

reconnecting man with nature

post-industrial landscape development



era regional park

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project summary

Era Regional Park
Old Era Brick Works, Brick factory
Erf R/171, 254, 306 Derdepoort 326-JR
Cnr St. Joseph & Filander Ave.
Eersterust. Silverton.
Pretoria.
South Africa.
S25°42'49.12". E28°18'12.48"

Environmental Potential & Heritage and Cultural Landscapes

a special thanks to...

Ida Breed, for her admirable guidance and ongoing support throughout the year.

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Michelle Bester, for editing this document.

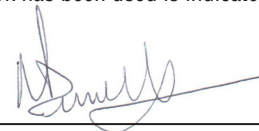
Mc for your love and support.

To all my friends and family, I thank you for the ongoing encouragement and inspiration. Without your support, none of this would have been possible.

In accordance with Regulations 4(e) of the General Regulations (G.57) for dissertations and theses, I declare that his dissertation, 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 state that no part of this dissertation 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.



marina burmeister
november 2014

Vir my pa, Christiaan.

Dit is 'n voorreg om pa as my rolmodel te hê en ek kan net hoop om eendag die waardes, geduld, liefde en geloof aan ander te leer soos wat pa dit aan my geleer het.

abstract

Industries became a permanent addition to cities in the 18th century, transforming the natural landscape and influencing the people directly dependant on it, this enforces to the consumer culture we experience every day.

This industrial development all over the world has disregarded apparent and non-apparent relationships that humans have within nature, resulting in the connection between humans and nature to become estranged, leaving humankind searching for identity and purpose.

This study investigates the connection between humans and nature through adapting the post-industrial landscape, to ultimately establish an identity of place for human well-being.

The study proposes that apparent and non-apparent relationships between humans and nature can be introduced in the post-industrial landscape through the concepts of ecosystem services and commemorative design. By commemorating the natural landscape, memories and experiences will create an appreciation for the natural landscape, strengthening the connection

between humans and nature. Different ecosystem services are generated by the design to establish ecological and human well-being.

The sketch plan design intervention proposes that, these apparent and non-apparent relationships between humans and nature are revealed and celebrated. The non-apparent relationships are transformed into apparent design features within the landscape to make visitors aware of their unity with nature and the services it provides them with. The design proposal creates opportunities for interaction, education and appreciation by means of food gardens, utility gardens, biodiversity gardens and experiments of spontaneous succession.

The purpose of these interventions is to restore the post-industrial landscape while creating a strong cultural connection to heritage within industries and nature to reconnect humankind with their own identity as part of nature.

Gedurende die 18de eeu het industriële n permanente toevoeging tot ons stede geword, wat veroorsaak dat die natuurlike landskap verander. Die verandering van die landskap het 'n direkte invloed op die mense wat afhanklik daarvan is en dra grootliks by tot die huidige verbruikers kultuur.

Die wêreldwye industriële ontwikkeling het gelei tot die minagting van die direkte en indirekte verhoudinge wat die mensdom teenoor die natuur het. Dit veroorsaak dat die mensdom soek na identiteit en 'n doel vir hul lewe.

Hierdie studie ondersoek die verband tussen mense en die natuur, deur die aanpassing van die post-industriële landskap, om uiteindelik 'n indentiteit van plek vir menslike welsyn te vestig.

Hierdie studie stel voor dat die direkte en indirekte verhoudings tussen die mens en die natuur herstel kan word in die post-industriële landskap, deur die gebruik van ekosisteem dienste asook die gebruik van 'n herdinkings benadering tot die ontwerp. Deur die herdenking van die natuurlike landskap, sal herhinneringe en ervarings

samevatting

'n waardeering skep van die natuurlike landskap, wat sal lei tot die bevordering van die verhouding tussen die mens en die natuur. Verskillende ekosisteem dienste word deur die ontwerp gegeneer om ekologiese en menslike welsyn te hervestig en te bevorder.

Die skets plan ontwerp ingryping stel voor dat die direkte en indirekte verhoudinge tussen die mens en die natuur geopenbaar en gevier moet word. Die indirekte verhoudings word omskep in direkte ontwerp funksies binne die landskap wat besoekers bewus maak van hul eenheid met die natuur en die dienste wat die natuur hulle bied. Die ontwerp skep geleenthede vir interaksie, opvoeding en waardeering, deur middel van produktiewe-tuine, nut-tuine, biodiversiteits-tuine en die eksperimente van spontane opvolgings in die natuur.

Die doel van hierdie intervensies is om die post-industriële landskap te herstel, en terselfde tyd 'n sterk kulturele en erfensies verband te skep tussen nywerhede en die natuur, wat die mensdom se verhouding en identiteit as deel van natuur sal herstel.

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01_introduction

01_introduction

01.01_background

Landscapes that are left behind from the works of industries, mining and other industrial manufacturing are called post-industrial landscapes. These landscapes pose the threat of being major sources of pollution that can lead to overall degradation of the surrounding areas.

Niall Kirkwood argues in the book *Manufactured Sites: Re-thinking the Post-industrial landscape*, that these sites offer great opportunity to be adapted in post-use landscapes that can be leisurely occupied, and address issues of social, economic and environmental crisis (Niall Kirkwood 2011:xiv).

Over the last 20 years the need to address the damaging legacy of derelict and abandoned industrial buildings, environmentally compromised land areas as well as polluted soils and water have become crucial within the urban realm (Niall Kirkwood 2011:xiv). All over the world