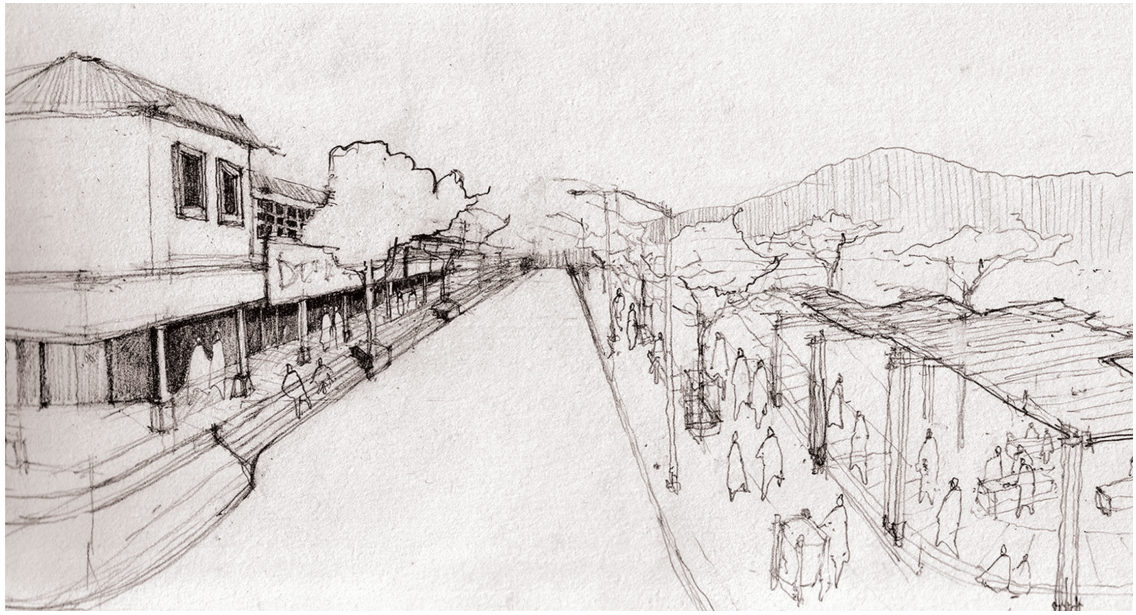

Figure 4.25 Conceptual sketch of framework vision (group member 2013)

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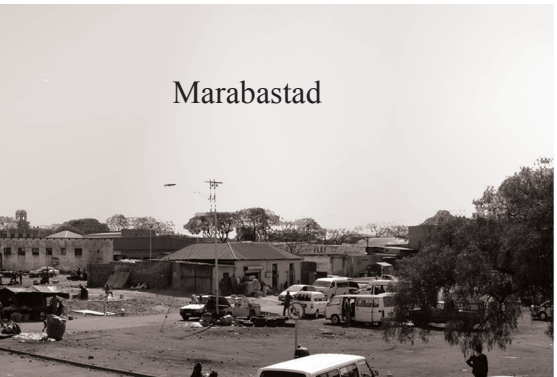
Site Location

The site chosen encompasses one Marabastad block, it is on the corner of 10th and Grand Street. The site deals with many issues addressed within the framework. It lies adjacent to the channelized Steenhovenspruit and must address the river edge. It is located on the boundary of Marabastad and acts a threshold into the Marabastad as well as the cultural precinct. It is in a position to deal with both the old fabric and the introduction of the new.



Figure 4.26 Aerial photograph indicating site location (author 2013) *adapted from Google earth*





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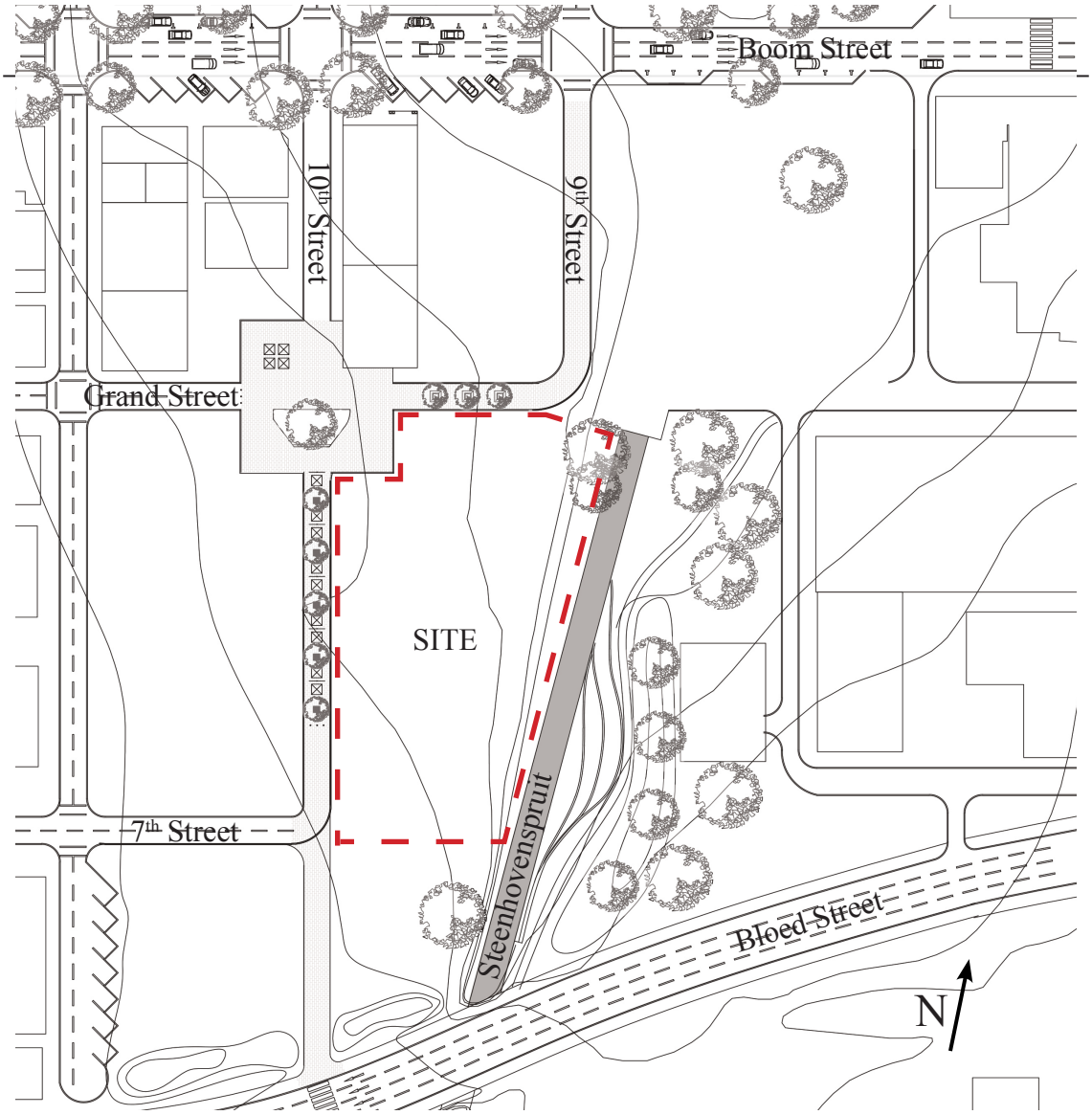

Figure 4.27 Location plan NTS (author 2013)


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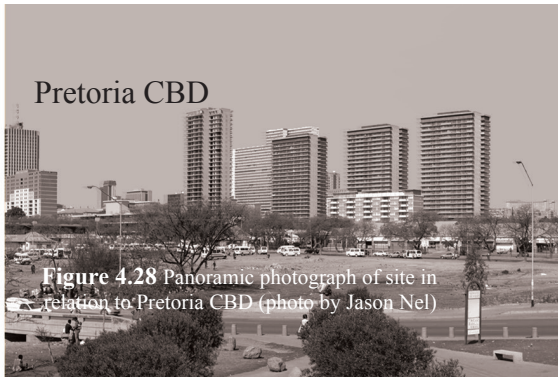

Figure 4.28 Panoramic photograph of site in relation to Pretoria CBD (photo by Jason Nel)

Chapter Five

The Existing Food Culture



Figure 5.1 African adoption of the western diet (author 2013) *adapted from: http://www.plainpicture.com/en/images/502433*

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Introduction

To influence the food culture within the focus area of Marabastad, a greater understanding of what comprised the food culture needed to be achieved. Food forms a large portion of a cultures rituals, it constitutes relationships between members of a community and often becomes the basis for a daily routine. The rituals and relationships incur spatial implications which influence the development and arrangement of the living and communal spaces. The economic status of an area can be reflected through its food culture; food price and its availability have an influential role on what is being consumed. There is a multitude of defining factors of the food culture within Marabastad, it is therefore important to understand the context of Marabastad in its entirety, identifying important components within the current and historical conditions that can be utilized to connect more readily to the inhabitants.

Information recieved during the research for this dissertation, from passed community members indicates that the food culture at the time was community based. The social dynamic of Marabastad consisted of unconventional family types. Clusters of community members considered each other family, immaterial of the absence of conventional relations. Food was grown and brought together, cooked together and eaten together. Due to the low economic status of the area and its inhabitants it made economic sense to cook in bulk and use low cost ingredients; potatoes, tomatoes, curries, rice, roti, meat was a rare commodity. The courtyard spacial organisation patterns existed due to tight knit community rituals and behaviours. Food culture forms a large part of everyday ritual and often becomes the basis around which the daily routines are carried out. Food and the connected rituals of preparation and consumption was therefore a major influence on how daily life was experienced in Marabastad.

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The Influence of the Nodal Interchange on Trade

In the current condition Marabastad no longer has a residential community therefore the food culture of the area is based on other informants. Marabastad plays the role of a nodal interchange and a trade hub in its relationship with Pretoria, as previously discussed. It contains Belle Ombre train station, two bus stations, two proposed bus stops, one formalised taxi rank and four informal taxi ranks. Marabastad has direct access to E'skia Mphahlele Drive (previously DF Malan Drive), a main road running through Pretoria, it acts as a major feeder of people and of products. The township is therefore rife with movement, connecting different forms of transport to different areas. This transportation node played a vital role in the townships survival. The area has high levels of pedestrian energy created by the various transport interchanges. The trade culture of Marabastad latched onto this energy, making it a cultivator of entrepreneurs and small businesses.



Figure 5.2 Major transport routes with influence on the Marabastad precinct (author 2013) *adapted from Google earth*

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Figure 5.3 Marabastad as a nodal interchange, major transportation influences (author 2013) *adapted from Google earth*

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Food culture trends

The prevailing aspects that influence the food culture within Marabastad are availability, opportunity, demand, and ritual. They are sewn together in a delicate relationship created between the food source/availability, the traders and the demands of the consumer.

The informal traders act as a mediator between what types of foods are accessible from the farmers market and the consumers. They can then react fastest to both the market in terms of availability and the consumers in terms of demand and preparation techniques. The role of the informal trader is therefore pertinent in the food culture ritual. They determine where, when and what to sell.

To infiltrate the current rituals of the food culture focus was aimed at understanding the trade rituals. This was achieved through observations and interviews



Figure 5.4 Mabalie Baloe and her informal food stand (photo by Jason Nel 2013)

Mabalie Baloe

Mabalie Baloe is a local food trader in Marabastad, her store come residence is located in the ruins of a burnt down building on the corner of 9th and Grand Street. Mabalie runs her own food stand. Cooking and selling pap, fresh salads and sauce with chicken giblets.

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Mabalie is originally from Hammanskraal and previously had to travel into Marabastad early every morning to beat the morning rush into the city. Mabalie capitalizes on the movement of the work force in and out of the city. Like most of the informal food traders she purchases her ingredients from the fresh produce market just outside Marabastad and ensures her cooking and preparation work is done in time to accommodate the peak influx in the mornings. One of the key limitations that Mabalie pointed out as a trader is the limited amount of storage space.

Mabalie describes her food as affordable, tasty and filling. The informal stand allows for takeaway style exchanges to happen as well as accommodating for the sit and eat style of service. A small wooden fire is made to allow for the initial cooking of the food, its then kept simmering through the day to keep the food hot. The wood used for the fire is sourced from odds and ends found around the site.



Figure 5.5 Photos of utensils and ingredients of Mabalie Baloe's informal food stand (photos by Jason Nel)

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Predominant food types

The food type consumed is compiled predominantly from fresh fruit and vegetables, which is readily available from the fresh produce market. The observation can be made that the opportunity of a nearby food source is exploited. The meat products are purchased at local butcheries which are supplied by abattoirs in and around Gauteng. Protein intake is low as meat products are expensive. Low nutritional foods are distributed by Goolams' wholesale sweet store, located in Marabastad (this is the source of low nutritional foods for many of the informal traders throughout Pretoria), the produce is sourced predominantly from cartoon candy factory in Johannesburg. The starches stem from the staple diet of South Africa, consisting mainly of vetkoek, pap and rice, readily available in markets and grocery stores. The meat, starches and low nutritional foods are all accessible due to the ease of distribution through E'skia Mphahlele Drive that Marabastad is exposed to. The mopane worms are one of the only fully imported foods that form a major part of the food culture. Depending on availability they are sourced from Zambia, Zimbabwe or Limpopo. The extra effort and energy used in transporting this food source re-iterates the potential for insect consumption to grow in Pretoria and highlights Marabastad as a successful candidate for an introduction of entomophagy as an alternative food source.



Figure 5.6 Informal food stand selling dried mopane worms (author 2013)



Figure 5.7 On-the-go style food stand (author 2013)



Figure 5.8 Sit and eat style food stand (author 2013)

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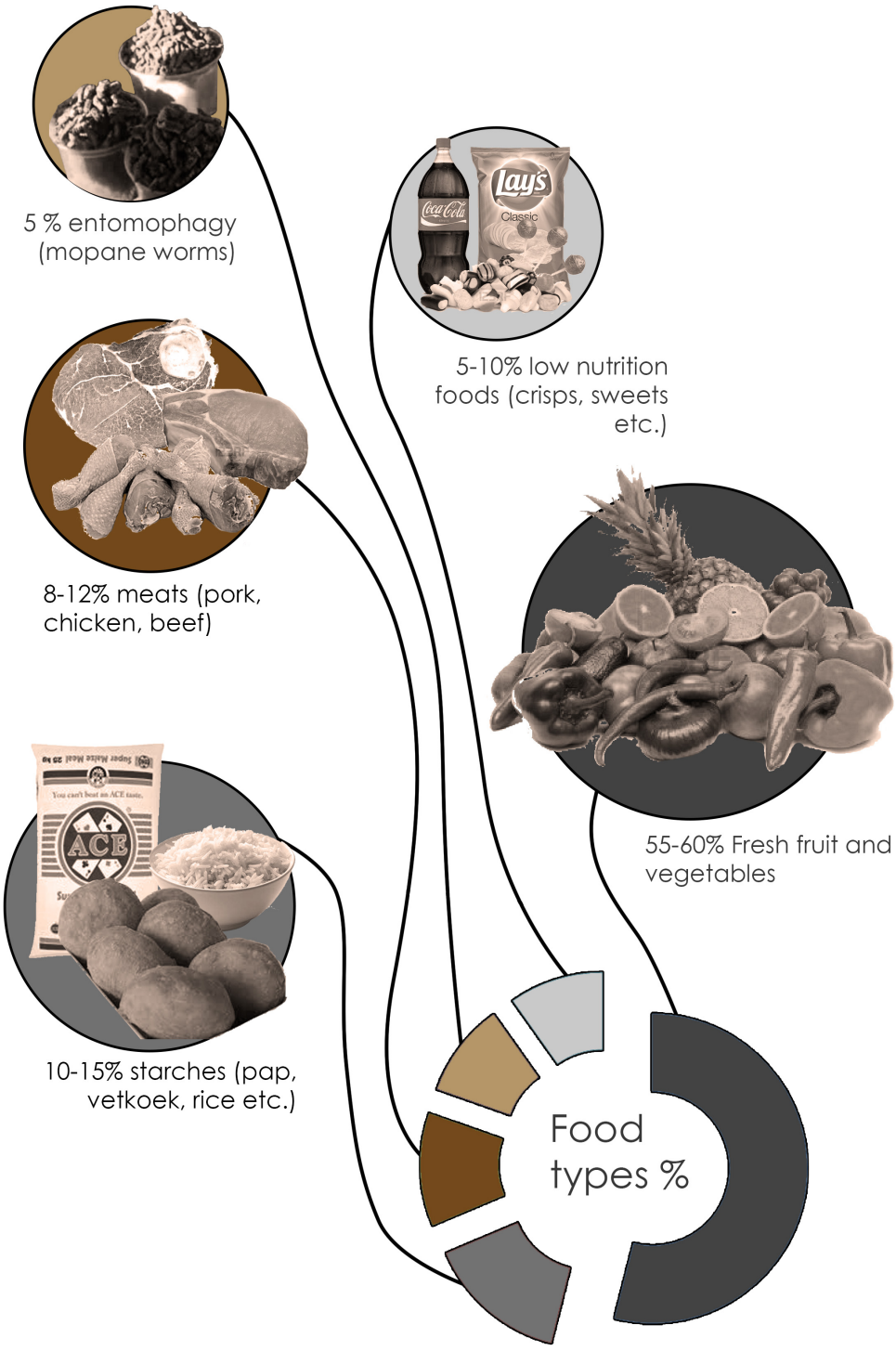

Figure 5.9 Food types sold in Marabastad, expressed as percentages (author 2013)

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The Pedestrian and Trade

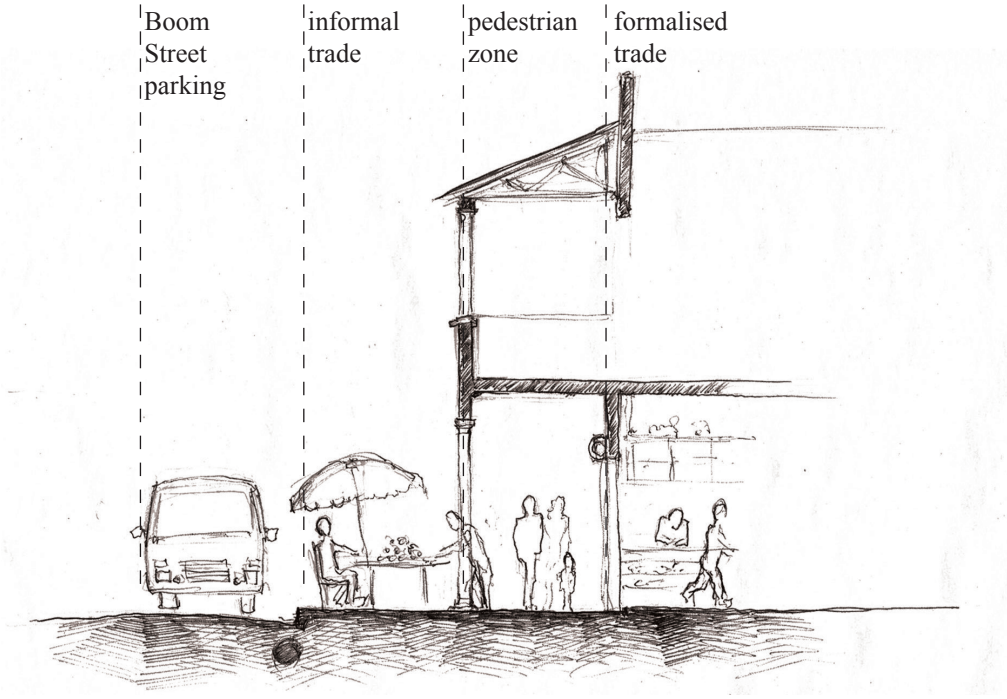

Figure 5.10 Section illustrating the relationship between the pedestrian and trade (author 2013)

Through the investigation process it became evident that the trade industry both formal and informal followed the energy of pedestrian movement. The pedestrian treatment in the township, particularly on Boom Street, is unique to the urban fabric found within Pretoria.

The edges of the buildings are set back on ground level, creating arcades that shield the pedestrians from the elements, and exposes them to the formalized retail traders within the building. The informal traders then act as a buffer protecting the pedestrian from the busy road edge. The pedestrian zone is therefore well protected and intimate, it is due to this relationship with the fabric and the ritual that makes the trade and retail industry the success it is today.

Only every third street is a through-way. 9th street, like many of the streets does not intersect with Boom Street on the northern side. It creates a dead end. The road however still allows for services and deliveries from one end. As this activity is not continuous the road becomes pedestrian dominant, this stimulates informal market growth. The space between 9th and Boom street then creates a large sidewalk which acts a pedestrian threshold between informal market and the busy vehicular dominant street. This space is often vegetated with planters.

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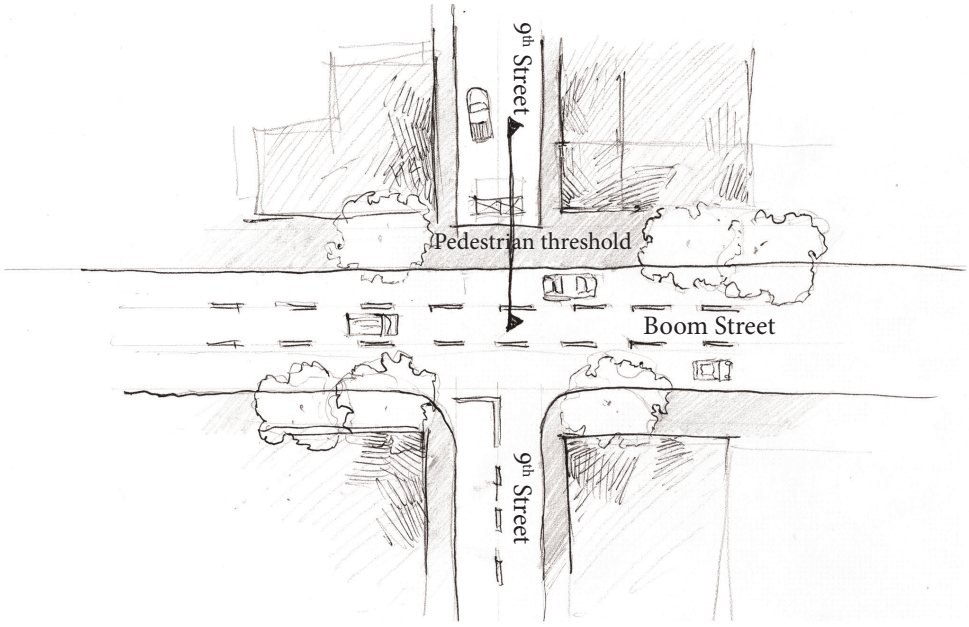

Figure 5.11 Plan of the 'intersection' of 9th and Boom Streets (author 2013)

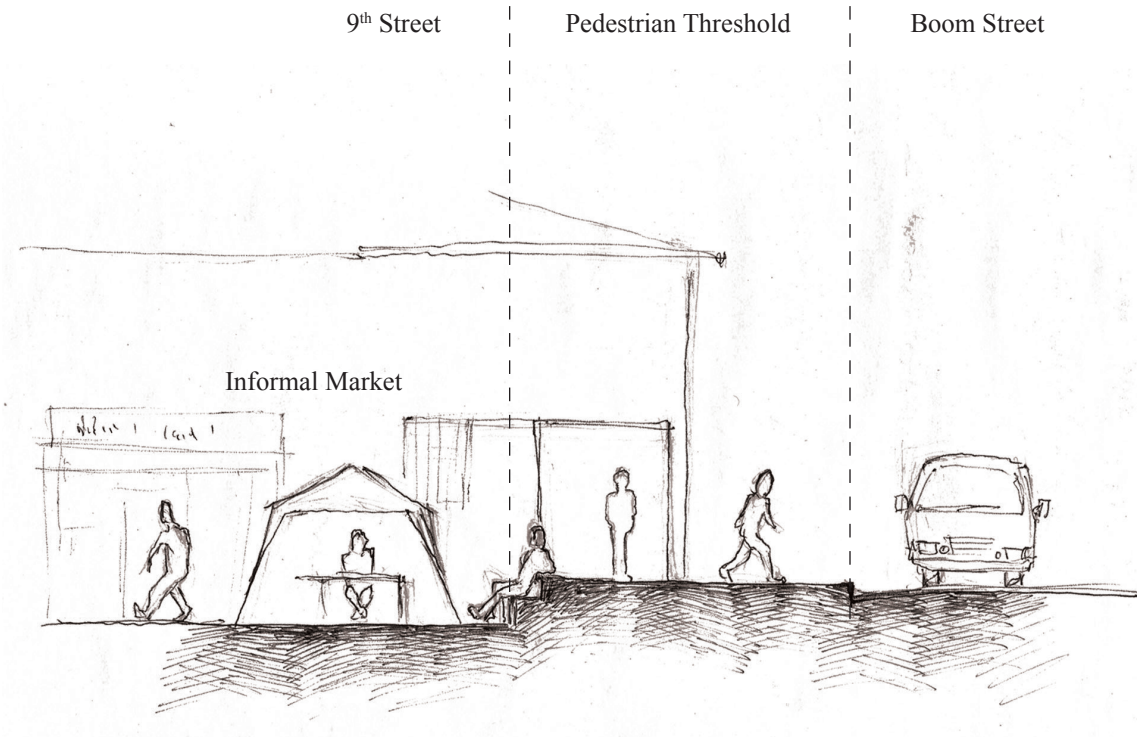

Figure 5.12 Section through the 'intersection' of 9th and Boom Streets illustrating the pedestrian threshold (author 2013)

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Mapping

Trade perceptibly follows pedestrian movement as is illustrated in the mapping images. There is a clear correlation between pedestrian energy and trade. The movement patterns are layered as connection points between modes of transport as well as destinations, the movements themselves have attributed functions depending on the programme of the destination. This programme has a spatial implication influencing the ritual of the space. The ritual is affected exploitable opportunity created in various ways and strongly affected by the time of month, week and day.

An estimated 50% of informal traders are selling food. During the mapping three different trading and purchasing techniques were identified; the first is the on-the-go style, the second is where consumption occurs at the trading space “restaurant” style and the third is more of bulk sale or “grocery” style for later consumption. Each technique is implemented to fulfil a niche created by the users, spacial availability and rituals. The on-the-go technique occurs in the bustling spaces predominantly on Boom Street, where space is a limited commodity, no seating spaces can be made available for consumers. The preparation techniques allow buyers to make quick purchases and eat on the go. This ritual occurs daily during peak times, the trader stands are temporal and mobile. The restaurant style informal food trade occurs off the main roads in secondary streets, where space is more readily available, it usually consists of a table with a few chairs and a primitive shading device, the meals are prepared to be eaten there and may require cutlery and crockery made available by the trader. Although the structures are temporal the space utilized is more permanent. Grocery/bulk sale occurs mainly in the afternoon at transport interchanges, specifically Belle Ombre train station. This is targeted at consumers picking up food to take home to their respective families. Food items cannot be purchased separately as it would make the items unfeasible to sell.

After a greater understanding of the food culture was achieved the programme of the intervention could then be amended to infiltrate and exploit opportunities that the context held in terms of its food culture. The chosen site was then viewed in terms of its own opportunities which determined which kind of food trade techniques would be appropriate and effective. The site is located on the edge of Marabastad between the new residential components and the trade hub. It also lies on the movement route to and from Belle Ombre station.

The framework proposes a market space on that path to feed off that energy. This path that is used routinely by commuters to the city will activate the ritualistic fashion of on the go as well as bulk sale of foods, the intervention will be ustilizing this market space for distribution as well as incorporating a sit down restaurant and a more easily accessible “fast food” component. These different sales/trading techniques will be able to infiltrate the food culture of Marabastad at all its different levels, making the range of influence more immersed and further reaching.

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Figure 5.13 Aerial photo indicating levels of pedestrian energy (author 2013)



Figure 5.14 Aerial photo indicating locations of all informl traders (author 2013)

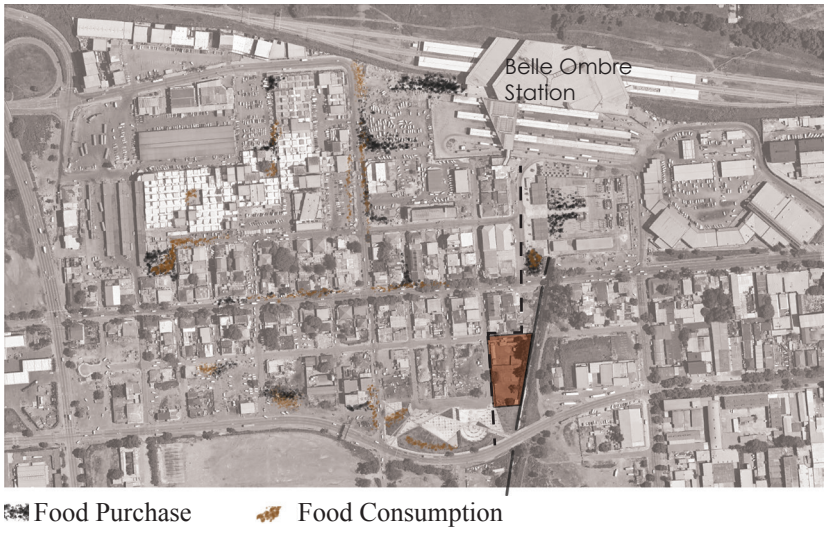

Figure 5.15 Aerial photo indicating where food is purchased and consumed (author 2013)

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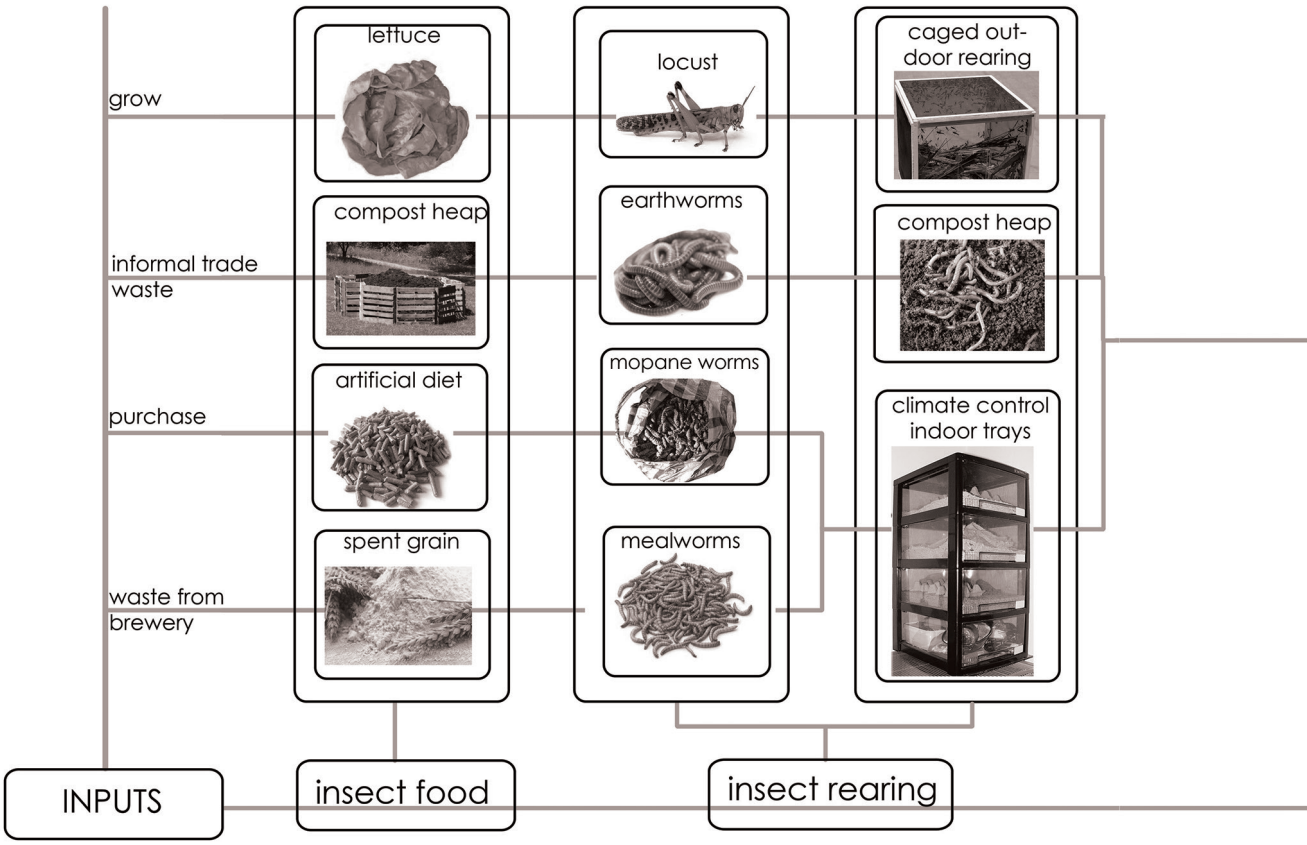
Chapter Six

The Programme



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Introduction

Commercial insectaries are not yet feasible in the climate of our current food culture. There needs to be a larger demand for human consumption of insects in order for mass production to be feasible. The project intentions are to create that demand and become a catalyst for the adoption of a more sustainable food culture. For entomophagy to be readily accepted the perception of insect consumption needs to be addressed. The theoretical discourse of the dissertation leads the premise into the direction of systematic desensitization, gradual exposure and cognitive theory of conditioning.

This can be programmatically translated into infiltrating the rituals of the food trade culture and gradually exposing new comers to the premise. The building will also have to display a more sustainable form of food production.

The intervention will cultivate insects through sustainable means and provide a public platform where the distribution and consumption of insects can be experienced through space.

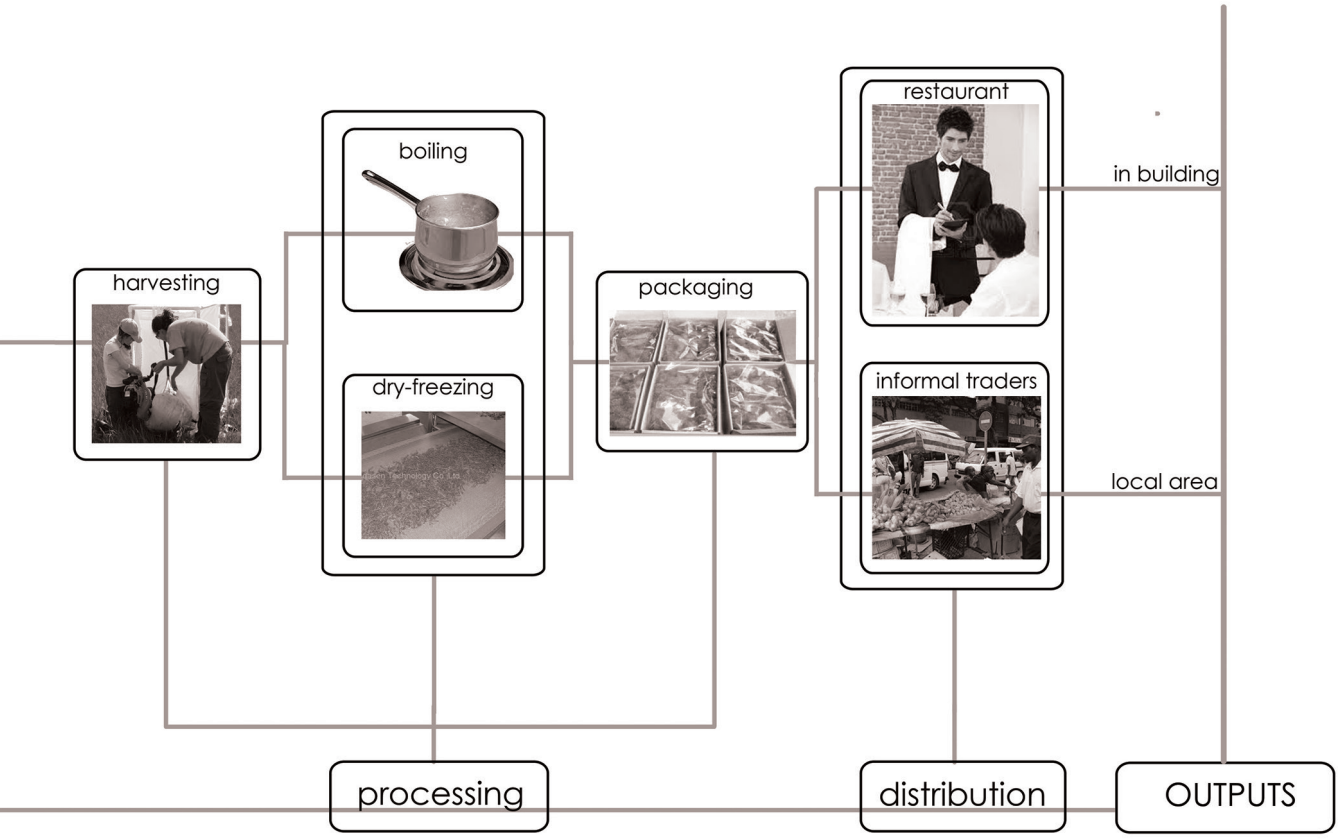

Figure 6.1 Concept diagram of production process (author 2013)

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Insect Cultivation

The Mealworm (*Tenebrio molitor*)

In discussions with entomologist Kerstin Kruger from the Zoology department of The University of Pretoria it was decided that mealworms would be relatively simple to cultivate, they are high in protein and there is a large turnover in a relatively short time period. They can feed on fresh vegetables grown on site. Spent grain will be used as the substrate in which the mealworms will grow, breed and feed. Mealworms can be grown in trays, there is no need for sunlight. However they need to be cultivated in climate controlled environments where humidity and temperature must remain constant.



Figure 6.2 Mealworm larvae stage (author 2013) *adapted from: http://insects-morphology.blogspot.com/2012/11/mealworms.html)*

Production conditions

Temperature: 25-27°C, temperature effects production drastically, a drop in 2°C can add an extra day in the pupation period. (Molitor 2013)

Relative humidity: 70% is ideal. Darkling beetles produce more eggs at 80-100%, but mould becomes an issue at those levels. (Molitor 2013)

Lighting: Mealworms and specifically the darkling beetle prefer dark spaces, they are more active in the dark this means they eat more and grow faster. (Molitor 2013)

Architectural requirements: Mealworms will be grown in trays inside climatically controlled towers. Optimum mealworm growth spaces require a constantly controlled temperature, humidity and light for all stages of the life cycle and every stage of production. Climatically controlled environments are the key to its success. The building will include an active climate controlled system.

Production process: The tray will contain the substrate in which they are grown, this can consist of spent grain attained from the microbrewery, or other wheat based products. The mealworms will attain their water from carrots that will be grown in a vegetable garden. The trays will be easy to remove, clean and sorted at cleaning stations. It is ideal if the mealworms are separated into their different stages of growth this minimizes cannibalism and is easier to manage. When they are ready to be harvested, the trays will be removed and trolleyed either to evisceration or to the boiling station. The boiling station will boil the worms after which they can be distributed as fresh food items. The worms going to the evisceration will be cleaned and then dried in industrial dryers. The insects will then be packaged and sold or stored for an extended period of time. A percentage of the worms will be left to become beetles for breeding purposes.

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Figure 6.3 Mealworms as food (author 2013) *adapted from: http://abcnews.go.com/blogs/health/2012/12/20/mealworms-the-future-of-farm-to-table-dining/*

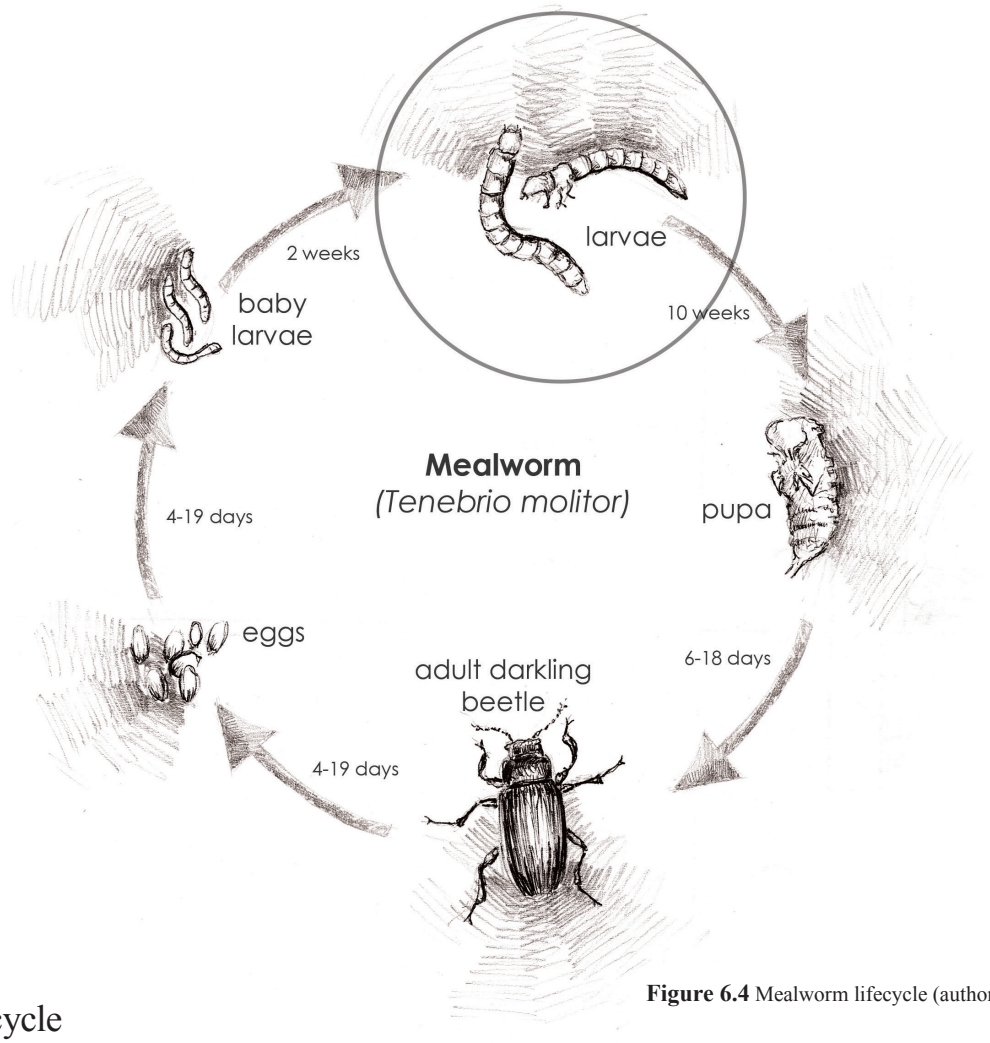

Figure 6.4 Mealworm lifecycle (author 2013)

Life cycle

There are four main stages in development- egg, larvae (edible stage), pupa and beetle. An adult darkling beetle, aged from as young as 4 days old, can lay over 200 eggs. The eggs have an incubation period of 4-19 days before hatching. The hatchlings grow continuously and shed often, 10 weeks after hatching the larvae are big enough to be harvested as a food source. If the larvae are left up to 12-15 weeks they will become a pupa. They do not move or feed in this cocoon-like state. After 6-18 days they emerge a darkling beetle. At first they are light brown-almost white in colour and they eventually darken with age. An adult darkling beetle can live up to 3 months. (Molitor 2013)

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Insect Cultivation

For a better understanding of insect cultivation and rituals pertaining to the process a mealworm farm was started in May and maintained for the duration of the thesis year.

The farm began with ±300 mealworms. Jungle oats was used as substrate. The worms and the substrate were placed in tupperware containers. Carrot and potatoe slices were used as a source of water. The mealworms progressed through pupation during the winter months which, prolonged the phase due to the low temperatures . They eventually became darkling beetles and completed a full life-cycle after the eggs began hatching in September.

The larvae are to be harvested and utilized in the preparation of a meal.



Figure 6.5 Starting out with ±300 mealworms (author May 2013)



Figure 6.6 The tupperware, the worms and the substrate (author May 2013)



Figure 6.7 The farm (author May 2013)

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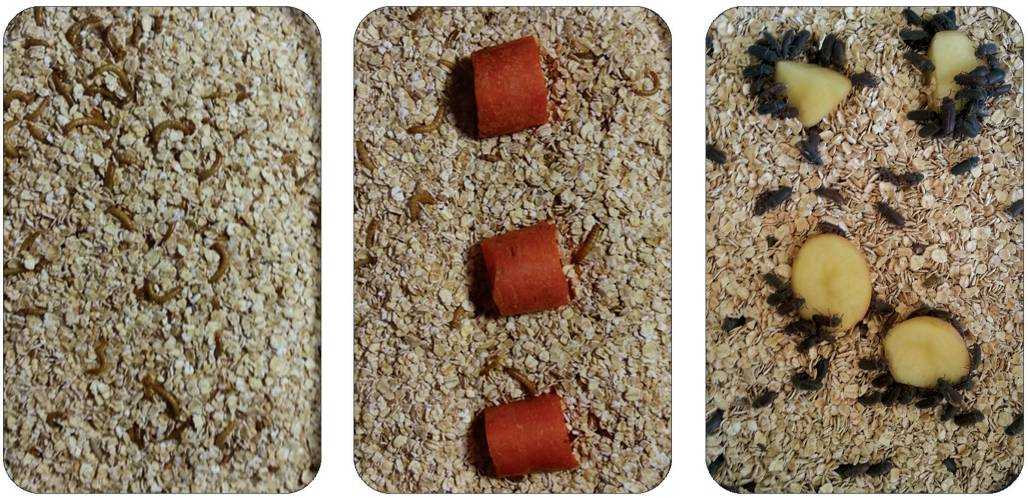

Figure 6.8 Worms to beetles (author May to August 2013)



Figure 6.9 Darkling beetles eating a potatoe slice (author September 2013)

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Insect Cultivation

The Brown Locust (*Locustana pardalina*)

The brown locust was selected because it has good nutritional value, its climatic requirements match the current climate of Pretoria. There is an opportunity for the insect to be exposed and reared outside with minimal energy input. The brown locust consumes fresh lettuce and other vegetable that will be attained from the vegetable garden.



Figure 6.10 Adult Locust (author 2013) *adapted from: http://www.123rf.com/photo_2111778_desert-locust-in-front-of-a-white-background.html*

Production conditions

Temperature: 15-30°C, Locusts have a wide temperature comfort range. Production is optimal between 22-27°C. (Green 2012)

Relative humidity: 55-65%. (Green 2012)

Lighting: Locusts work well in natural sunlight however production can be increased by limiting darkness to between 4-6 hours a day. This creates an environment with longer day spans, which increases productivity. (Green 2012)

Architectural requirements: The locust cultivation area will be covered with a steel mesh. the mesh allows sunlight in, wind and air movement, a percentage of rain through but protects the insects from damage caused by hail storms and predation by birds. Inside the mesh covering, separate locust boxes/cages will be used. Each cage will be equipped with a removable birthing pit, lattice structures to increase surface area, a heating pad and a bulb, for winter months. The heating pad can be run by hot water produced by parabolic solar water heaters. The cages can be exposed to the elements as the climatic requirements of the Brown locust match the climate, specifically the temperature, relative humidity and sunlight, within Pretoria.

Production process: The locusts will be separated into their different instars (stages) of development. This will make managing the production a lot simpler in terms of monitoring harvests etc. When the locust reaches reproductive maturity, removable birthing pits will be utilized to collect eggs. Birthing pits consist of shoe box sized plastic containers with 70mm of soil. These can then be incubated either in separate cages or in climatically controlled towers, depending on the season. After laying eggs the locusts can be harvested, they can either be taken to the evisceration or boiling stations. They are then either dried or fresh packed respectively.

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Figure 6.11 Locusts as food (author 2013) *adapted from: http://abcnews.go.com/blogs/health/2012/12/20/mealworms-the-future-of-farm-to-table-dining/*

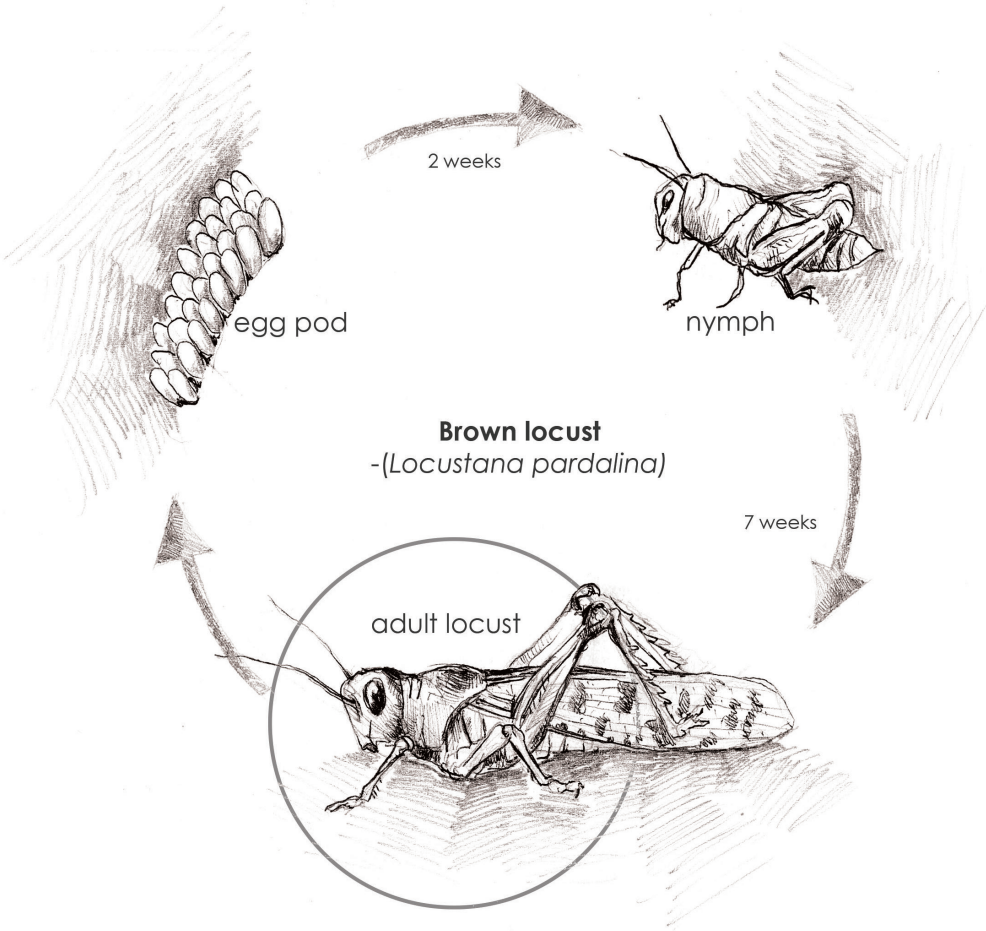

Figure 6.12 Locust lifecycle (author 2013)

Life cycle

There are three main stages in the life cycle of the brown locust- egg, nymph (hopper) and adult (edible phase). The eggs hatch after 2 weeks of incubation, the hatchling is born without wings and is known as a nymph. The nymph then progresses and grows through different stages of moulting known as instars. After 7 weeks the nymph becomes a fully developed adult locust with wings. The female locust drills a hole into the ground and lays a 'pod' of eggs, sealing it off with a froth, to protect it. (Green 2012)

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Insect Cultivation

The Earthworm (*Eisenia fetida*)

A composting earthworm called a tiger worm was selected. It has a wide range of production temperatures that are suited to Pretoria's climate and can grow up to 130mm. Composting earthworms were selected because theycan be cultivated through the production of compost. There is an excess of fruit and vegetables wastage in Marabastad, the unsold produce becomes waste and is improperly utilized. Earthworm rearing will make use of this material. Earthworms also have a high protein content and large turnover in a small time period.



Figure 6.13 Adult earthworm (author 2013) *adapted from: http://www.warrenphotographic.co.uk/05557-earthworm*

Production conditions

Temperature: The ideal working temperature for these worms is between 15-25°C. (Bobby 2004)

Relative humidity: The soil or compost heaps that they work in should remain at a relatively high humidity; 80-90%. The compost heap should never be saturated. This brings the earthworms to the surface and lowers productivity. Over moistened compost heaps tend to produce an unpleasant odour. (Bobby 2004)

Lighting: Although the worms require a relatively high temperature they prefer dark shady areas. The composting process which includes a lot of movement actually warms up the heap. (Bobby 2004)

Architectural requirements: Earthworm pits need to be in a well-ventilated area with minimal direct sunlight. Large pits will be used in a shaded well ventilated space. Compost production and earthworm sorting can be a messy process, the finishes of the respective spaces should be able to be cleaned easily.

Production process: The rearing process will utilize waste to produce earthworms and compost. The microbrewery will process and sort the fresh produce waste attained from Marabastad. The insectary will use the waste to cultivate earthworms and produce compost. The compost will be used in the insectary's vegetable garden to grow carrots and lettuce that will be fed to the locusts and mealworms. Excess compost will be sent back to the microbrewery to grow hops for the beer brewing process. Excess carrots and lettuce can be fed back into the compost heaps. The waste will come into the space where it will be cut into smaller sizes, as this aids the compost process. The heaps have to be monitored in terms of humidity and should be tossed occasionally to ensure aeration. The heaps will be separated according to time spans. The worms will be harvested after 5-8week periods. All harvested worms will be boiled, after boiling they can be fresh or dried and packaged for distribution.

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Figure 6.14 Earthworms (author 2013) *adapted from: http://www.warrenphotographic.co.uk/05557-earthworm*

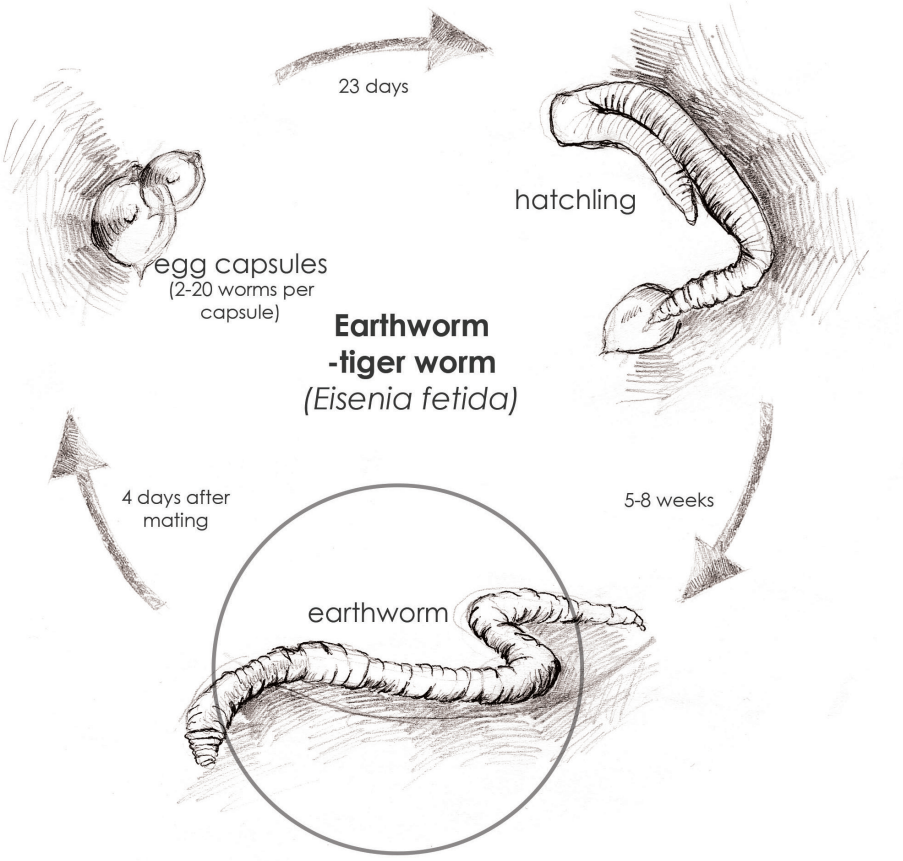

Figure 6.15 Earthworm lifecycle (author 2013)

Life cycle

Earthworms are prolific breeders and can reproduce at an alarming rate. Each earthworm has both female and male reproductive organs. After being fertilized the worm will produce an egg capsule every 4-7days. Each capsule is capable of holding between 2 and 20 worms, the average is 4. The capsules incubate for an average of 3 weeks after which hatchlings emerge. After 5-8 weeks the worms reach sexual maturity and will start reproducing, however the worms will continue to grow for perhaps six months or more before reaching its full size. (Bobby 2004)

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Insect Cultivation

The Mopane worm (*Gonibrasia belina*)

The mopane worm was selected due to the existing niche market of mopane worm consumption within Marabastad. This is a key point to draw parallels between an existing food source and introducing new ones. The mopane worms are currently imported from Zambia, Zimbabwe and Limpopo. Importing has energy and cost implications. Additively for the mopane worm to be transported it needs to be dried. This limits the preparation variations in the meals. Similarly to the mealworms, mopane worms can be grown in trays in climatically controlled rooms. (Ghaly 2009)



Figure 6.16 Adult mopane worm (author 2013) *adapted from: http://www.bizarrefood.com/blog/edible-mopane-worms/*

Production conditions

Temperature: 20-25°C. (Toms 2003)

Relative humidity: At the larval stage humidity levels should range between 60-80%. Once the larvae pupate humidity levels should remain fairly the same decreasing to about 40-70% after 4 months. (Toms 2003)

Lighting: It is only during the pupating phase that the lighting conditions need to be altered. No light should be introduced during this phase. (Toms 2003)

Architectural requirements: The mopane worms will be grown in trays inside climatically controlled towers; optimum mopane worm growth spaces have a constantly controlled temperature, humidity and light for various stages of the life cycle. Climatically controlled environments are the key to its success. The building will include an active climate controlled system.

Production process: The diet for the mopane worm in its natural environment is mopane leaves. It is not feasible to grow mopane trees in Pretoria, as they are an exotic species that require much more humid conditions. The mopane worms will have to be fed a synthetic diet that will be contrived with a combination of required nutrients. This diet will be produced in the diet preparation laboratory. When the eggs hatch the worms/larvae will be kept in the insect towers, here they will be fed until they reach maturity. The worms will then be harvested for consumption. They will go through the evisceration process. This is a labour intensive process during which the innards of the worms are removed and the worm is cleaned. They can then be dried and made available for distribution. A percentage of the worms will be used to continue the breeding process, they will pupate and become emperor mopane moths, at this stage they will be moved into the outdoor spaces in the locust cage to mate and lay their eggs.

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Figure 6.17 Mopani worms (author 2013) *adapted from: http://www.warrenphotographic.co.uk/05557-earthworm*

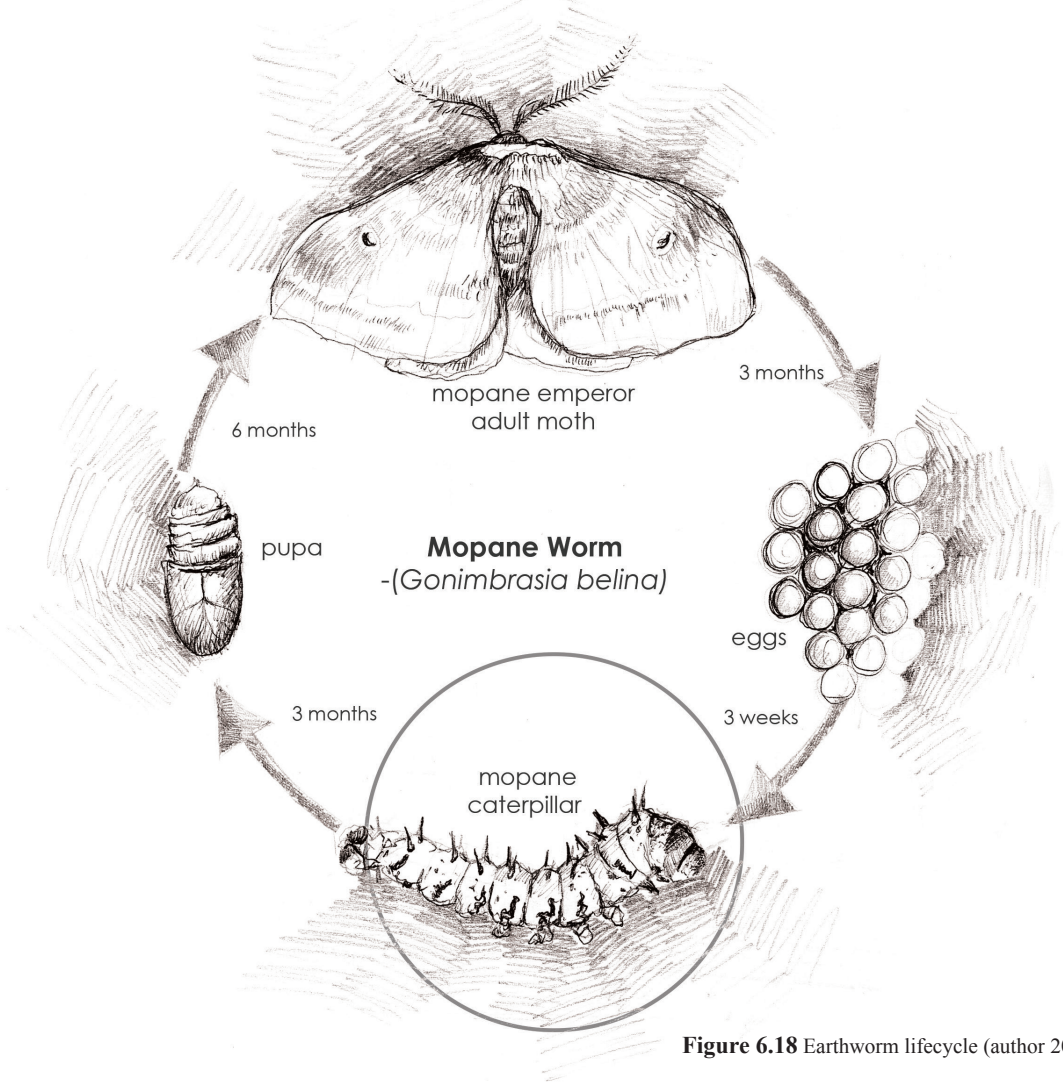

Figure 6.18 Earthworm lifecycle (author 2013)

Life cycle

In their natural environment mopane worms form an important part of the winter dietary needs of both animals and people in the northern parts of southern Africa. Every year as the first rains fall, millions of larvae (edible phase) emerge in search of foliage-filled Mopane trees. After feasting for 3 months, those surviving the winter harvest, burrow into sandy soils where they pupate for 6-8 months emerging as emperor mopane moths. During the next 3 weeks the insects mate and the females lay their eggs on the bare branches of the same trees. (Toms 2003)

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Building Requirements

The building will act as an introduction to entomophagy by cultivating insects and focusing on the experiential qualities of the public users. It will harness the ritual of trade within Marabastad to infiltrate and influence the food culture of the precinct. These major elements establish the design brief in a hierarchy and guide the building in terms of the requirements setup by the programme. The allocation of area to each function satisfies functional requirements. The ratio of area allocation symbolizes importance of each function within the building.

Insect cultivation	
Climatically controlled towers and workspace for mopane worms and mealworms cultivation.	±450m²
Outdoor cultivation space with protection against direct summer sunlight, hailstorms and predation for locusts.	±350m²
Well-ventilated shaded area and workspace for earthworm cultivation.	±300m²
TOTAL:	±1100m²

Insect cultivation (support):	
Vegetable garden	±180m²
Testing Laboratories	±140m²
Sterile and controlled environment for diet preparation and storage	±100m²
TOTAL:	±420m²

Insect Processing	
Evisceration rooms with workspaces	±200m²
Boiler room with work space and monitoring space and 3 x boilers (Dimensions: ± 2.5m diam. X 2.2m h.)	±100m²
Drying room with sorting space and 3 x industrial drying machines. (Dimensions: 2.62m l x 2.26m w x 2.27m h.)	±100m²
Packaging space with assembly line conveyor system	±100m²
Cold storage space	±80m²
TOTAL:	±580m²

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Public Interface	
Distribution centre with surfaces to prepare and pick up orders	±100m²
Office for orders and purchases	±15m²
Kitchen with dry and cold storage, office, washing-up, plating, preparation, refuse and cooking	±230m²
Inside and outside restaurant space to accommodate for ±150 customers	±300m²
Outside seating and recreational space	±150m²
Outside shaded bar to accommodate for ±30 customers	±60m²
Outdoor exhibition space	±150m²
Gourmet ice-cream and insect store with preparation room	±60m²
Lockable storage for informal traders with powers supply	±10 units at 2m² each
TOTAL:	±1150m²

Administrative	
Office space for administrative work	±150m²
Reception office	±15m²
Canteen/kitchen with storage and cooking space	±30m²
Communal break area	±130m²
TOTAL:	±325m²

Building energy, water and ventilation systems	
Public Bathrooms	±60m²
Staff bathrooms	±120m²
Water storage and pump rooms	±110m²
Room for steam turbine generator and battery room	±35m²
TOTAL:	±325m²

Figure 6.19 Area schedules and ratios (author 2013)

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Public Interface

The most accessible and influential point of insertion into the existing food culture of Marabastad is through the informal trade sector. As highlighted in the previous chapter it has the largest influence on the food culture within the precinct. To alter perceptions of entomophagy the premise needs to systematically desensitize the public to its neophobia, this can occur through a gradual exposure to the production of the insects as well as a continuous conditioning to their presence. This is attainable through the rituals of trade and the presence of insects in the market space. The aim of the project is not to compete with the informal trade sector but rather to empower it.

The intervention will play a similar role of the fresh produce market, as a supplier of wholesale foods. Food/ insects in their various forms will be prepared, packaged, weighed and sold in bulk to traders. The food preparation techniques and selling points thereafter will be controlled by the organic dialogue between the trader and customer. For this process to occur a distribution centre is required that connects readily to the market space.

To create more public awareness and extend the reach of the building's influence, a restaurant and exhibition space will be added to the programme of the building. The restaurant will serve gourmet style foods in differing forms of insect exposure. Certain dishes can be made with ground-up insects so they cannot be identified by the consumer. Other variations would include the insect being completely exposed to celebrate its presence. These levels of exposure allow the consumers to progress in comfort levels with the food source. The exhibition space displays live insects at various stages of their lifecycles and allows the public to physically interact with them. These different levels of exposure move the user through the different levels of comfort creating counter conditioning, which associates the positive feeling experienced through space with entomophagy.

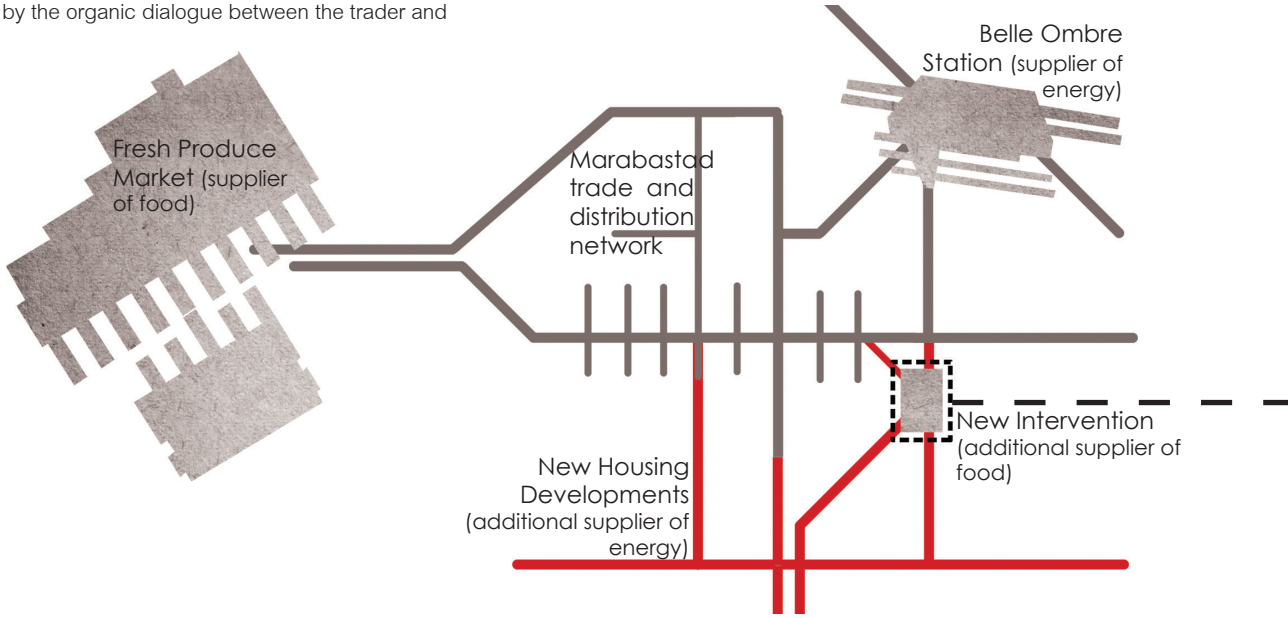

Figure 6.20 Concept diagram of programme infiltraing trade network rituals of Marabastad (author 2013)

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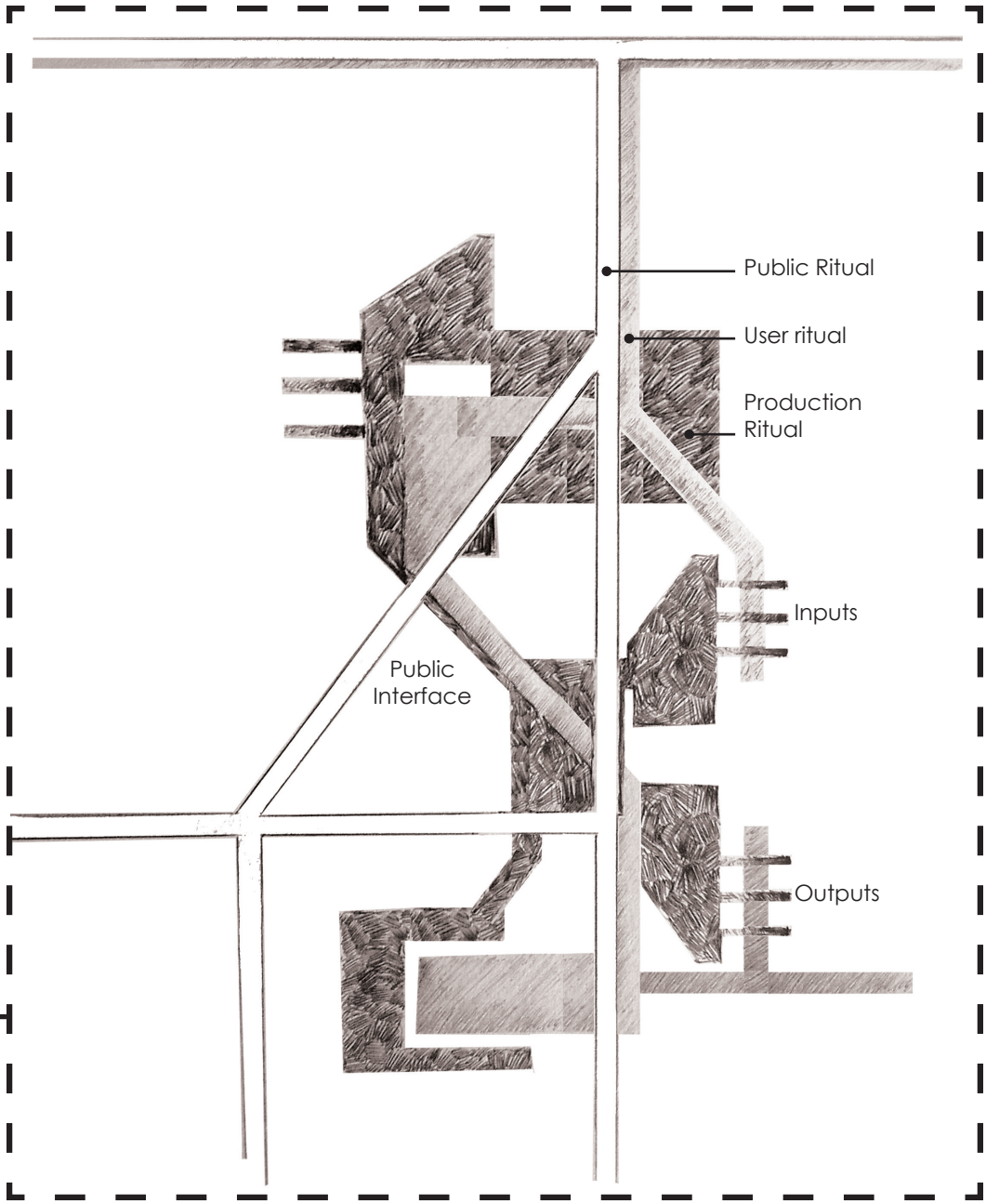

Figure 6.21 Concept diagram of programmatic rituals (author 2013)

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Chapter Seven

Design Informants and Concept

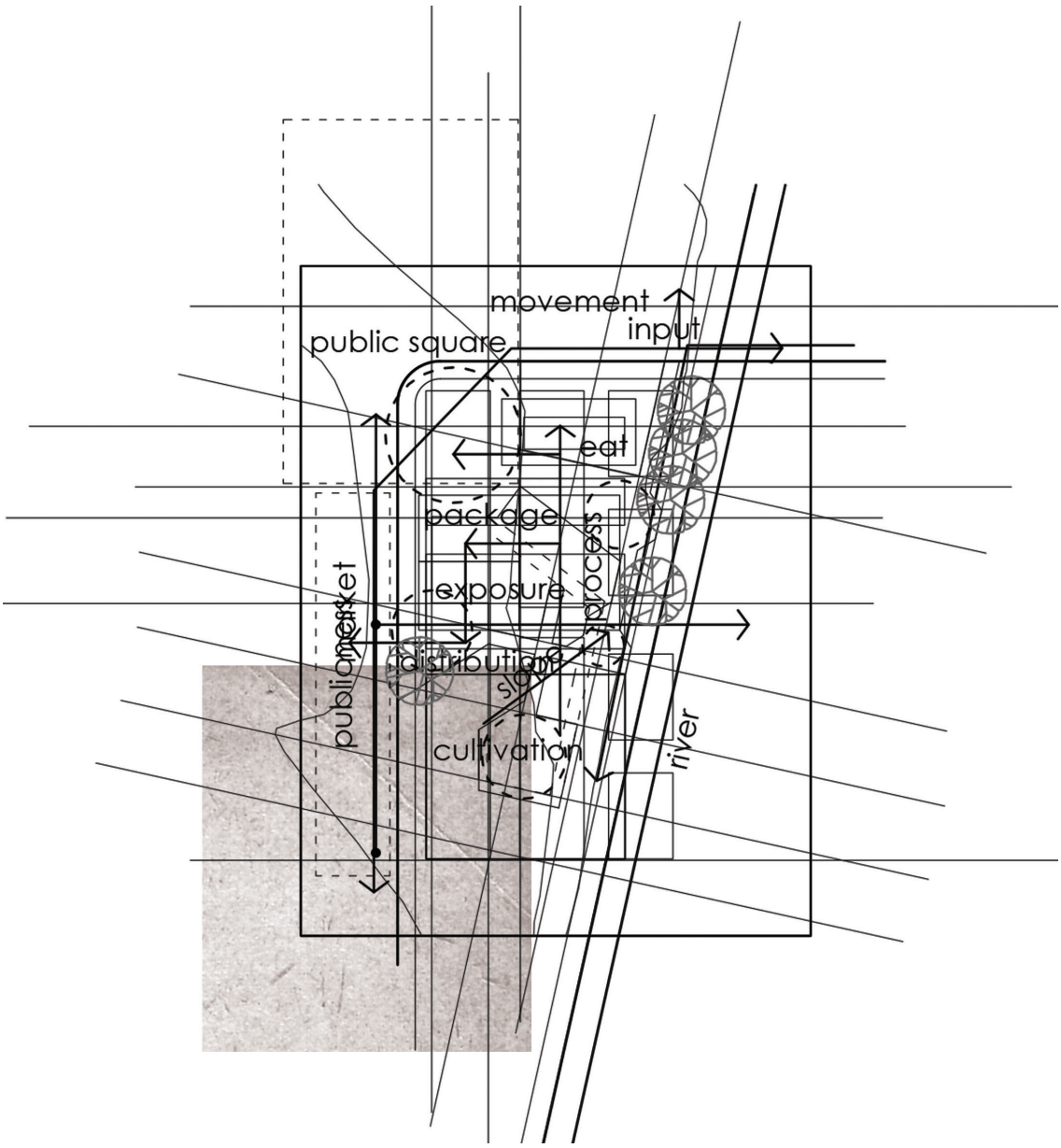

Figure 7.1 Diagram of layered informants (author 2013)

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Introduction

The design concept of the building relies on a conceptual manifestation of each design informant. The design informants are derived from the various physical, physiological, programmatic and contextual aspects that have an influence on the project. Each of the informants was conceptualised with the objective of forming a framework to create a solid basis for decision making in the design process. Informants were selected according to a hierarchy of relevance to the site, the programme and overall project intentions. The physical informants are derived from the site conditions and the framework. The physiological informants are derived from the historical spatial organisation of the context as well as the theoretical discourse of progressive exposure. The programmatic informants are derived from the programme requirements.

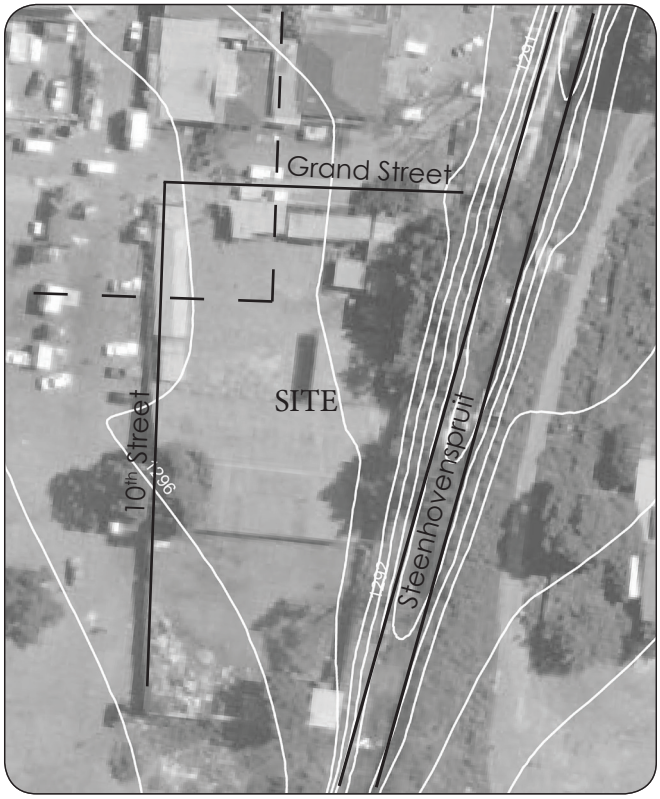

Figure 7.2 Aerial photo of site indicating major physical site informants (author 2013)

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Physical Informants

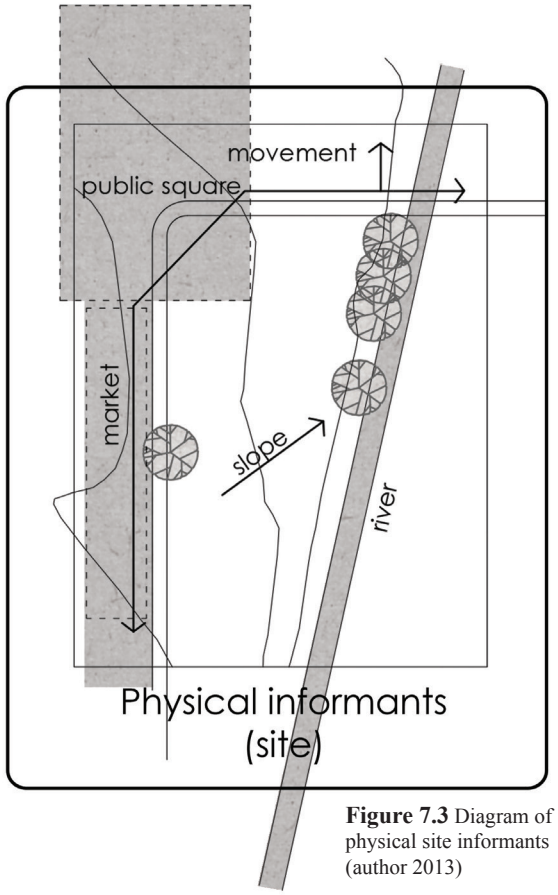

Figure 7.3 Diagram of physical site informants (author 2013)

Site Geography

The site is located adjacent to the Steenhovenspruit. The river has been channelized and will remain so as the water is redirected to flow underneath the Belle Ombre station. The aim of the framework is to re-establish a connection with the river. This can be achieved by creating a dialogue between the structure and the channel as well as creating a relationship between the public users and the natural systems. The footprint of the building allows for majority of the existing vegetation to be retained. The site has a natural gradual slope running from the south-west corner to the north-east corner of the site which will be responded to by stepping the building down.

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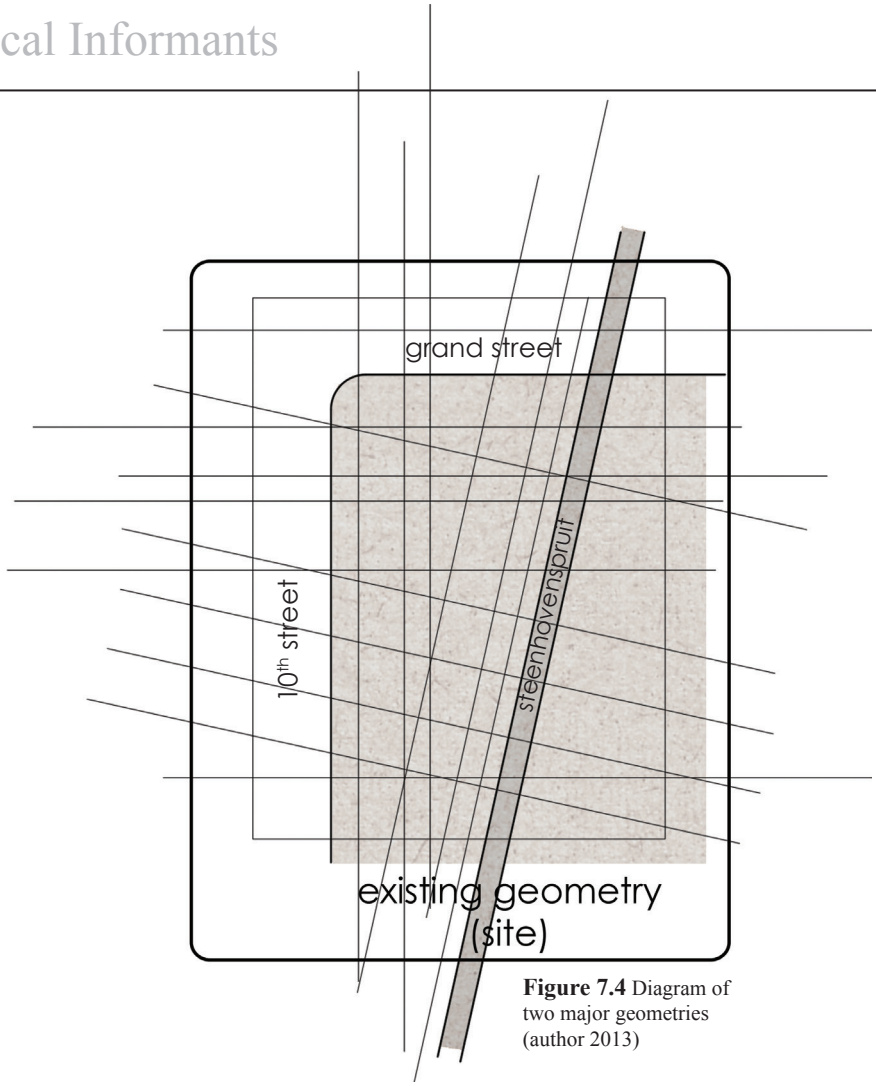

Figure 7.4 Diagram of two major geometries (author 2013)

The Geometry

The site is defined by two major geometries, 10th Street and the Steenhovenspruit channel. The street which is an extension of the Marabastad grid is seen as the public realm because it is the movement pattern on which the public is oriented by. The river, although canalized, is part of the natural system in Pretoria that is overlooked. Part of the objective of the framework is to expand the awareness of natural systems back into the public realm. The building therefore adopts the geometry of the river and morphs it into the geometry of the street. This approach illustrates progress on multiple levels; progress of a re-introduction into nature, progress into the exposure of a new food culture and progress from private to public.

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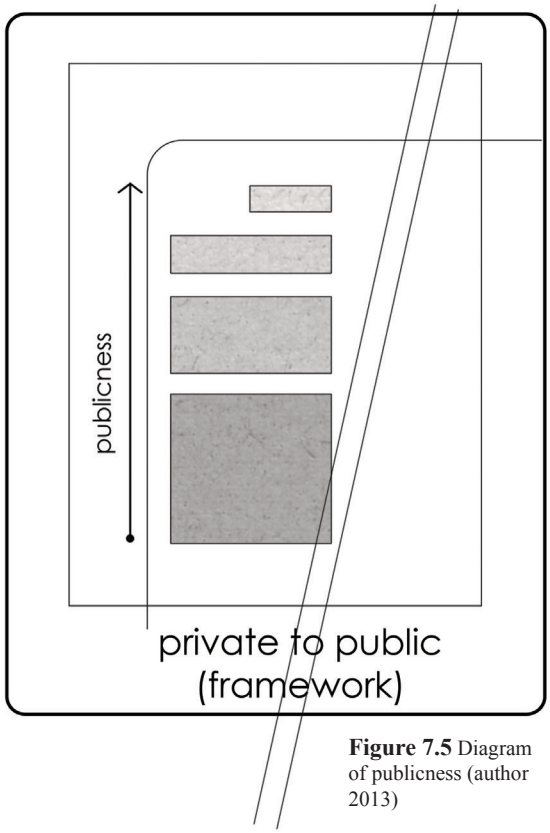

Figure 7.5 Diagram of publicness (author 2013)

The Framework

The framework proposes a BRT stop on Bloed Street, to the south of the site, this would create a movement pattern that connects to the Belle Ombre station through the cultural precinct. The movement and spatial quality experienced on that journey progressively becomes more public. The project enhances that experience by organising the functions of the programme in the same progression of publicness. The building steps down to the public realm, the edge conditions are energized with programmes to enhance public experience.

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Physiological Informants

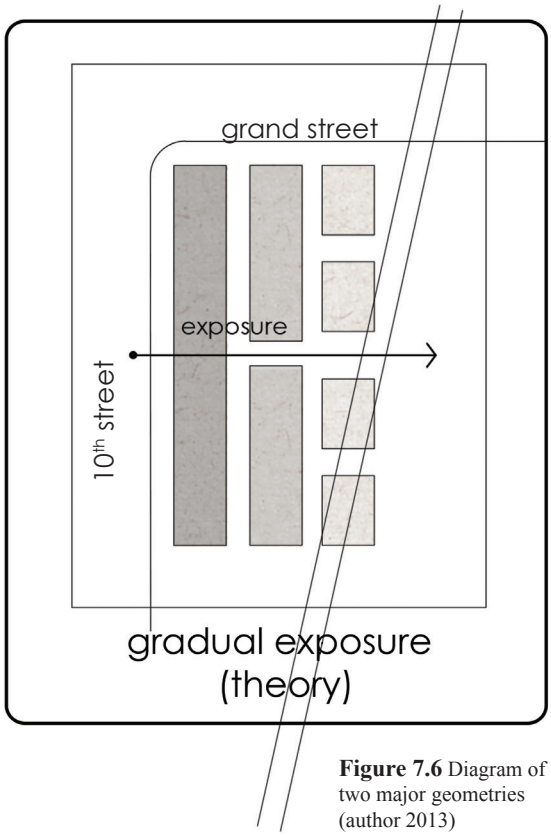

Figure 7.6 Diagram of two major geometries (author 2013)

Gradual Exposure

The building needs to introduce the premise of entomophagy and alter the perception that it has attained in the public realm. The project uses multiple forms of phobia treatments and conditioning to achieve this. In the programming, the building infiltrates the public ritual of food trade. It continually exposes the premise of entomophagy to the public creating a constant conditioning approach. The intervention then uses a counter conditioning approach and relates the positve feeling experienced through space and architecture to the premise of entomphagy. The architecture becomes a systematic desensitising therapy. It needs to gradually expose users to the cultivation of the insects and the consumption thereof. The building therefore needs to become gradually more transparent, the exposure level is proportional to the level of involvement that is achieved by the public users.

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Physiological Informants

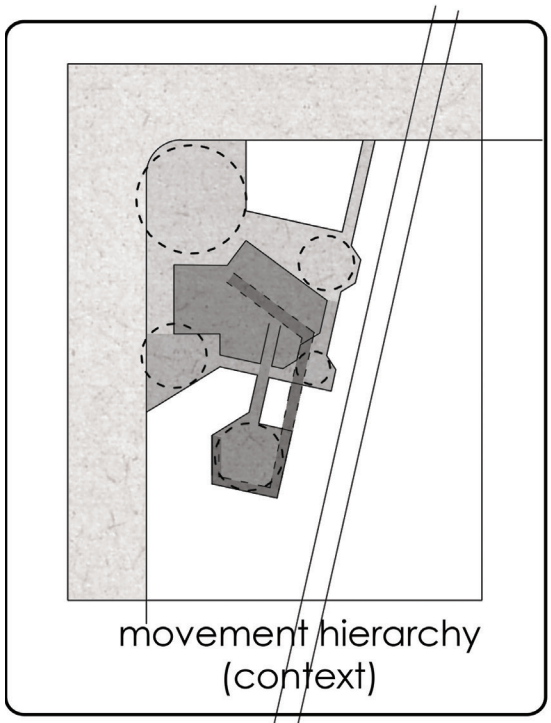

Figure 7.7 Diagram illustrating the influence of the historic spatial organisation (author 2013)

Spatial Organisation

The approach to spacial organisation on the site was adopted through the exploration of the organically formed movement spaces that had historically connected the residential communities of Marabastad together. This typology was created by the subversive nature of the culture. Layered movement patterns with thresholds of privacy and involvement. The project re-interprets those spatial divisions to create movement patterns that promote discovery and reward. The design extrapolates the experiential patterns of the past in social settings and applies them to create a form that aids experience through exploration. The main structure of the building will be designed around public space. The movement patterns will expose users to the programmes and will penetrate the skin where users are granted access. The figure highlights defined spaces and layers movement in a hierarchy of exposure.

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Programmatic Informants

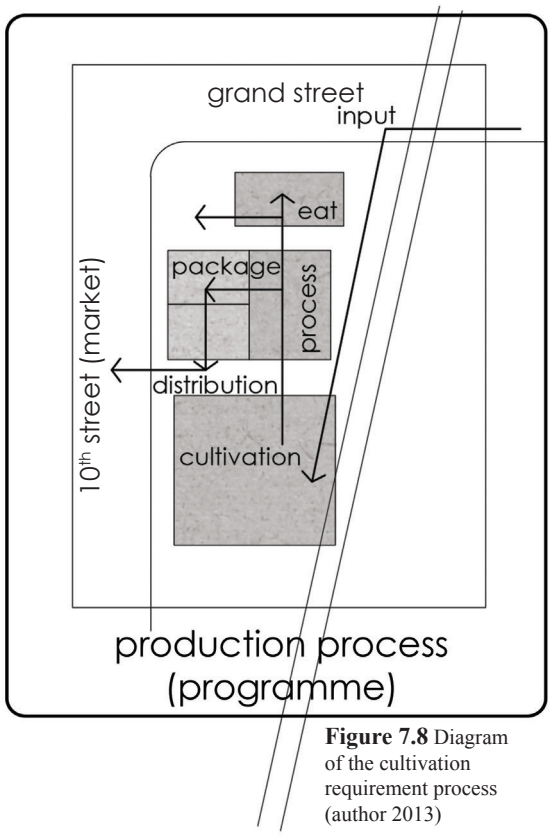

Figure 7.8 Diagram of the cultivation requirement process (author 2013)

Programmatic Organisation

The cultivation process needs to work optimally to produce the insects to feed into Marabastad. The programme was broken down into stages and organised in connection with the dynamic nature of the public spaces. The programme infiltrates the ritual of trade. It is using a counter conditioning technique to create an everyday environment that exposes users to entomophagy. The building needs to systematically desensitise the users by gradualy increasing exposure and comfort levels. It allows users to consciously increase their own involvement to the ultimate level of exposure. The programme is comprised of the following components: insect cultivation, processing, drying, packaging, distribution, restaurant and exhibition. Functionally there needs to be a linear flow of movement from the cultivation to distribution. The connections between these spaces are pertinent to the success of the programme. However the buildings productive function will not inhibit public space and movement, it is used to accentuate it.

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Concept Synthesis

The focus of the project is to influence an existing food culture by changing the current perception of entomophagy. The project shifts focus to the experience of the public user. Various cognitive theories are to be implemented to be able to condition and change the mind-set of the public users. The concept is therefore grounded in the theoretical premise of the dissertation that utilises the various forms of conditioning treatments: flooding, counterconditioning, systematic desensitisation and gradual exposure.

The building will fold space to the movement and programme of the public. The building and its functions will become increasingly exposed to the users. The architecture will morph to move the experience of space perceptibly from private to public, and opaque to transparent. This can be illustrated in the materiality and form. The structure and the skin will move from a solid form, grounded in the landscape to become lighter floating elements whilst stepping down to meet the public on a more pedestrian scale.

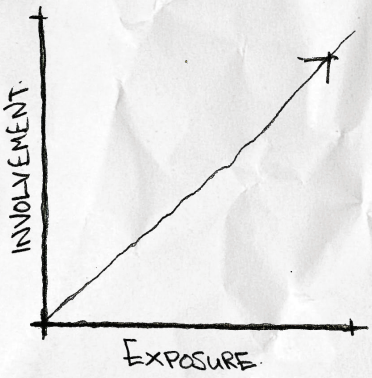

Figure 7.10 Graph indicating the linear relationship between involvement and exposure (author 2013)

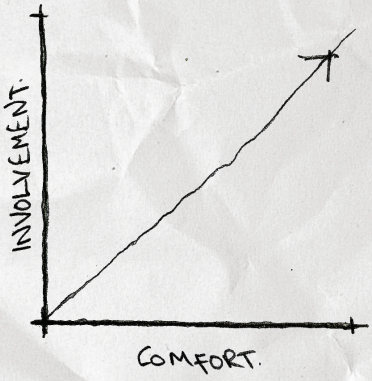

Figure 7.9 Graph indicating the linear relationship between involvement and comfort (author 2013)

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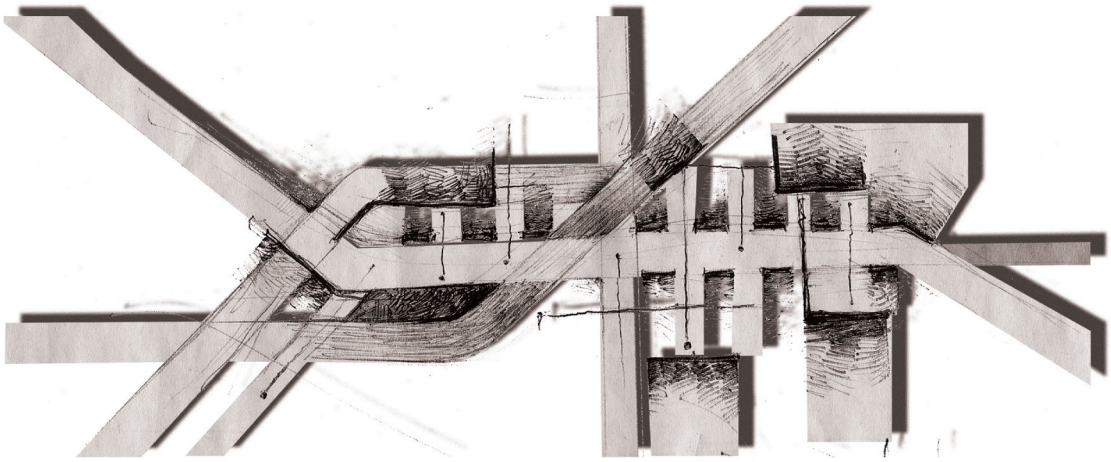

Figure 7.11 Conceptual sketch of ritual and exposure (author 2013)

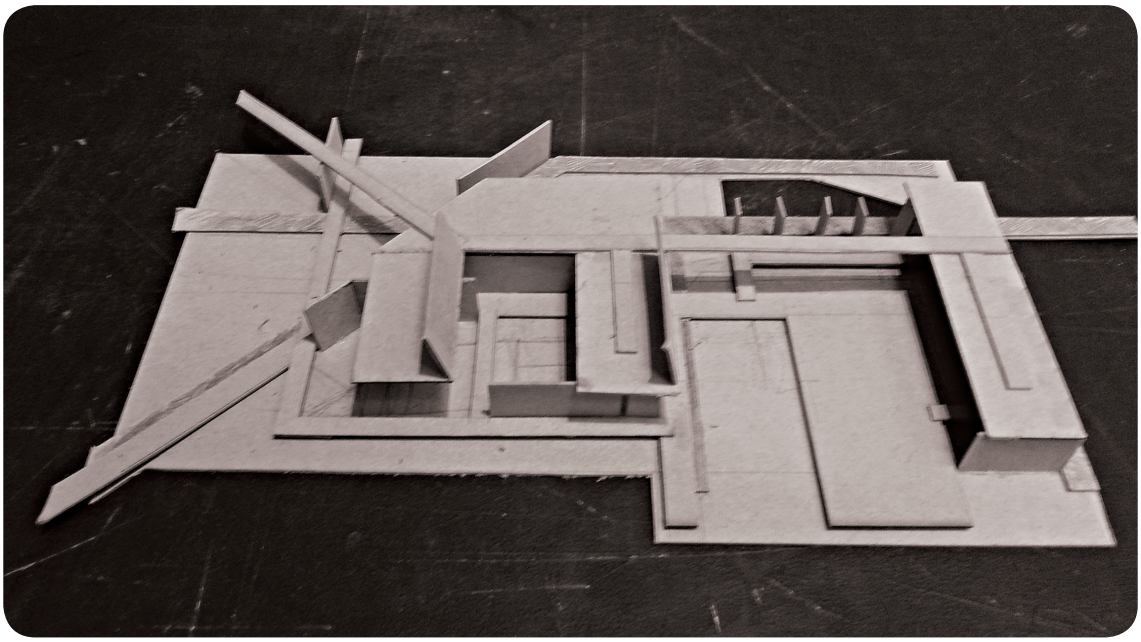

Figure 7.12 Conceptual model expressing ritual and exposure (author 2013)

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Chapter Eight

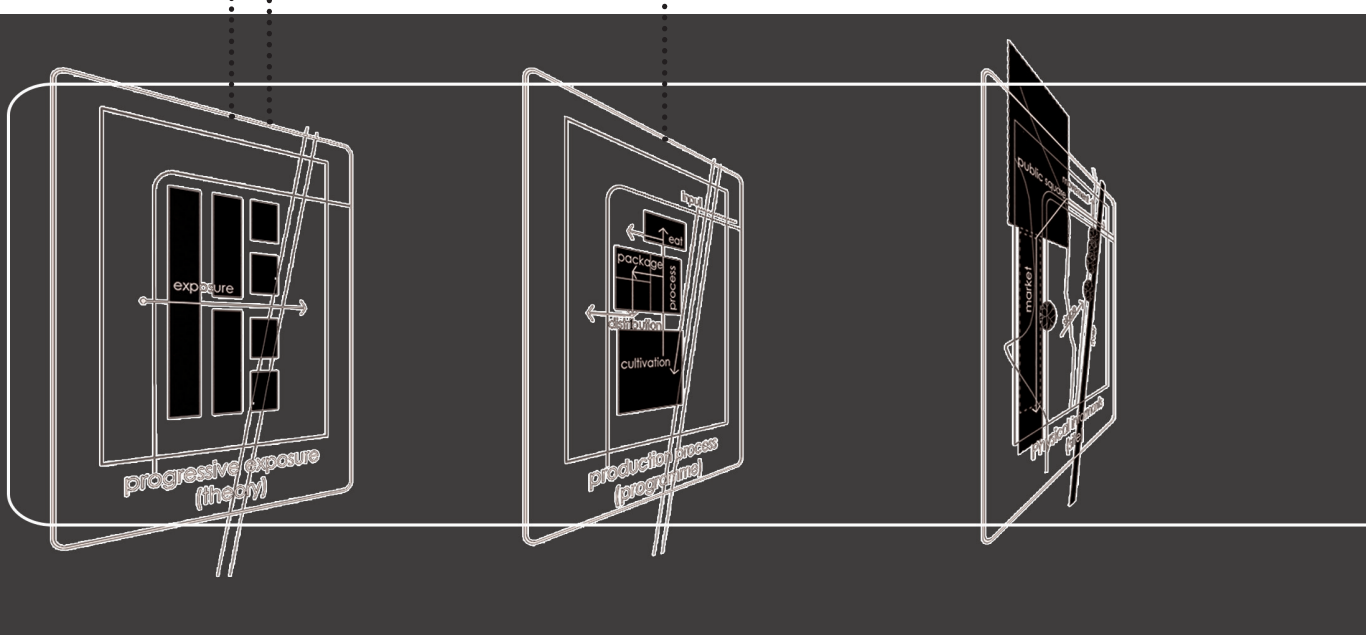
Precedents



Figure 8.1 Blurring boundary adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/



Figure 8.2 Chapelle Notre Dame du Haut (adapted from http://www.archdaily.com/84988/ad-classics-ronchamp-le-corbusier/



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Introduction

The precedents utilized were selected according to the relevance to the design informants and conceptual technological approach. The conclusion of the design informants leads the project to attain a certain language that can display progression in transparency and a progression in publicness. The project needed to draw on precedents that dealt with similar approaches and not necessarily with similar programmatic challenges.



Figure 8.3 Barcelona market (adapted from http://www.dezeen.com/2011/06/24/barceloneta-market-by-mias-architects/)

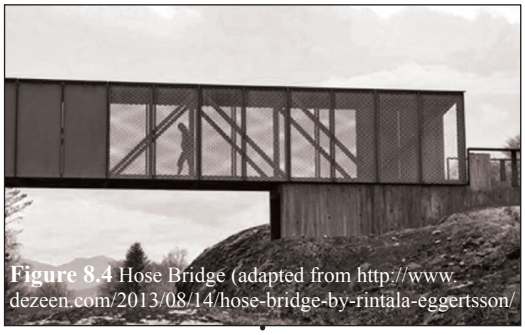

Figure 8.4 Hose Bridge (adapted from http://www.dezeen.com/2013/08/14/hose-bridge-by-rintala-eggertsson/

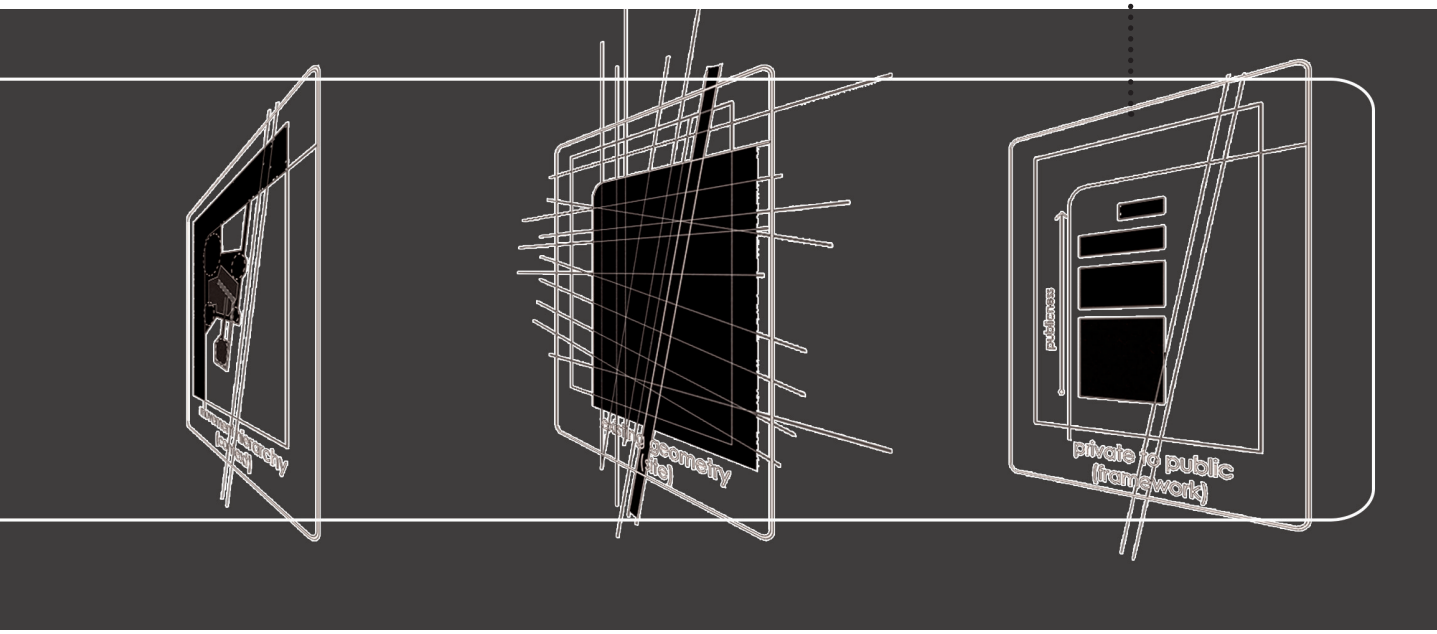

Figure 8.5 Diagram illustrating the choice of precedents in relation to the informants (author 2013)

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Barcelona Market

Project: Barcelona Market

Architects: MiAS Architects (Josep Miàs)

Site Location: Barcelona, Spain

Year: 2007

Programme: Market space

Client: Public

Project type: heritage rehabilitation and expansion

Size: 5200m²

Concept: The project aimed to refurbish and rehabilitate an existing bomb-damaged structure, give it a presence in the city so it could become a point of reference and a destination. The project needed to reflect the high density nature of its context, feed off its energy and participate seamlessly in the neighbourhoods rituals. The programme of the building consisted of restaurants markets, shops and bars.

Relevance: Programmatically the building launches itself into the context, filling the voids that are required in the community. The building also successfully addresses the issue of scale within its context, relating to the high density urban fabric around it. The structure then brings the scale down to an appropriate pedestrian scale that connects to the public space that the market opens up onto. The roof structure in the public realm stretches out defining space, creating a threshold between the publicness of the square and the retail nature of the market.

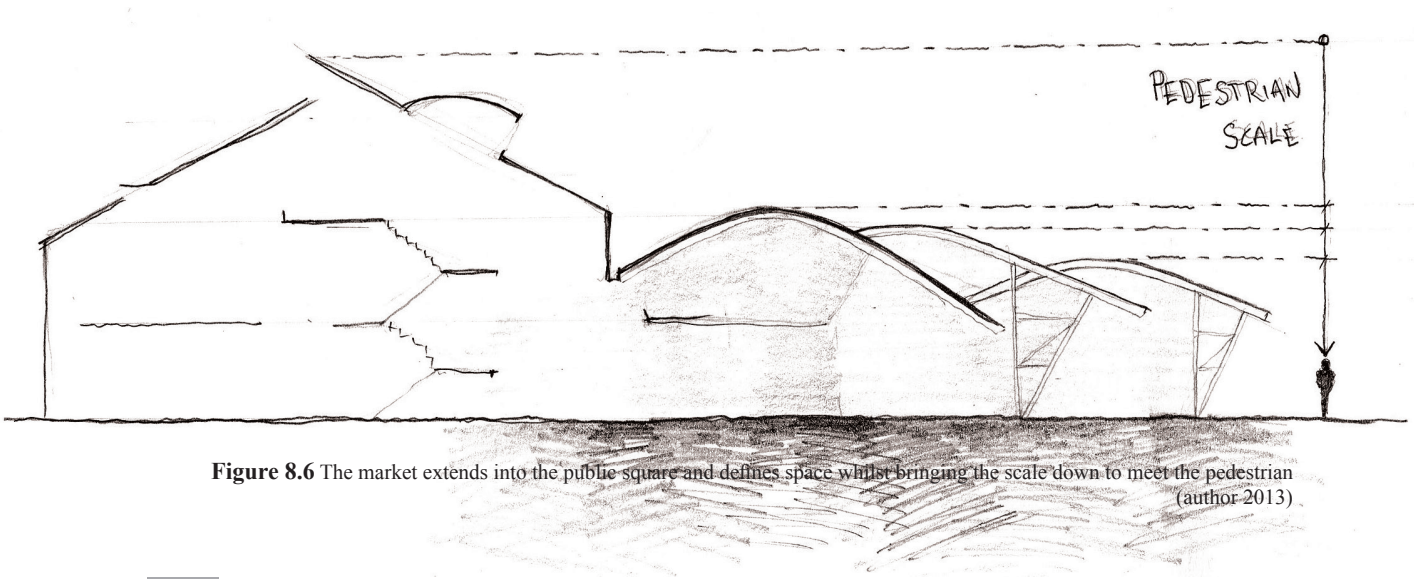

Figure 8.6 The market extends into the public square and defines space whilst bringing the scale down to meet the pedestrian (author 2013)

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Figure 8.7.



Figure 8.8.

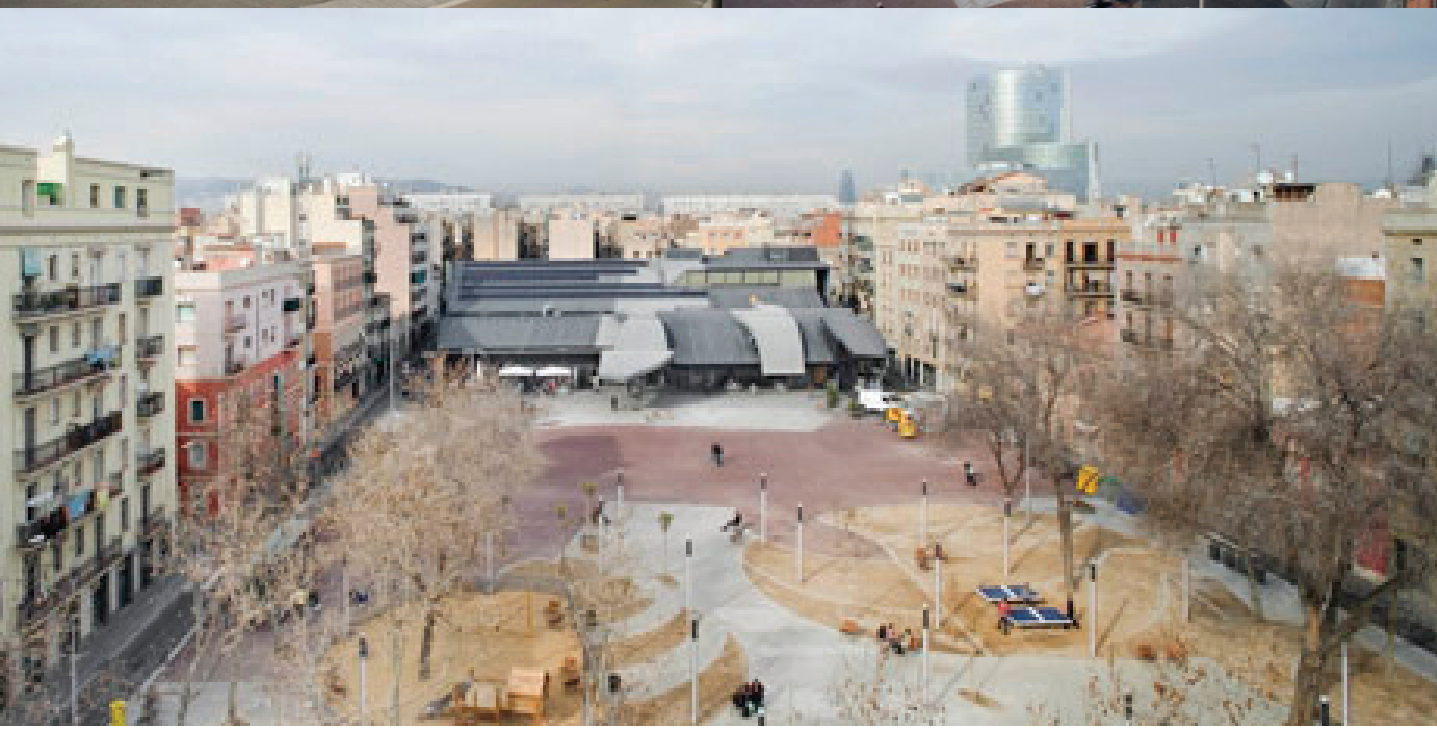

Figure 8.9 Barcelona market in context (all barcelona market images adapted from http://www.dezeen.com/2011/06/24/barceloneta-market-by-mias-architects/)

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Høse Bridge

Project: Høse Bridge

Architects: Rintala Eggertsson Architects

Site: Suldalslågen river, Suldal, Norway

Year: ±2011

Programme: pedestrian bridge

Client: Lauritz Lauritzen Inge Vandvik and Alf Waage Suldal Municipality

Concept: The Bridge was used to connect residents of the Sand town with a woodland recreational area. The idea behind the pedestrian bridge was to create a horizontal line of reference to emphasize the undulating nature of the landscape. The cladding system allowed light and sound to penetrate, it amplified the sounds of the river. The bridge is lit up during the night.

Relevance: The integrity and simplicity of the material palette used in the bridge express different levels of transparency and opaqueness. It exposes the users to their position in the landscape, making them aware of their surroundings. The materials express the concept of weathering processes that rivers have on the landscape. The corten steel is allowed to rust, the effect of which is displayed on the concrete.

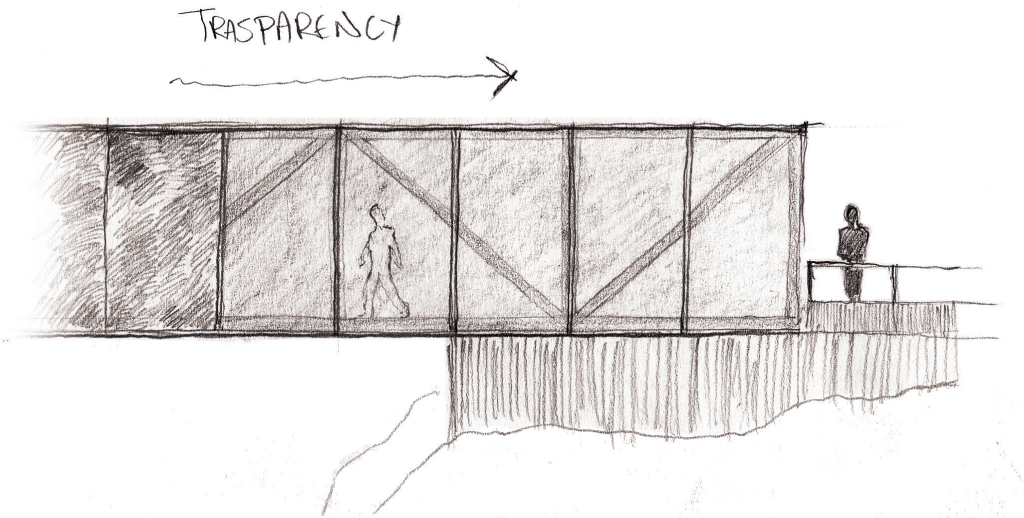

Figure 8.10 Materiality of the bridge illustrates a progression in transparency (author 2013)

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Figure 8.11.



Figure 8.12.



Figure 8.13.



Figure 8.14 Hose Bridge in the landscape illustrating levels of transparency through materiality (all images of Hose bridge adapted from http://www.dezeen.com/2013/08/14/hose-bridge-by-rintala-eggertsson-architects

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Blurring Boundary

Project: Blurring Boundary

Architects: UTAA

Site location: Dongdaemungu, Seoul, South Korea

Year: 2012

Programme: Security office

Client: University of Seoul campus

Size: 90m²

Concept: The building acts as a threshold. It aims to blur the lines between the city and the university. It creates a transitional space to make users aware of the change. This is done in a harmonious manner.

Relevance: The structure, although small and in a manner of speaking humble, plays an important transitional role. It expresses itself from heavy to light and can be interpreted in terms of exposure. The building also bleeds out into the landscape in terms of its paving design. The paving defines the space, it slows vehicular movement down and makes users aware of their immediate environment.

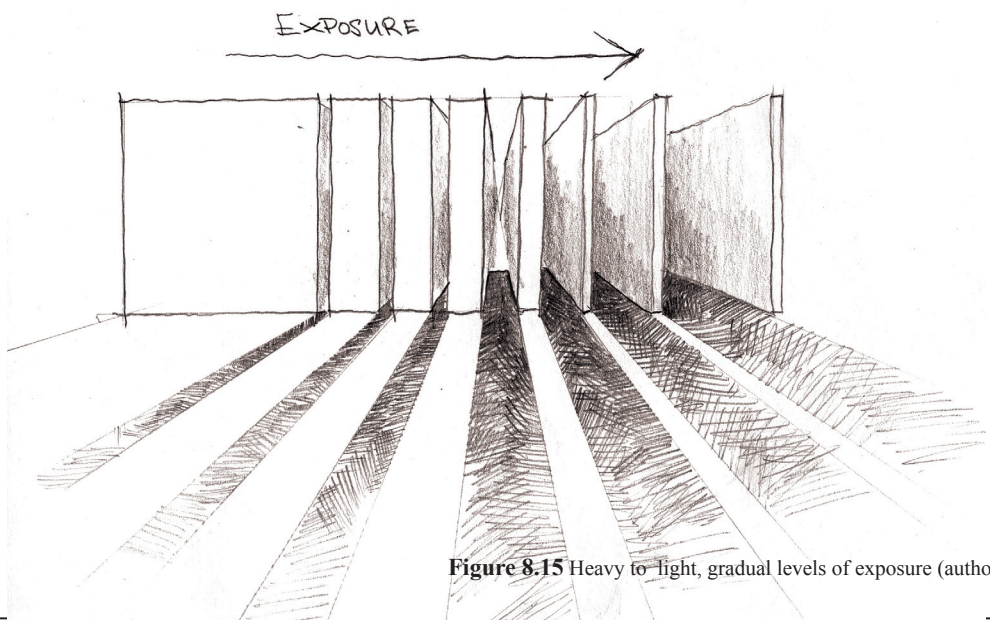

Figure 8.15 Heavy to light, gradual levels of exposure (author 2013)

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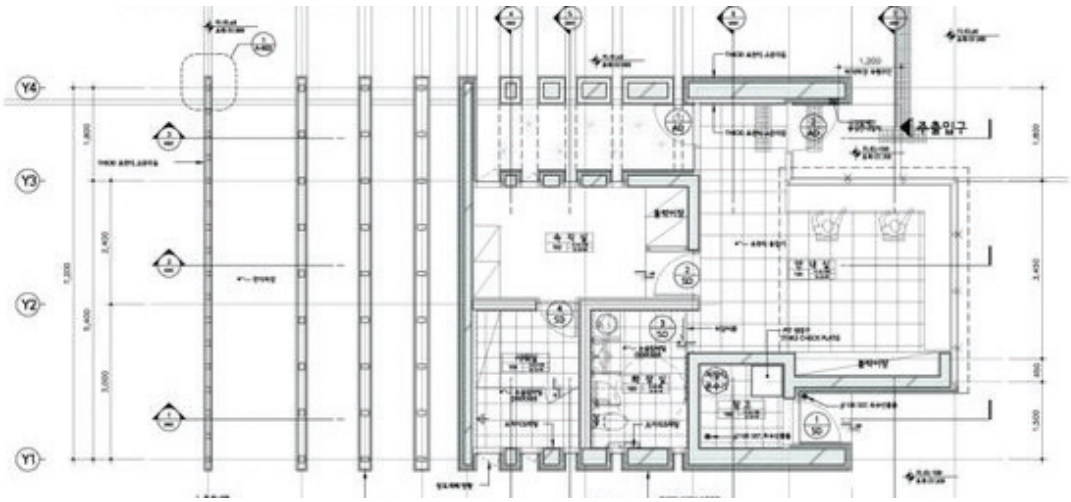

Figure 8.16 Plan (adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/)



Figure 8.17 Lighting accentuates the concept (adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/)



Figure 8.18 Paving design (adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/)

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Chapelle Notre Dame du Haut, Ronchamp

Project: Chapelle Notre Dame du Haut, Ronchamp

Architects: Le Corbusier

Site: Ronchamp, France

Year: 1955

Programme: Chapel

Client: Catholic church

Concept: The site within Ronchamp had long been a destination of catholic pilgrimage. Spatial purity was one of the main focuses of the building. Le Corbusier created a space of contemplation and reflection. The design of the interior of the building is simplistic, an open plan. The building becomes a large sculptural element in the landscape. It rests atop a hill or metaphorical pedestal, this gives the landscape a focal point and allows the structure to have a more prominent presence. The building uses the contrasting elements of mass and light to evoke emotion and solemnity.

Relevance: The building holds a presence created through the impression of mass. Deep walls expressed through deep, narrow openings evoke a thoughtful response. The walls of the main entrance fold around defining rooms on the interior. Viewed from the outside these folding walls are perceived as a large mass, this gives dominance and helps define the main entrance.

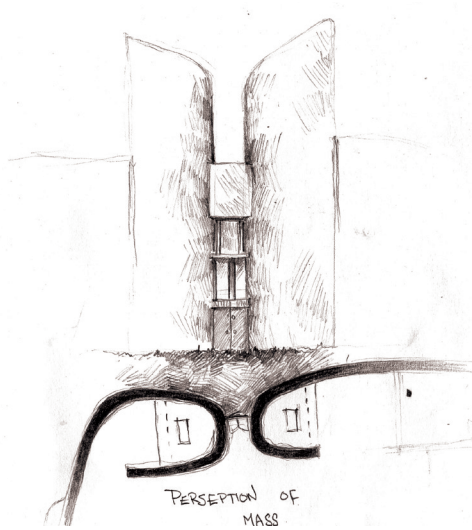

Figure 8.19 Expression of mass (author 2013)

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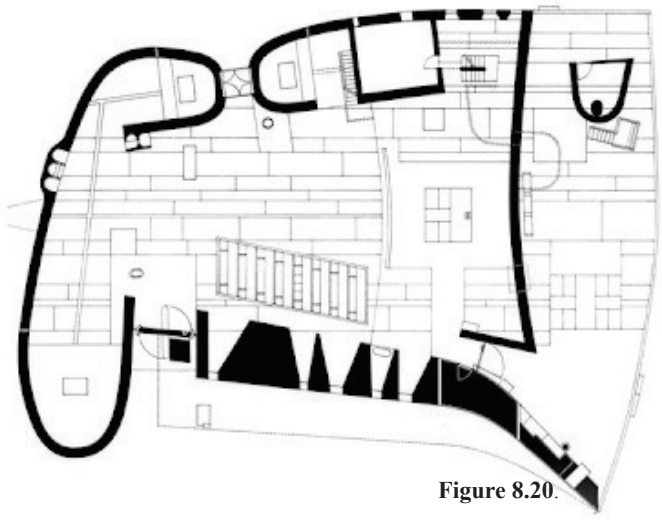

Figure 8.20.



Figure 8.21.



Figure 8.22.



Figure 8.23.

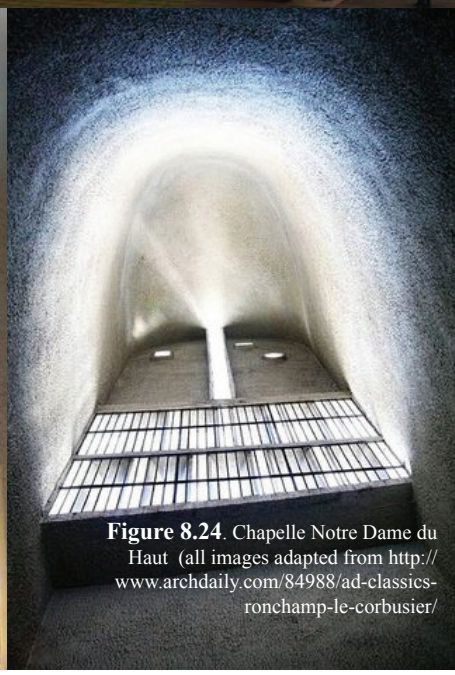

Figure 8.24. Chapelle Notre Dame du Haut (all images adapted from http://www.archdaily.com/84988/ad-classics-ronchamp-le-corbusier/

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Chapter Nine

Design Development

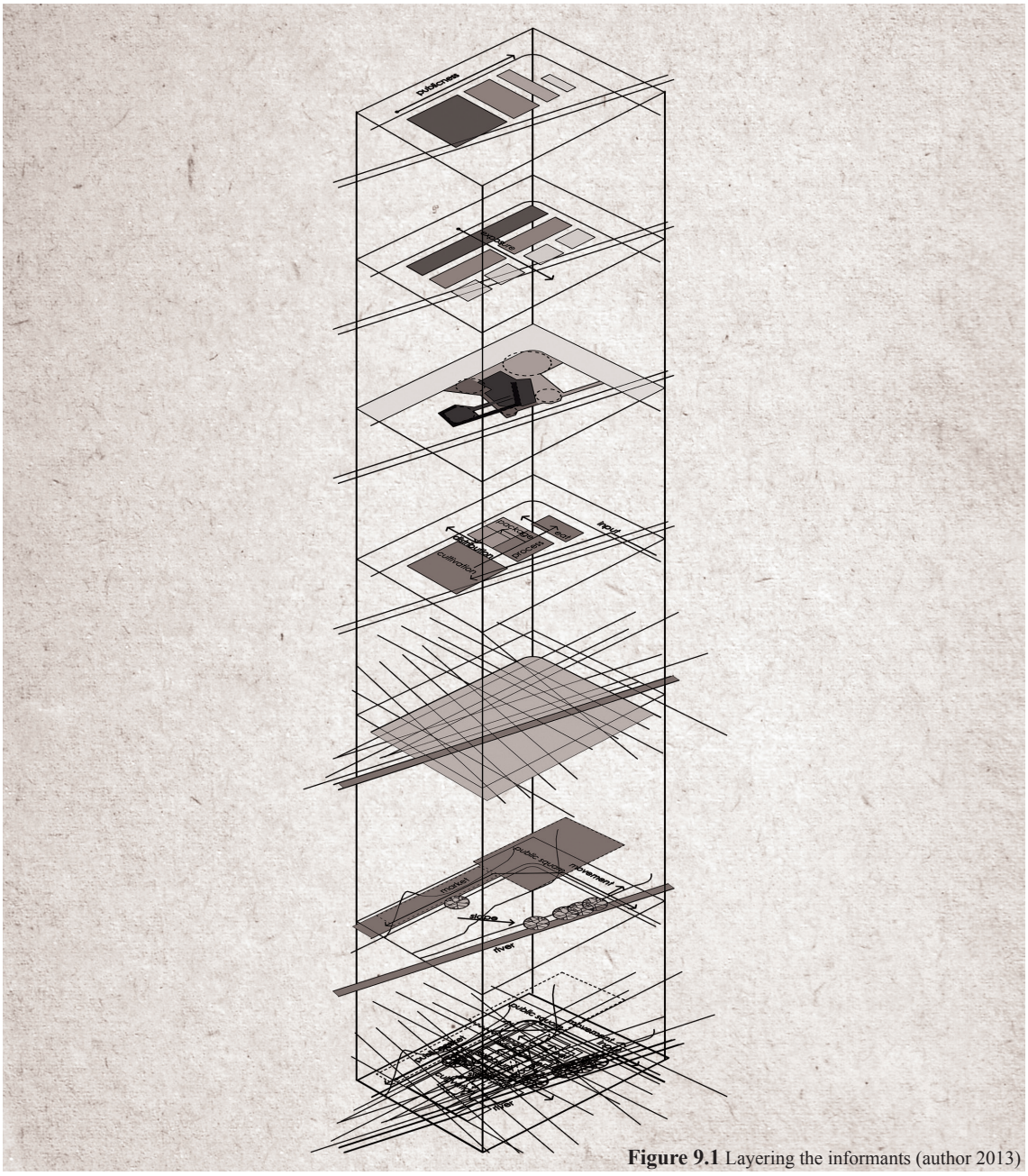

Figure 9.1 Layering the informants (author 2013)

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The Design Approach

The design informants and the subsequent concept of the building were identified and outlined to create a framework on which decisions can be based. The informants were in a dynamic movement, switching hierarchies at different stages within the design process.

It is important to the project that the informants are understood as a flexible framework to allow expression of design to be uninhibited, whilst the design decisions remain in a well-grounded argument keeping to the objectives set within the proposal. The creative process drew from an internalised understanding of the informants, the existing and historical context. The various design stages layered the informants in reaction to each other to create space, form and in turn architecture.

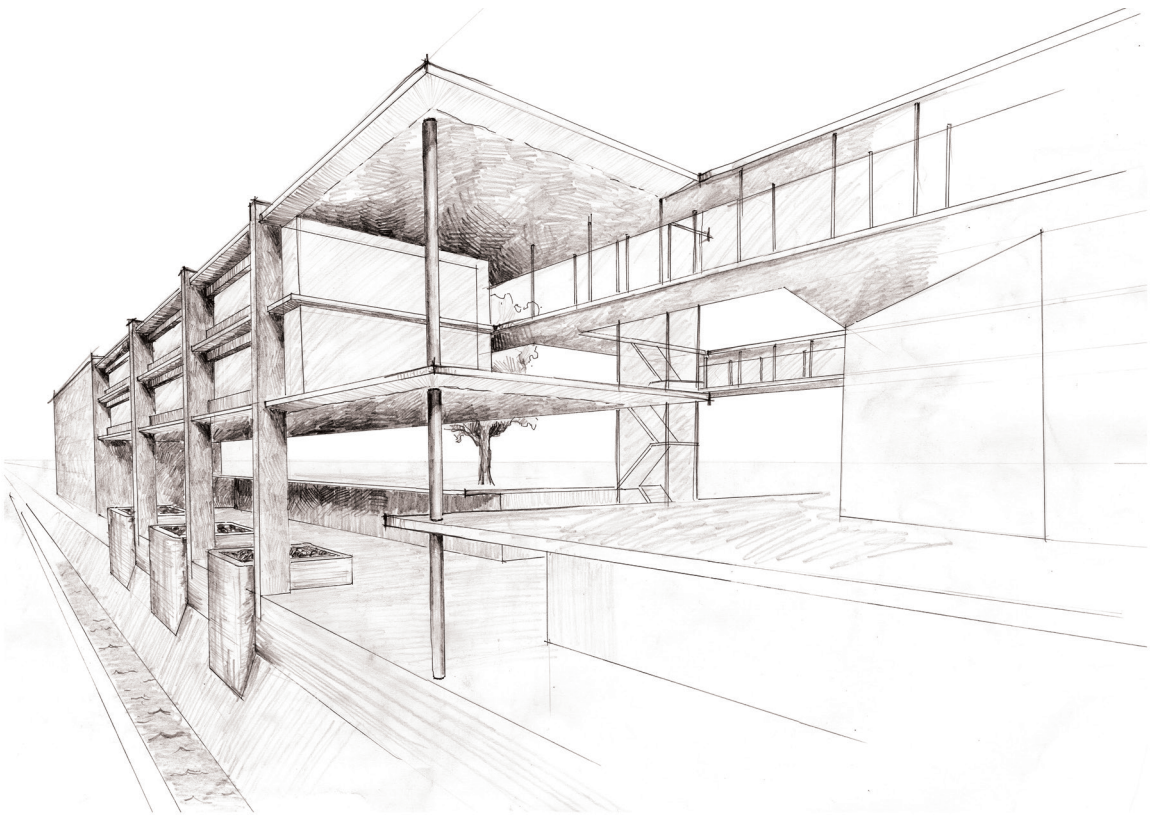

Figure 9.2 Concept sketch of earthworm pits and eastern facade (author May 2013)

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The Ground Plane

The premise of the project is to influence an existing food culture through the infiltration of public ritual. The focus of the design is aimed at the experience of the public and pedestrian users. The ground plane became an important element as it contains and dictates the movement patterns of the public users. The ground plane is manipulated to create various relationships between the building and the users. The horizontal plane is raised and depressed, creating floating elements and submerged elements defining spaces and shaping experiences.

Marabastad has a very fine grained urban fabric. The block sizes are 30x60m and are generally compiled of different buildings and infill structures. It is these elements that help create the delicate character within the precinct. The site chosen encompasses an entire block, it was therefore important to break the structure up as to not create one monotonous extrusion from the site. Breaking the building up and segmenting it allowed the site to become more porous. The porosity and the explorative experience it creates is an abstraction of the communal passageways and subversive culture that existed in the historic domestic spatial organisation of Marabastad.

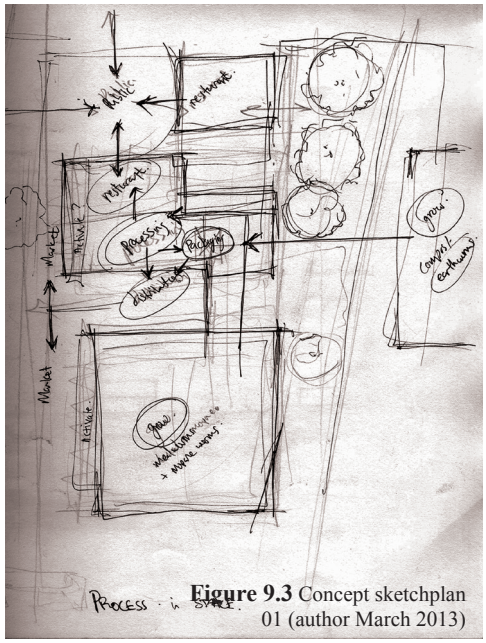

Figure 9.3 Concept sketchplan 01 (author March 2013)

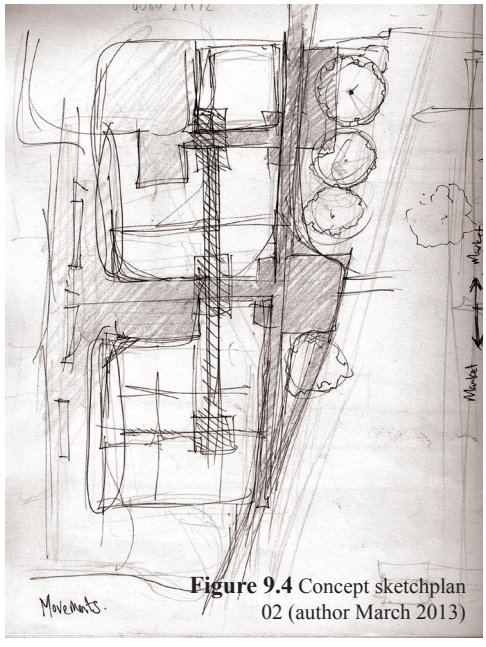

Figure 9.4 Concept sketchplan 02 (author March 2013)



Figure 9.5 Concept sketch of softening edge and public/ private space (author March 2013)

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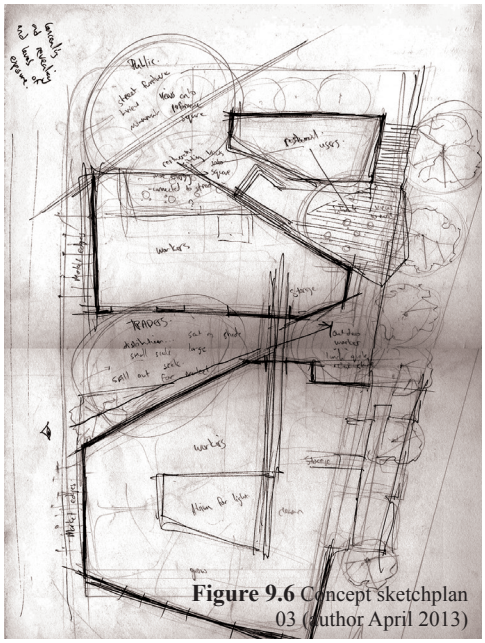

Figure 9.6 Concept sketchplan 03 (author April 2013)

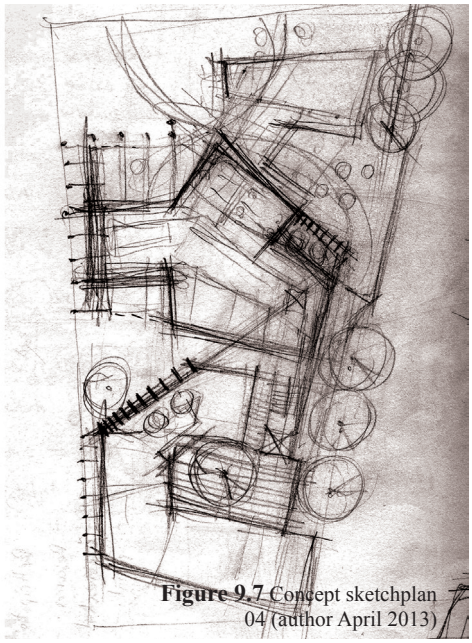

Figure 9.7 Concept sketchplan 04 (author April 2013)

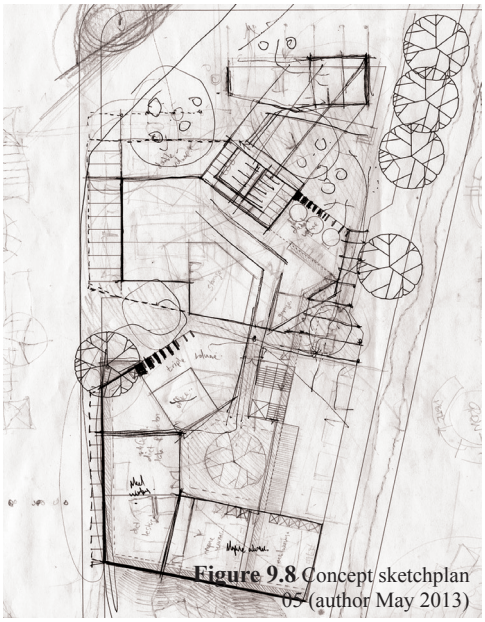

Figure 9.8 Concept sketchplan 05 (author May 2013)

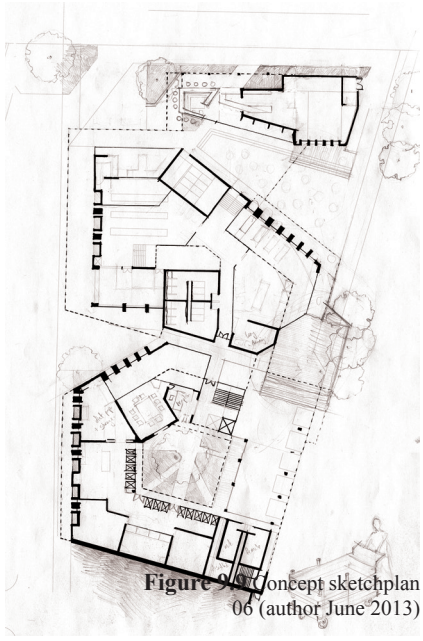

Figure 9.9 Concept sketchplan 06 (author June 2013)

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The Edge Conditions

The edge of a building is the initial region of interaction between the architecture and the public. The edge condition illustrates how the building relates to its physical context. It acts as a threshold between structure, programme and contextual space. The edge conditions of the project became an important design element. Establishing a relationship with the public and dictating public involvement is achieved through the connection between the ground plane and the edge condition. The building displays a progression from a private condition in the south to a more public and exposed condition in the north. This is achieved by shielding the internal programme from the public realm. The edge is then activated by becoming part of the market. Storage was identified as a limitation for informal traders within Marabastad. Storage units are then used to soften the private edge of the building, these storage units become part of the market as they provide electricity and light to traders, allowing them to sell directly from the storage units.

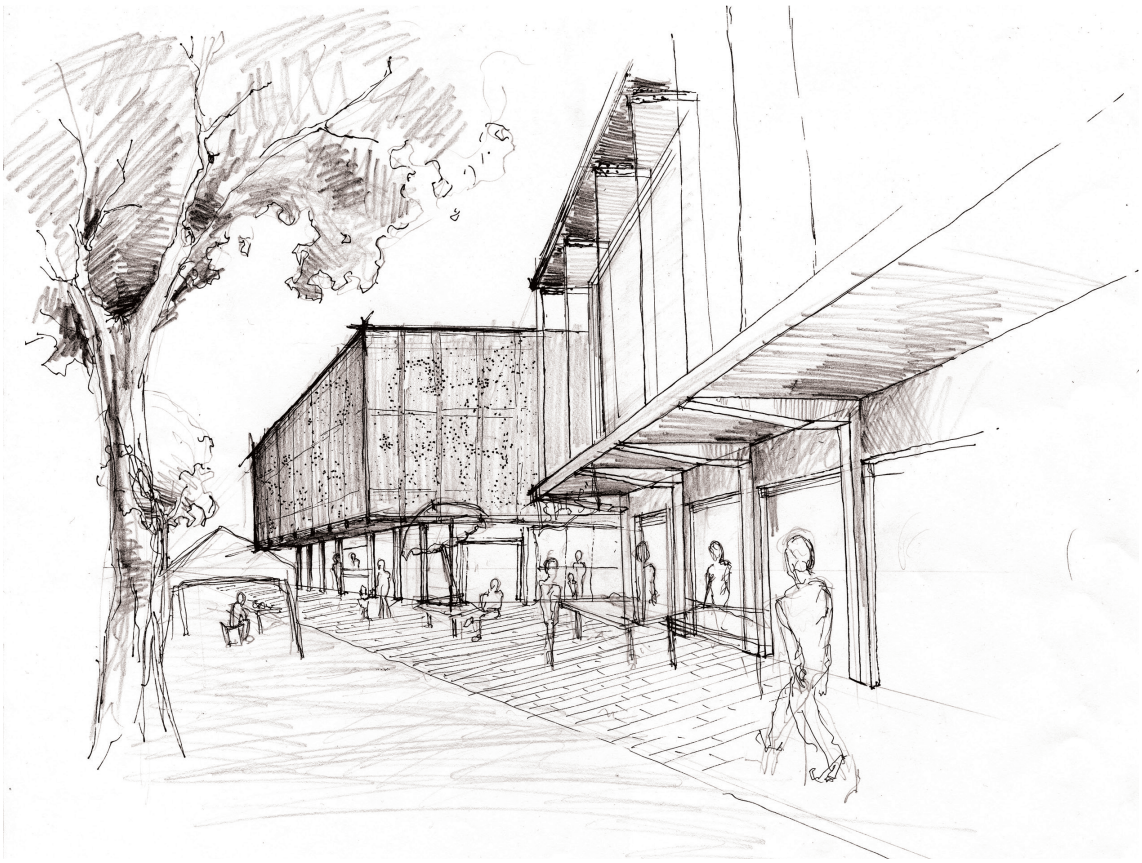

Figure 9.10 Concept sketch of market sedge and locust cage (author August 2013)

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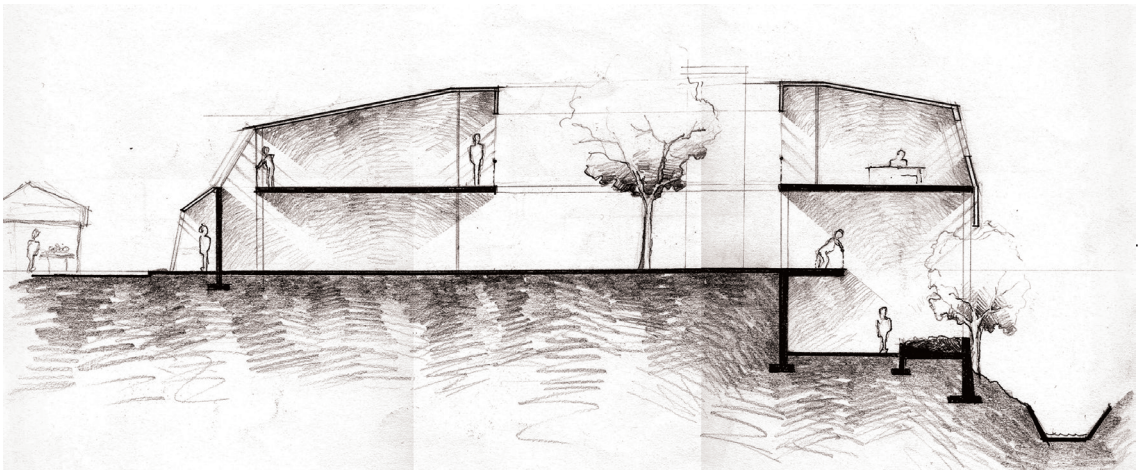

Figure 9.11 Cross section through river channel and market edge (author May 2013)

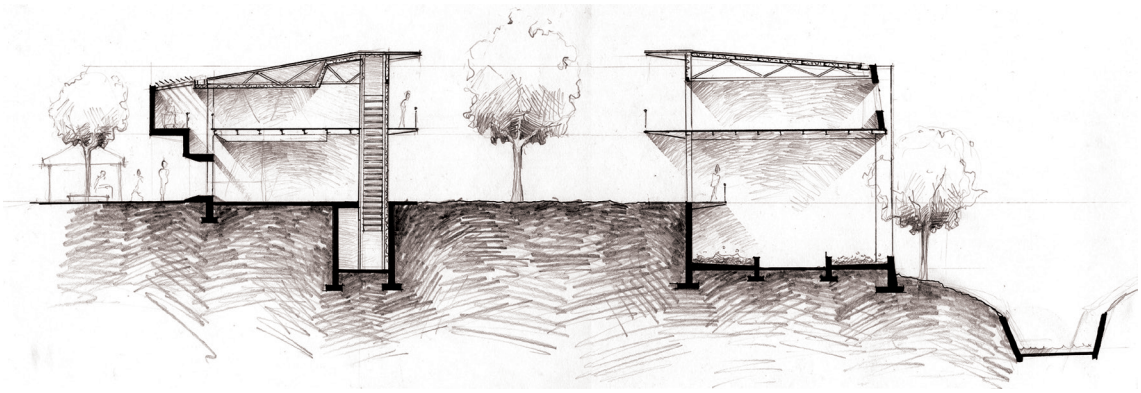

Figure 9.12 Cross section through river channel and market edge (author June 2013)

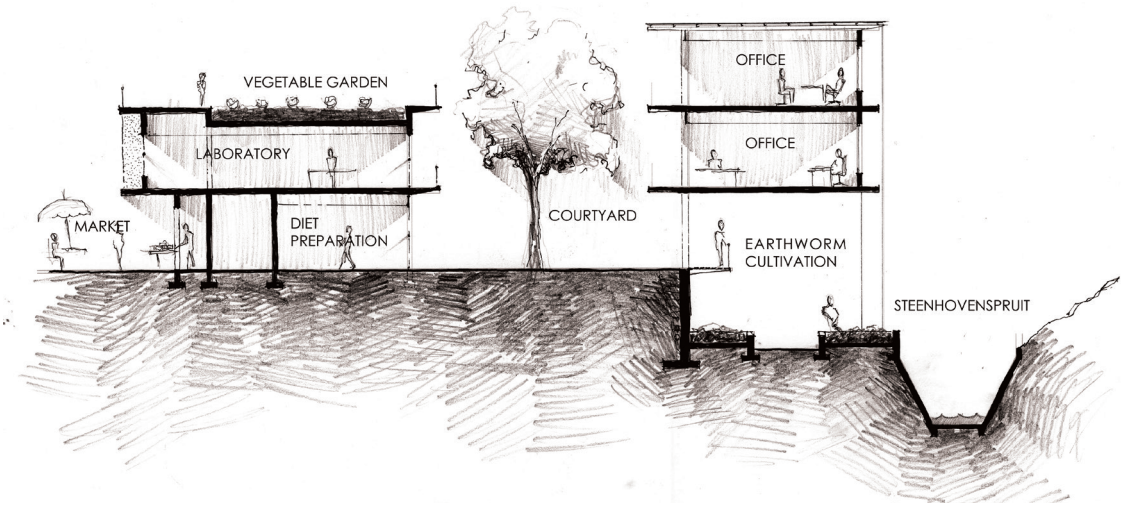

Figure 9.13 Cross section through river channel and market edge (author August 2013)

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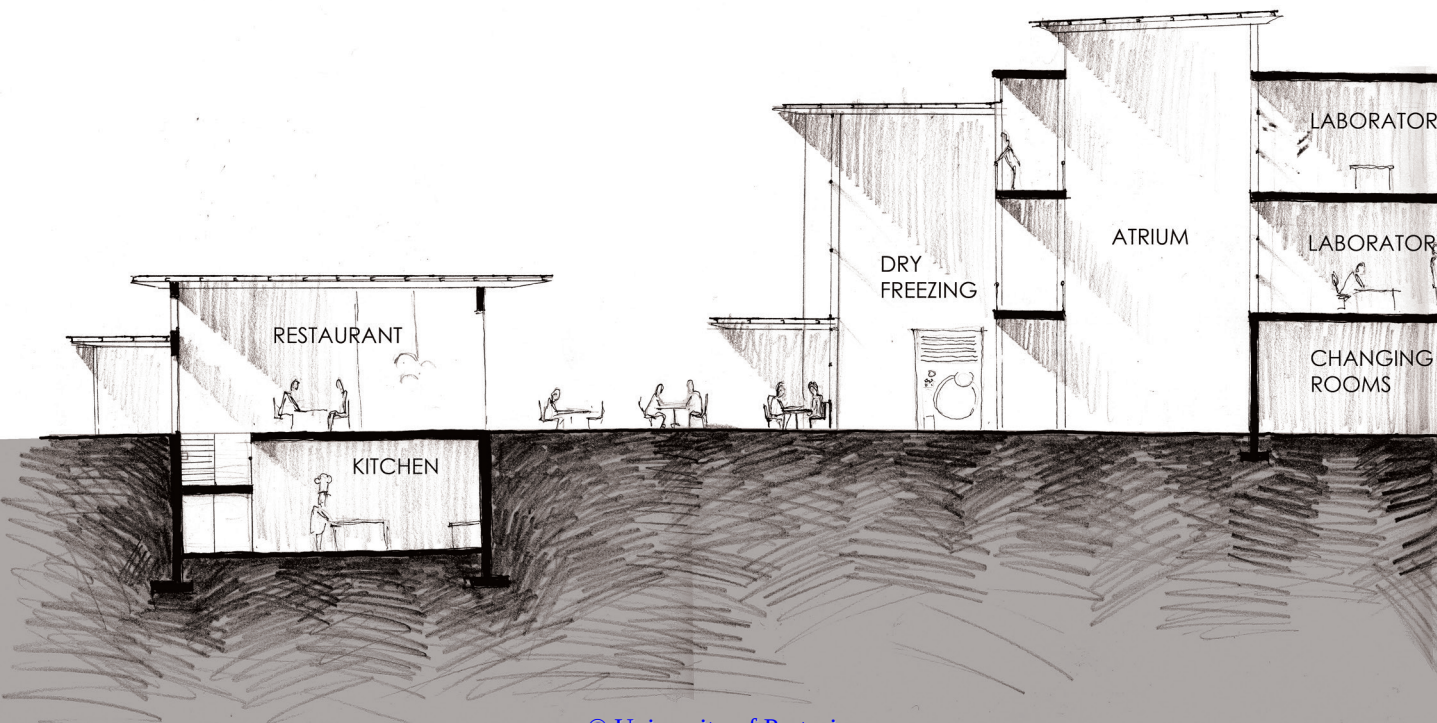
The Edge Conditions

The building becomes more transparent allowing the programme to become more accessible both physically and visually.

The edge of the building provides shelter for the public at a pedestrian scale. This pedestrian treatment wraps around the building drawing public users through the site and exposes them to different experiences. The edge of the building illustrates the different levels of exposure through various engagement opportunities.

The building opens up to its ultimate exposure at the exhibition space. In the exhibition space, the public is exposed and allowed to physically interact with the insects at different stages in their respective lifecycles. From this space the whole building opens up visually, exposing the public to the programme of the building.



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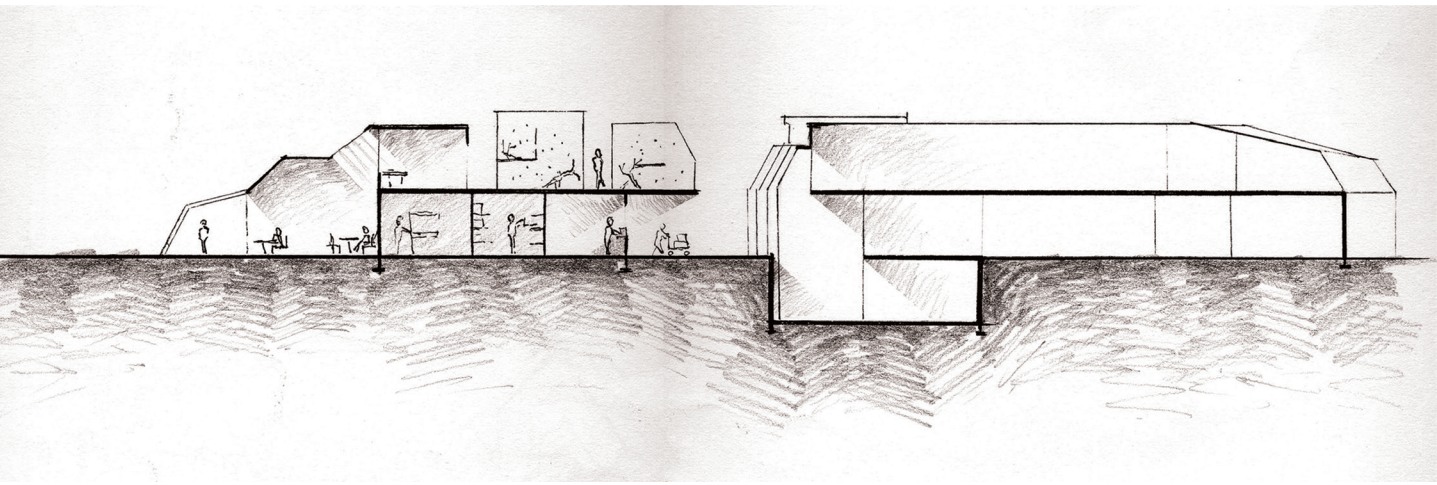

Figure 9.14 Longitudinal section through locust cages. Illustrating scale changes (author May 2013)

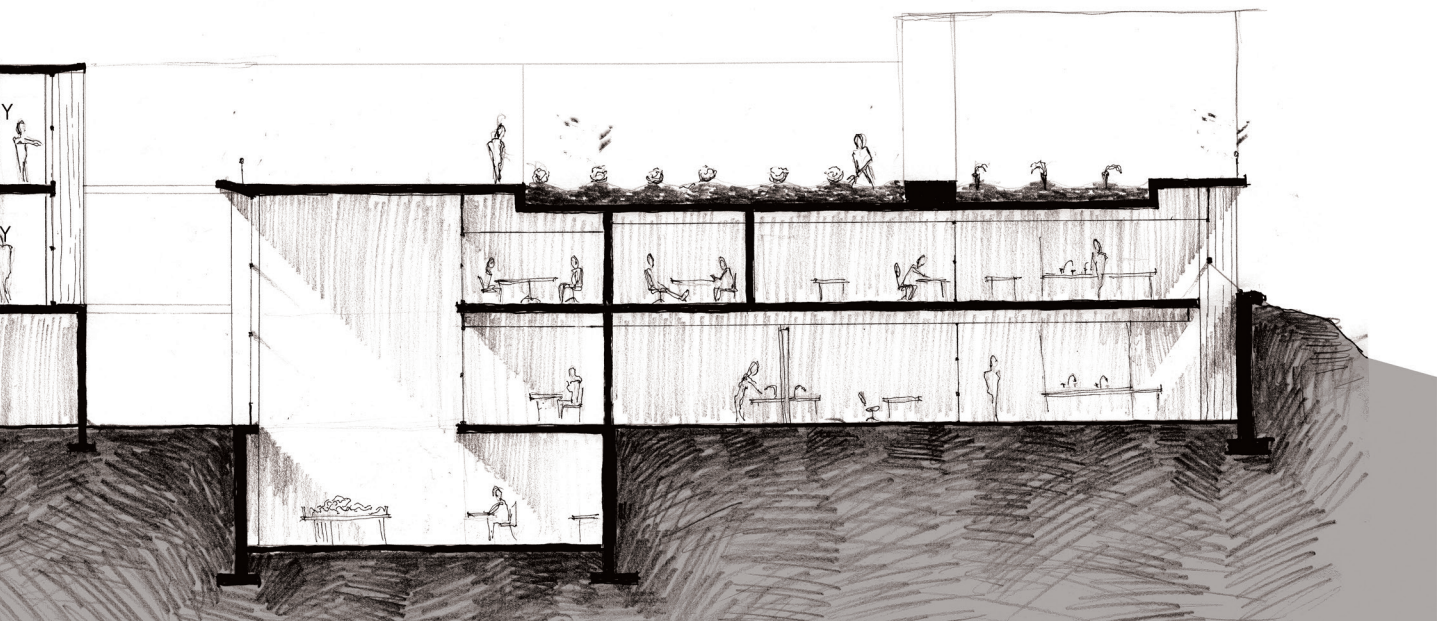

Figure 9.15 Longitudinal section through. Illustrating scale and function (author May 2013)

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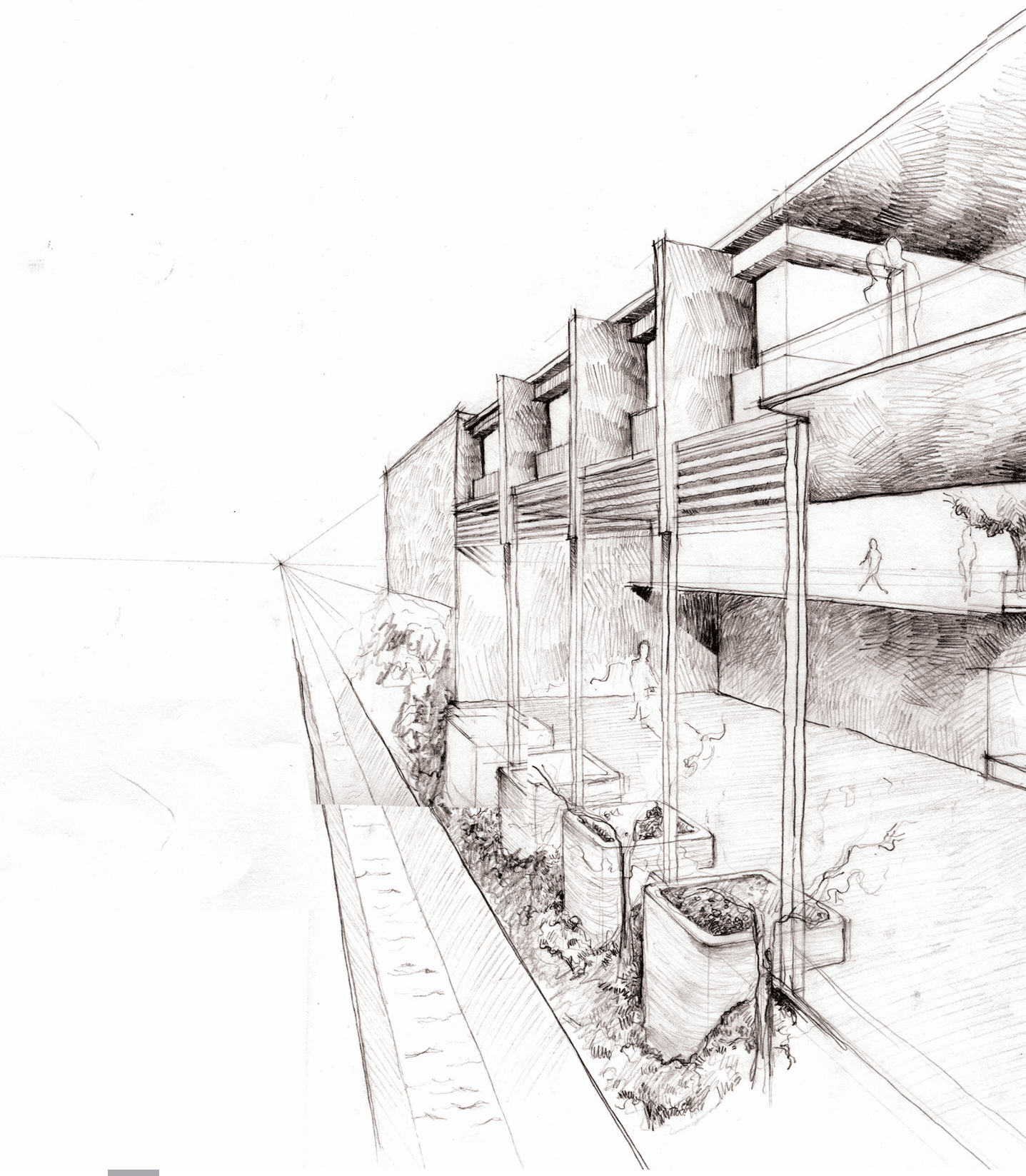

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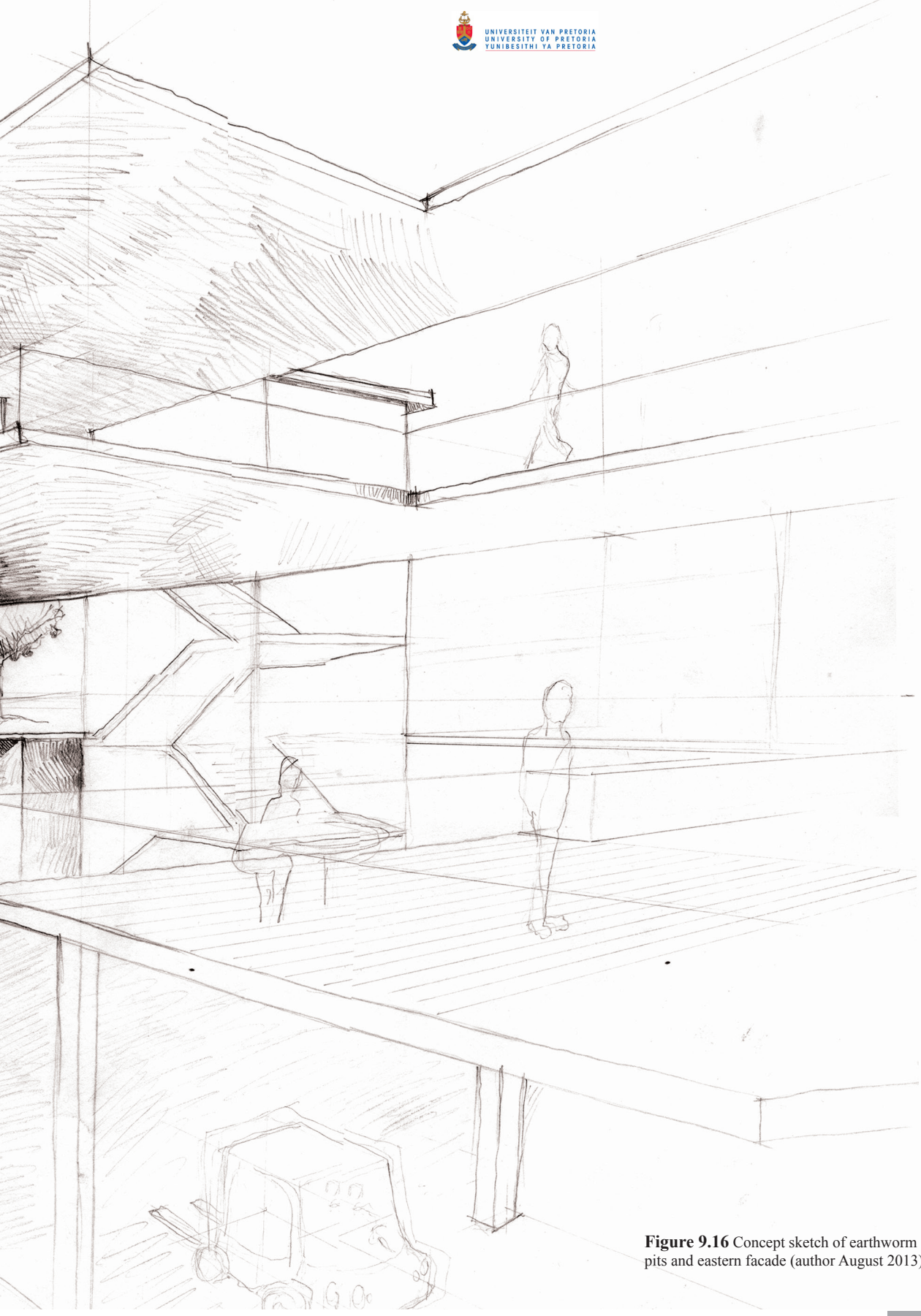

Figure 9.16 Concept sketch of earthworm pits and eastern facade (author August 2013)

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Public Space

According to the informant established by the framework, the building needed to become more public towards the public square. The footprint steps back and cuts in, creating programmed public spaces. The footprint becomes smaller allowing the public space to become bigger. The structure breaks up and becomes part of the performance square, this allows the public presence to become dominant on the site. The programmes are allocated in a private to public hierarchy to link with the appropriate publicness of the spaces. The pockets of defined public spaces are also placed within their respective functions in terms of publicness and levels of involvement. Their connections through “passageways” allow for the whole site to be experienced even though the whole site is not necessarily accessible to all members of the public.

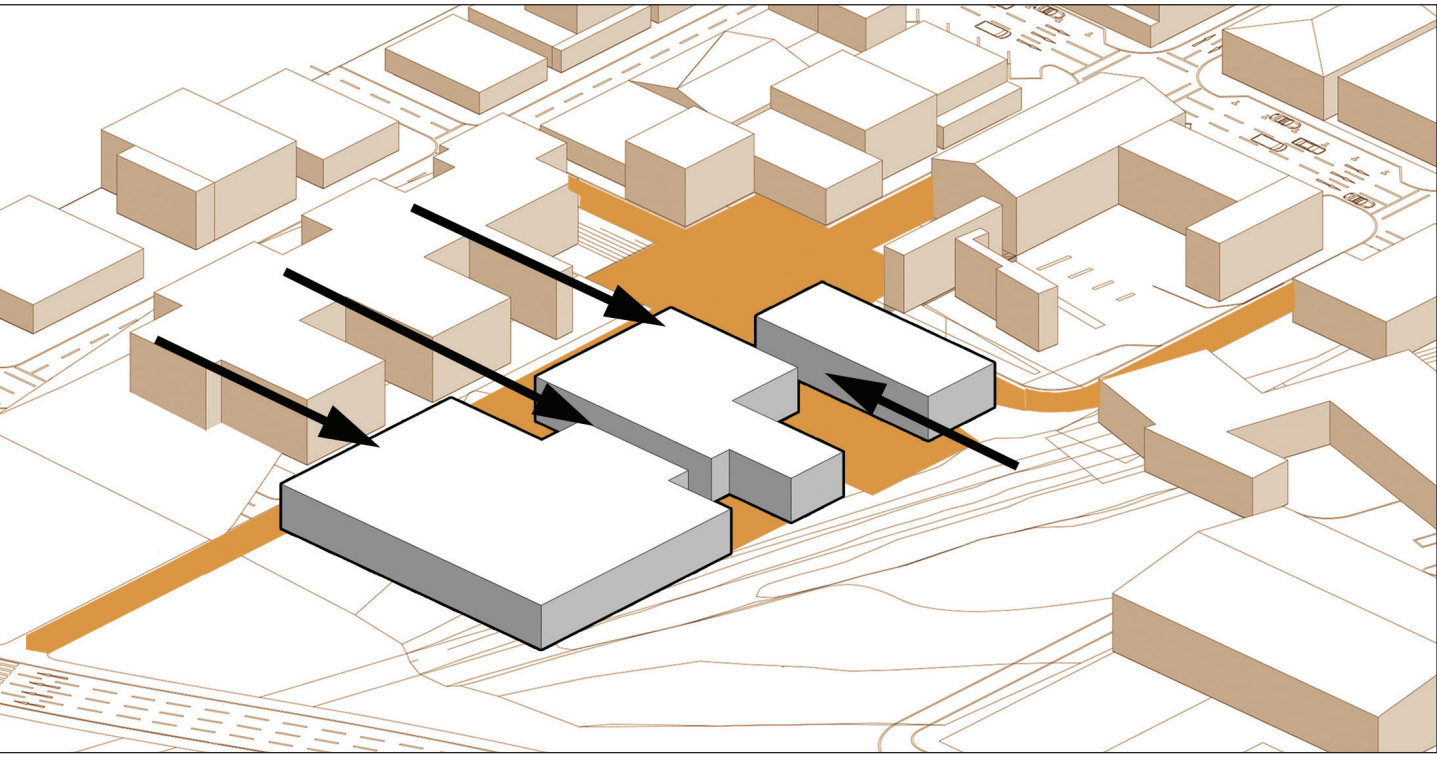

Figure 9.17 Diagram illustrating how the footprint becomes more public (author 2013)

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Natural Light

The site has an unfortunate north-south orientation. This furthers the argument to fragment the building; allowing for deeper penetration of natural light into the building. A courtyard and atrium were added to maximise the light penetration to all spaces. The private courtyard, which is only visually accessible to the public, will be used as a relaxation space as well as an informal meeting space for the general staff, entomologists and administrative users of the building. The atrium allows for light penetration into all the spaces, it also acts as a central point of departure uniting the spaces through movement creating impromptu interactions and visual links between programmatic functions and users. The building and its programmes are on display to the public making transparency an important element. All glazed facades are protected from direct sunlight.

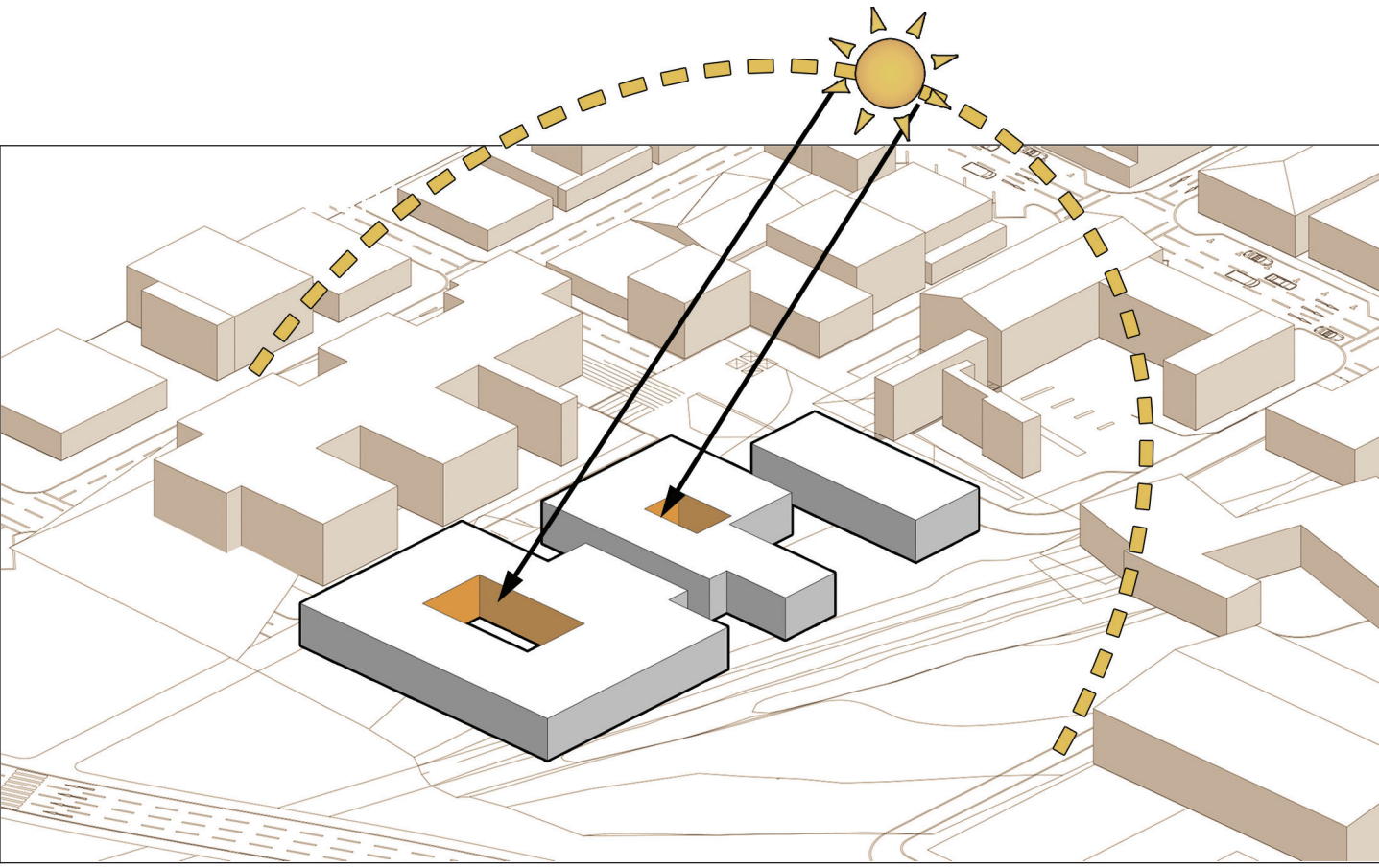

Figure 9.18 Diagram illustrating natural light penetration into spaces (author 2013)

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Geometry

As discussed in a previous chapter the site is defined by two major geometries; 10th Street and the Steenhovenspruit channel. The building needs to react to both simultaneously whilst integrating the appropriate responses to the other informants. The street is viewed as the public realm and it is the geometry on which all movements as well as public reference points are based. The building adopts the geometry of the river in its more private sections, as the programme and structure becomes more public it morphs into the geometry of the street. This creates a relationship and awareness of the river and relates it back to the urban fabric of Marabastad. The convergence of the two geometries allows for a more dynamic form, it integrates and promotes movement through the spaces.

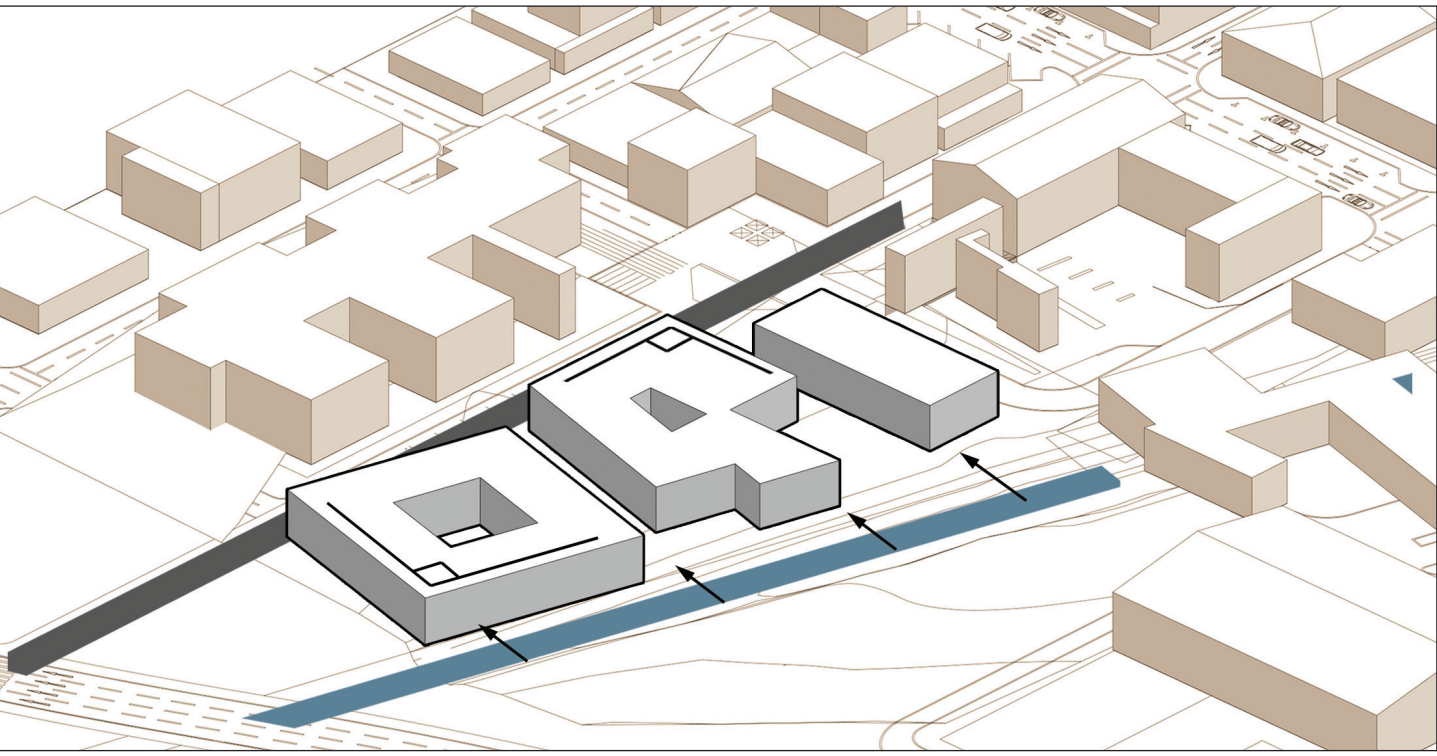

Figure 9.19 Diagram illustrating the influence of the major geometries on site (author 2013)

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Movement

The form of the building cuts back and opens up to allow for outdoor spill-out space from the restaurant. With the use of a strong diagonal line, the space draws energy off the public square. The space that is created is slightly more intimate and at a more pedestrian scale. Connections are made through movement where the edges of the building offer protection and create activities. This draws the public between the spaces, allowing the involved as well as the uninvolved users to explore and experience the various processes within the building. The building contains visual and experiential gems that are revealed to explorative users as rewards. The public is conditioned to associate the positive response elicited through the experience of space with the premise of entomophagy

The fragmented nature of the building gives preference to the pedestrian and public user. For the building to run optimally it needs to be connected seamlessly between programmes. Bridges between the two main structures are used to allow for a better flow between the cultivation processes.

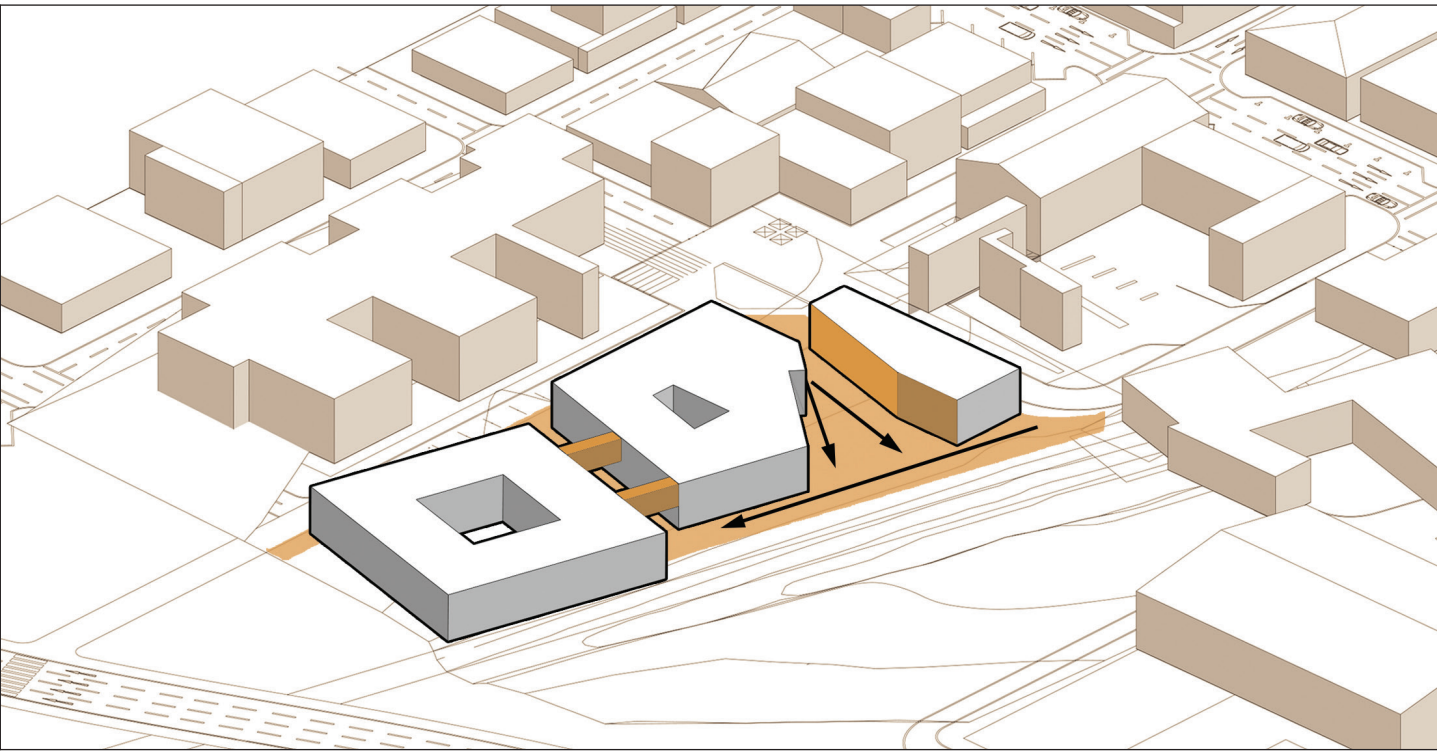

Figure 9.20 Diagram illustrating movement patterns on site an in building(author 2013)

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Natural Systems

One of the objectives within the framework is to establish a relationship between people and the natural systems. The building steps down allowing the basement to open up towards the Steenhovenspruit. The earthworm pits are placed in the basement because they require cool shady spaces, the pits reach down to connect with the concrete walls of the channel, this physical connection becomes sculptural and celebrates the relationship between the river and the building.

The outdoor seating area of the restaurant opens up and directs the visual focus towards the river. The space then steps down creating seating to allow users to enjoy the presence of water. The edge of the channelized river is softened by allowing natural vegetation to grow. The stairs/ seats act as a threshold between hard paved space and soft vegetated space, they are made from porous pavers, allowing vegetation to grow but remaining sturdy enough to take human traffic.

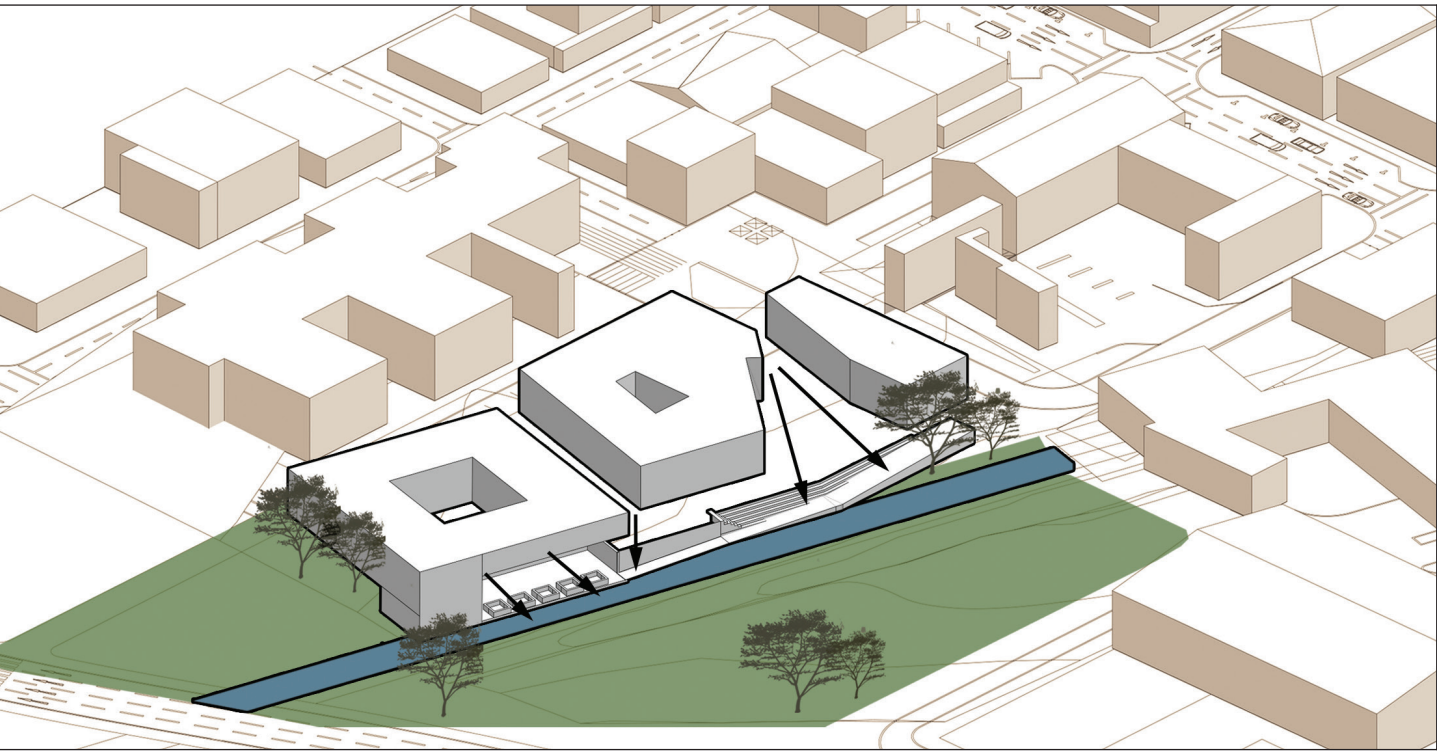

Figure 9.21 Diagram illustrating the building opening towards the natural systems (author 2013)

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Scale and Hierarchy

The building sits in a precinct of a delicate scale. The relation to the pedestrian scale is of utmost importance. The edges of the building step down to meet the pedestrian on the public edges. The building steps up to three storeys on the river side to increase the buildings productivity and to relate to the scale of the warehouse structure across the Steenhovenspruit. The site slopes from the south down towards the public square. The design utilizes this natural slope to scale the building down from the private section to the more public/pedestrian scale.

The structure celebrates its function and gives visual hierarchy to the insect cultivation spaces. The concrete cultivation towers are the highest point of the building, located on the southern end, they extrude out of the ground and become a solid mass that the structure seems to latch on to. The locust cage is on the north west corner of the structure, it is wrapped in perforated steel sheeting. It will be lit up at night and becomes a sculptural identity of the building and a reference point from the performance square.

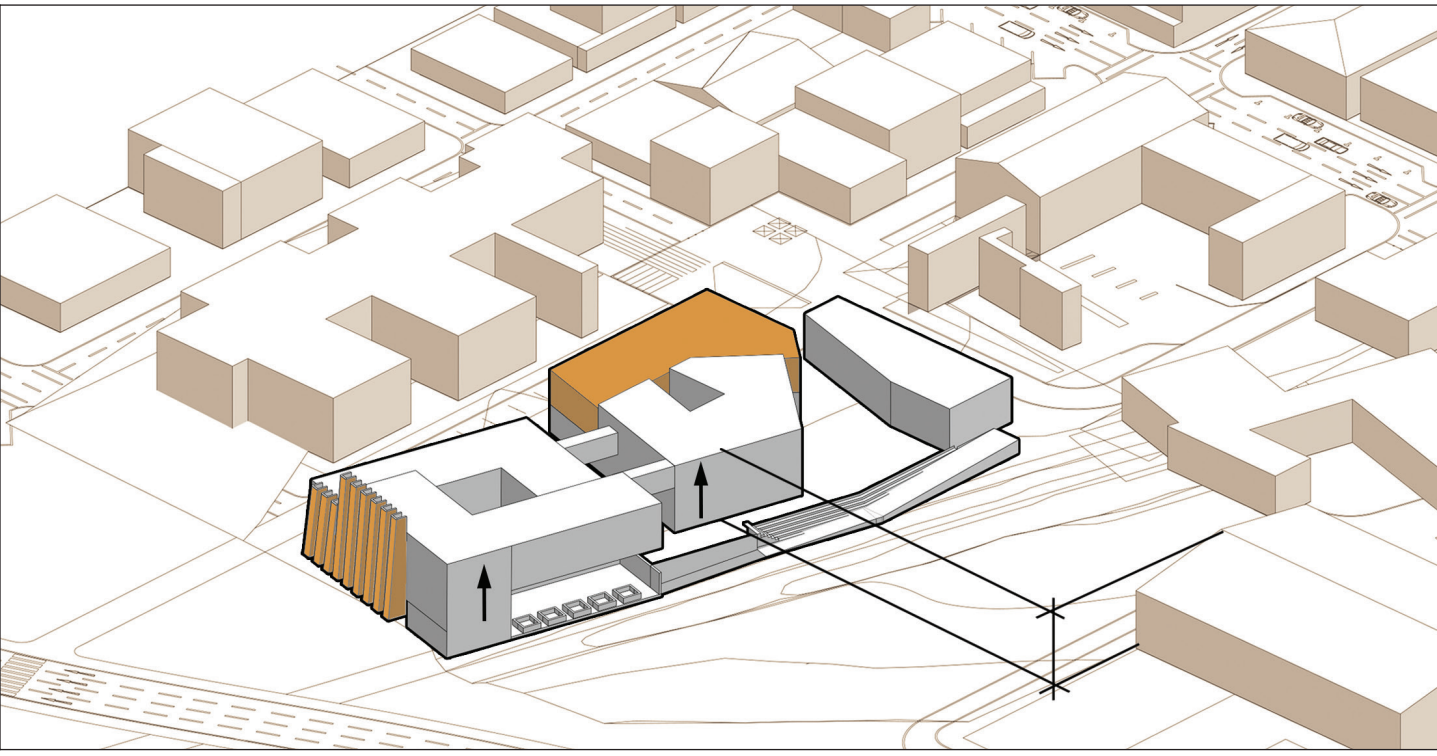

Figure 9.22 Diagram illustrating changes in scale and establishing hierarchy (author 2013)

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Functions

The building is organised into programmatic zones namely; cultivation, processing, administrative, movement, service core and public interface. The zones are arranged to associate with the public spaces created on the site, they also need to correlate to each other for the programme and function of the building to be successful. There are three cultivation spaces; the insect towers, the locust cage and the earthworm/compost heap pits. The cultivation zones become features within the architecture which celebrates the function of the building and gives the building its identity.

The restaurant is the most public component of the programme and is therefore placed on the most public connection of the site; the edge of the performance square. The packaging needs to be connected to the distribution centre which will be located in close proximity to the market space running along 10th Street. This will blur the lines between the market and the building, creating one unified experience. The processing and drying of the insects is the most visually stimulating stage of production. It is the only stage where all the insects are handled in one position at the same time. This will therefore be visually accessed from the public realm of the restaurant.

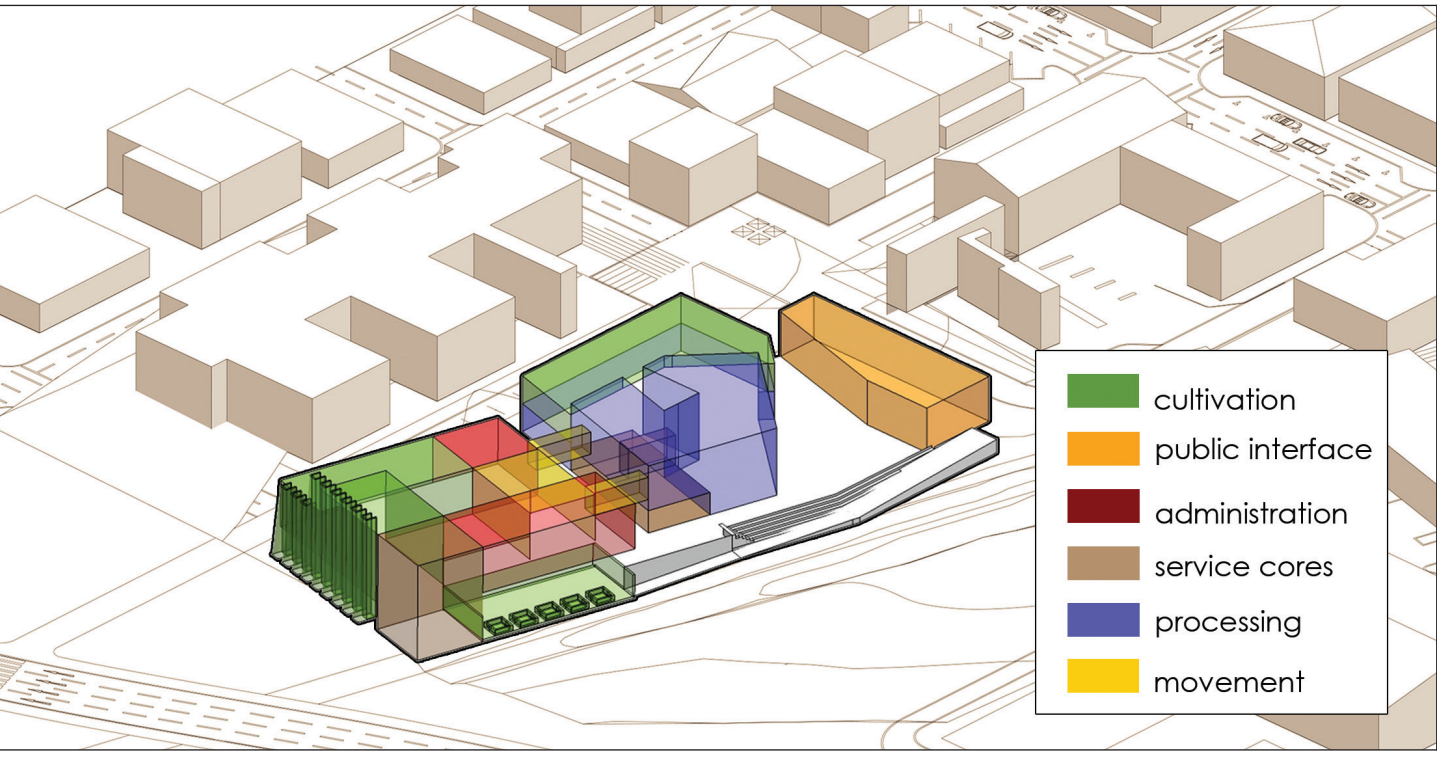

Figure 9.23 Diagram illustrating positioning of various programmatic functions (author 2013)

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Composite Structure

The exhibition space needs to be “discovered”, this will allow a gradual introduction into the space. In terms of the conditioning theory the exhibition space will use a flooding technique which is head-on confrontation. It is the ultimate exposure to the premise, where people can physically interact with live insects and gain a further understanding of the processes.

Administration offices are placed away from the public realm to create more private working environments. There are two service cores in the building that support the functions of the building. The services are grouped together to allow for ease of management and maintenance, it allows for grey water and energy systems to be put into place.

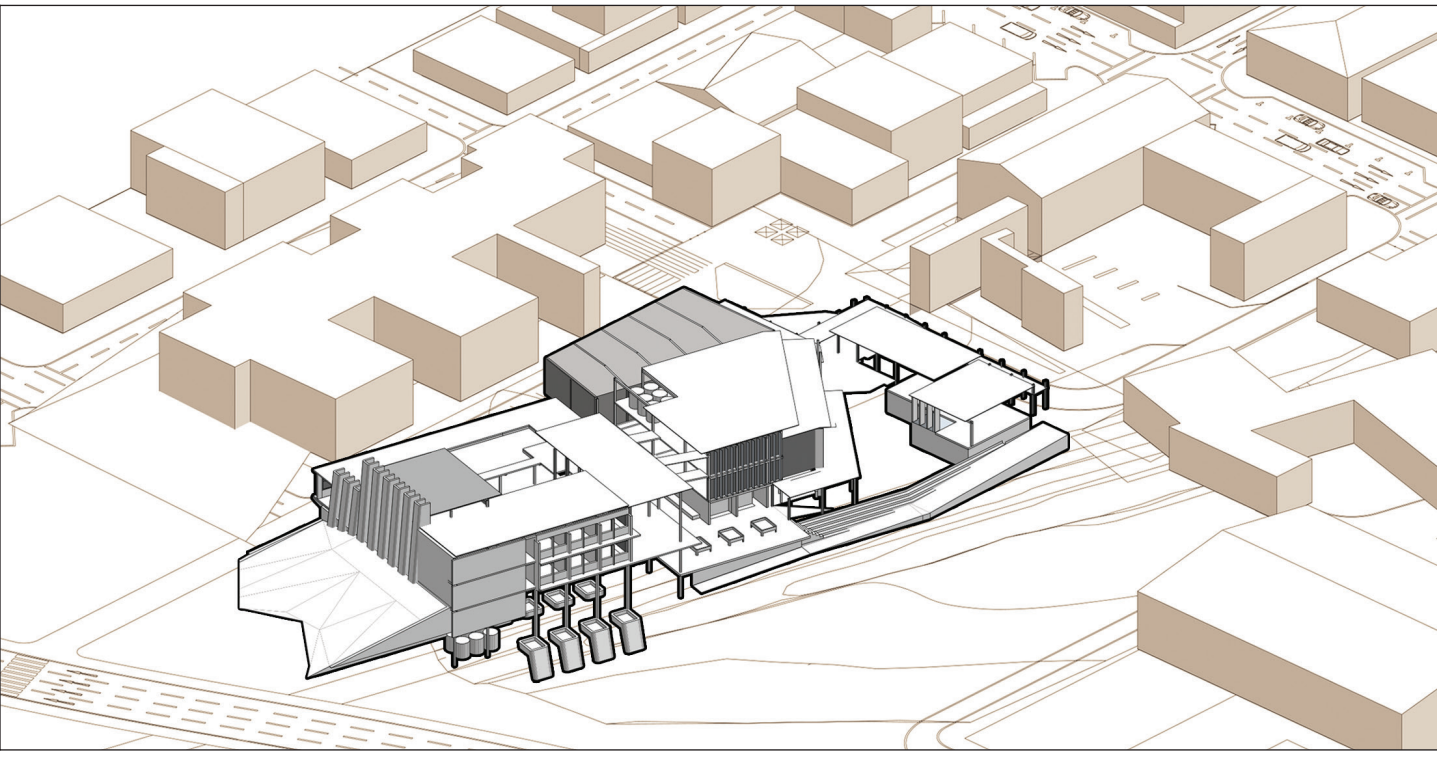

Figure 9.24 Diagram of composite structure (author 2013)

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Design Synthesis

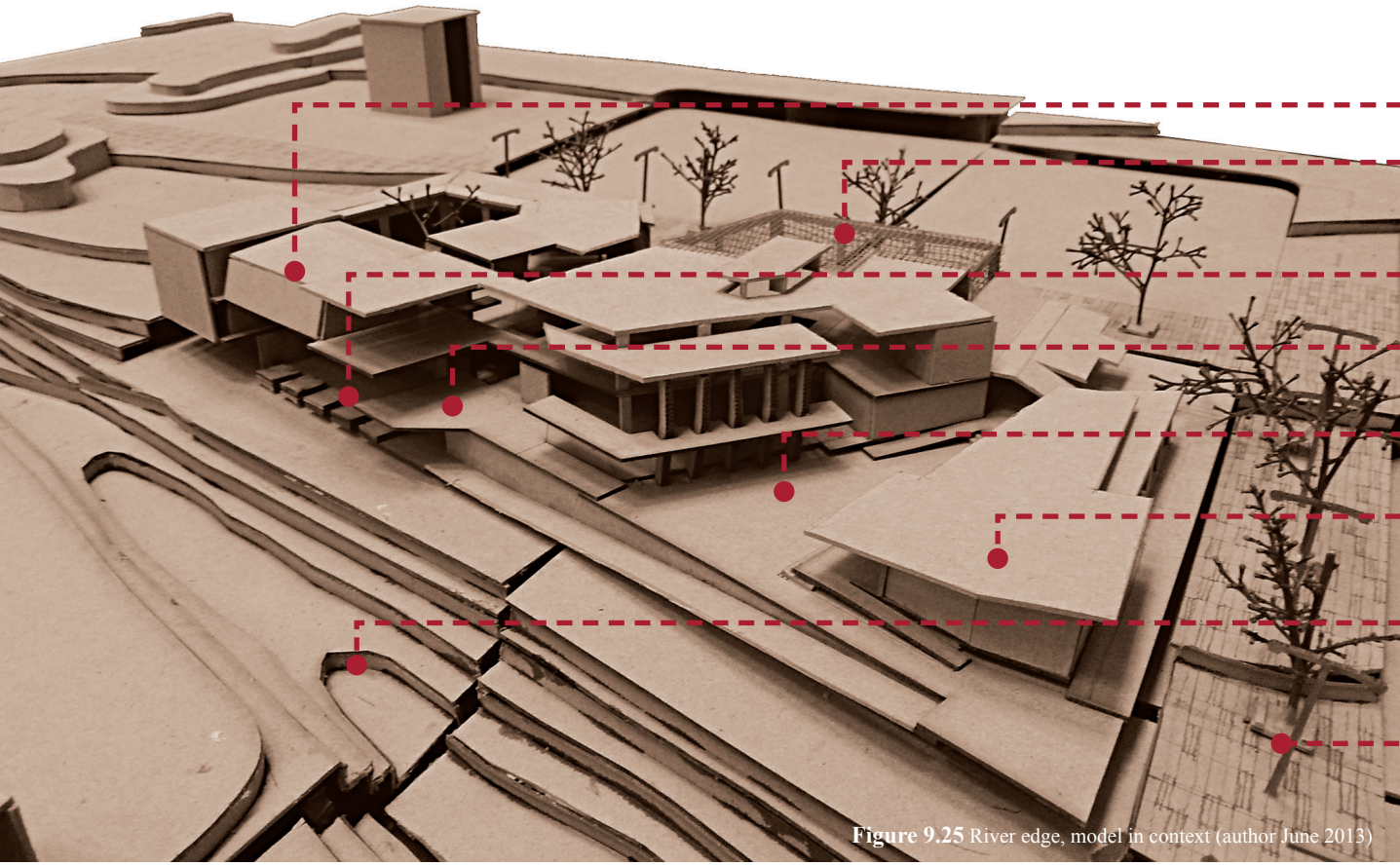

Figure 9.25 River edge, model in context (author June 2013)

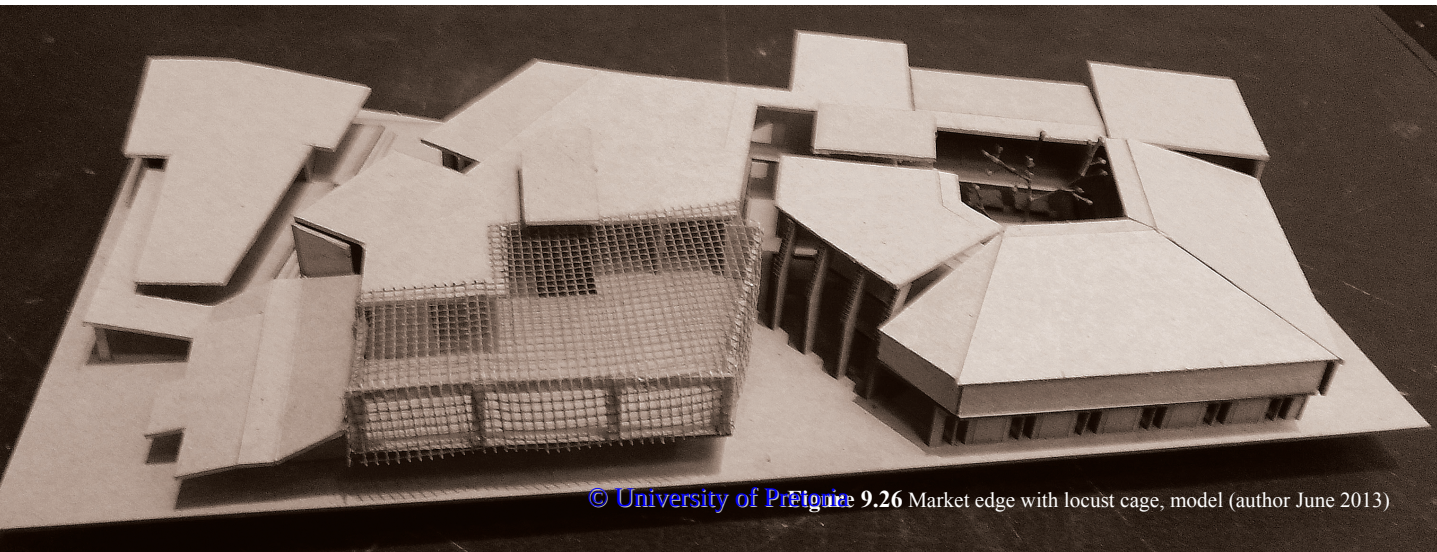

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Figure 9.26 Market edge with locust cage, model (author June 2013)

- Offices and Administration
- Locust Cage
- Earthworm Pits
- Exhibition Space
- Outdoor Restaurant Space
- Restaurant Kitchen
- Steenhovenspruit
- Grand Street

The building is designed to create experience around ritual. It adopts and infiltrates rituals from the context and proposes new ones within the programme of the building. The form and edges create activity, it encourages flow and movement, engaging users and stimulating different levels of experience. The ground plane has a specific relationship with the shell of the building, dictating the levels of publicness and exposure.

The nature of the programme is very industrial in terms of its productive processes. The objective of the design is to alter the perception of entomophagy and the processes associated with it to a more relatable and positive experience. The building will explore different approaches in terms of its materiality to react to set objectives within the informants.

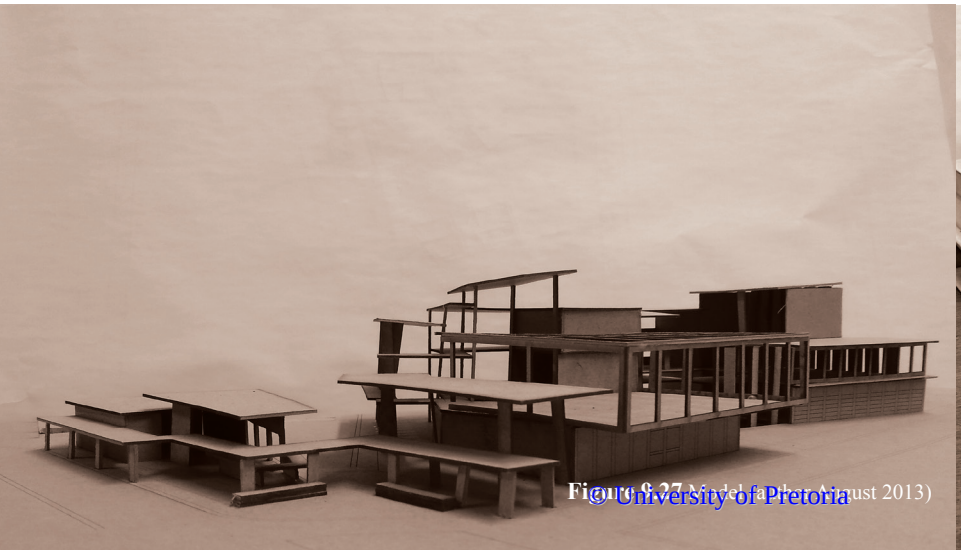

Figure 9.27 Model (author August 2013)

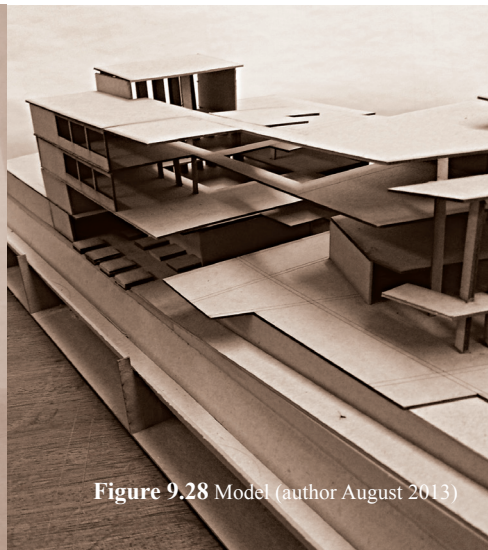

Figure 9.28 Model (author August 2013)

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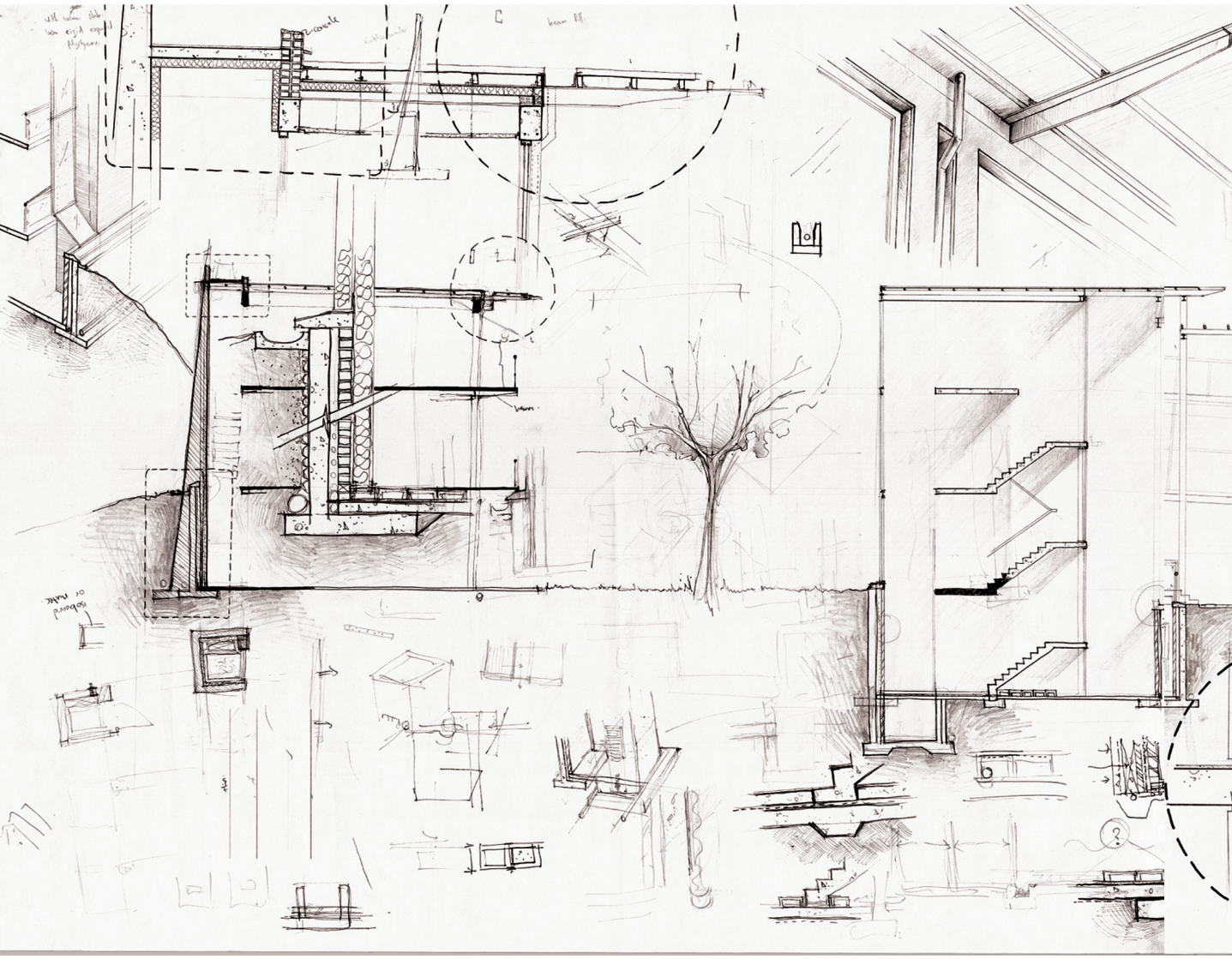
Chapter Ten

Technical Resolution



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Technological Approach

The technology of the building reflects the requirements set up by the informants and concept of the building. Together they form an overall framework on which technological decisions are based. The building illustrates progression in publicness and exposure. The materiality translates these concepts into a public understanding and dictates activity relative to the level of progression in the public realm. The context of the building is Marabastad; a very humble and delicate precinct. The technology expressed in the building reflects the simplicity of its context while the material selection reflects the texture. Joints between materials are easily understood. This approach avoids alienating the local residents and the contextual aesthetic of technology.

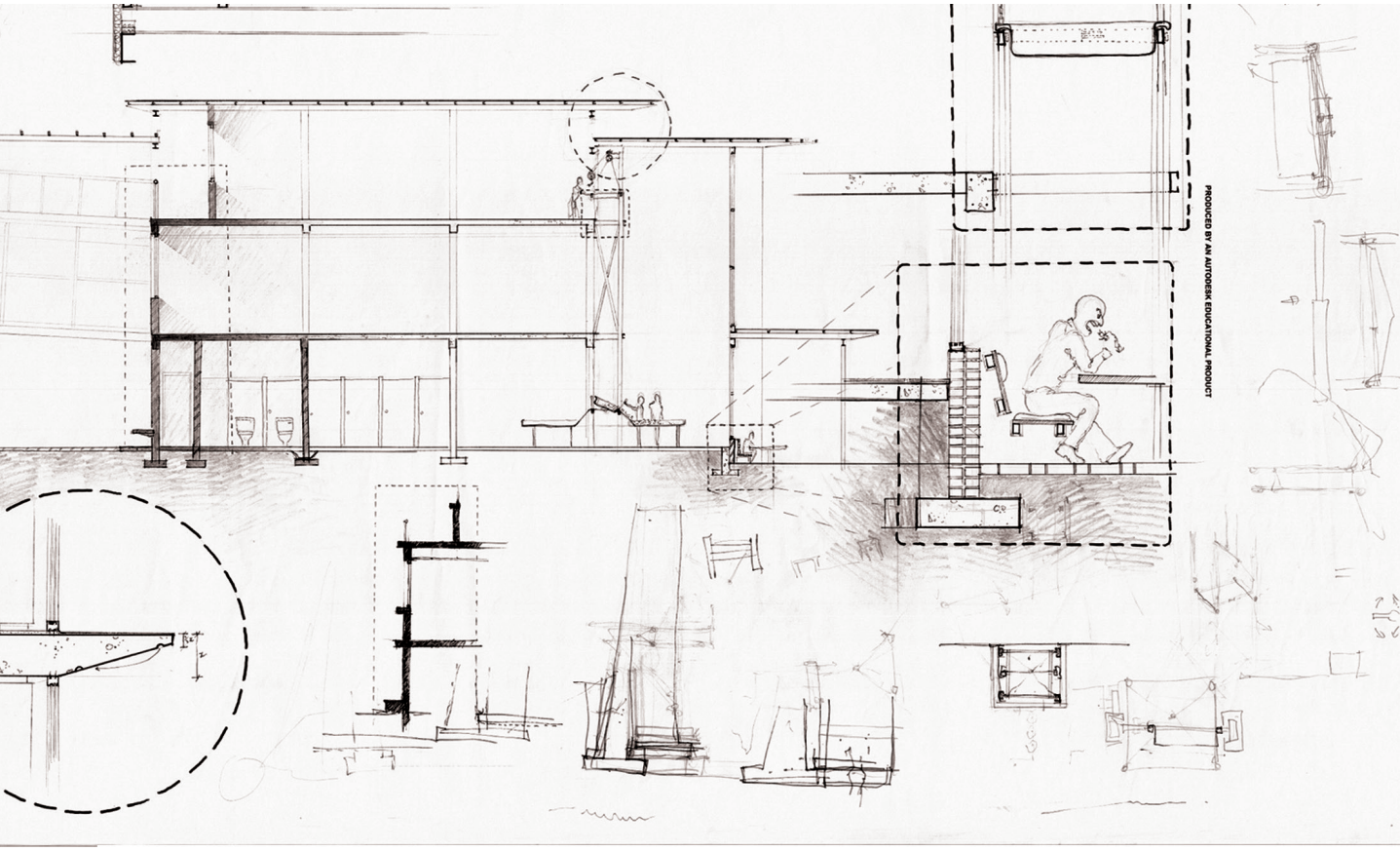

Figure 10.1 Longitudinal section with technological exploration (author September 2013)

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Tectonic concept

The tectonic concept of the building is a culmination of the relationships between the site, the users, the programme and the overall design concept. Figure 10.3 illustrates a very heavy tectonic relationship with the landscape. The insect towers are dug into the earth, nestling into the ground plane creating a solid more private edge onto which the rest of the form latches. It creates a visual hierarchy using mass and height. The horizontal plane is manipulated to create space and define experience. In spaces of exploration and public activity, the horizontal plane creates a floating effect freeing up space and allowing the structure to progress from heavy and enclosed to light and exposed.

The horizontal ground plane is cut into and depressed allowing a relationship with the river to ensue. The structure steps down to meet the concrete river channel. Visually, the building seemingly grows out from the river channel. The roof is used as an element to tie the fragmented footprint of the building together. It is a pergola roof that floats above the stereotomic structure. The structural elements are used to connect the roofs at different levels allowing the scale of the building to be manipulated, stepping down towards the public realm. The roof also allows breaks, becoming completely exposed, displaying only its structural elements, this illustrates different levels of exposure as the building becomes lighter and disintegrates into space. The breaks in the roof also allow for the building to receive more natural light, it defines space and plays on the idea of inside outside and vice versa. This approach makes users aware of their natural environment and develops a relationship with the daily changing conditions of the external climate.

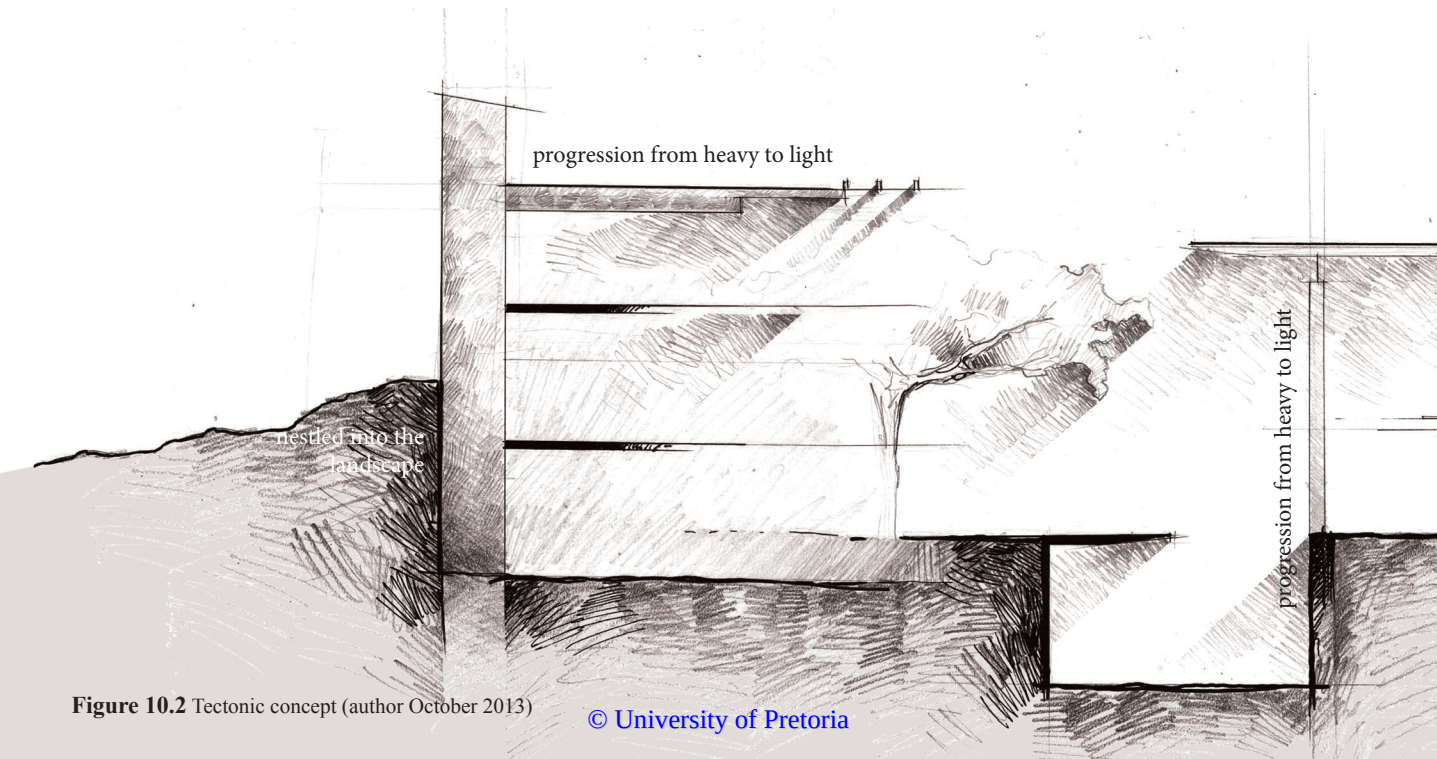

Figure 10.2 Tectonic concept (author October 2013)

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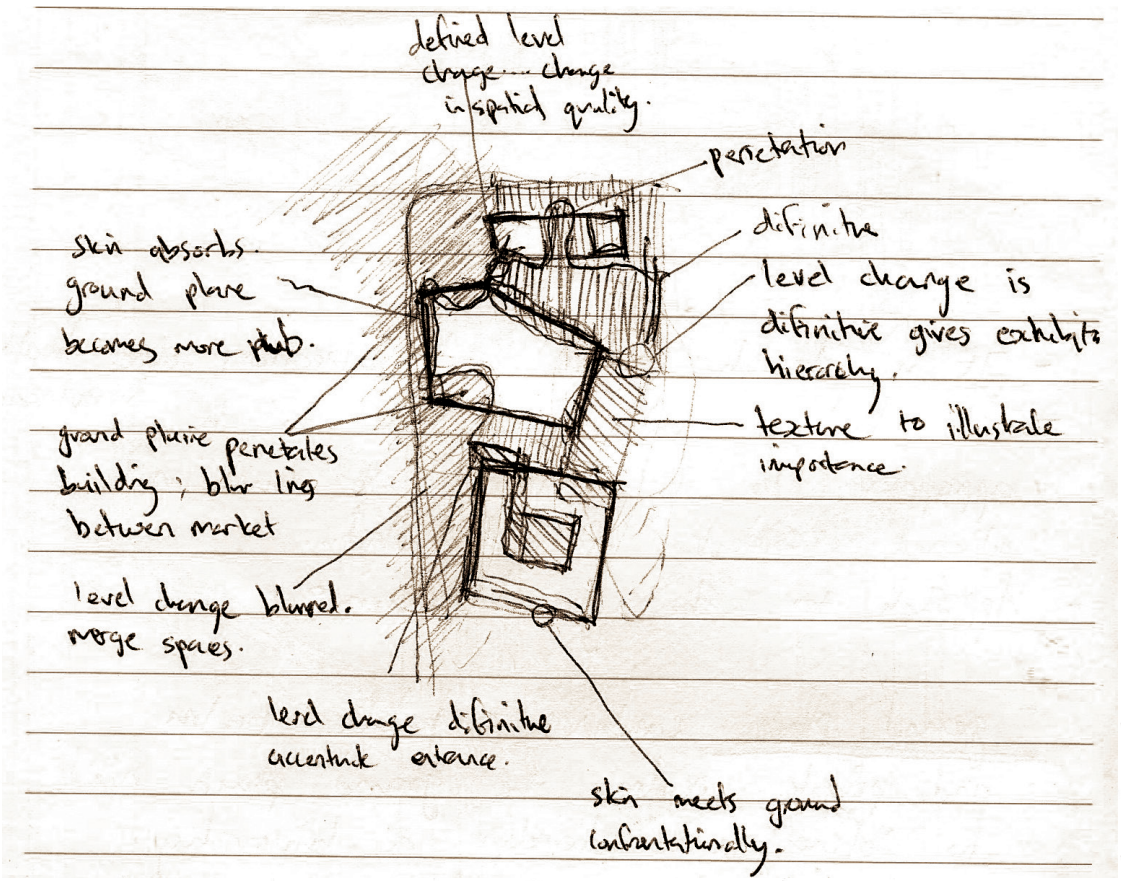
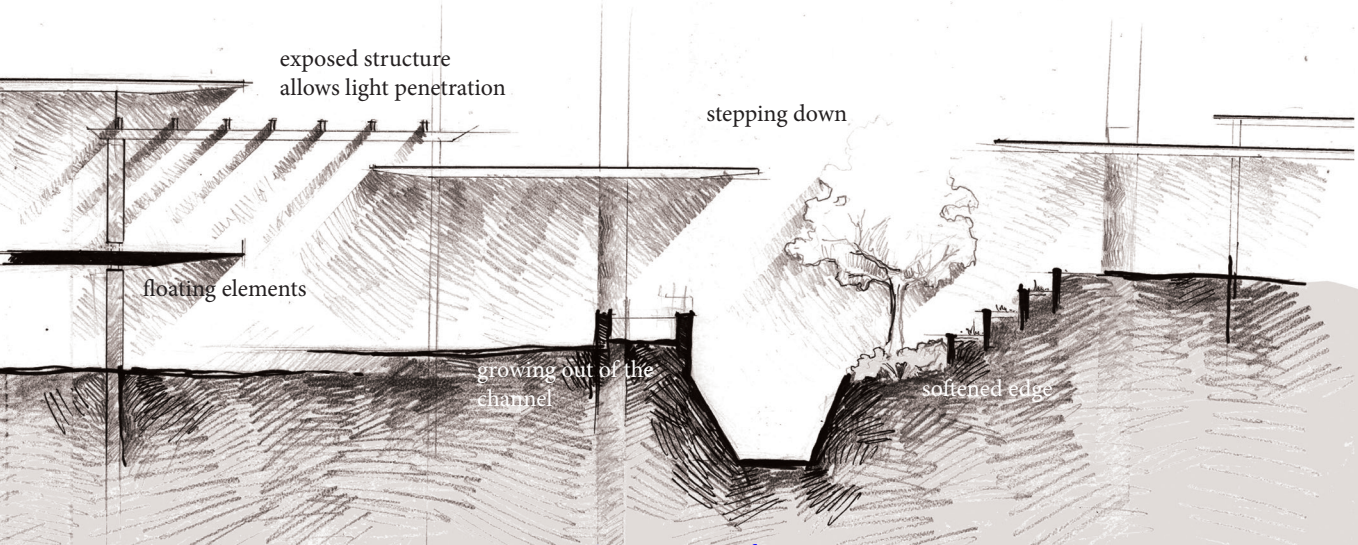
Figure 10.3 The skin as a mediator, expressed through technology (author September 2013)





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Materiality

The materials are selected in accordance with the relation to the context, the design informants and concept of the building. In the context of Marabastad there is a certain language that is displayed with the use of humble materials. The fabric within the precinct is textured with local materials used in basic forms. Many structures and shelters are fashioned through local knowledge and workmanship. It is within this scope that the structure will be built. Materials are selected as to not alienate local residents and will be easily relatable to create a seamless introduction of the new into the old.

The building needs to display heaviness in its relationship to the landscape, it creates pockets of privacy that need to disintegrate into publicness and transparency. Off-shutter concrete is selected to create an opaqueness of privacy, folding and wrapping to form the insect towers- creating the illusion of solid mass. The towers are sculptural creating dominance in the landscape and an introduction into the cultural precinct.

The ground plane is viewed as the public domain, paving is extended from existing walkways into the site. By manipulating the geometry and orientation of the paving, movement patterns are dictated and spaces are defined. Height changes on the ground plane are used as a medium to define space allowing users to understand and experience the spaces differently. The level changes are defined with a change of material to become a threshold, as is expressed in figure 10.6. However, the level change from the market space into the distribution centre is made to look and feel as one continuous space to blur the lines between the programmes.



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The Skin

The skin of the building defines the relationship that is experienced by the public relative to the programme, it dictates the level of inclusivity and is the first physical interaction that the public encounters. The connection between the skin of the building and the ground plane articulates the relationship that the building has with the public. These connection points illustrate the publicness of defined spaces. As the building becomes more public it allows the ground plane to penetrate the skin. The building uses concrete to define programmes belonging to cultivation and exposed masonry brickwork to define public spaces. The masonry is a visual connection to the existing fabric of Marabastad. The skin is comprised of an array of material progressing from heavy and opaque to lighter and transparent.



Figure 10.4 Preliminary Material palette (author September 2013)

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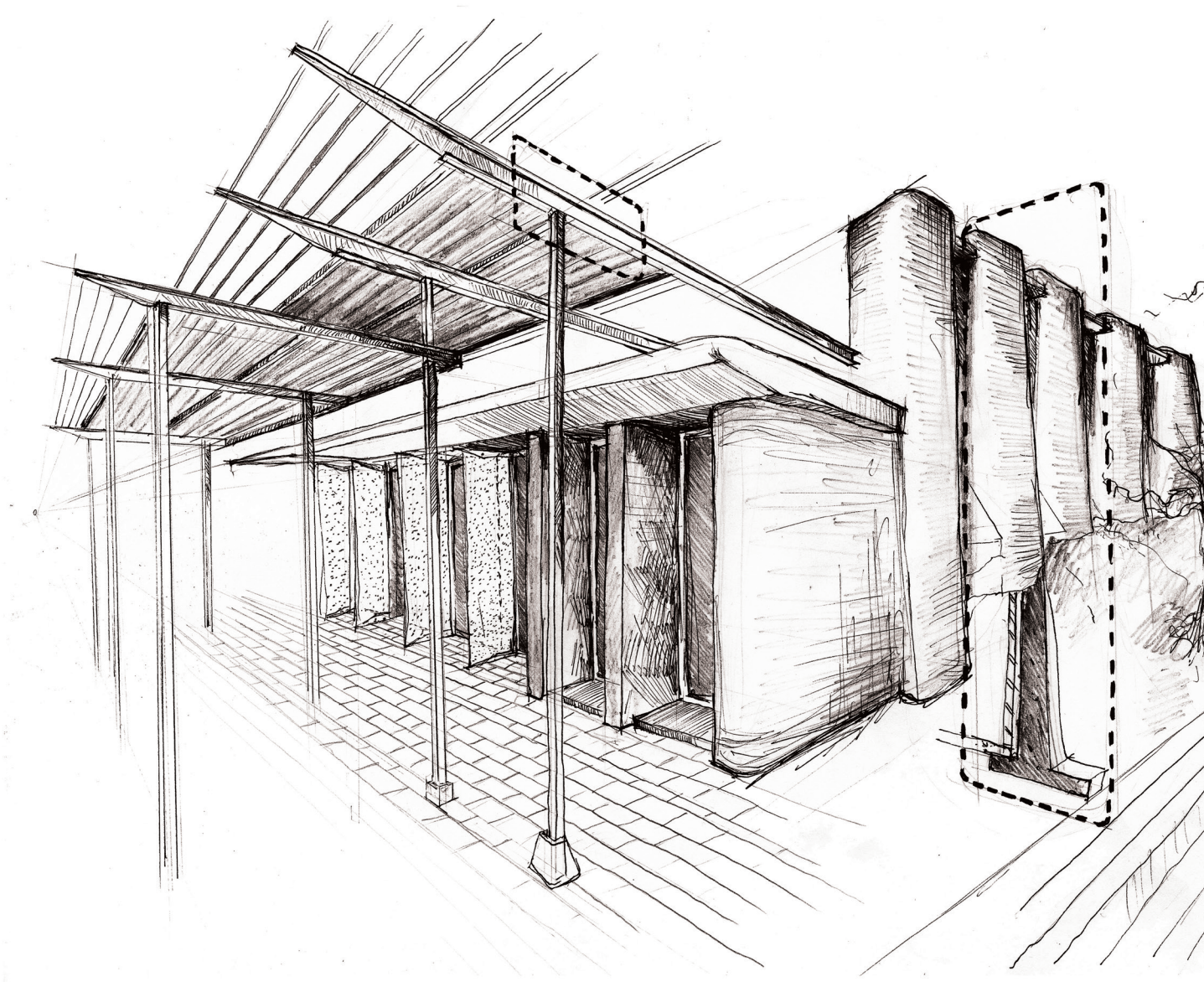
Materiality



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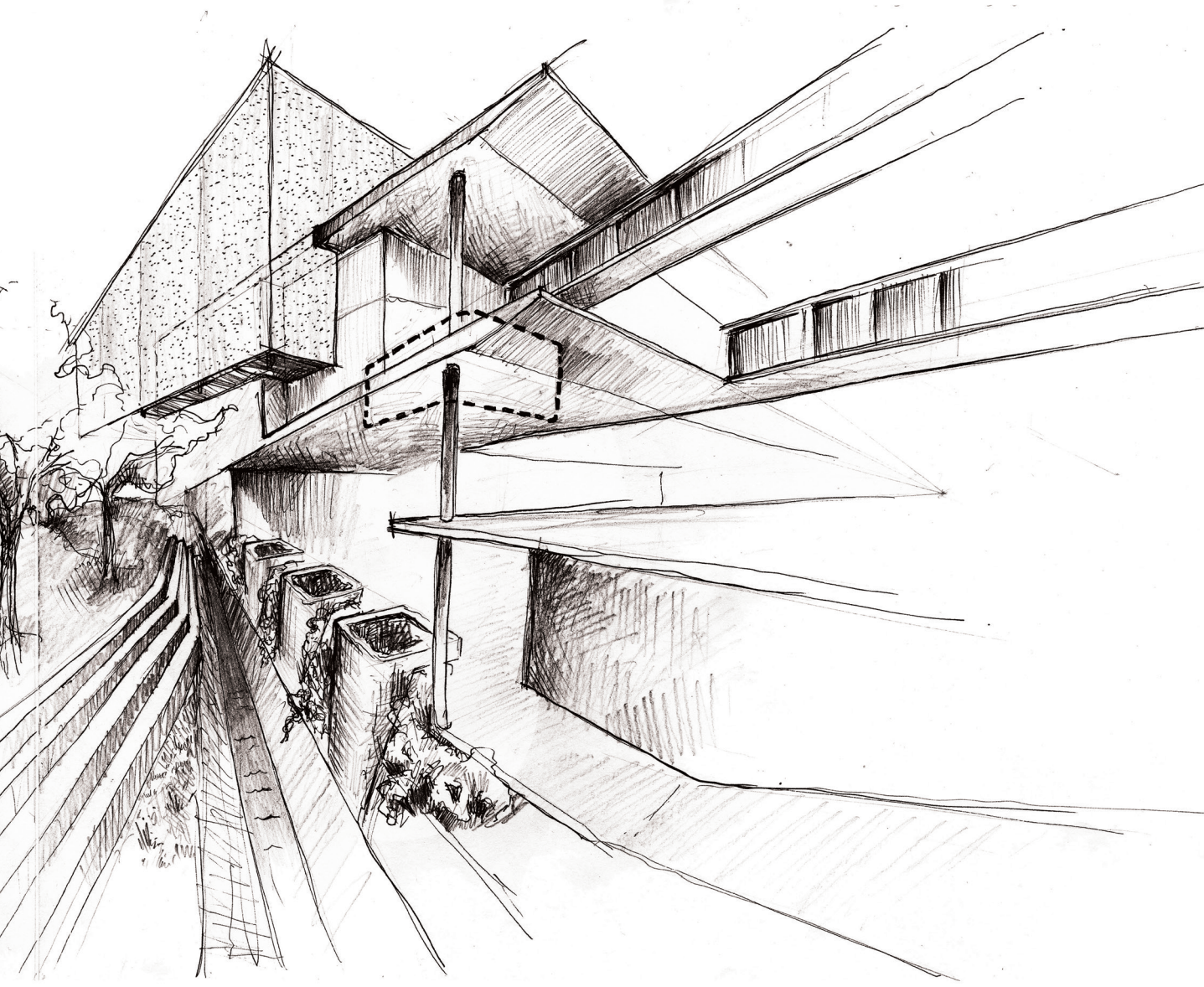

Figure 10.5 Concept sketch expressing the tectonic nature and materiality of the building (author September 2013)

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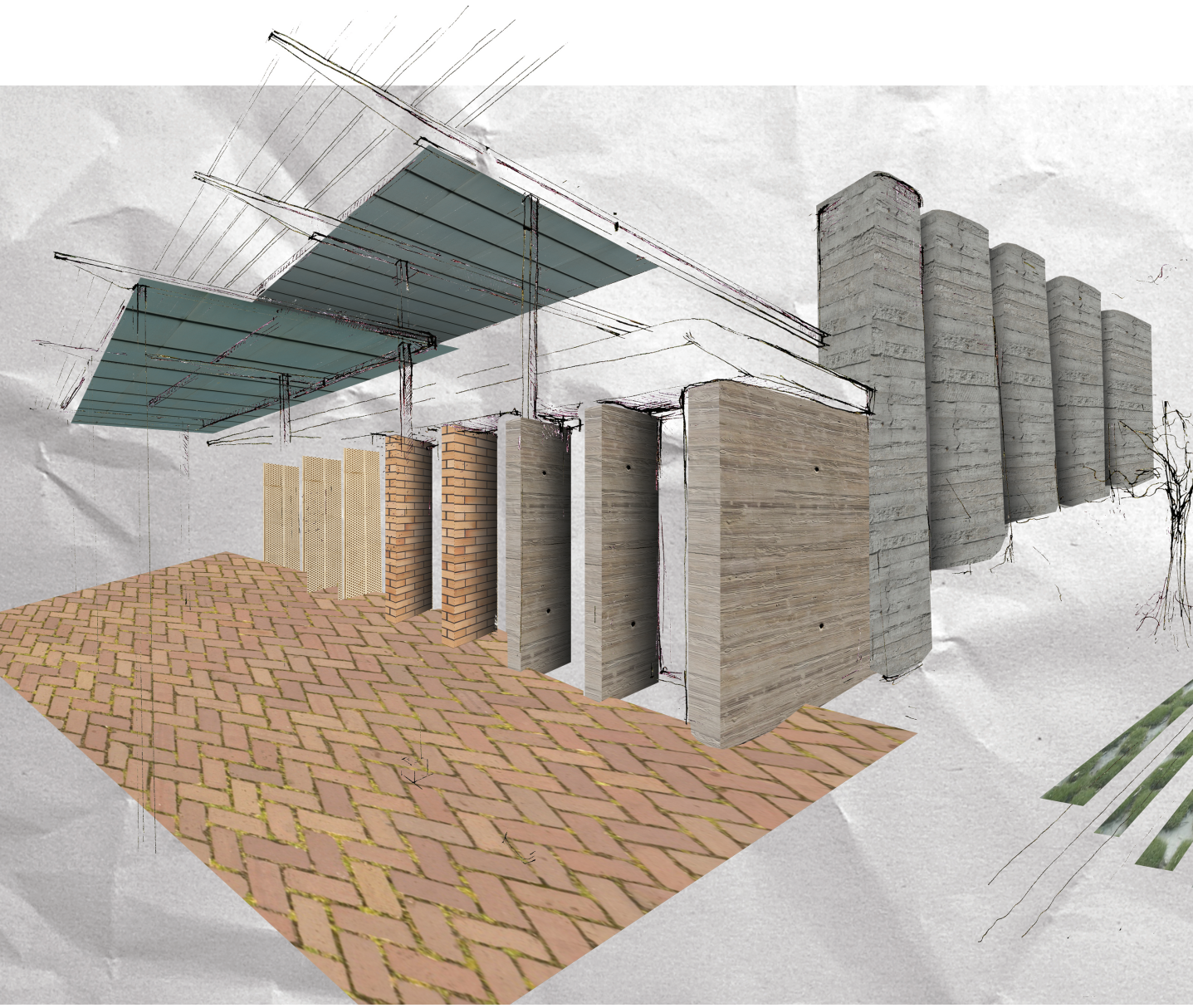
Materiality



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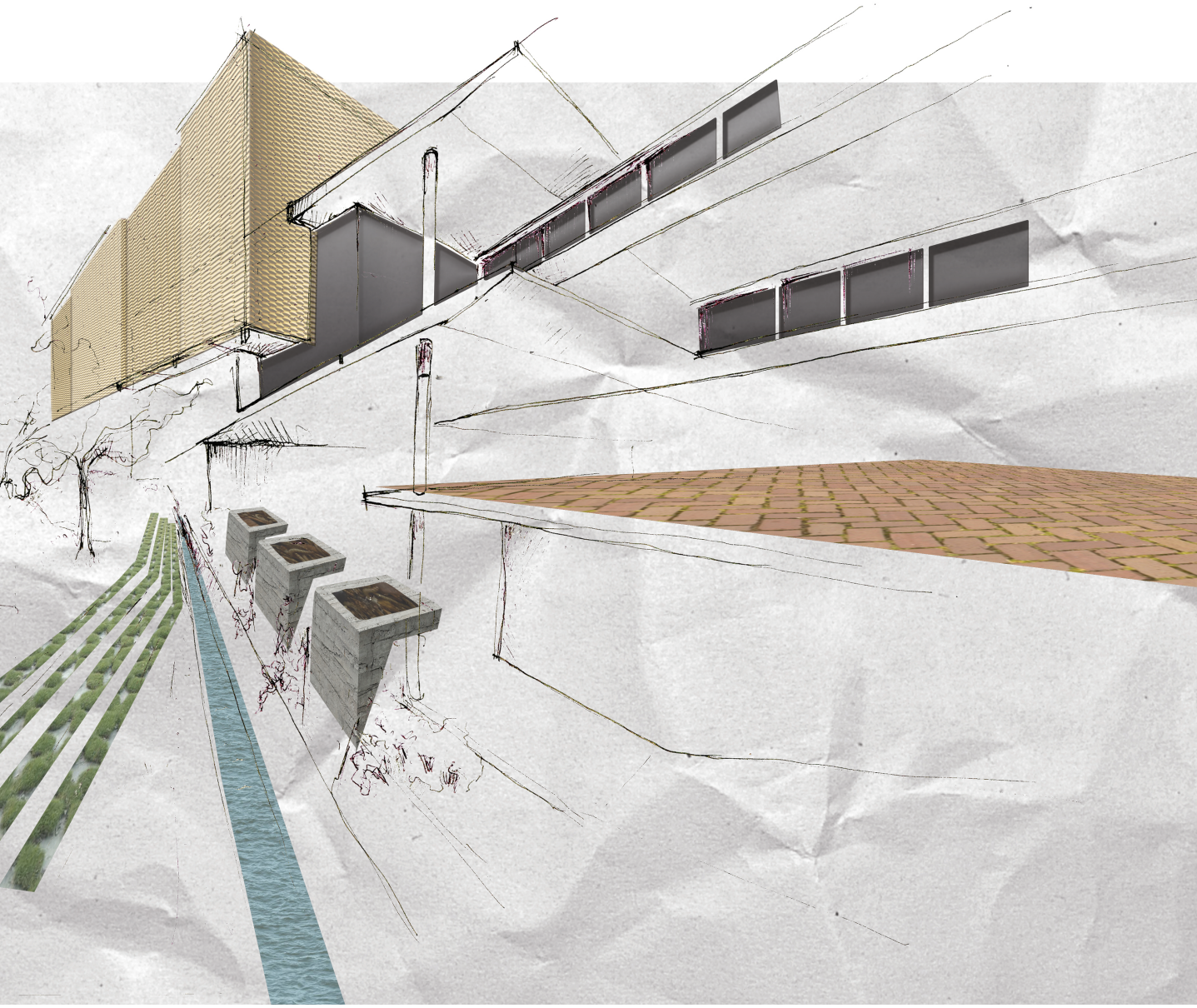

Figure 10.6 Concept sketch expressing the tectonic nature and materiality of the building (author September 2013)

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Tectonic Phasing

The diagrams illustrate a progression of the construction, they also portray the manifestation of the concept into an architectural form giving an understanding of spacial experience both from an internal and external point of view. In figure 10.6 the ground plane is manipulated to articulate space and creates a dialogue with the river. It reacts to the natural slope of the site, progressively stepping the spaces down from the south-western corner to the north-eastern corner. The changes in levels are used to act as thresholds and define space.

In figure 10.7 the concrete structure of the building visibly expresses the tectonic nature of the concept, moving from heavy and opaque to light and transparent. As the building extends vertically the elements become lighter. The roof is supported by lightweight steel construction with large overhangs. The roof becomes more of a floating element that united the form of the building and steps down to meet the public realm at a more pedestrian level. The skin of the building articulates the materiality of the building. It responds to the climate by protecting all fenestration from direct sunlight with louvered systems or overhangs. The skin is also the first layer of interaction with the public and defines their involvement and dictates activities.

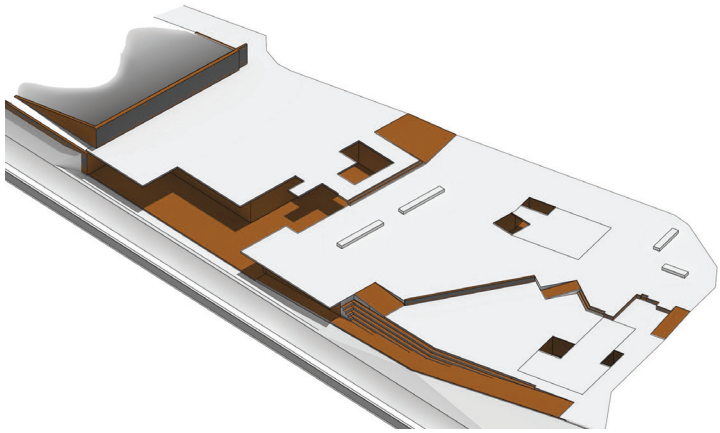

Figure 10.7 The ground plane is used to dictate movement and define space (author 2013)

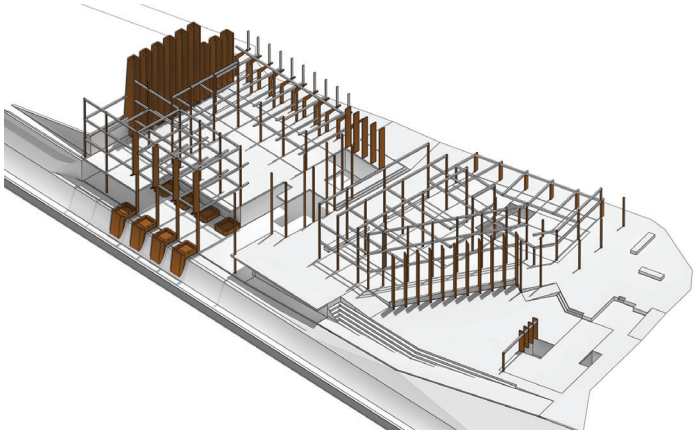

Figure 10.8 Concrete is used to create privacy. It illustrates a heaviness into a lightness (author 2013)

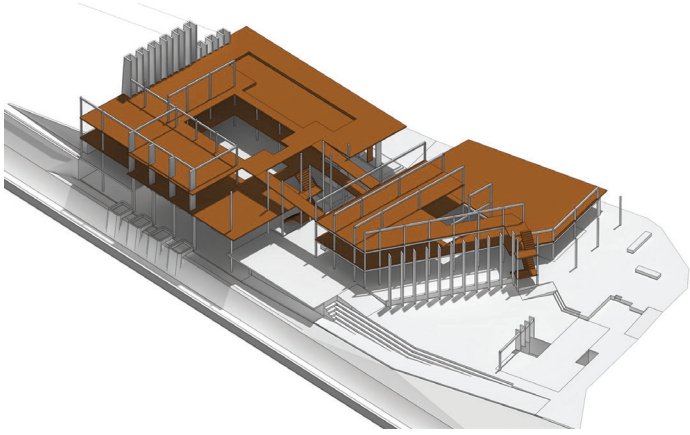

Figure 10.9 The slabs create overhangs and define space. They become lighter floating elements to illustrate exposure.(author 2013)

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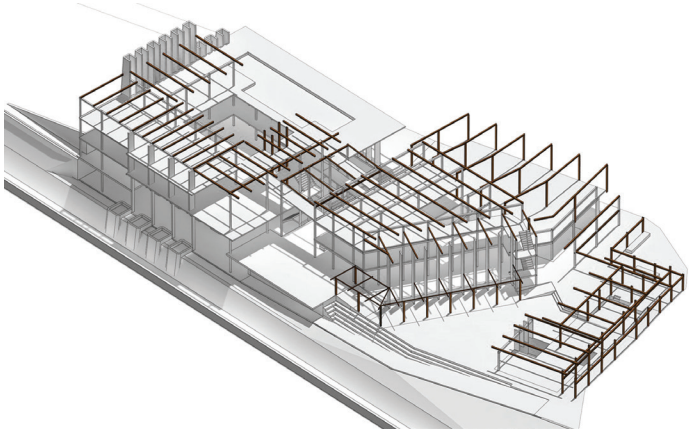
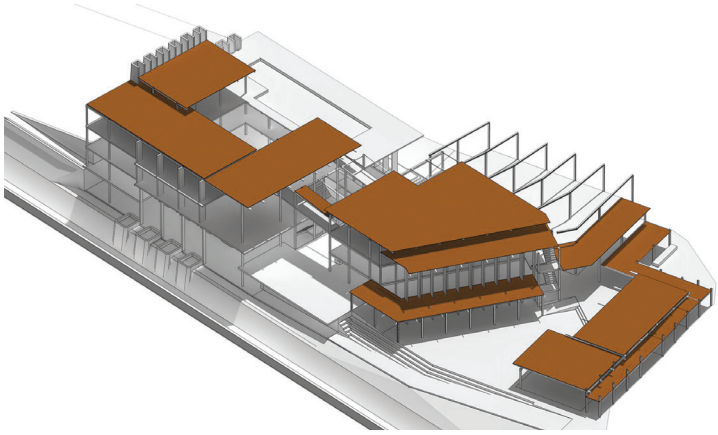


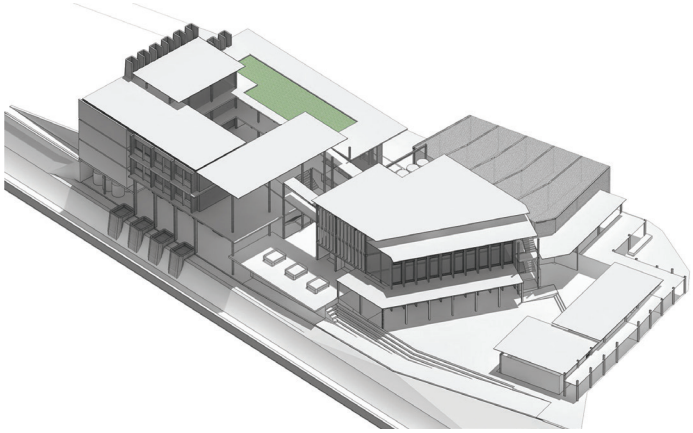
Primary Steel Structure

Figure 10.10 The building becomes lighter as it extends into the sky with the use of lightwieght steel (author 2013)



Roof Sheeting

Figure 10.11 Steel roof sheeting is used on the pergola roof. It is used to unite the form and manipulate scale (author 2013)



Composite Structure

Figure 10.12 The skin of the building articulates the interaction with the public.(author 2013)

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Building Systems

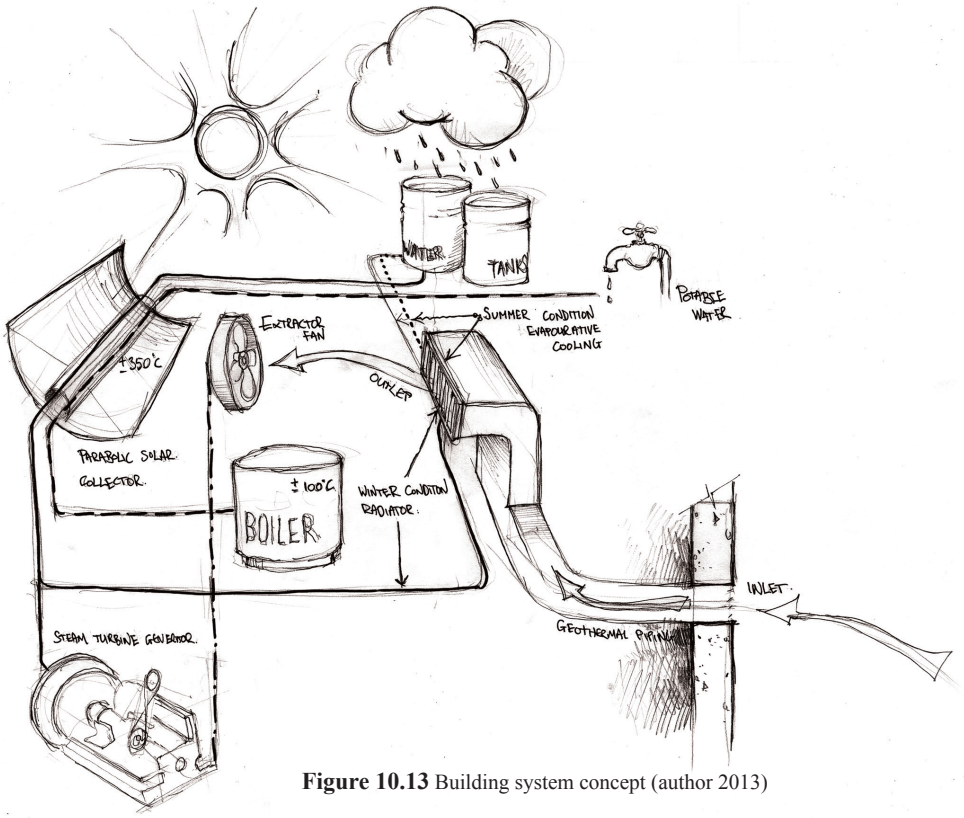

Figure 10.13 Building system concept (author 2013)

Systems Approach

The building aims to utilize passive systems, where possible, to achieve optimal comfort and energy use within the building. The basic design of the building applies passive design strategies to minimize requirements of external energy input. The orientation of the site is combated by the fragmented footprint of the building, ensuring natural light penetration. Large overhangs and louvered fenestration protects all glazing from direct solar contact. This ensures minimal heat gain from sunlight during summer months. The building then utilizes a combination of systems to create a holistic approach, capitalizing on available natural resources. The building harnesses solar energy and rainwater to help subsidise the energy and water requirements for the programme.

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Technological Precedent

Project: Low-energy School Complex in Pichling
Architects: Loudon + Habeler, Vienna
Date of completion: 2003
Programme: School
Location: Pichling, Austria

The building utilises basic passive design principles to lower its reliance of external energy input. The South facing longitudinal double glazed facades, which are protected with adjustable aluminium louvres, provide an abundance of natural light.

Geothermal heat exchange earth pipes are used to passively cool and heat air, before entering the building. The PVC pipes are 30mm in diameter and are laid 1m below the concrete surface bed with a combined length of 220m. The supply air enters at a low level and is extracted by vents in the ceiling.

The systems in place are simple and effecitve. Drastically reducing the energy requirements of the building and more importantly creating comfortable working spaces

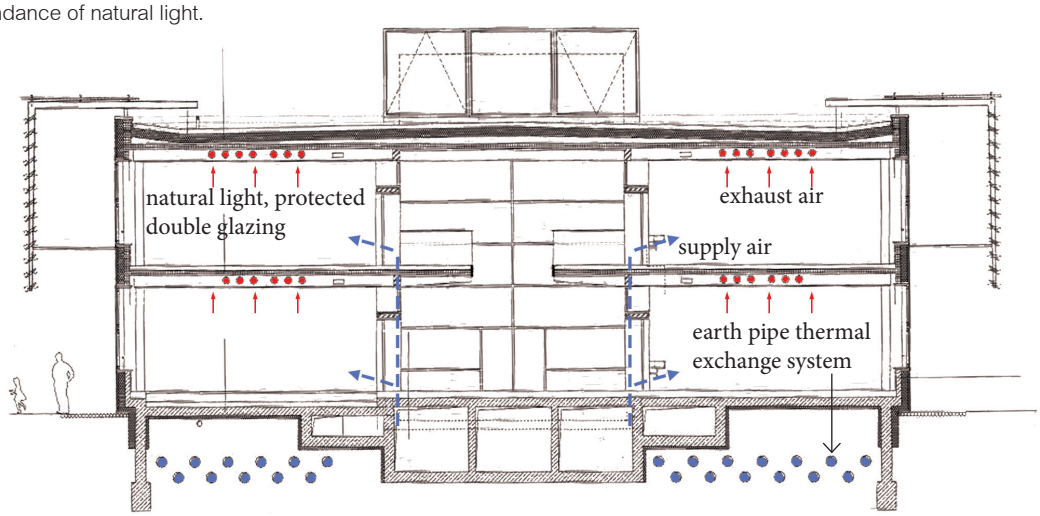

Figure 10.14 Earth pipe ventilation system (author 2013) *adapted from Gonzalo, 2006: 174*



Figure 10.15 Louvered facade (author 2013) *adapted from Gonzalo, 2006: 174*



Figure 10.16 Natural light in the classroom (author 2013) *adapted from Gonzalo, 2006: 173*

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Building Systems

Rainwater

The building harvests all water off the roof, landscape and excess water from the vegetable farm. The water will pass through a series of settlement chambers. This will seperate out any oils and sediment. The water is stored in water tanks on the basement level with no sunlight to ensure no bacteria growth. The grey water will not be used for showering or drinking and therefore no further filtering systems are required.

Booster pumps are used to pump water into pressurised tanks on the second floor. The water is then used to subsidise the water required for all toilets, irrigation and for cleaning surfaces. Grey water will also be used to heat the building and locust cages in winter. Collected rainwater will be pumped through the parabolic solar collectors and circulated through radiators that are connected to the air ducts within the building.

MONTHS	YIELD PxAxC (m^3)	TOTAL REQUIREMENTS (m^3)	STORAGE (m^3)
JAN	275.196	49.12	97.5
FEB	151.763	49.12	97.5
MAR	165.927	49.12	97.5
APR	103.199	38.56	97.5
MAY	26.306	38.56	87.746
JUNE	14.165	38.56	63.35
JULY	6.071	38.56	30.861
AUG	12.141	38.56	4.442
SEP	44.517	38.56	10.399
OCT	143.669	49.12	97.5
NOV	198.303	49.12	97.5
DEC	222.585	49.12	97.5

Figure 10.17
Rainwater catchment, usage and storage table

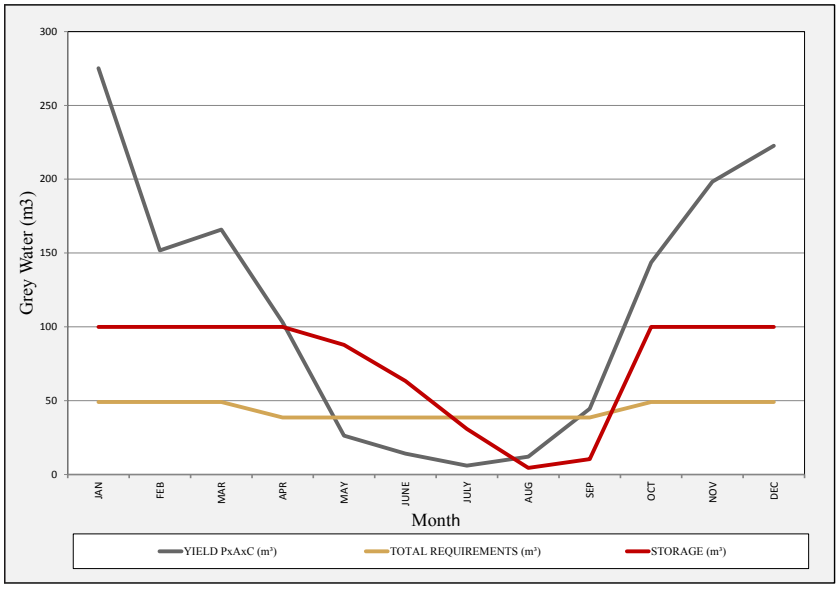

Figure 10.18
Rainwater catchment, usage and storage graph (author 2013)

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Parabolic Solar Collectors

Harvested insects need to be boiled in preparation for either drying or fresh packaging. The boiling of potable water on a daily basis requires a mass amount of energy. To reduce the consumption of electric energy or continual burning of fossil fuels it was determined that parabolic solar collectors would be a more feasible option to achieve the required amount of boiling water. Parabolic solar collectors will heat potable water to temperatures upwards of 350°C; the water will be then piped to the boiler room where the water can be used to boil the insects. The pipes will be insulated to minimize temperature loss. Heated potable water will also be stored in geysers as a source for warm water in the building; this reduces energy required for day to day hot water use. The parabolic solar collectors simultaneously heat collected grey water which is utilized to heat the interior spaces in winter.

The parabolic solar collectors will also be producing high pressured steam. The steam will be used to power a steam turbine engine. The power created will be stored in a battery room. The energy will be used to power extractor fans and help subsidize other power requirements within the building.

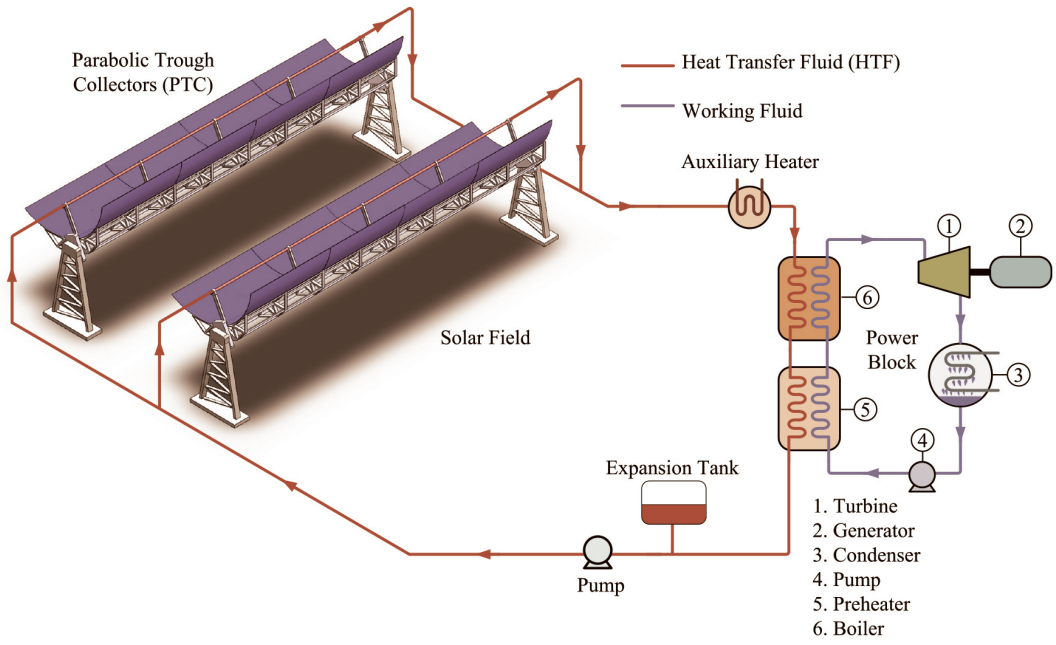

Figure 10.19 Parabolic solar collector system (author 2013) *adapted from http://www.technologystudent.com/energy1/solar3.htm*

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Building Systems

Ventilation

The building utilizes earth pipes to mediate air temperature in both summer and winter. Three separate sets of PVC earth piping are used to feed into the three main structures of the building. PVC is used to prevent corrosion and it is strong enough to withstand the soil pressure. The pipes are laid at a minimum of 2700mm underground and 750m apart. This depth warrants an average temperature of 18°C. Each set will have a minimum length of 100m. The diameter of the pipe will be 300mm, this ensures sufficient contact of the air with the pipe walls and minimizes through-flow. The inlets are located on southern facing façades, air entering the earth pipes therefore moves over a shaded surface as opposed to entering over a heat radiating surface. The air from the pipes is then used to ventilate the building using cross ventilation. The outlets are positioned at a low level within a space, across from extractor fans on a higher level. In summer the extractor fans draw out warm air that has risen in a space, this creates a negative pressure which pulls in cooler air from the earth pipe outlet. In winter, heated grey water will circulate through radiators that are positioned in the earth pipe outlets. The air heats up indirectly from the water as it moves over the radiator before entering the space.

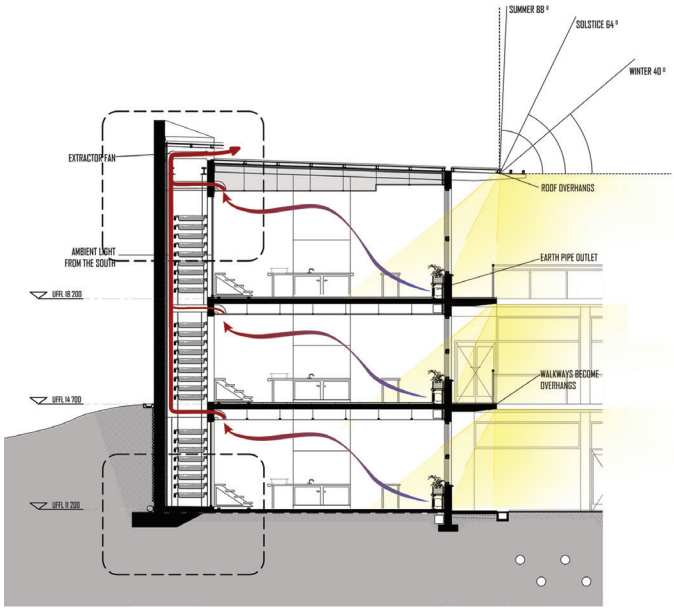

Figure 10.20 Section illustrating ventilation through cultivation space (author 2013)

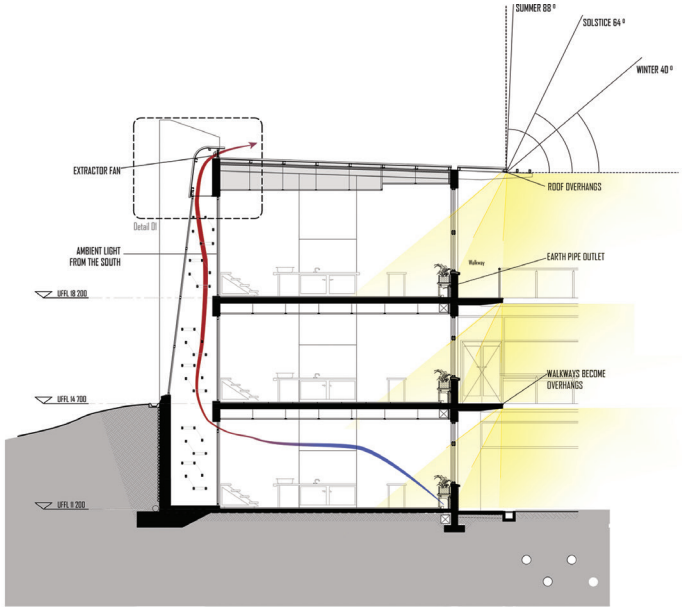

Figure 10.21 Section illustrating ventilationthrough moth tower (author 2013)

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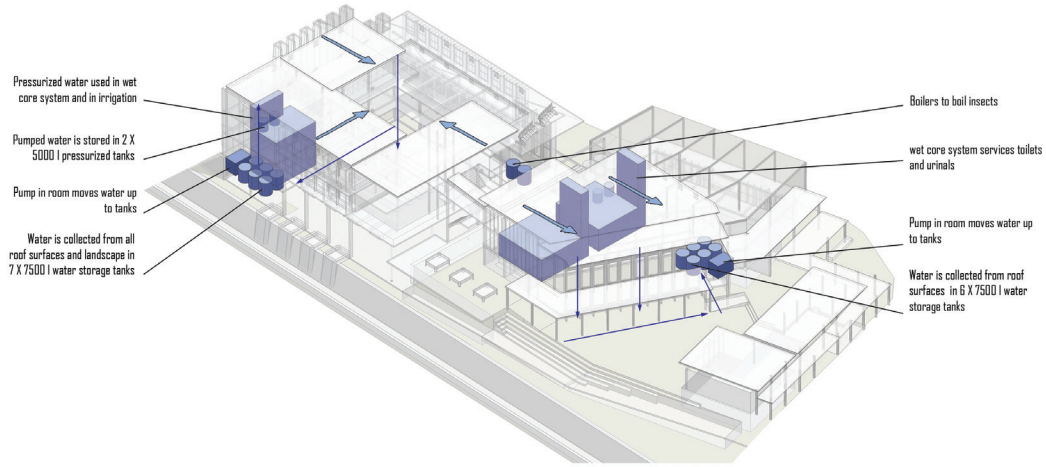

Figure 10.22 Rainwater is collected off roof surfaces and is stored. There are two wet core systems in the building (author 2013)

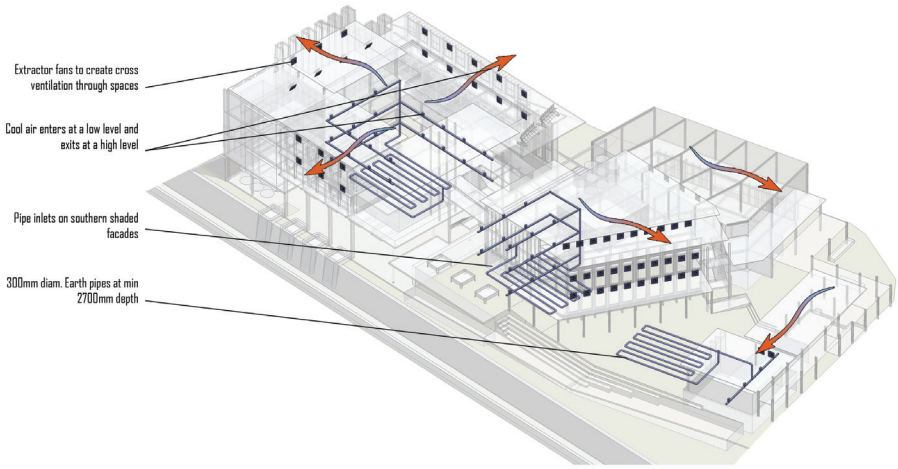

Figure 10.23 Three sets of earthpipes used to cool air before entering the building. Extractor fans used to create cross ventilation (author 2013)

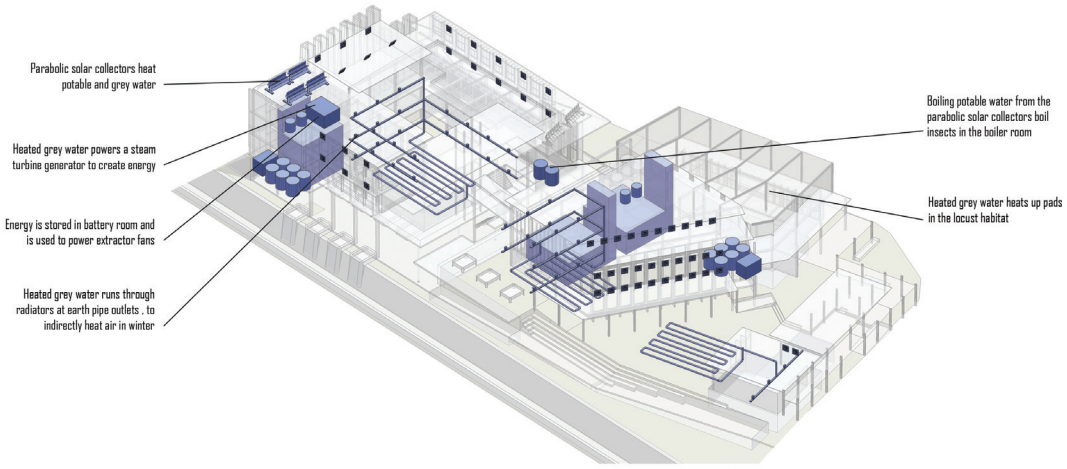

Figure 10.24 Parabolic solar collectors heat water to boil insects, create power and to warm the building in winter (author 2013)

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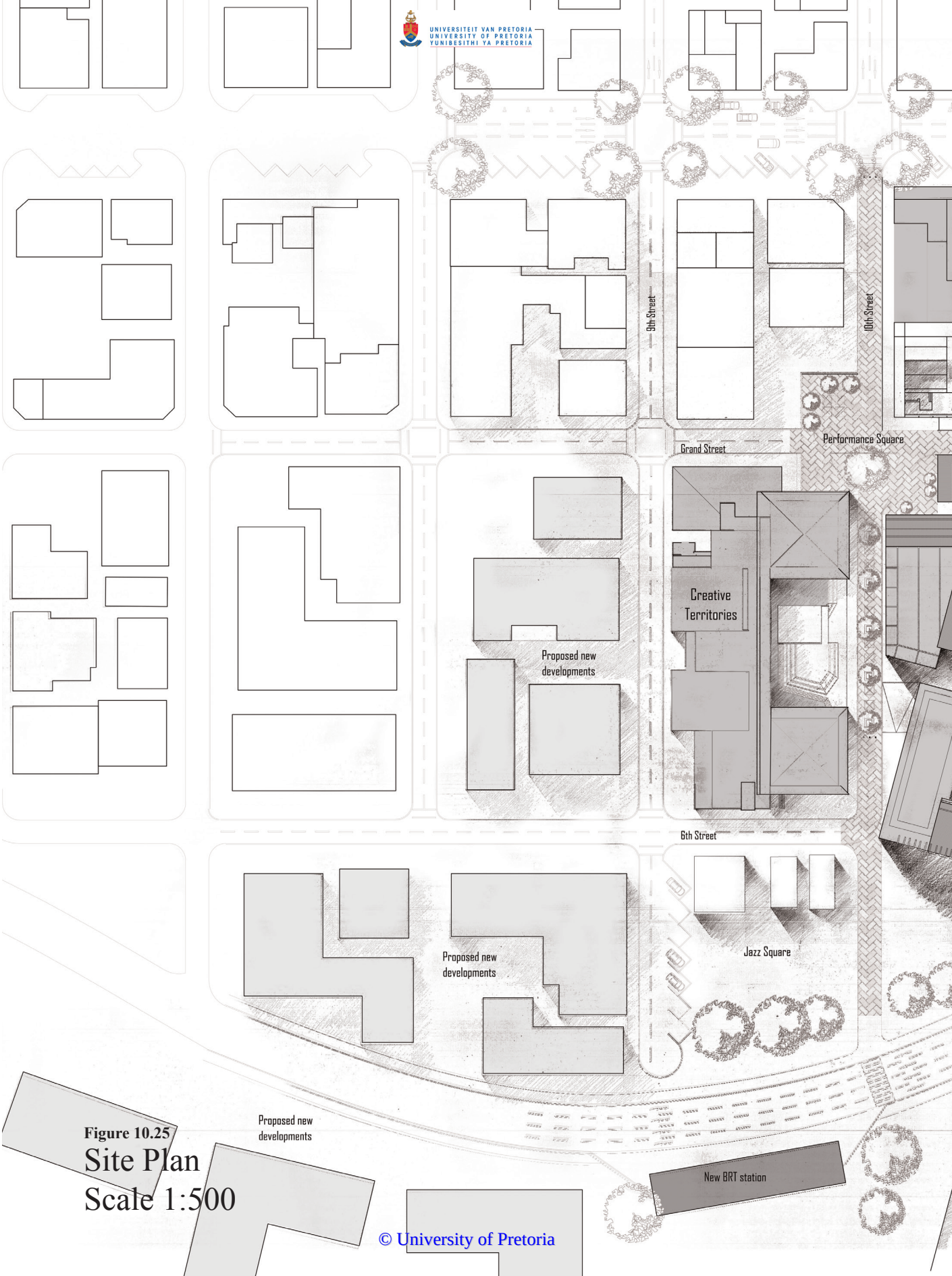

Figure 10.25
Site Plan
Scale 1:500

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Figure 10.26 Ground floor plan NTS (author 2013)

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Ground Floor Plan
Scale 1:100

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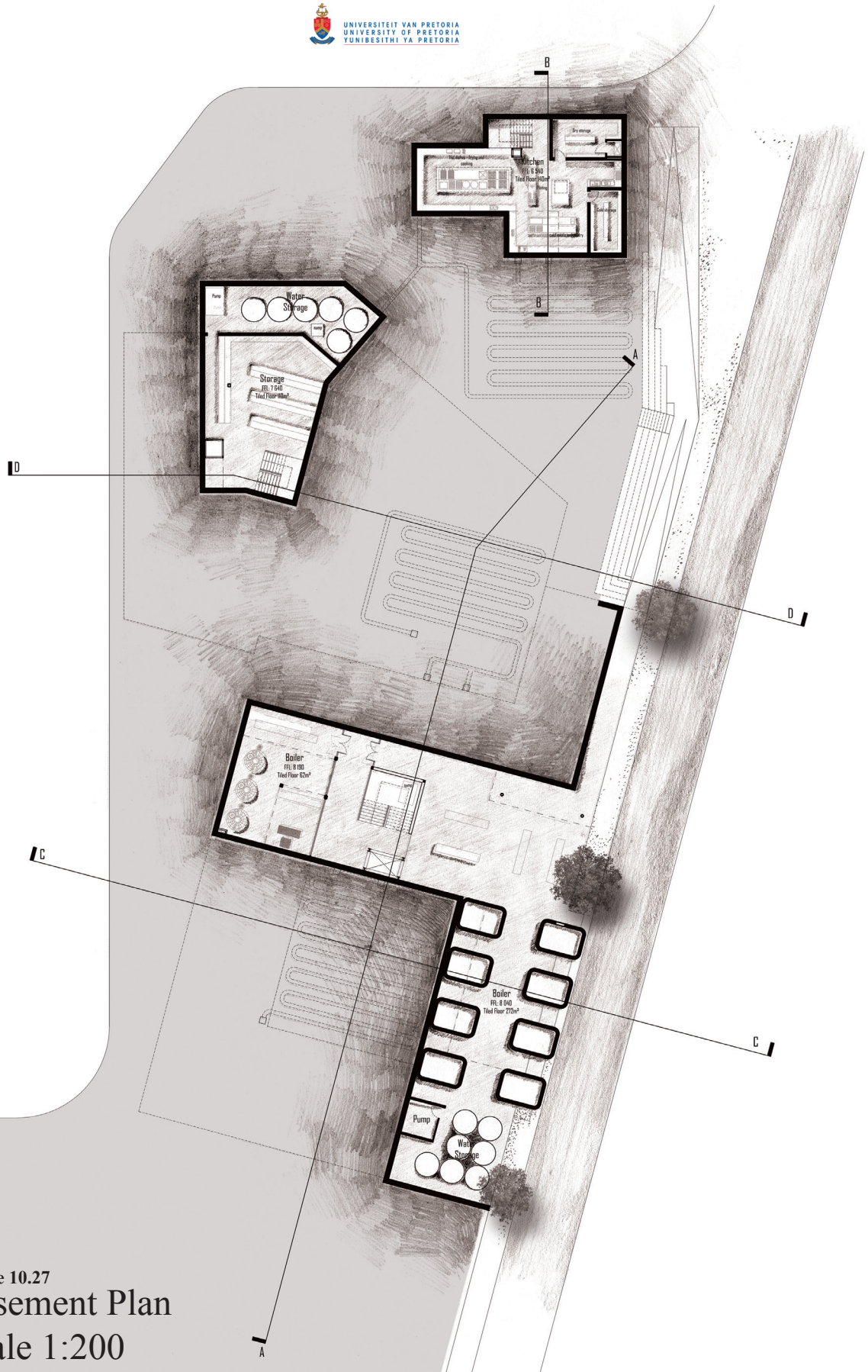

Figure 10.27
Basement Plan
Scale 1:200

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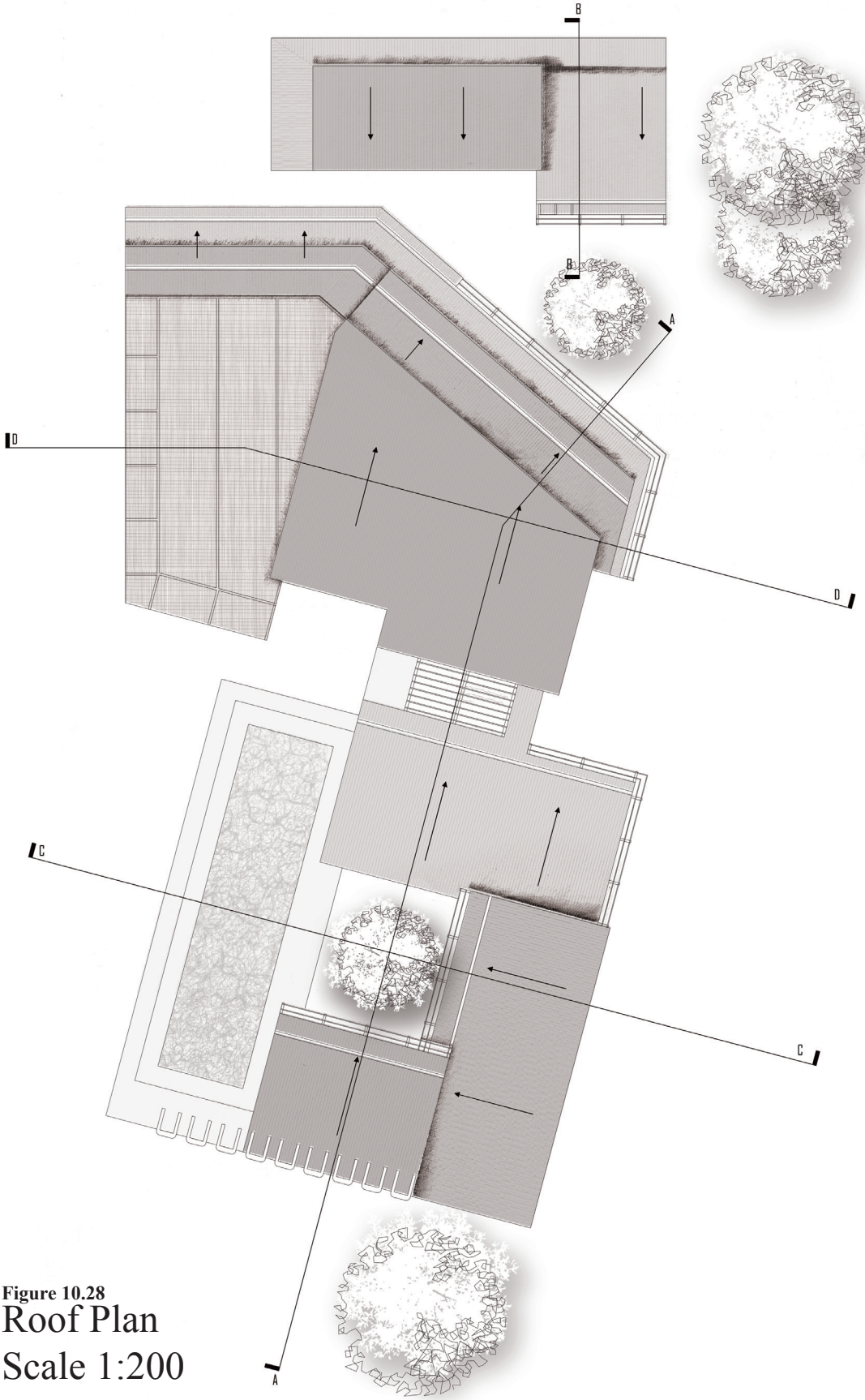

Figure 10.28
Roof Plan
Scale 1:200

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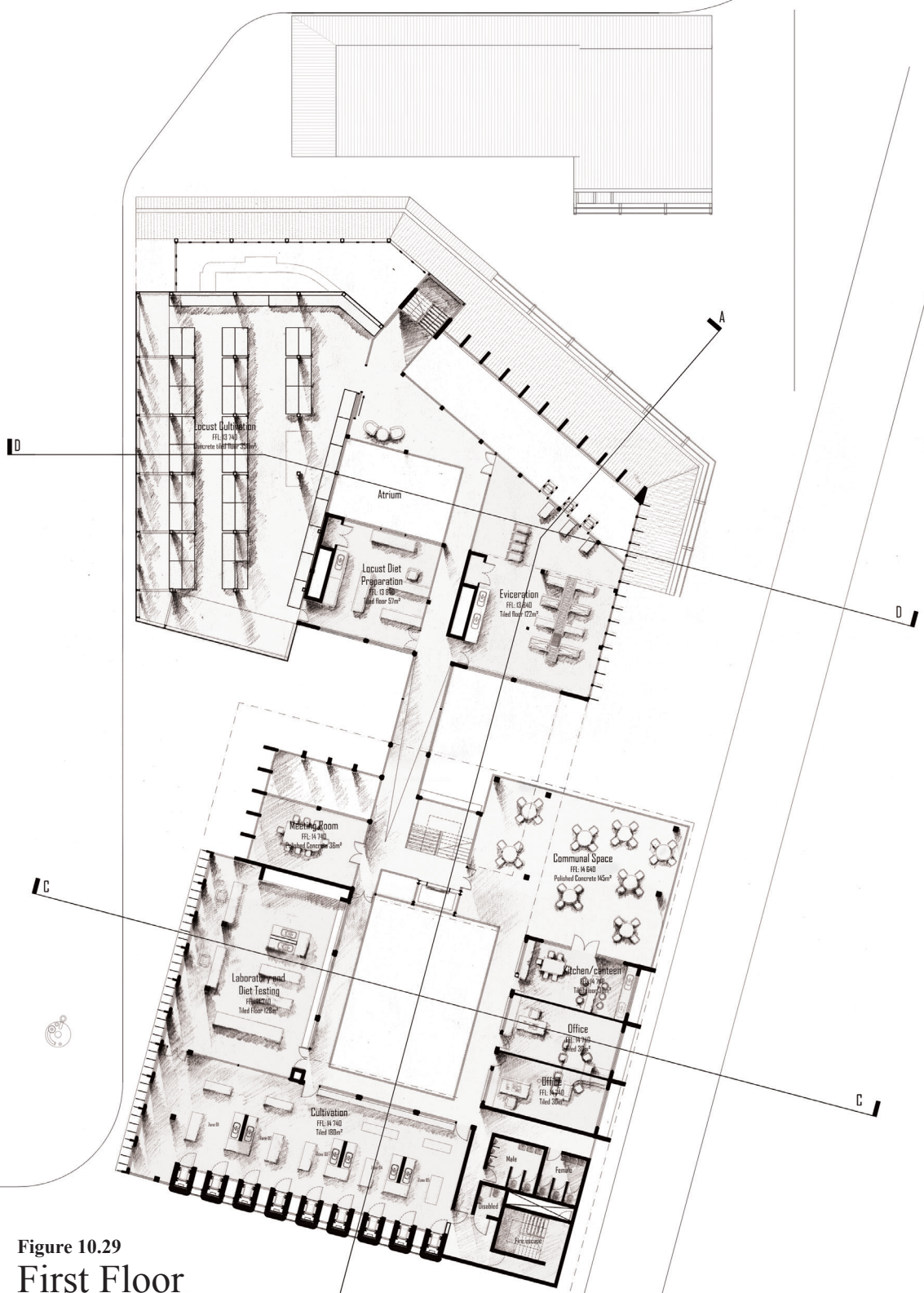

Figure 10.29
First Floor
Scale 1:200

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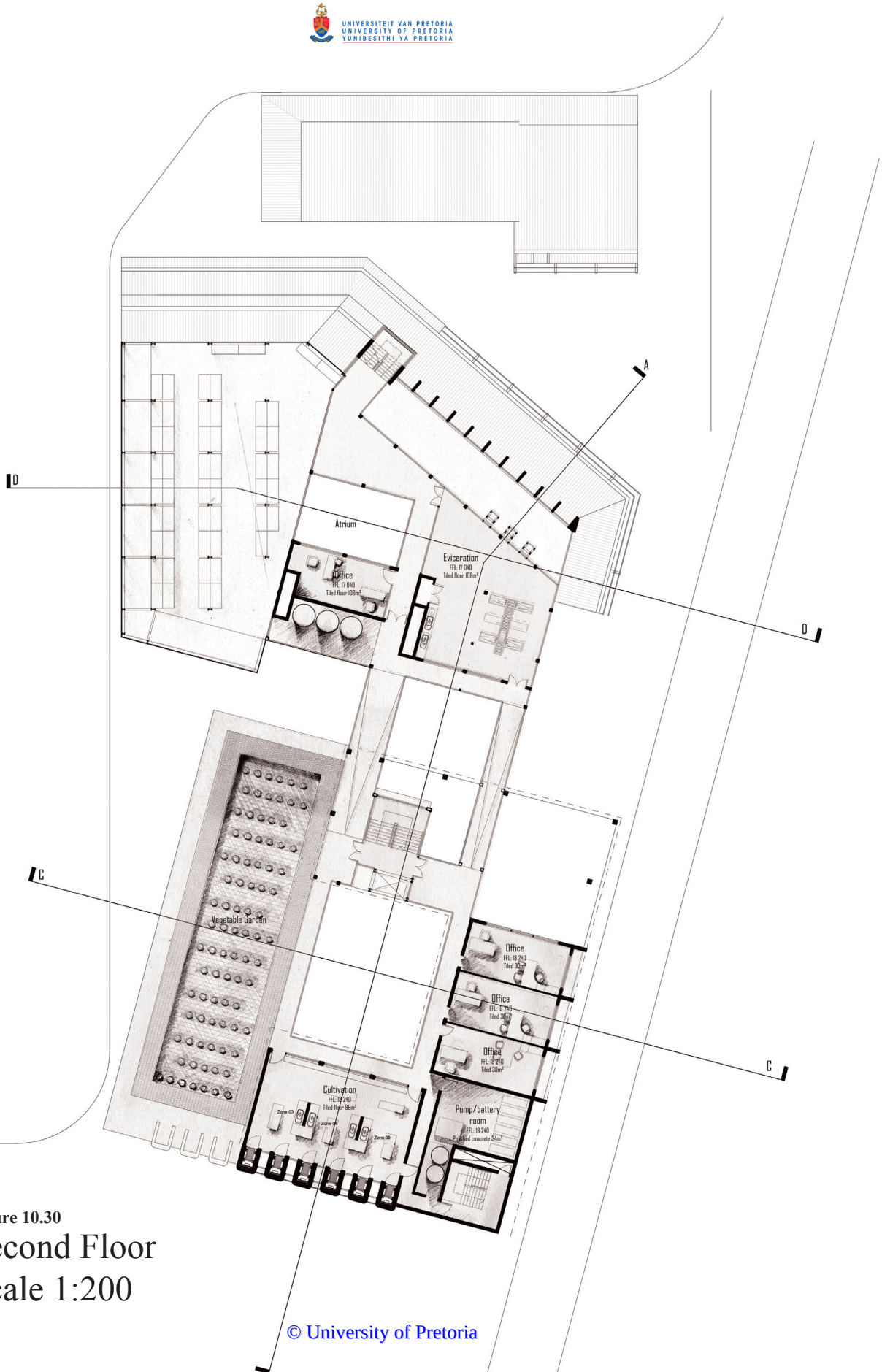

Figure 10.30

Second Floor
Scale 1:200

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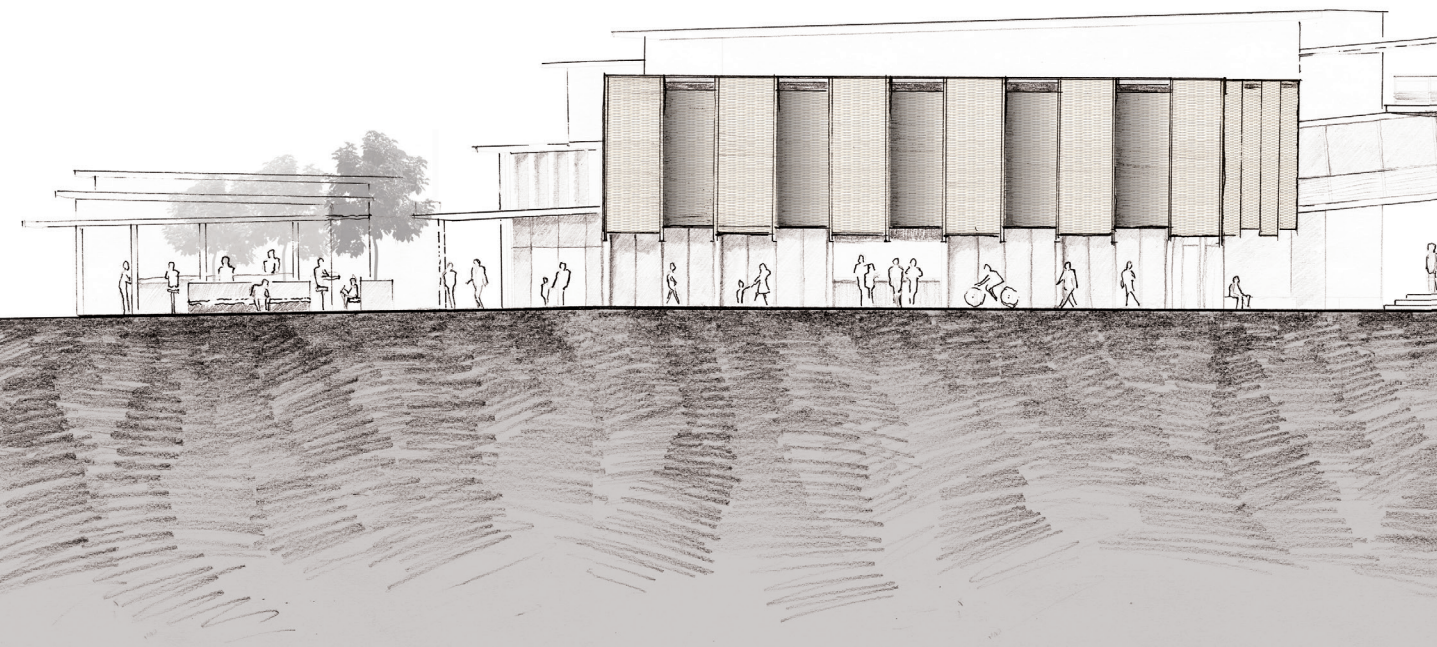

Figure 10.31
Western Elevation
Scale 1:100

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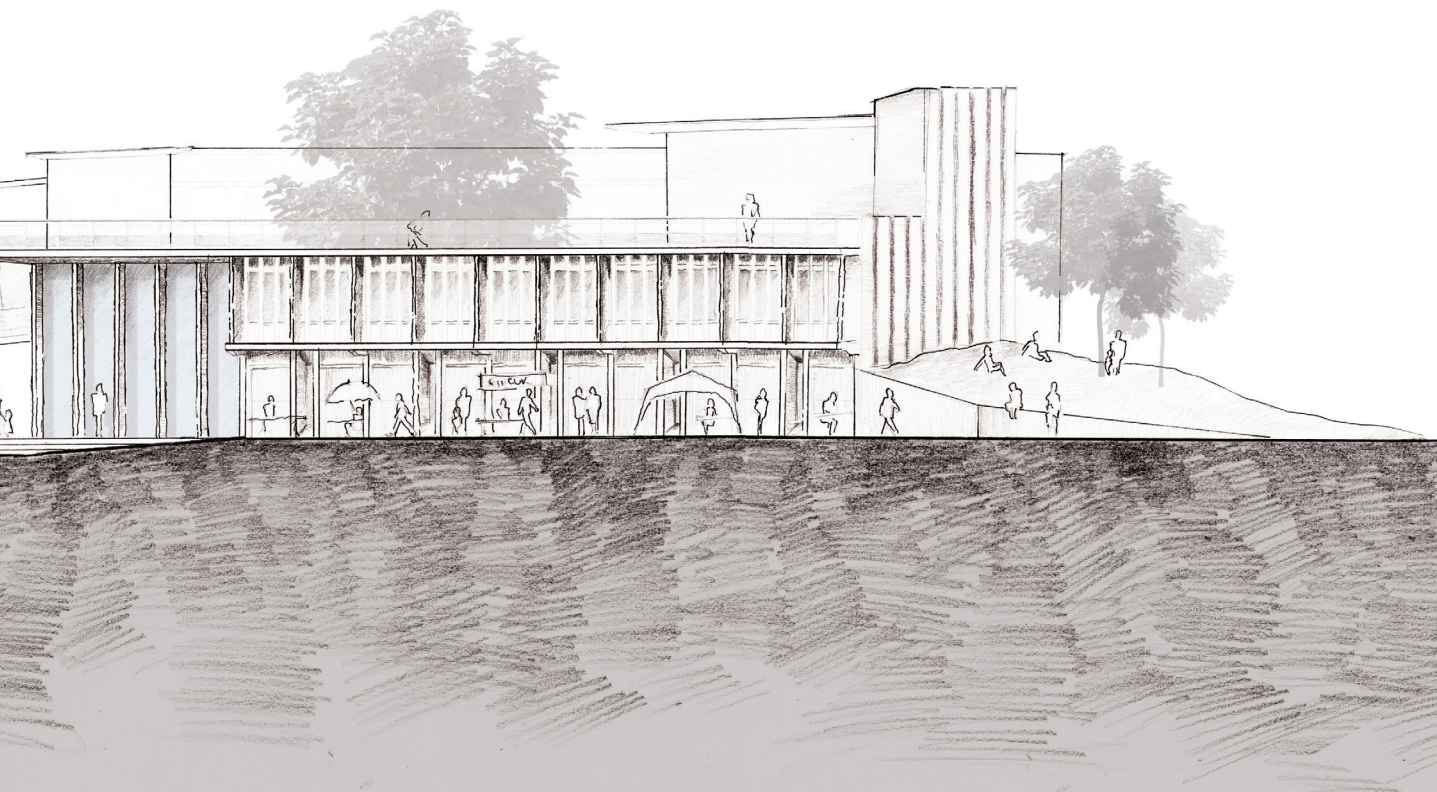

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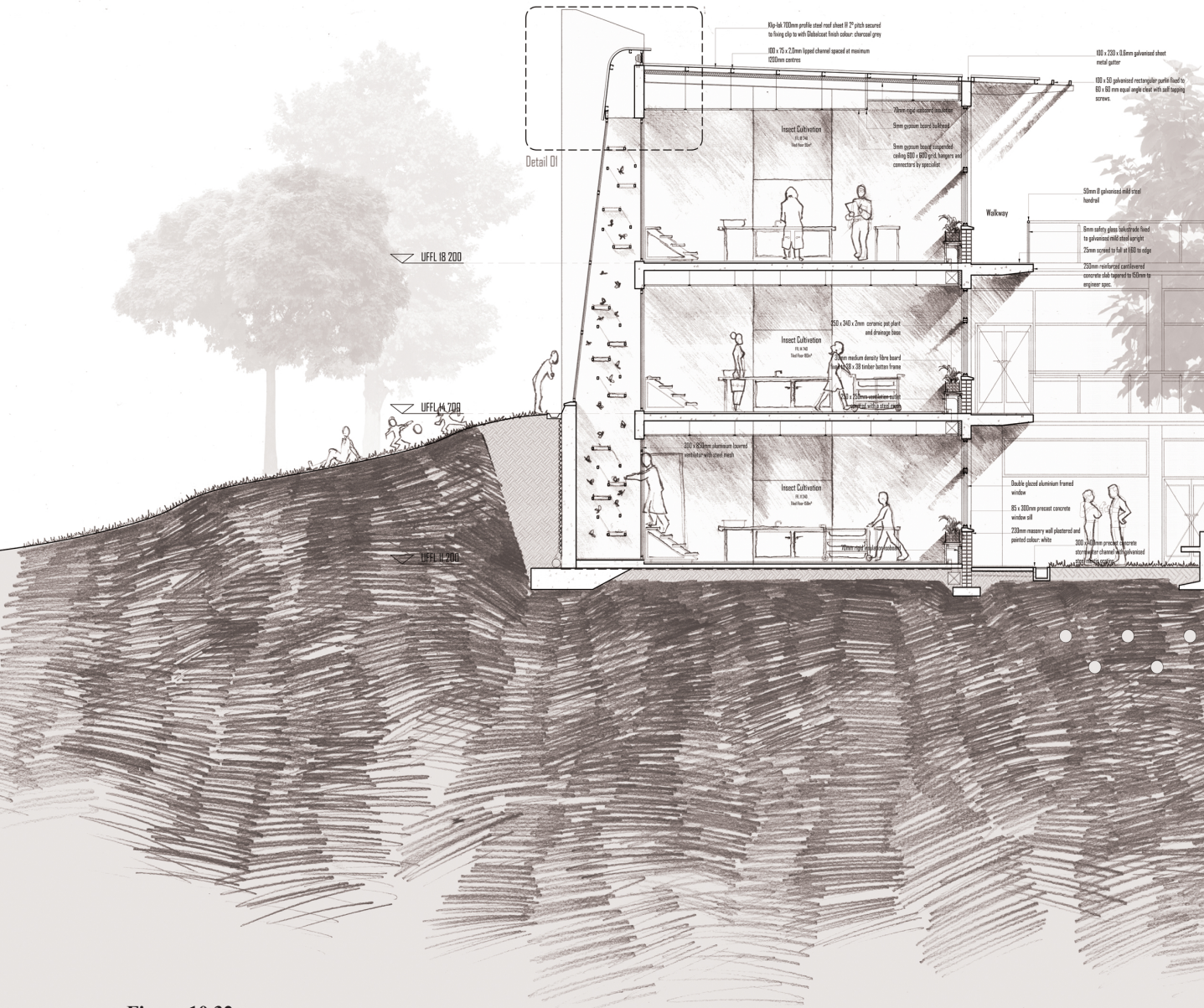

Figure 10.32

Section A-A
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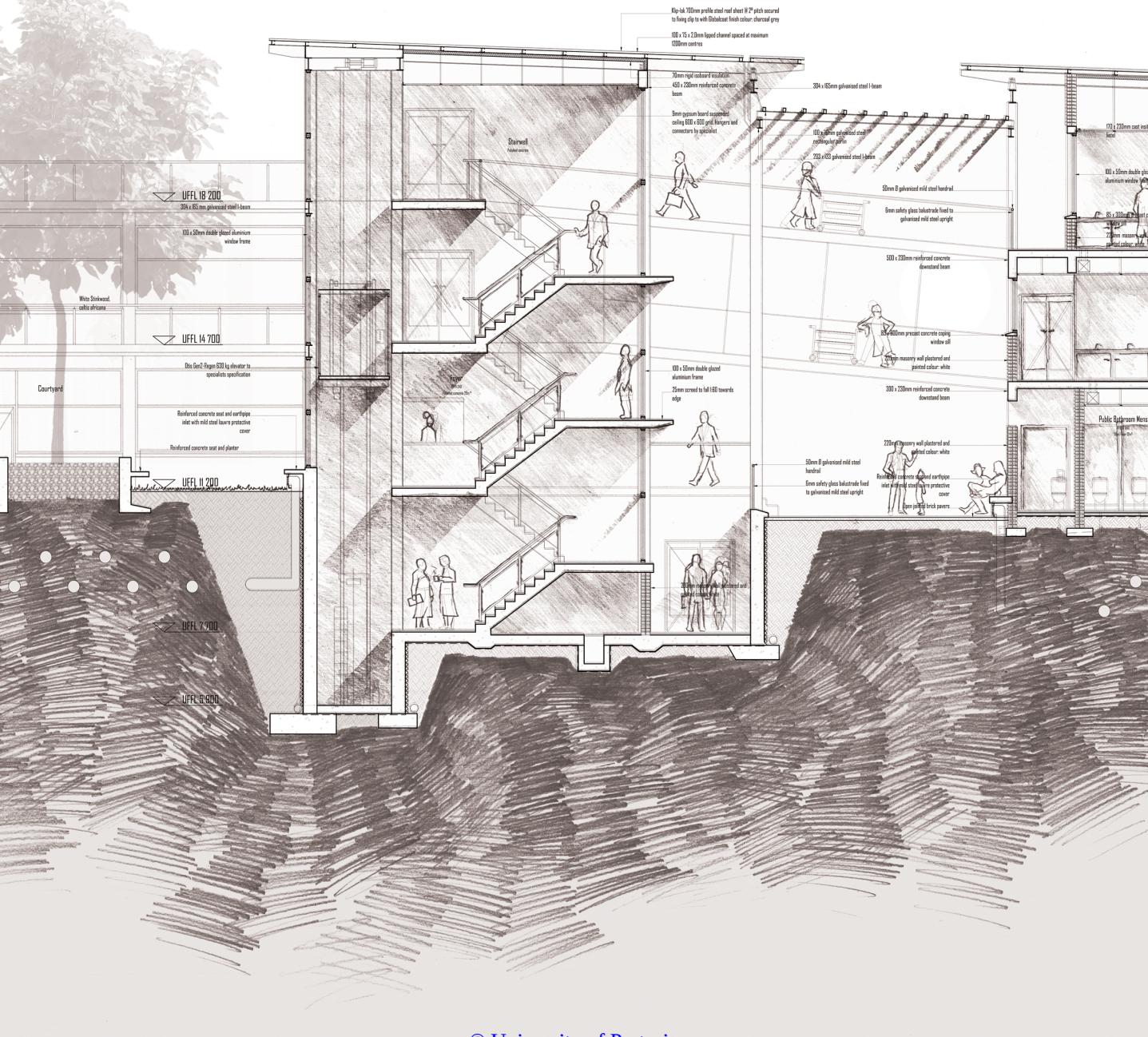

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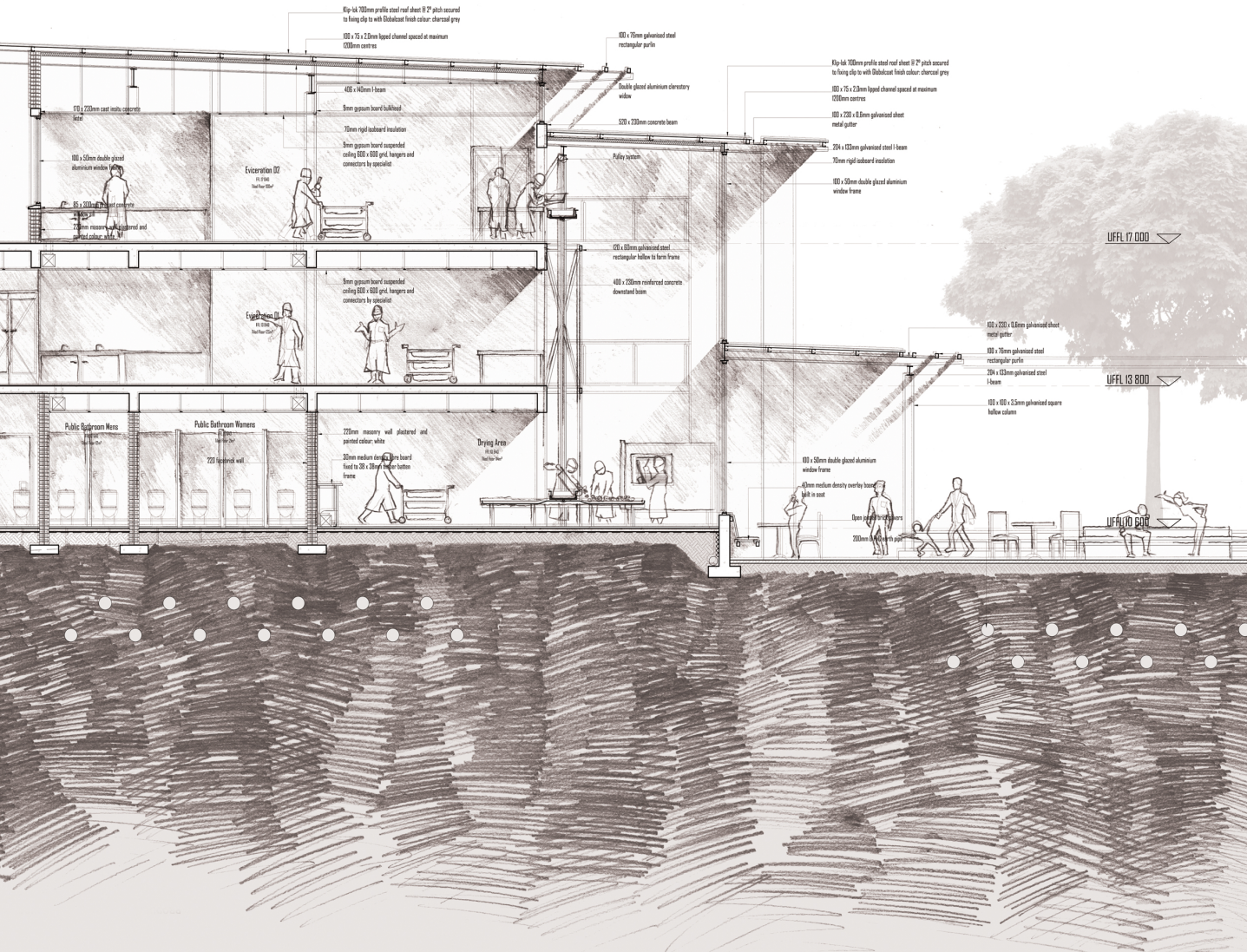

Figure 10.33

Section A-A

Scale 1:50

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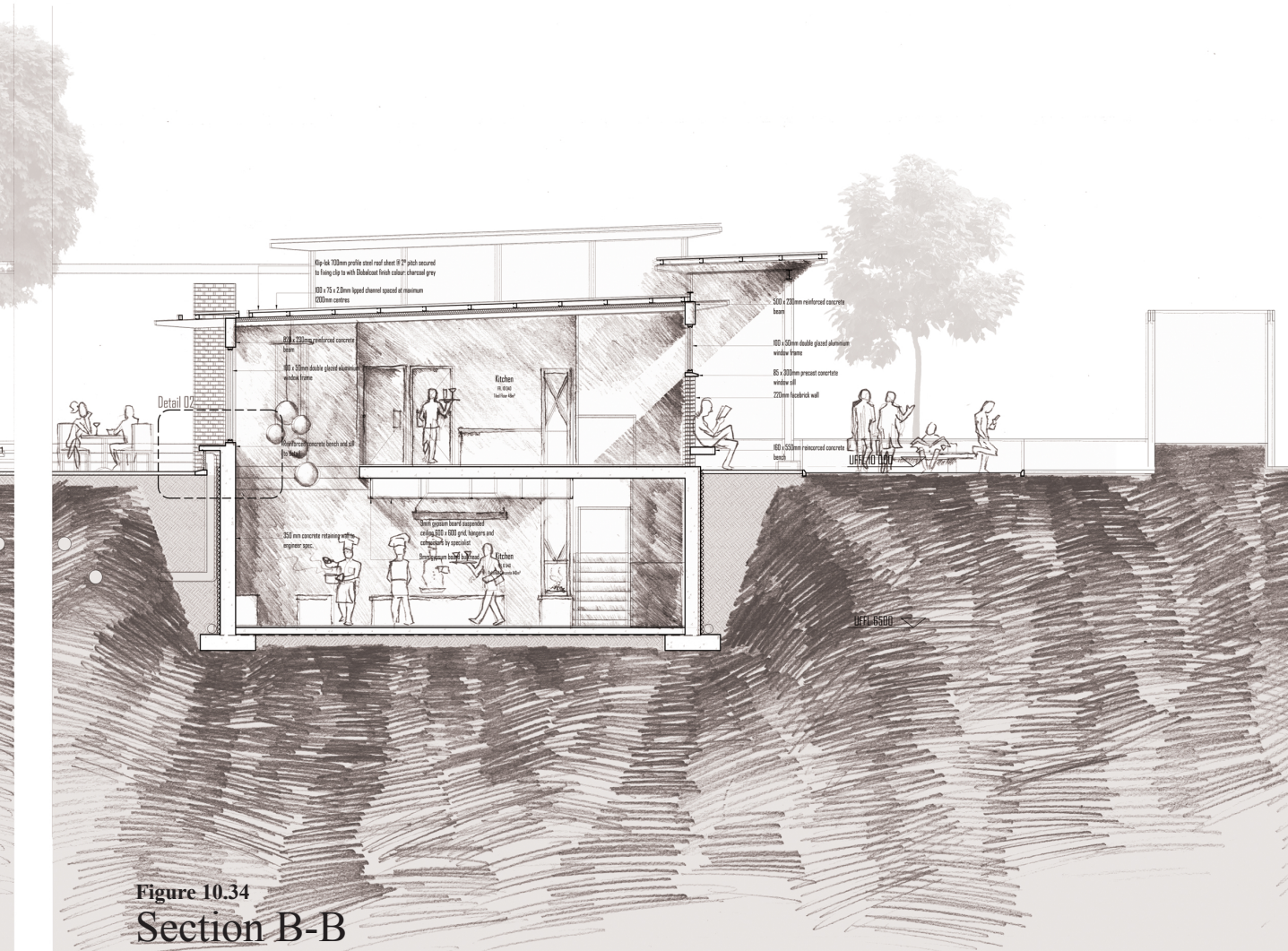

Figure 10.34

Section B-B
Scale 1:50

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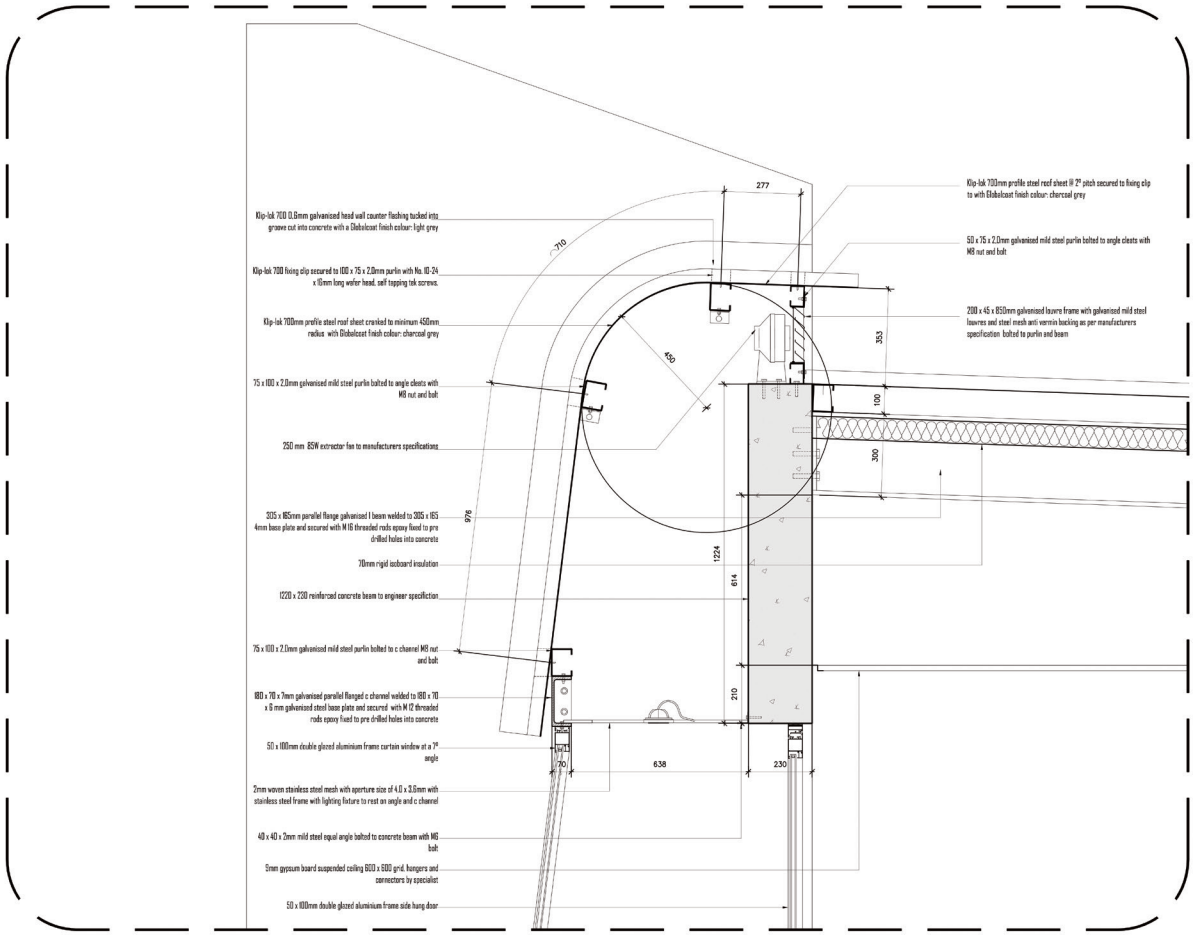

Figure 10.35

Detail 01
Scale 1:10

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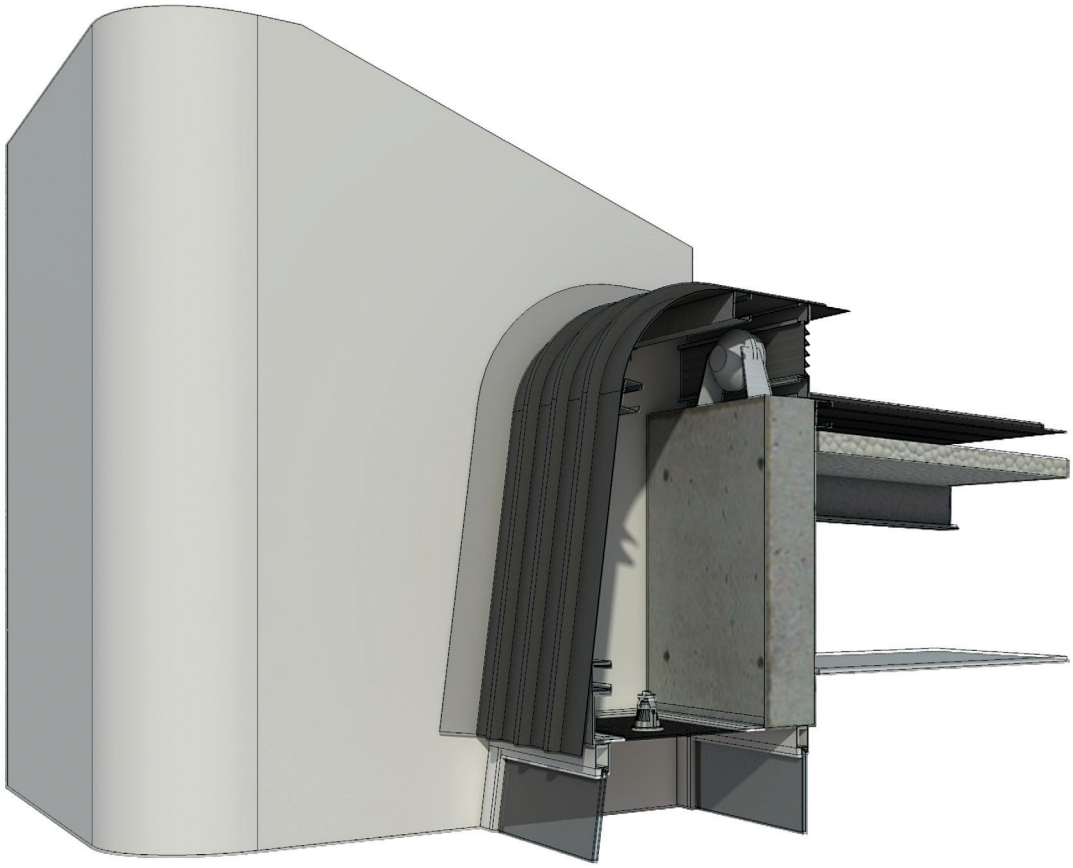

Figure 10.36 3-dimensional of roof detail and extractor fan (author 2013)

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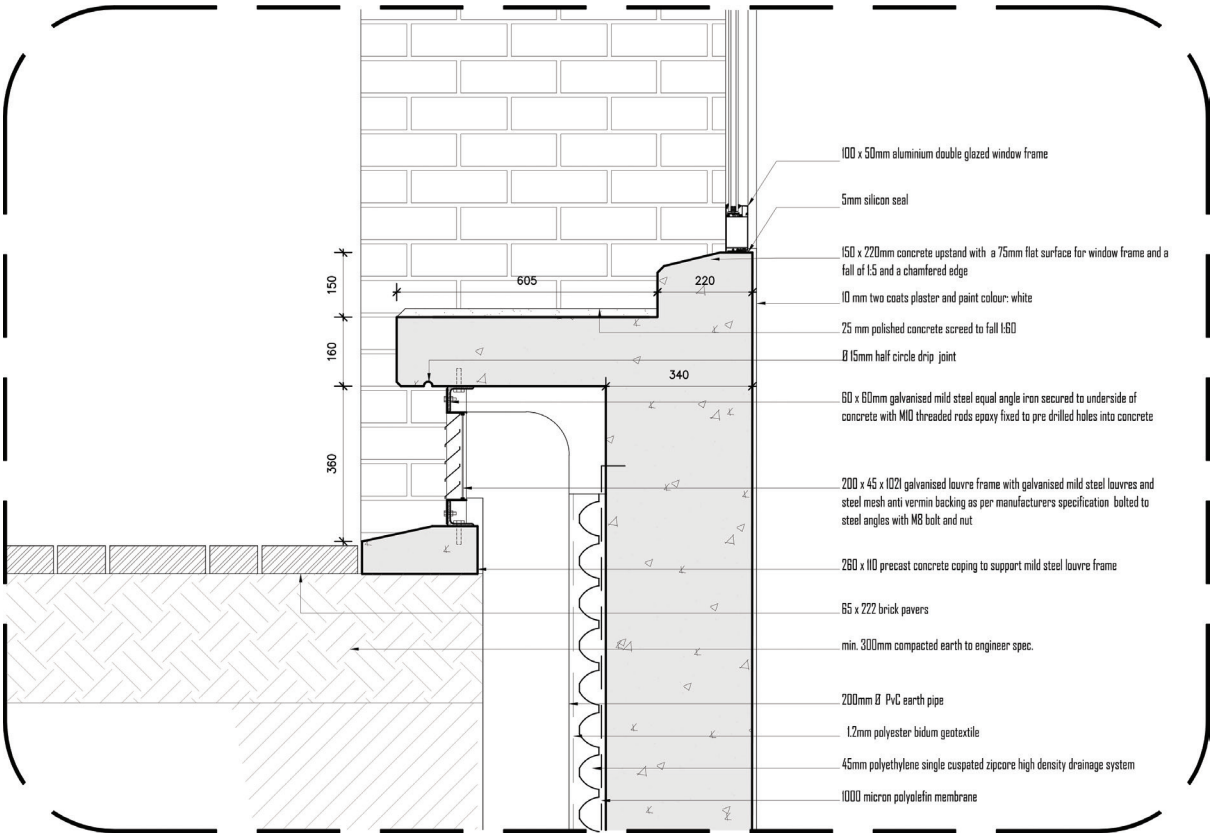

Figure 10.37
Detail 02
Scale 1:10

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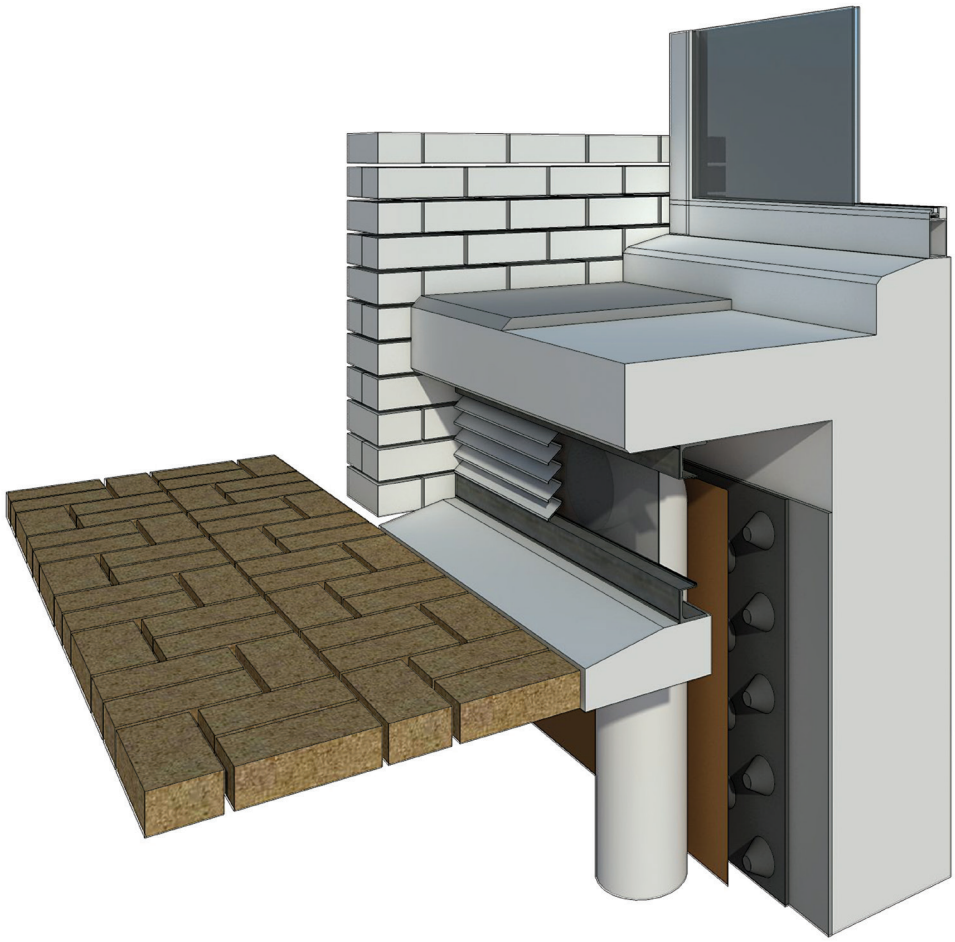

Figure 10.38 3-dimensional of bench detail with earth-tube inlet (author 2013)

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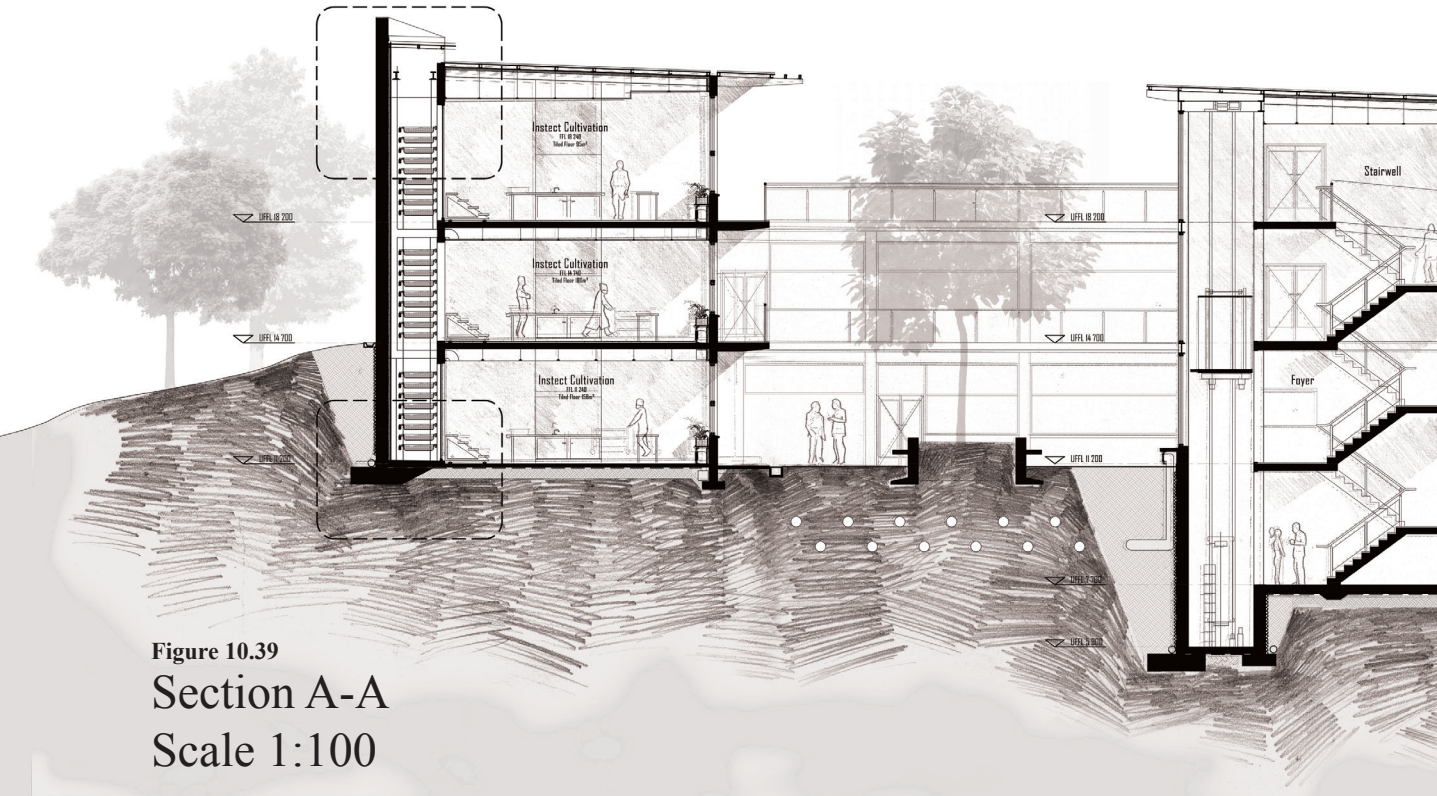

Figure 10.39
Section A-A
Scale 1:100

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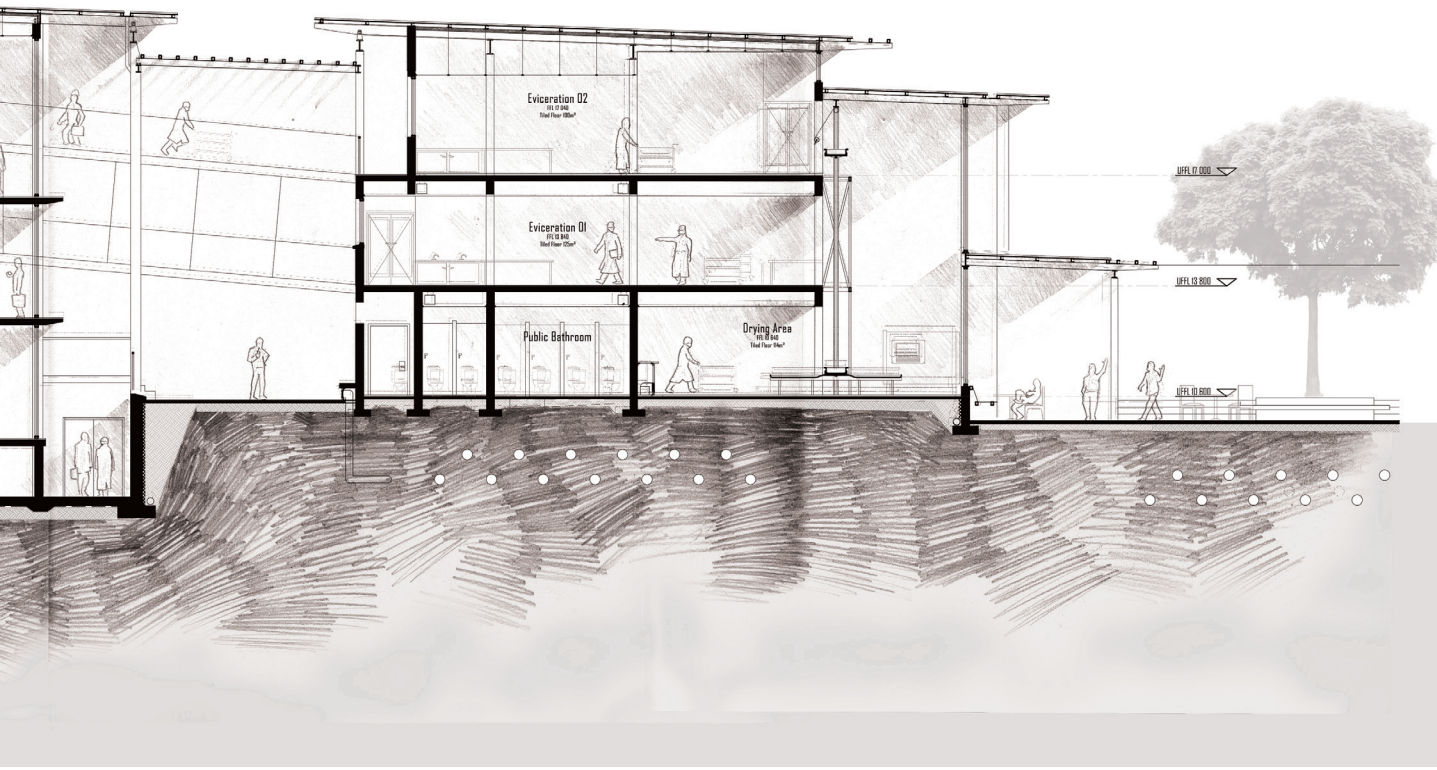

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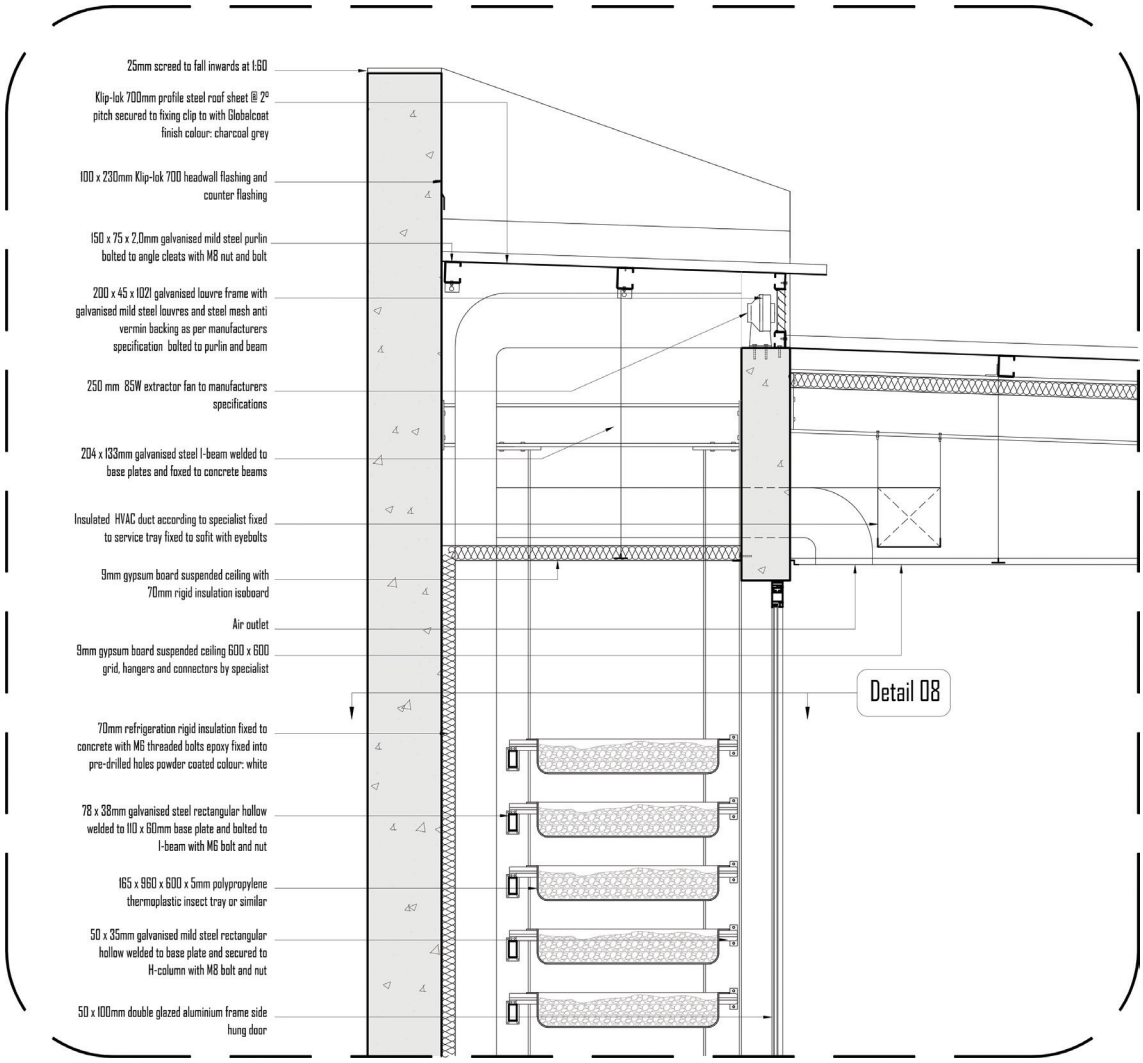

Figure 10.40

Detail 06
Scale 1:20

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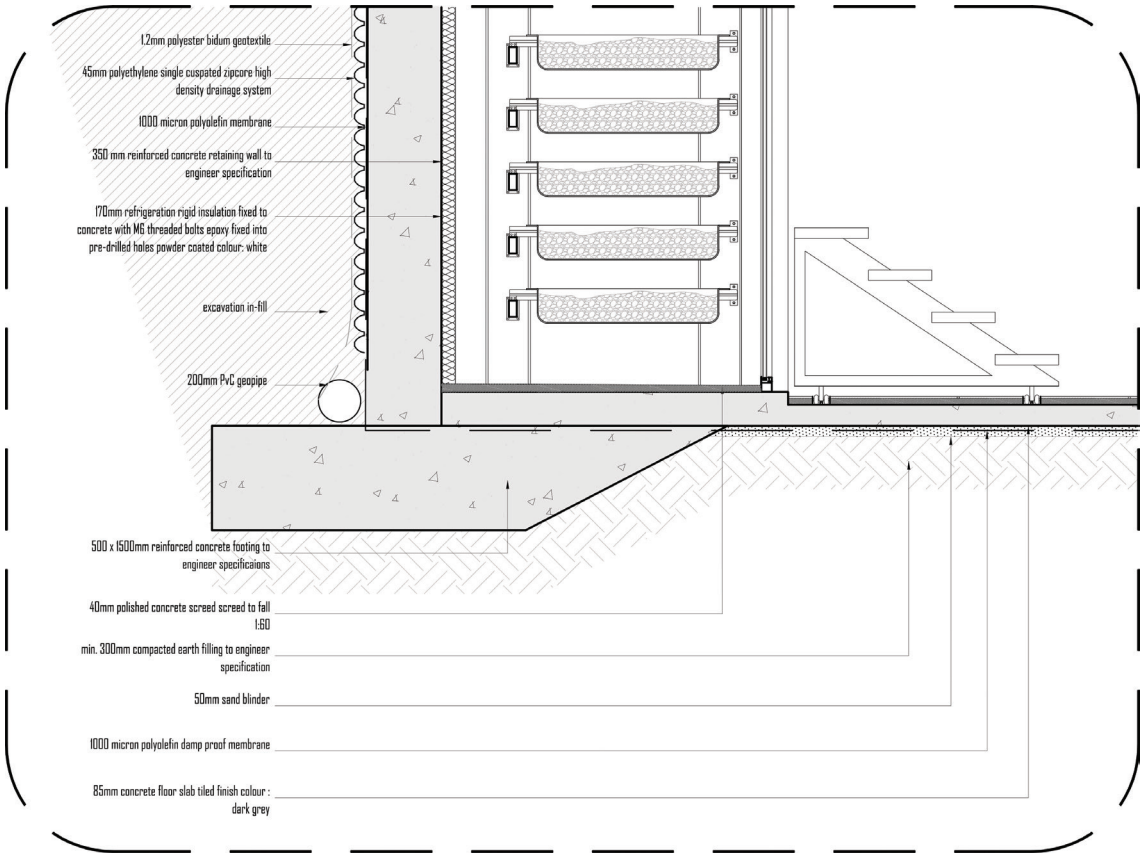

Figure 10.41

Detail 07
Scale 1:20

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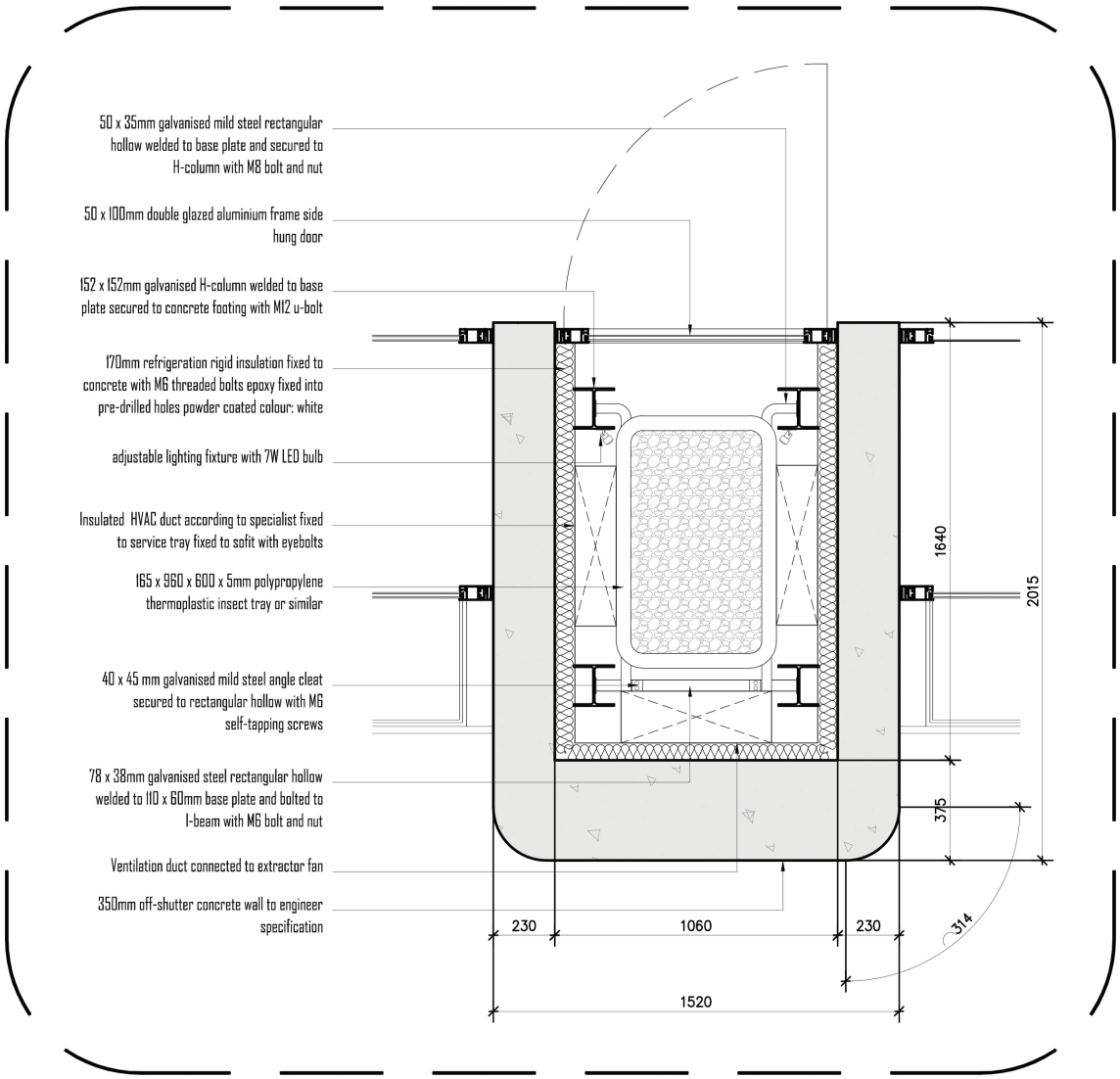

Figure 10.42

Detail 08
Scale 1:20

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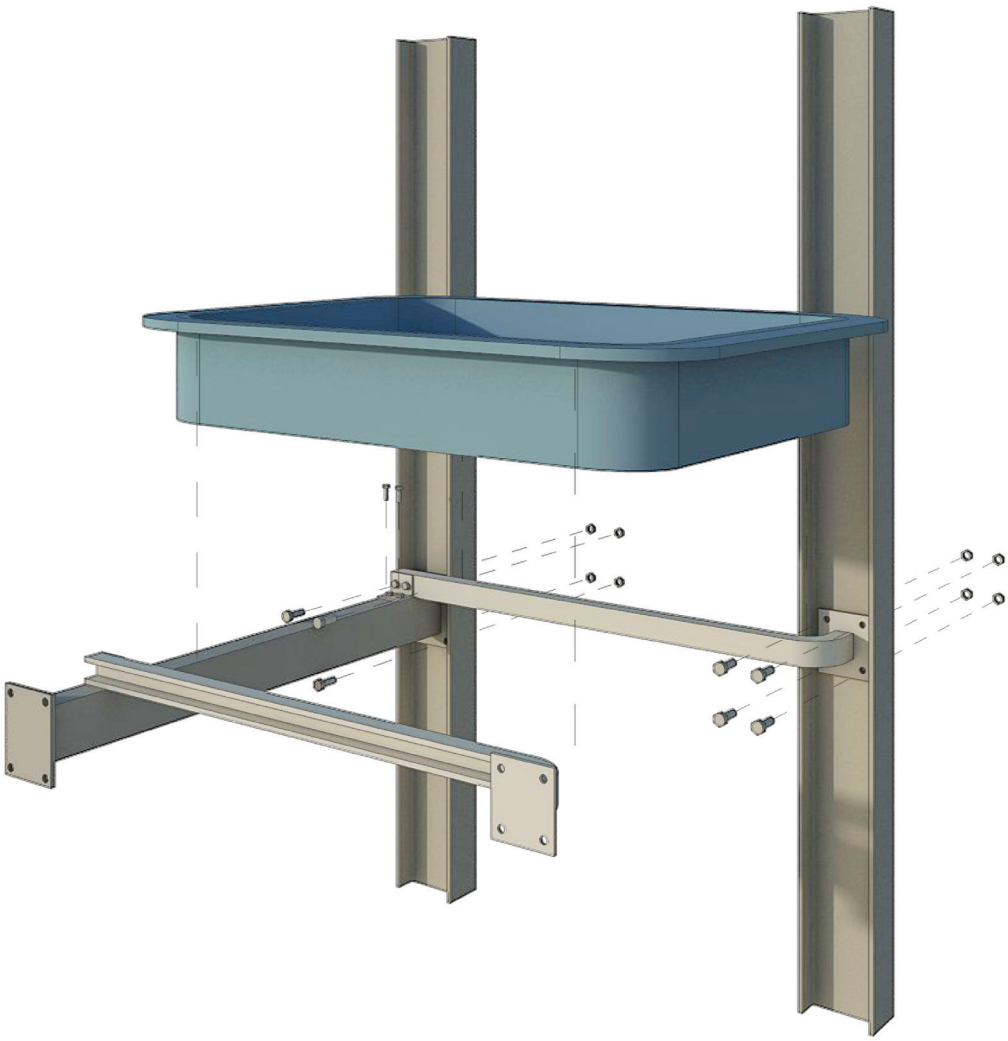

Figure 10.43 3-dimensional explosion detail of insect tray (author 2013)

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Figure 10.44 Sectional perspective illustrating the spacial quality created by the insect towers (author 2013)

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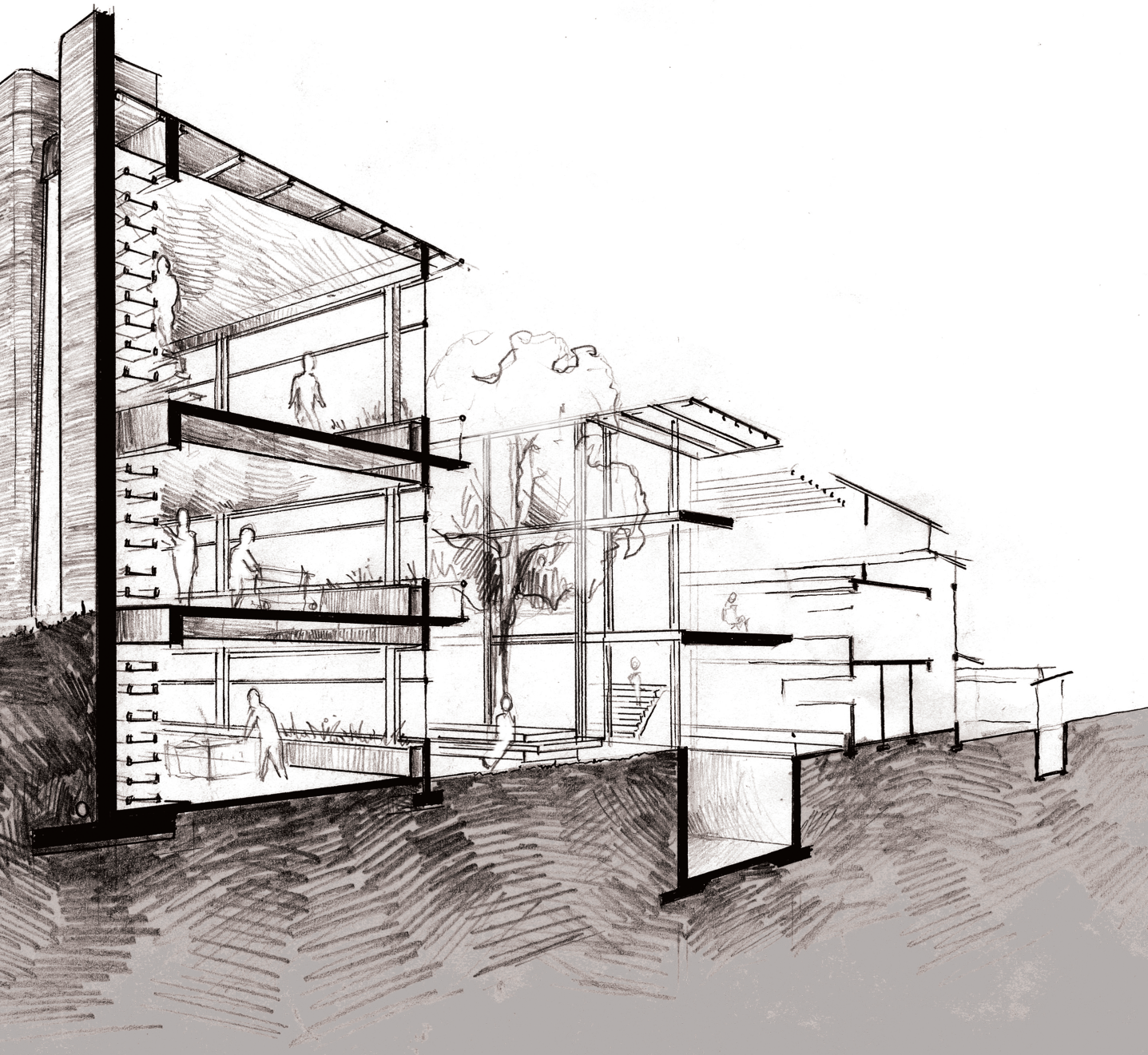

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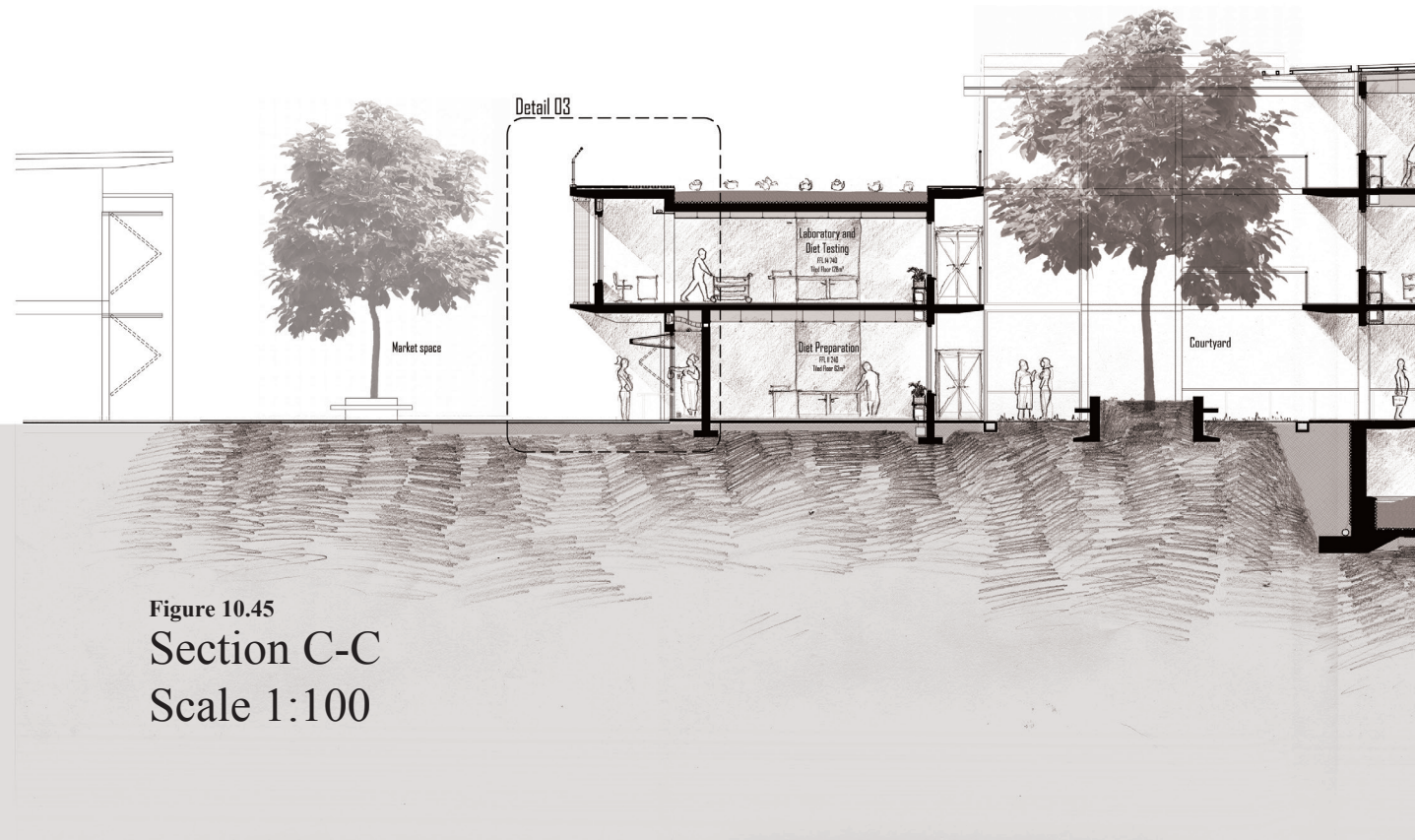

Figure 10.45
Section C-C
Scale 1:100

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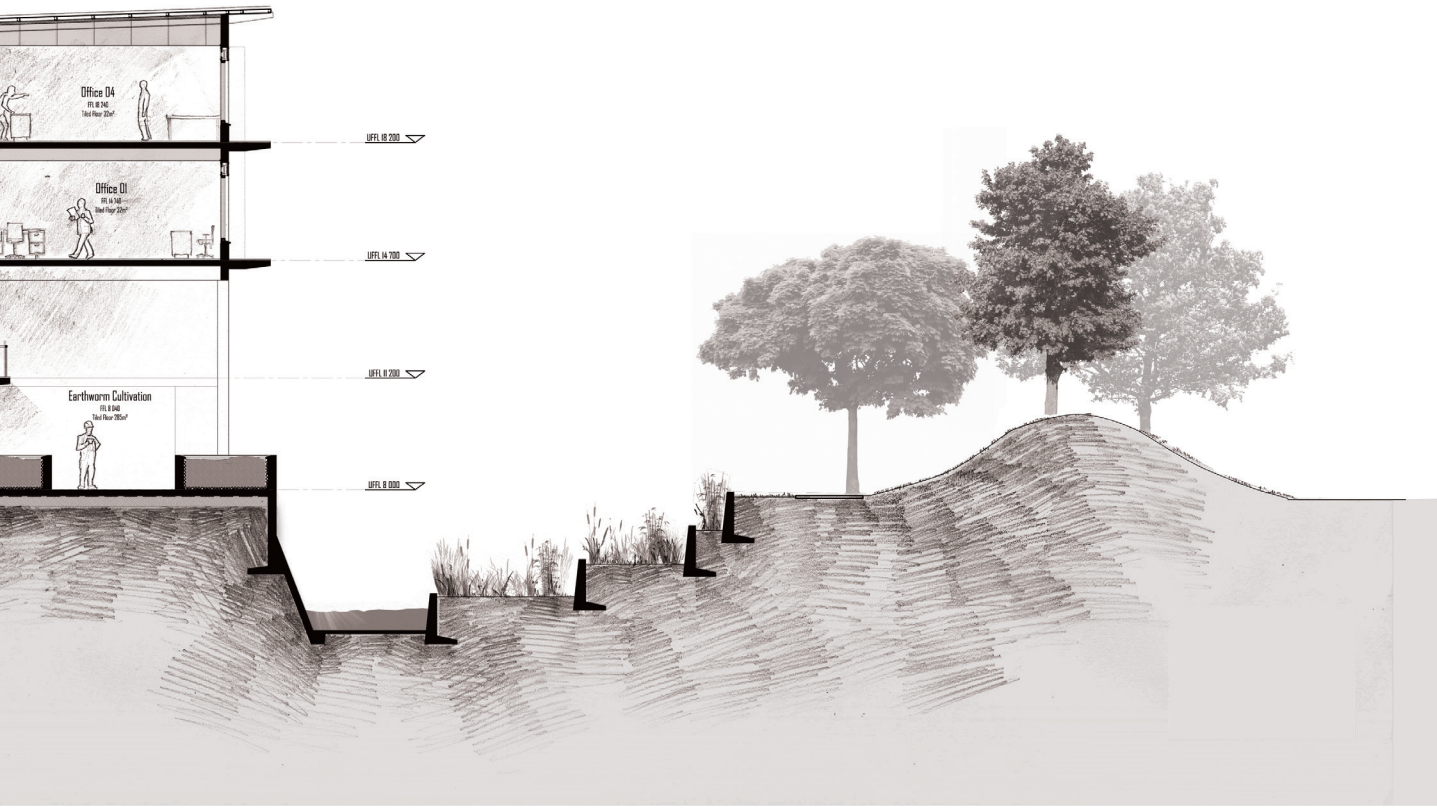

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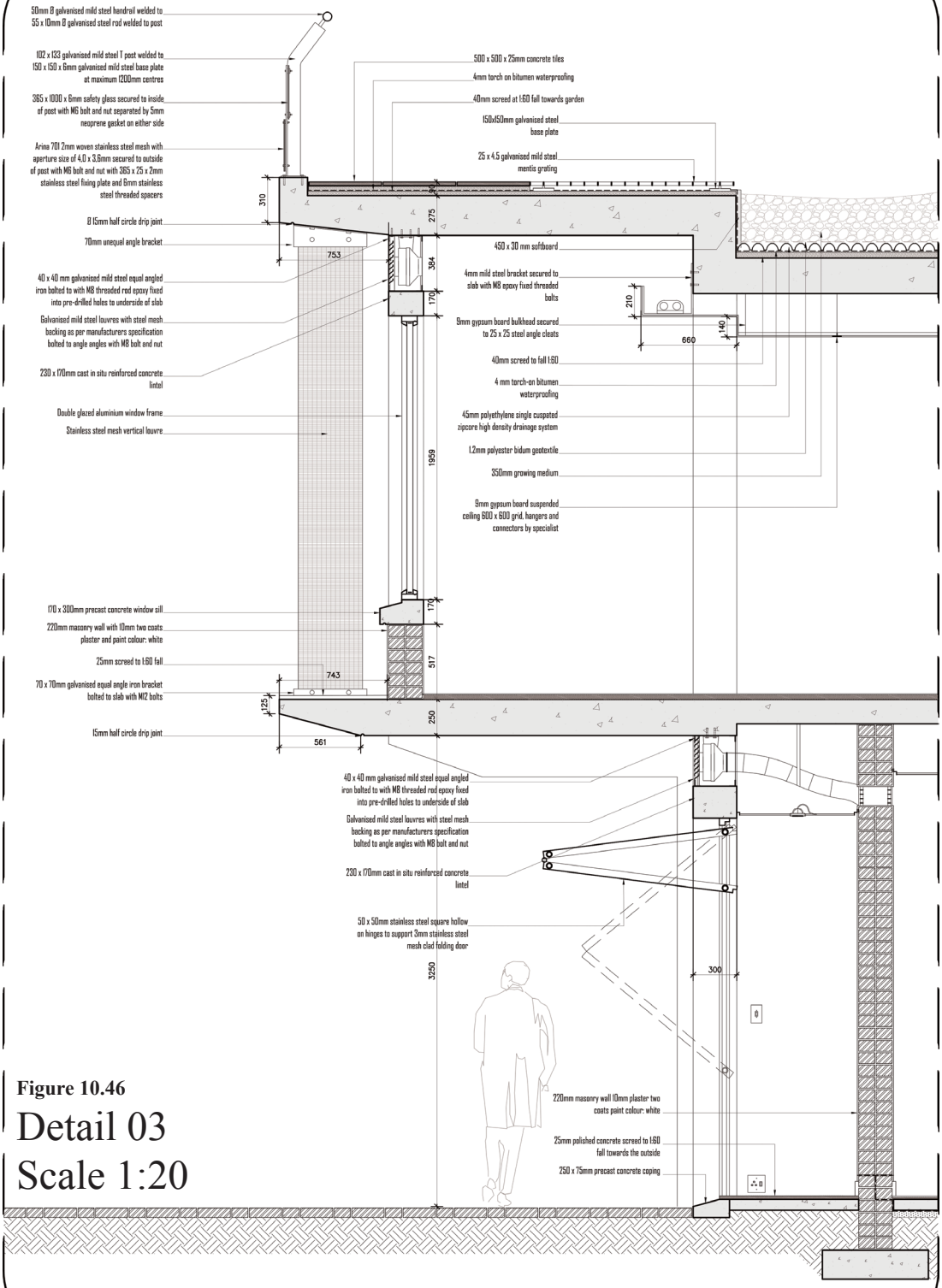

Figure 10.46

Detail 03
Scale 1:20

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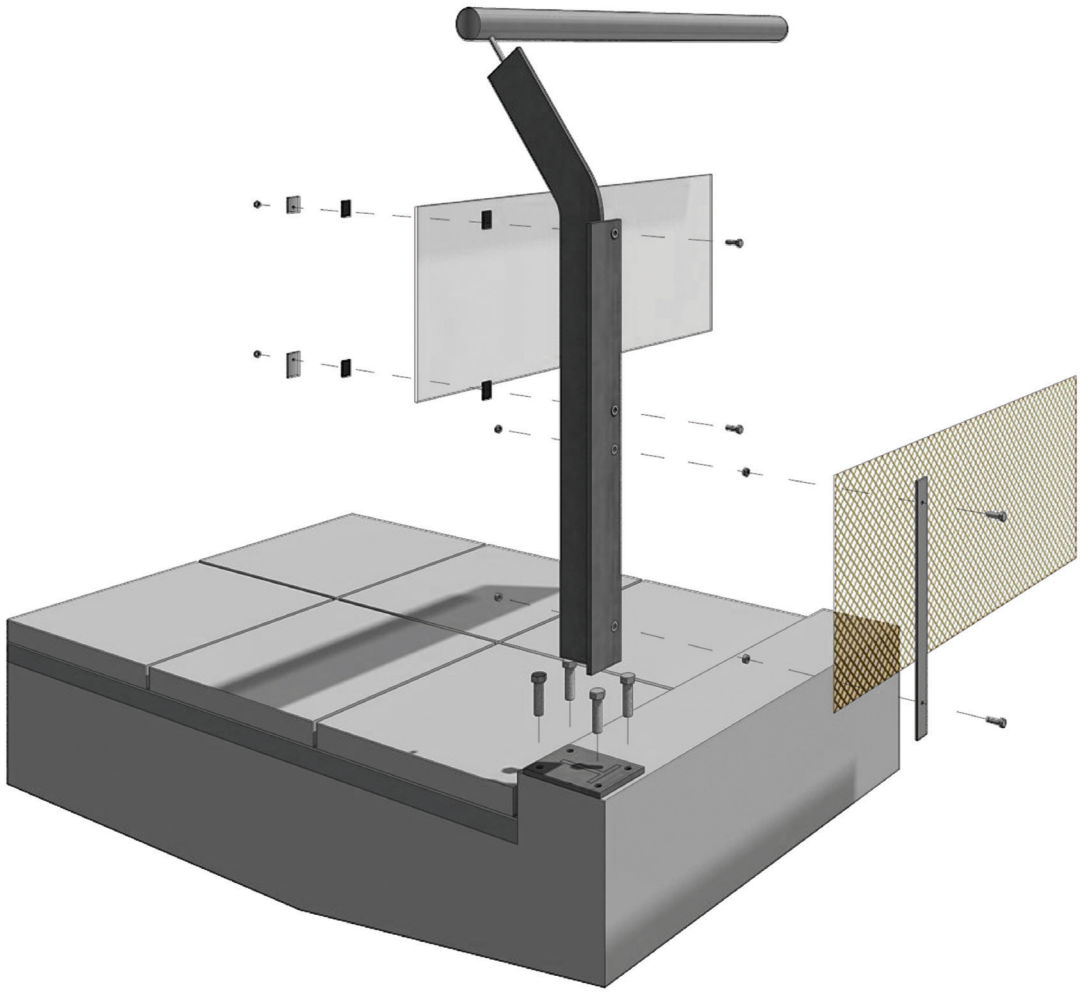

Figure 10.47 3-dimensional of handrail and balustrade (author 2013)

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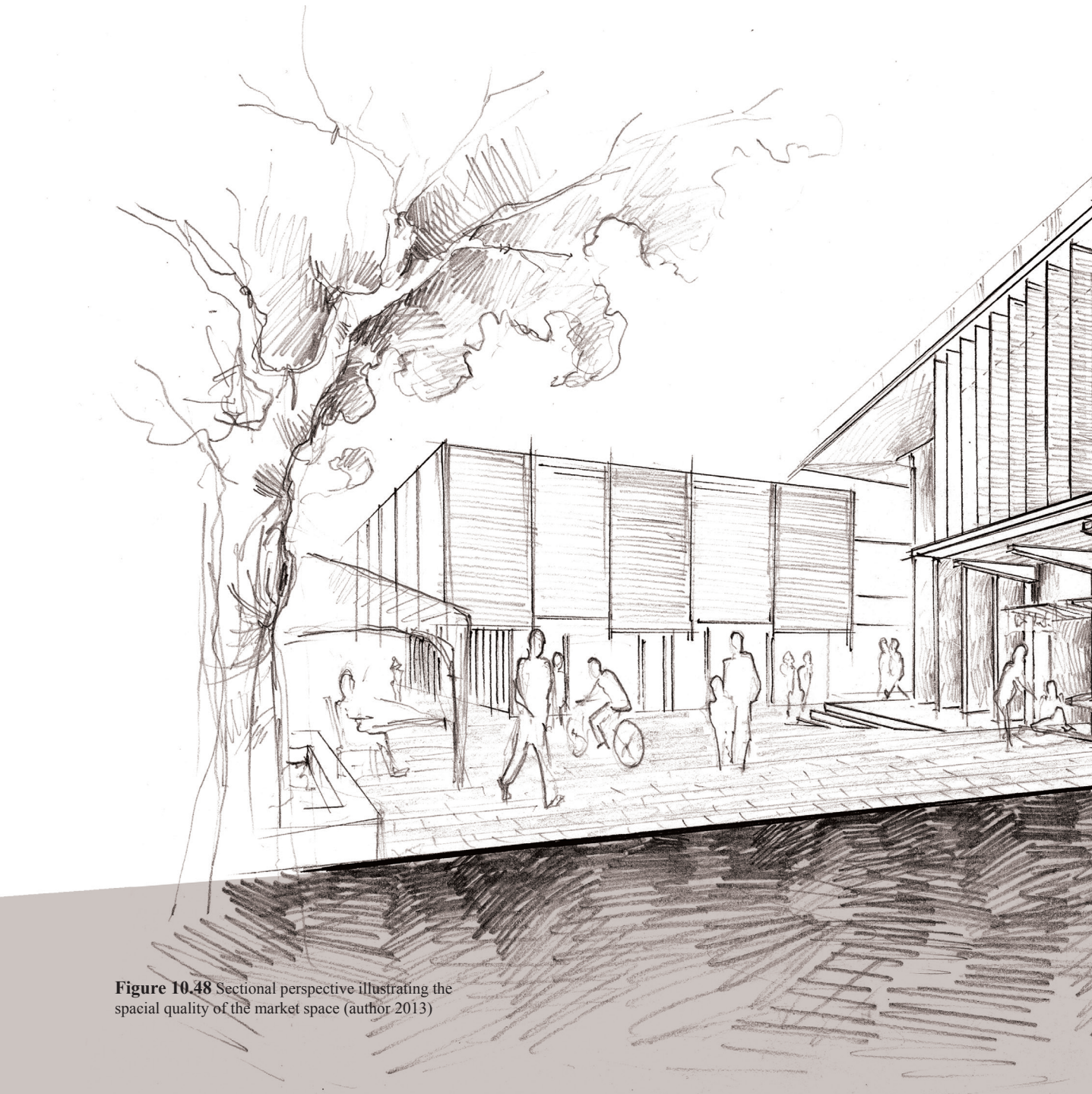

Figure 10.48 Sectional perspective illustrating the spacial quality of the market space (author 2013)

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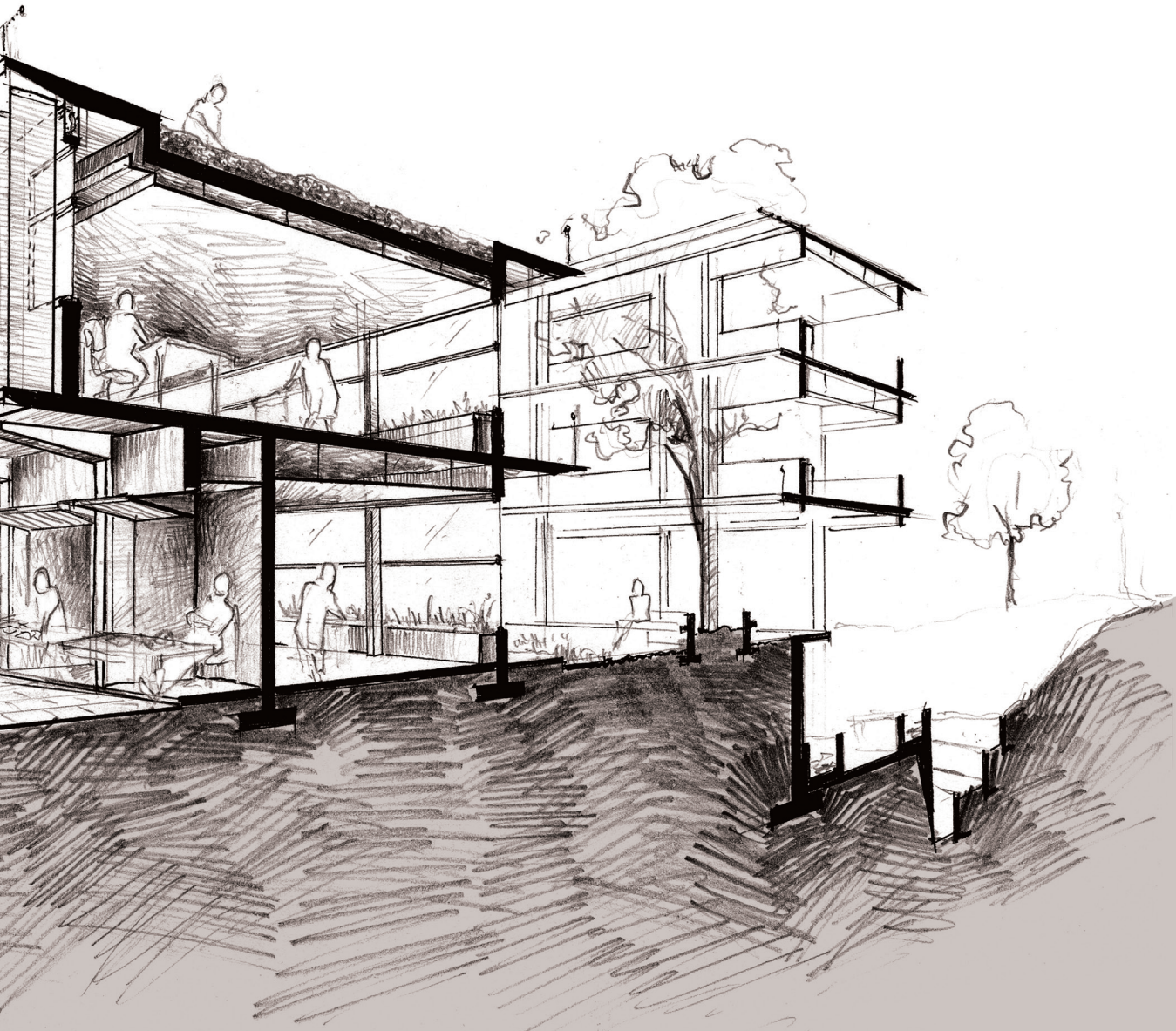

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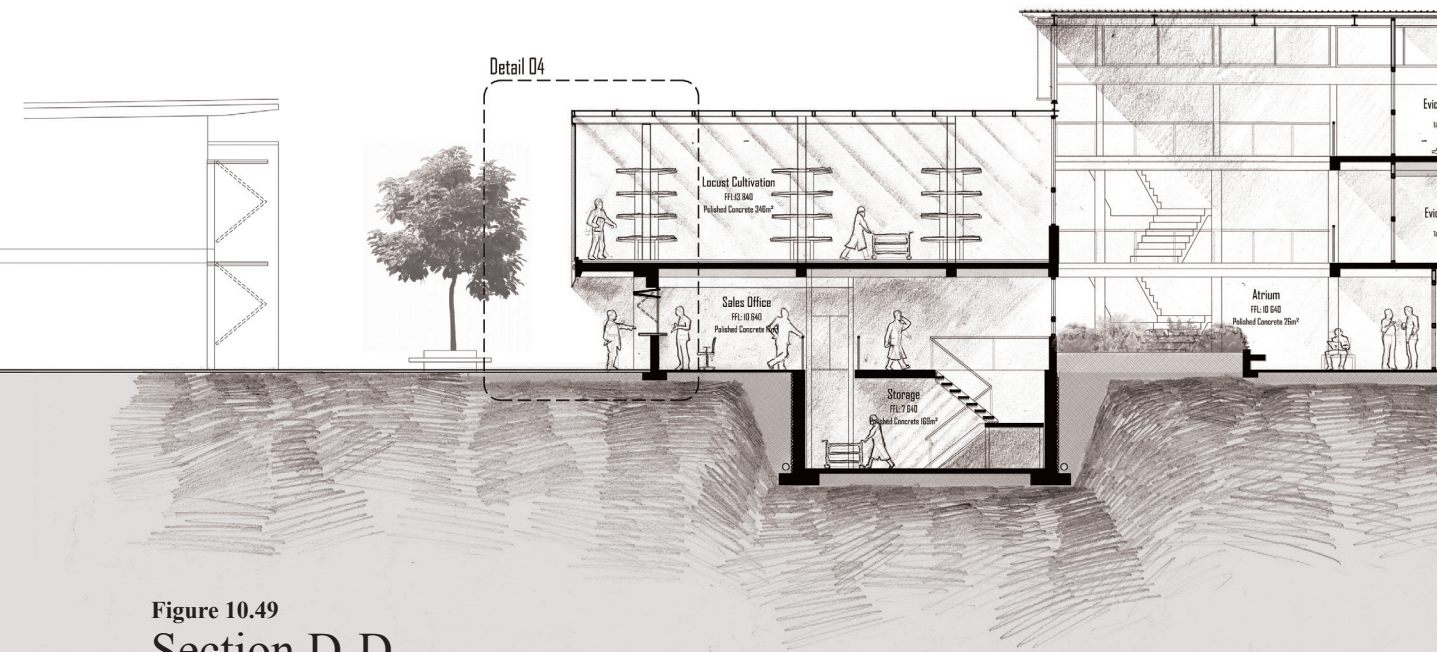

Figure 10.49
Section D-D
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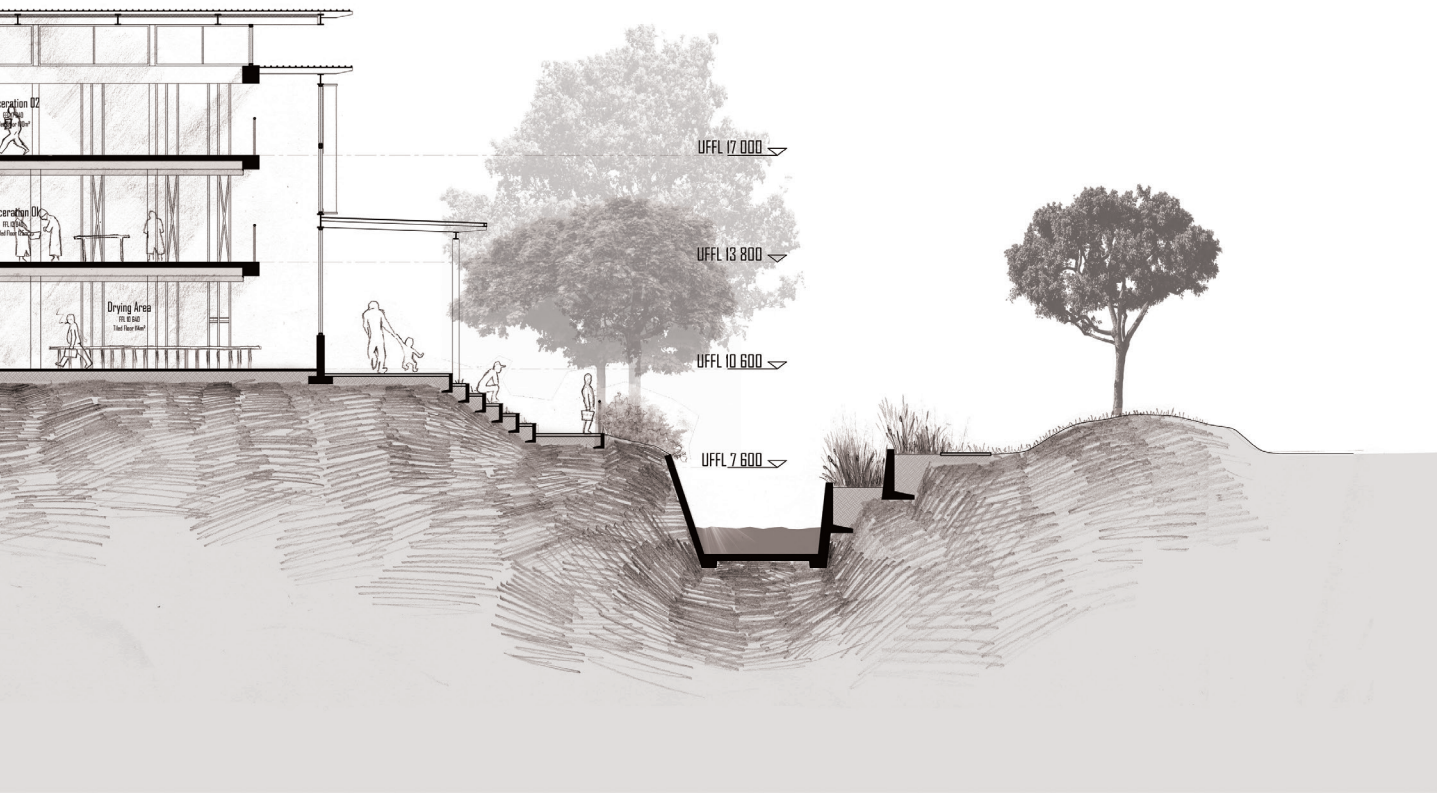

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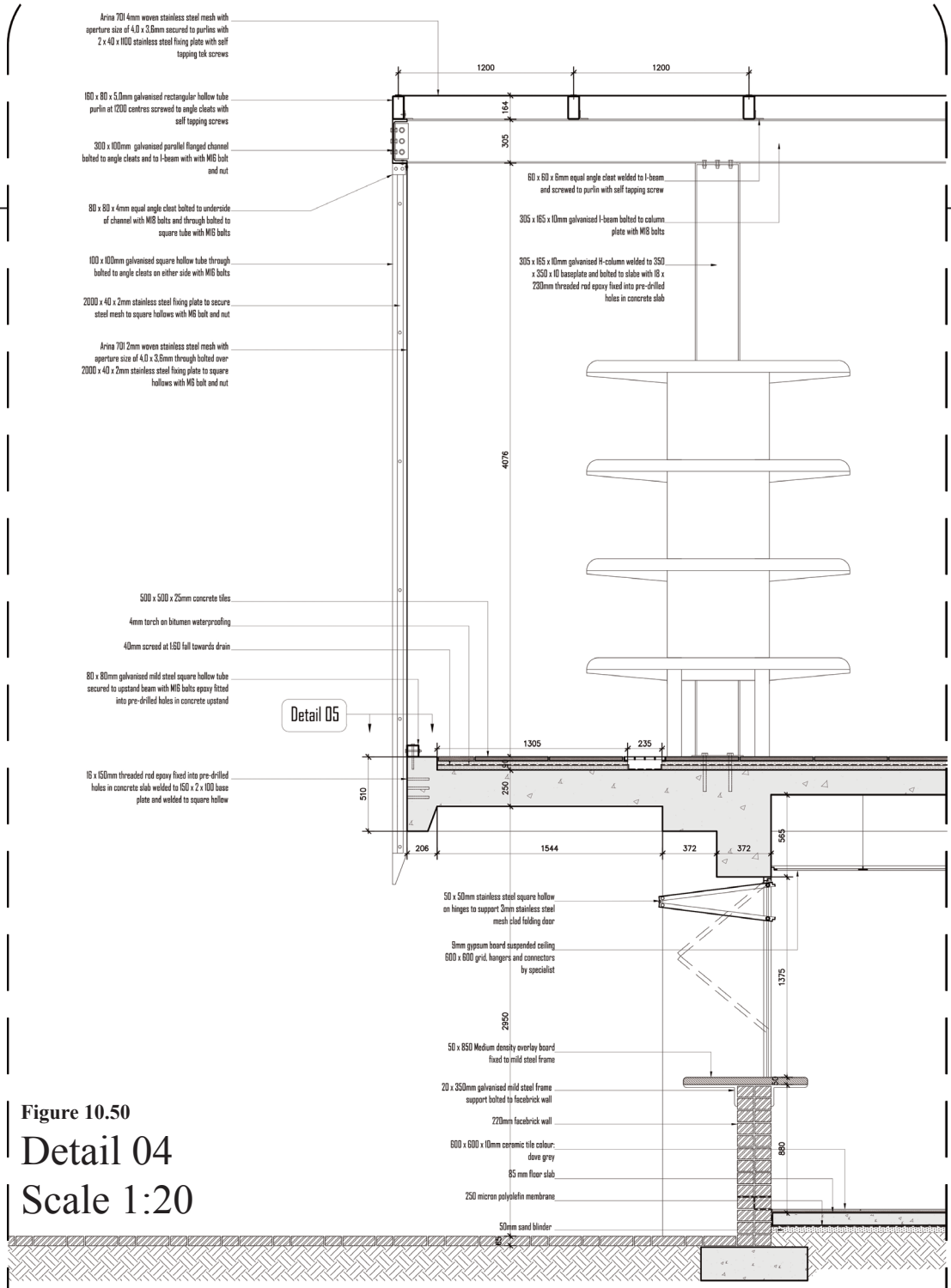

Figure 10.50

Detail 04
Scale 1:20

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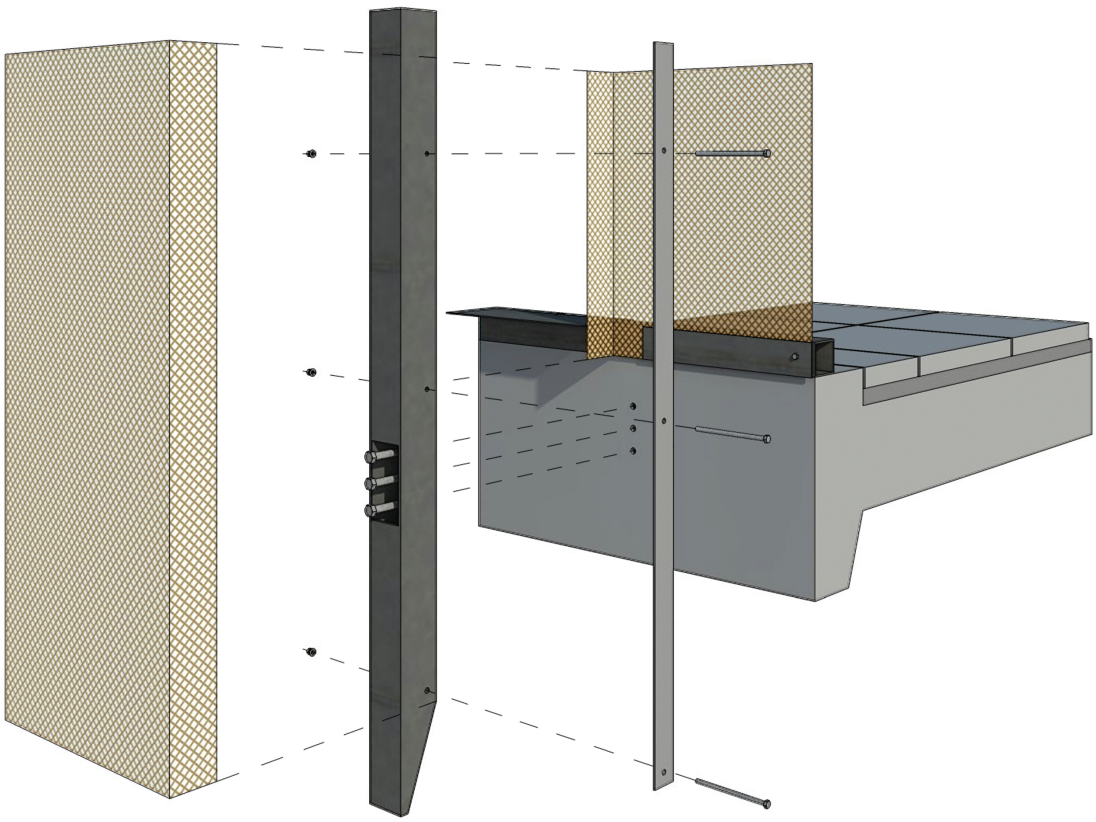

Figure 10.51 3-dimensional explosion of locust cage detail (author 2013)

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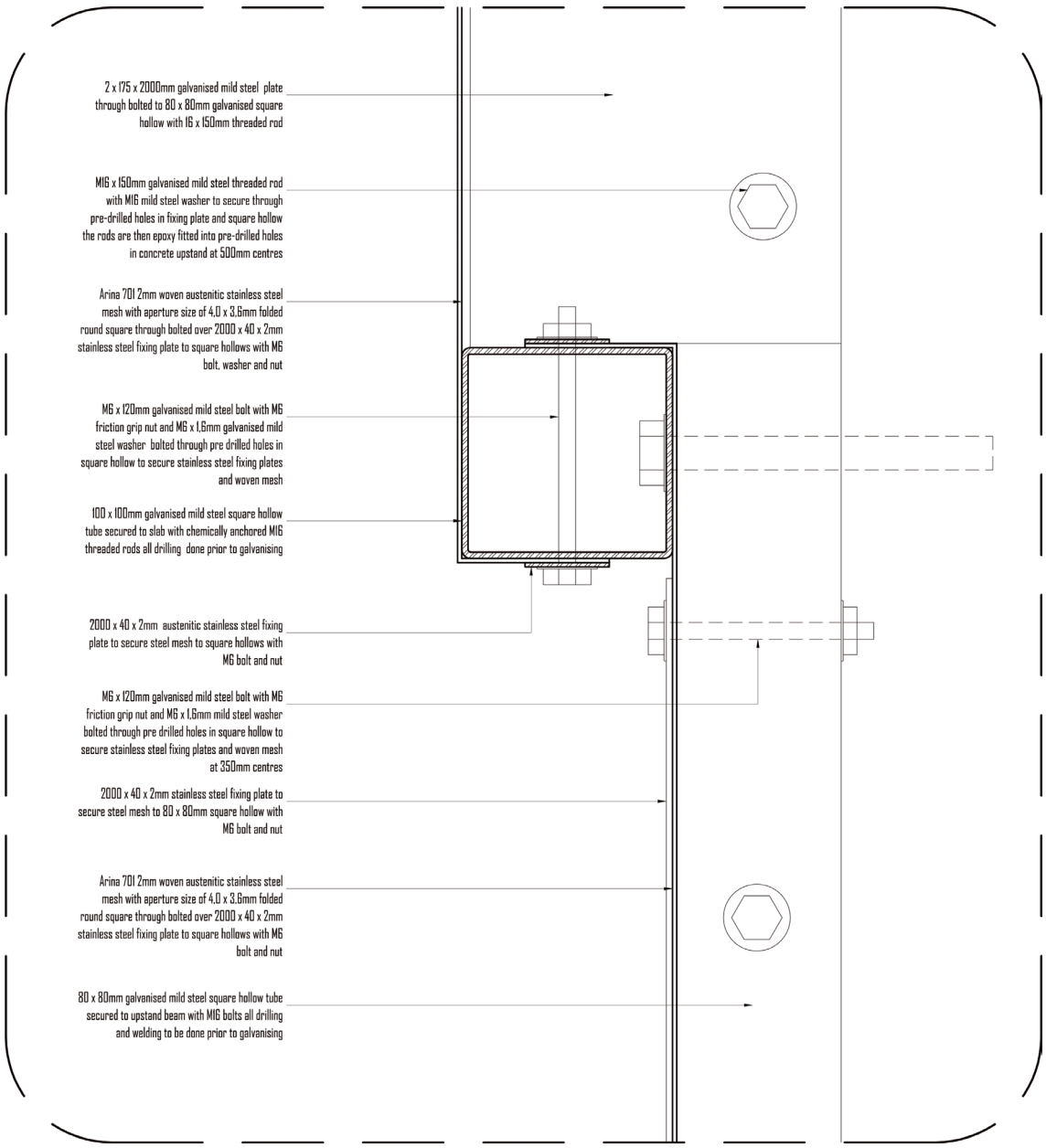

Figure 10.52

Detail 05
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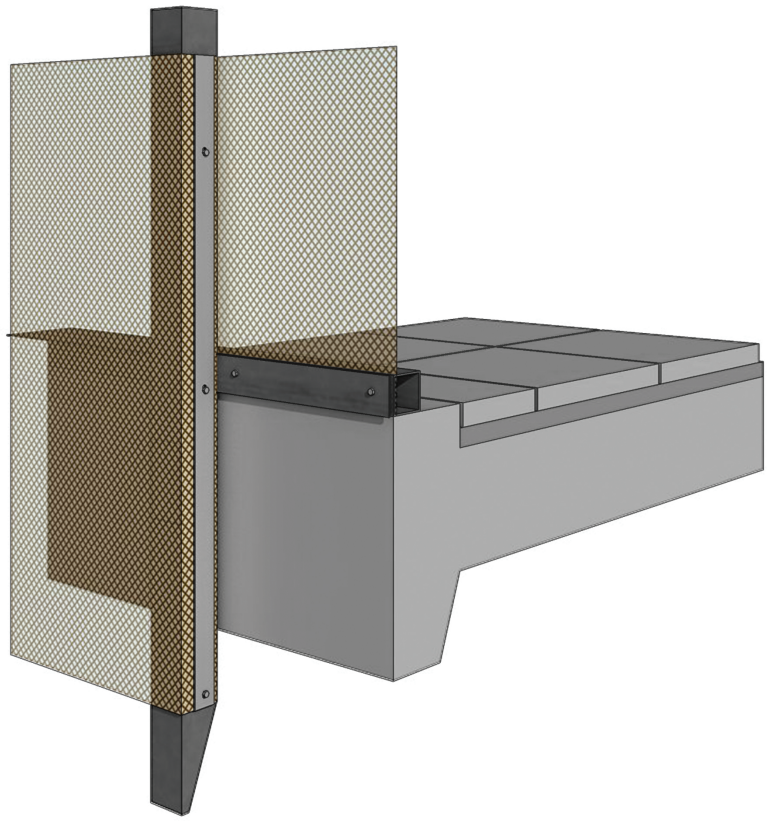

Figure 10.53 3-dimensional illustration of locust cage detail

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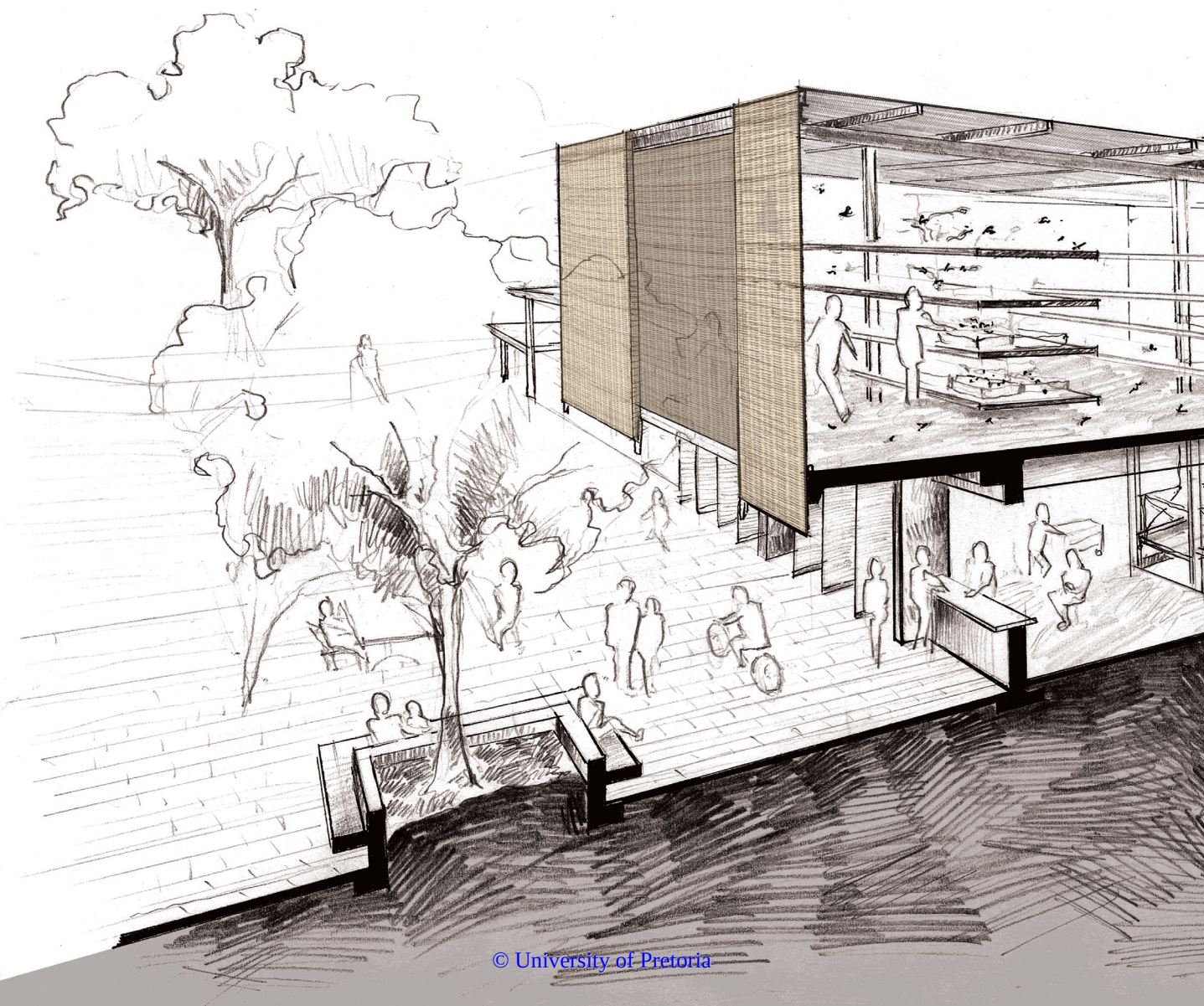

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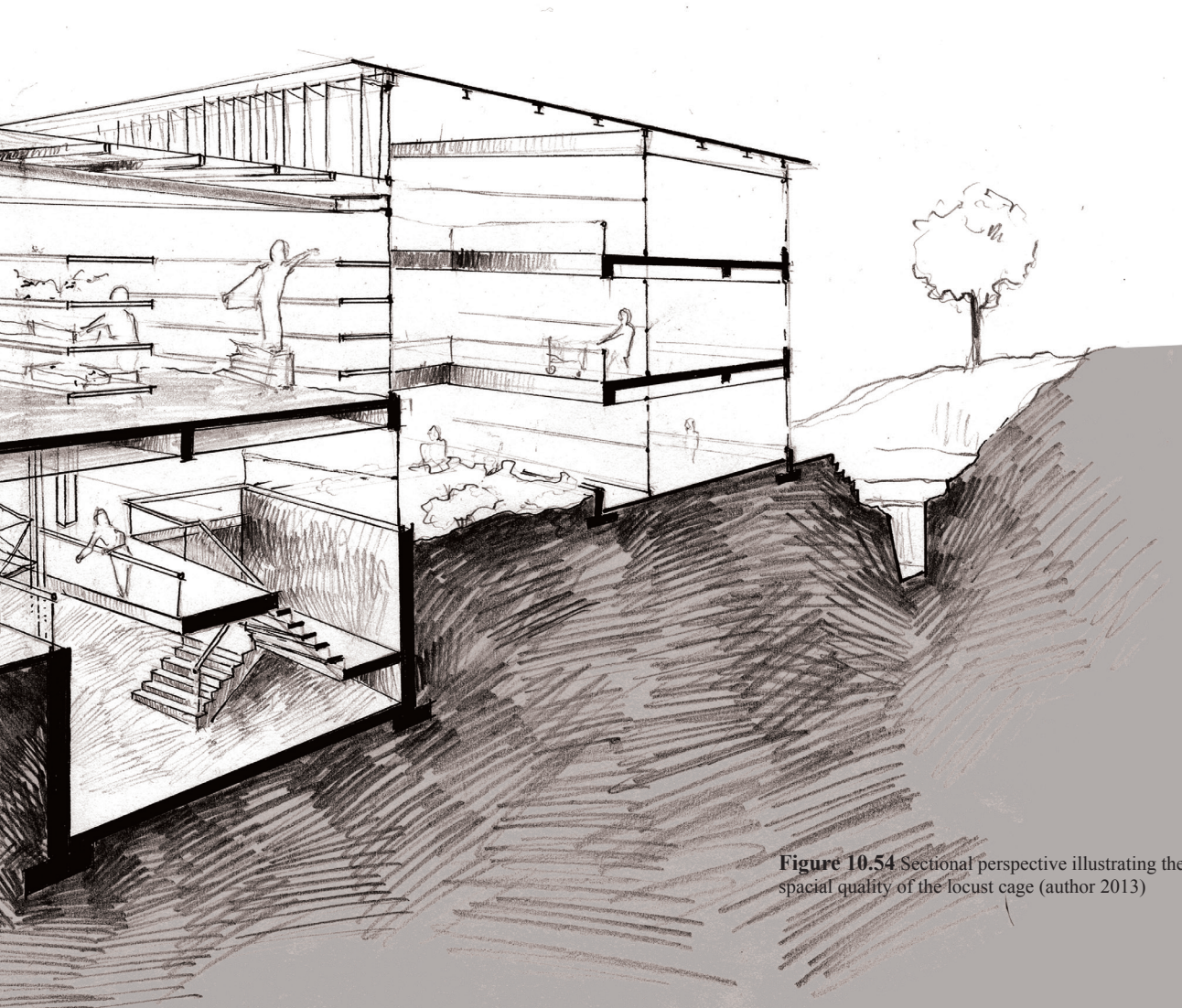

Figure 10.54 Sectional perspective illustrating the spacial quality of the locust cage (author 2013)

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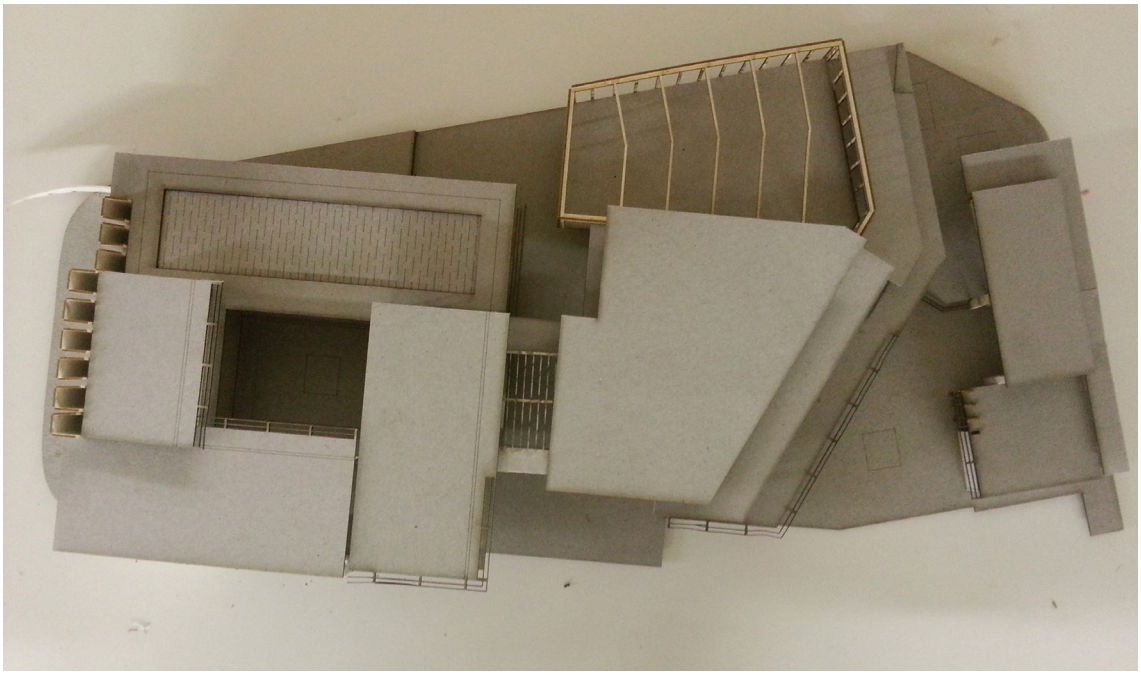

Figure 10.55 Above view of model (author 2013)

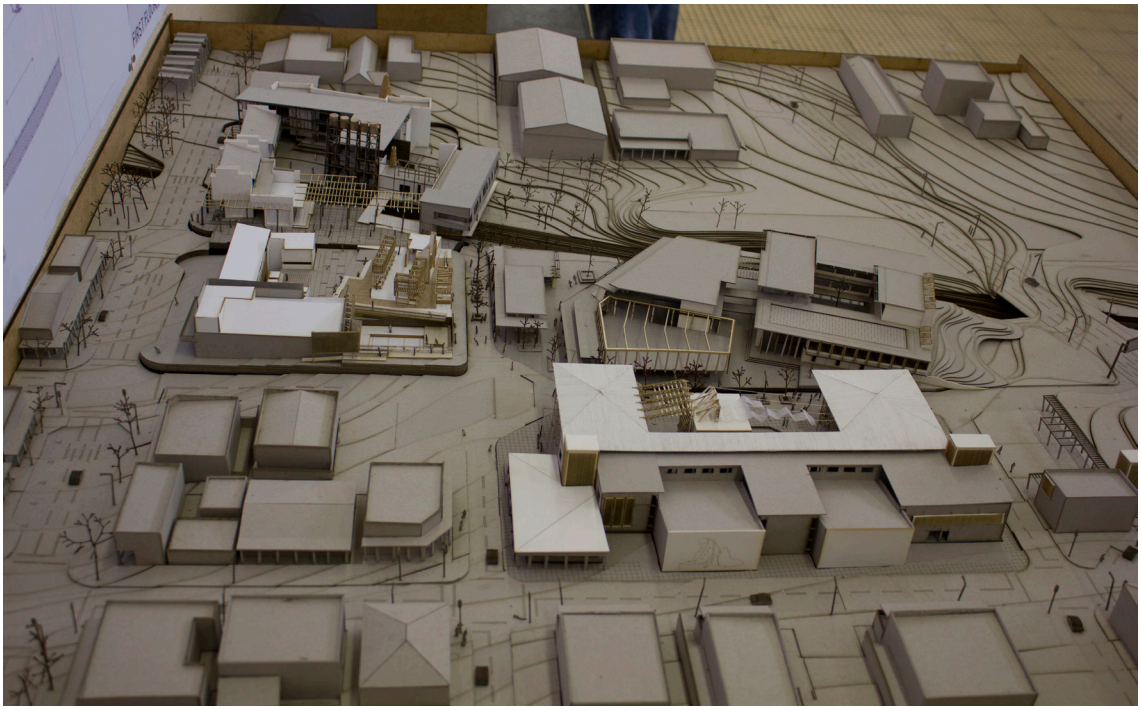

Figure 10.56 View of model in context from the west (author 2013)

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Figure 10.57 View of model from the Steenhovenspruit towards the north (author 2013)



Figure 10.58 View of model in context from the south-west (author 2013)

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Project Synthesis

The architectural investigation explores the relationship between human behavioural rituals and space. The aim of this dissertation was to investigate the possibility of influencing an existing food culture through altering people's perception. The project aimed to infiltrate the rituals of an existing food culture within Marabastad to introduce insects as a new food source. The project utilized classical conditioning as well as systematic desensitisation to gradually expose the public to the new food culture premise.

The architectural spatial organization and materiality reflects that of the context as well as the premise of progression and exposure.

The project is a catalyst. It acts as a starting point in a progression in food culture. It creates a new experience and stimulates a demand for a more sustainable food source. Within the framework, the building invigorates the context of Marabastad and celebrates its passed. The building addresses the rejuvenation of the old and becomes a threshold for the new.

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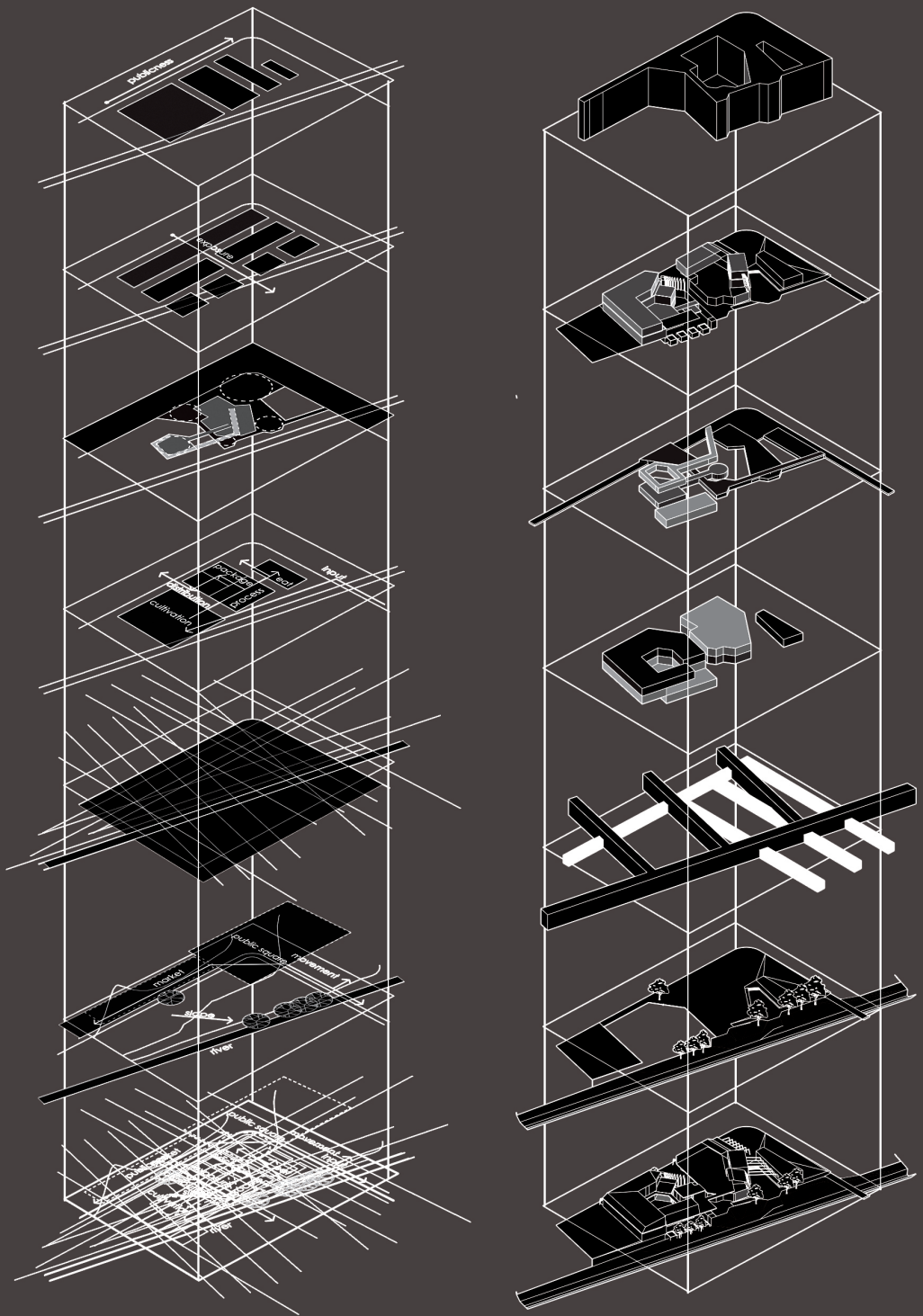

Figure 10.59 Synthesis of building elements that have reacted to the identified design informants (author October 2013)

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List of Figures

Figure 1.1 Conceptual sketch of a sustainable network (author 2013)
Figure 1.2 Illustration of world population (author 2013)
Figure 1.3 Current global food culture (author 2013) adapted from: http://www.head-held-high.org/category/blog
Figure 1.4 World population projection (author 2013)
Figure 1.5 Land-use implications of agriculture and livestock (author 2013)
Figure 1.6 Transport associated with the current food culture and implications incurred with the diminishing relationship with the consumer (author 2013)
Figure 1.7 Illustration of western diet in Africa (author 2013) adapted from: http://lori-palooza.blogspot.com/2011/01/fatty-fatty-two-by-four-cant-fit.html
Figure 1.8 Nutritional comparison between livestock and insects production (author 2013)
Figure 1.9 Land use comparison between livestock and locusts production (author 2013)
Figure 1.10 Carbon footprint comparison between beef and locust production (author 2013)
Figure 1.11 Lifecycle comparison between livestock and locusts (author 2013)
Figure 1.12 Feed to weight ratio comparison between livestock and locusts (author 2013)
Figure 1.13 Problem statement (author 2013)
Figure 1.14 The seductive consumption of an insect (author 2013) adapted from: http://www.bbc.co.uk/blogs/food/2011/03/why-not-eat-insects.shtml
Figure 2.1 Expression of disgust (author 2013)
Figure 2.2 Phobia treatment: contemporary exposure therapies (author 2013)
Figure 2.3 Pavlovian dog, the basis of all cognitive theory (author 2013)
Figure 3.1 Aerial photograph of South Africa highlighting the City of Tshwane (author 2013) *adapted from: Google earth*
Figure 3.2 Aerial photograph of the City of Tshwane highlighting Pretoria central (author 2013) *adapted from: Google earth*
Figure 3.3 Aerial photograph highlighting the township of Marabastad in relation to Pretoria Central Business District (CBD) (author 2013) *adapted from: Google earth*
Figure 3.4 Informal food stand selling dried mopane worms (author 2013)
Figure 3.5 Abandoned mosque on Boom Street (author 2013)
Figure 3.6 Typical pedestrian treatment (author 2013)
Figure 3.7 View of the Steenhovenspruit from Bloed Street (author 2013)
Figure 3.8 Aerial photograph of existing Marabastad indicating major streets and places (author 2013) *adapted from: Google earth*
Figure 3.9 Historical map indicating the footprint of Marabastad and potential site location (author 2013) *adapted from: Pretoria City Council circa 1913*
Figure 3.10 Historical photo capturing the fabric of Marabastad (Aziz Tayob Partnership)
Figure 3.11 Marabastad Footprint development over time (author 2013)
Figure 3.12 Photograpgh of Fareed Vally circa 1970 (author 2013)
Figure 3.13 Diagram of historic spatial organisation indicating Fareed Vally's residence. The Diagram illustrates the organic formation of communal spaces. (author 2013)
Figure 3.14 Photograpgh of Bonnie Vally circa 1970 (author 2013)
Figure 3.15 Section through shop and residential unit indicating layers of thresholds, a progression from public to private and the subversive culture experienced in historical Marabastad

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Figure 3.16 Photograph of an existing poster in Marabastad advertising a historical photo compilation book. (Fellow student)
Figure 3.17 Photograph illustrating the contrasting economic statuses in the Marabastad precinct (photo by Jason Nel)
Figure 4.1 Conceptual sketch of framework (Marabastad group members 2013)
Figure 4.2 Conceptual sketch of framework vision (group member 2013)
Figure 4.3 Diagram indicating important nodes, green belt and urban fabric densities (author 2013) *adapted form ARUP architects*
Figure 4.4 Important nodes, and their potential to influence surroundings (author 2013) *adapted form ARUP architects*
Figure 4.5 Diagram illustrating hertiage buildings and Boom Street as a heritage artefact (group members 2013)
Figure 4.6 Coding parameters of Boom Street (group members 2013) *adapted from Gary White Architects*
Figure 4.7 Coding parameters of Boom Street (group members 2013) *adapted from Gary White Architects*
Figure 4.8 Coding parameters of Boom Street (group members 2013) *adapted from Gary White Architects*
Figure 4.9 Coding parameters of Boom Street (group members 2013) *adapted from Gary White Architects*
Figure 4.10 Transportation including: railway, bus routes, taxi ranks and private vehicular movement (group members 2013)
Figure 4.11 Pedestrian dominant zones. As well as major pedestrian routes (group members 2013)
Figure 4.12 Programmatic zones in and around the Marabastad precinct (group members 2013)
Figure 4.13 Naturalised Steenhovenspruit with programmed edges, utilised by new residents (group members 2013)
Figure 4.14 Aerial photograph indicating the focus area and pedestrian route to Belle Ombre (author 2013) *adapted from Google earth*
Figure 4.15 Group focus area (group members 2013)
Figure 4.16 Perspective sketch of framework and focus area (group members 2013)
Figure 4.17 Conceptual sketch of market (author 2013)
Figure 4.18 Diagram illustrating programmatic interactions between proposed interventions
Figure 4.20 Section B-B indicating spatial quality (group members 2013)
Figure 4.19 Section A-A indicating spatial quality (group members 2013)
Figure 4.21 Section C-C indicating spatial quality (group members 2013)
Figure 4.22 Physical parameters of the focus are (group members 2013)
Figure 4.23 The tangible and intangible qualities expressed through proposed interventions (author 2013)
Figure 4.24 Conceptual sketch of framework vision (group member 2013)
Figure 4.25 Conceptual sketch of framework vision (group member 2013)
Figure 4.26 Aerial photograph indicating site location (author 2013) *adapted from Google earth*
Figure 4.27 Location plan NTS (author 2013)
Figure 4.28 Panoramic photograph of site in relation to Pretoria CBD (photo by Jason Nel)
Figure 5.1 African adoption of the western diet (author 2013) *adapted from: http://www.plainpicture.com/en/images/502433*
Figure 5.2 Major transport routes with influence on the Marabastad precinct (author 2013) *adapted from Google earth*
Figure 5.3 Marabastad as a nodal interchange, major transportation influences (author 2013) *adapted from Google earth*
Figure 5.4 Mabalie Baloe and her informal food stand (photo by Jason Nel 2013)
Figure 5.5 Photos of utensils and ingredients of Mabalie Baloe's informal food stand (photos by Jason Nel)
Figure 5.6 Informal food stand selling dried mopane worms (author 2013)
Figure 5.7 On-the-go style food stand (author 2013)
Figure 5.8 Sit and eat style food stand (author 2013)
Figure 5.9 Food types sold in Marabastad, expressed as percentages (author 2013)

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List of Figures

Figure 5.10 Section illustrating the relationship between the pedestrian and trade (author 2013)
Figure 5.12 Section through the 'intersection' of 9th and Boom Streets illustrating the pedestrian threshold (author 2013)
Figure 5.11 Plan of the 'intersection' of 9th and Boom Streets (author 2013)
Figure 5.13 Aerial photo indicating levels of pedestrian energy (author 2013)
Figure 5.14 Aerial photo indicating locations of all informl traders (author 2013)
Figure 5.15 Aerial photo indicating where food is purchased and consumed (author 2013)
Figure 6.1 Concept diagram of production process (author 2013)
Figure 6.2 Mealworm larvae stage (author 2013) *adapted from: http://insects-morphology.blogspot.com/2012/11/mealworms.html)*
Figure 6.4 Mealworm lifecycle (author 2013)
Figure 6.3 Mealworms as food (author 2013) *adapted from: http://abcnews.go.com/blogs/health/2012/12/20/mealworms-the-future-of-farm-to-table-dining/*
Figure 6.5 Starting out with ±300 mealworms (author May 2013)
Figure 6.6 The tupperware, the worms and the substrate (author May 2013)
Figure 6.7 The farm (author May 2013)
Figure 6.8 Worms to beetles (author May to August 2013)
Figure 6.9 Darkling beetles eating a potatoe slice (author September 2013)
Figure 6.10 Adult Locust (author 2013) *adapted from: http://www.123rf.com/photo_2111778_desert-locust-in-front-of-a-white-background.html*
Figure 6.11 Locusts as food (author 2013) *adapted from: http://abcnews.go.com/blogs/health/2012/12/20/mealworms-the-future-of-farm-to-table-dining/*
Figure 6.12 Locust lifecycle (author 2013)
Figure 6.13 Adult earthworm (author 2013) *adapted from: http://www.warrenphotographic.co.uk/05557-earthworm*
Figure 6.14 Earthworms (author 2013) *adapted from: http://www.warrenphotographic.co.uk/05557-earthworm*
Figure 6.15 Earthworm lifecycle (author 2013)
Figure 6.16 Adult mopane worm (author 2013) *adapted from: http://www.bizarrefood.com/blog/edible-mopane-worms/*
Figure 6.17 Earthworm lifecycle (author 2013)
Figure 6.18 Earthworms (author 2013) *adapted from: http://www.warrenphotographic.co.uk/05557-earthworm*
Figure 6.19 Area schedules and ratios (author 2013)
Figure 6.20 Concept diagram of programme infiltraing trade network rituals of Marabastad (author 2013)
Figure 6.21 Concept diagram of programmatic rituals (author 2013)
Figure 7.1 Diagram of layered informants (author 2013)
Figure 7.2 Aerial photo of site indicating major physical site informants (author 2013)
Figure 7.3 Diagram of physical site informants (author 2013)
Figure 7.4 Diagram of two major geometries (author 2013)
Figure 7.5 Diagram of publicness (author 2013)
Figure 7.6 Diagram of two major geometries (author 2013)
Figure 7.7 Diagram illustrating the influence of the historic spatial organisation (author 2013)
Figure 7.8 Diagram of the cultivation requirement process (author 2013)
Figure 7.9 Graph indicating the linear relationship between involvement and comfort (author 2013)
Figure 7.10 Graph indicating the linear relationship between involvement and exposure (author 2013)
Figure 7.11 Conceptual sketch of ritual and exposure (author 2013)

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Figure 7.12 Conceptual model expressing ritual and exposure (author 2013)
Figure 8.1 Blurring boundary *(adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/)*
Figure 8.2 Chapelle Notre Dame du Haut *(adapted from http://www.archdaily.com/84988/ad-classics-ronchamp-le-corbusier/)*
Figure 8.3 Barcelona market *(adapted from http://www.dezeen.com/2011/06/24/barceloneta-market-by-mias-architect)*
Figure 8.4 Hose Bridge *(adapted from http://www.dezeen.com/2013/08/14/hose-bridge-by-rintala-eggertsson/)*
Figure 8.5 Diagram illustrating the choice of precedents in relation to the informants (author 2013)
Figure 8.6 The market extends into the public square and defines space whilst bringing the scale down to meet the pedestrian (author 2013)
Figure 8.7 Barcelona market *(adapted from http://www.dezeen.com/2011/06/24/barceloneta-market-by-mias-architects/)*
Figure 8.8 Barcelona market *(adapted from http://www.dezeen.com/2011/06/24/barceloneta-market-by-mias-architects/)*
Figure 8.9 Barcelona market in context *(all barcelona market images adapted from http://www.dezeen.com/2011/06/24/barceloneta-market-by-mias-architects/)*
Figure 8.10 Materiality of the bridge illustrates a progression in transparency (author 2013)
Figure 8.11 Hose Bridge *(adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/)*
Figure 8.12 Hose Bridge *(adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/)*
Figure 8.13 Hose Bridge *(adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/)*
Figure 8.14 Hose Bridge in the landscape illustrating levels of transparency through materiality *(all images of Hose bridge adapted from http://www.dezeen.com/2013/08/14/hose-bridge-by-rintala-eggertsson-architects/)*
Figure 8.15 Heavy to light, gradual levels of exposure (author 2013)
Figure 8.16 Plan *(adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/)*
Figure 8.17 Lighting accentuates the concept *(adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/)*
Figure 8.18 Paving design *(adapted from http://www.archdaily.com/371919/blurring-boundary-utaa/)*
Figure 8.19 Expression of mass (author 2013)
Figure 8.20 Chapelle Notre Dame du Haut *(adapted from http://www.archdaily.com/84988/ad-classics-ronchamp-le-corbusier/)*
Figure 8.21 Chapelle Notre Dame du Haut *(adapted from http://www.archdaily.com/84988/ad-classics-ronchamp-le-corbusier/)*
Figure 8.22 Chapelle Notre Dame du Haut *(adapted from http://www.archdaily.com/84988/ad-classics-ronchamp-le-corbusier/)*
Figure 8.23 Chapelle Notre Dame du Haut *(adapted from http://www.archdaily.com/84988/ad-classics-ronchamp-le-corbusier/)*
Figure 8.24 Chapelle Notre Dame du Haut *(all images adapted from http://www.archdaily.com/84988/ad-classics-ronchamp-le-corbusier/*
Figure 9.1 Layering the informants (author 2013)
Figure 9.2 Concept sketch of earthworm pits and eastern facade (author May 2013)
Figure 9.3 Concept sketchplan 01 (author March 2013)
Figure 9.4 Concept sketchplan 02 (author March 2013)
Figure 9.5 Concept sketch of softening edge and public/private space (author March 2013)
Figure 9.6 Concept sketchplan 03 (author April 2013)

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List of Figures

Figure 9.7 Concept sketchplan 04 (author April 2013)
Figure 9.8 Concept sketchplan 05 (author May 2013)
Figure 9.9 Concept sketchplan 06 (author June 2013)
Figure 9.10 Concept sketch of market sedge and locust cage (author August 2013)
Figure 9.11 Cross section through river channel and market edge (author May 2013)
Figure 9.12 Cross section through river channel and market edge (author June 2013)
Figure 9.13 Cross section through river channel and market edge (author August 2013)
Figure 9.14 Longitudinal section through locust cages. Illustrating scale changes (author May 2013)
Figure 9.15 Longitudinal section through. Illustrating scale and function (author May 2013)
Figure 9.16 Concept sketch of earthworm pits and eastern facade (author August 2013)
Figure 9.17 Diagram illustrating how the footprint becomes more public (author 2013)
Figure 9.18 Diagram illustrating natural light penetration into spaces (author 2013)
Figure 9.19 Diagram illustrating the influence of the major geometries on site (author 2013)
Figure 9.20 Diagram illustrating movement patterns on site an in building(author 2013)
Figure 9.21 Diagram illustrating the building opening towards the natural systems (author 2013)
Figure 9.22 Diagram illustrating changes in scale and establishing hierarchy (author 2013)
Figure 9.23 Diagram illustrating positioning of various programmatic functions (author 2013)
Figure 9.24 Diagram of composite structure (author 2013)
Figure 9.25 River edge, model in context (author June 2013)
Figure 9.26 Market edge with locust cage, model (author June 2013)
Figure 9.27 Model (author August 2013)
Figure 9.28 Model (author August 2013)
Figure 10.1 Longitudinal section with technological exploration (author September 2013)
Figure 10.2 Tectonic concept (author October 2013)
Figure 10.3 The skin as a mediator, expressed through technology (author September 2013)
Figure 10.4 Preliminary Material palette (author September 2013)
Figure 10.5 Concept sketch expressing the tectonic nature and materiality of the building (author September 2013)
Figure 10.6 Concept sketch expressing the tectonic nature and materiality of the building (author 2013)
Figure 10.7 The ground plane is used to dictate movement and define space (author 2013)
Figure 10.8 Concrete is used to create privacy. It illustrates a heaviness into a lightness (author 2013)
Figure 10.9 The slabs create overhangs and define space. They become lighter floating elements to illustrate exposure.(author 2013)
Figure 10.10 The building becomes lighter as it extends into the sky with the use of lightwieght steel (author 2013)
Figure 10.11 Steel roof sheeting is used on the pergola roof. It is used to unite the form and manipulate scale (author 2013)
Figure 10.12 The skin of the building articulates the interaction with the public.(author 2013)
Figure 10.13 Building system concept (author 2013)
Figure 10.14 Earth pipe ventilation system *(author 2013) adapted from Gonzalo, 2006: 174*
Figure 10.15 Louvered facade *(author 2013) adapted from Gonzalo, 2006: 174*
Figure 10.16 Natural light in the classroom *(author 2013) adapted from Gonzalo, 2006: 173*
Figure 10.17 Rainwater catchment, usage and storage table
Figure 10.18 Rainwater catchment, usage and storage graph
Figure 10.19 Parabolic solar collector system (author 2013) *adapted from http://www.technologystudent.com/energy1/solar3.*

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html
Figure 10.20 Section illustrating ventilation and light (author 2013)
Figure 10.21 Rainwater is collected off roof surfaces and stored. There are two wet core systems in the building (author 2013)
Figure 10.22 Three sets of earthpipes used to cool air before entering the building. Extractor fans used to create cross ventilation (author 2013)
Figure 10.23 Parabolic solar collectors heat water to boil insects and create power (author 2013)
Figure 10.24 Ground floor plan NTS (author October 2013)
Figure 10.25 Site plan (author 2013)
Figure 10.26 Ground floor plan (author 2013)
Figure 10.27 Basement plan (author 2013)
Figure 10.28 Roof plan (author 2013)
Figure 10.29 First floor plan (author 2013)
Figure 10.30 Second floor plan (author 2013)
Figure 10.31 West elevation (author 2013)
Figure 10.32 Section A-A (author 2013)
Figure 10.33 Section A-A (author 2013)
Figure 10.34 Section B-B (author 2013)
Figure 10.35 Detail 01 roof and extractor fan detail (author 2013)
Figure 10.36 3-dimensional of roof detail and extractor fan (author 2013)
Figure 10.37 Detail 02 concrete bench with earth-tube inlet (author 2013)
Figure 10.38 3-dimensional detail of concrete bench with earth-tube inlet (author 2013)
Figure 10.39 Section A-A (author 2013)
Figure 10.40 Detail 06 insect tower and roof detail (author 2013)
Figure 10.41 Detail 07 insect tower and retaining wall (author 2013)
Figure 10.42 Detail 08 plan of insect tower and tray system (author 2013)
Figure 10.43 3-dimensional illustration of insect tray detail (author 2013)
Figure 10.44 Sectional perspective illustrating the spacial quality created by the insect towers (author 2013)
Figure 10.45 Section C-C (author 2013)
Figure 10.46 Detail 03 of market edge condition (author 2013)
Figure 10.47 3-dimensional of handrail and balustrade (author 2013)
Figure 10.48 Sectional perspective illustrating the spacial quality of the market space (author 2013)
Figure 10.49 Section D-D (author 2013)
Figure 10.50 Detail 04 locust cage woven mesh (author 2013)
Figure 10.51 3-dimensional explosion of locust cage detail (author 2013)
Figure 10.52 Detail 05 locust cage woven mesh (author 2013)
Figure 10.53 3-dimensional illustration of locust cage detail (author 2013)
Figure 10.54 Sectional perspective illustrating the spacial quality of the locust cage (author 2013)
Figure 10.55 Above view of model (author 2013)
Figure 10.56 View of model in context from the west (author 2013)
Figure 10.57 View of model from the Steenhovenspruit towards the north (author 2013)
Figure 10.58 View of model in context from the south-west (author 2013)
Figure 10.59 Synthesis of building elements that have reacted to the identified design informants (author 2013)

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Declaration

In accordance with Regulation 4(e) of General Regulations (G.57) for dissertations and theses, I declare that this thesis, which I hereby submit for the degree Master of Architecture (Professional) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

I further declare that no part of my thesis has already been, or is currently being, submitted for any such degree, diploma or other qualification.

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



Rishaad Ismail Vally
October 2013

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Acknowledgements

I would like to thank course coordinator Arthur Barker and study leader Neels van Rooyen for their generosity with their time and knowledge.

Special thanks to Romaana Mckinnon and Adrian Klink without which this book would not have been possible.

Thank you to my family and friends for their support, strength and patience.

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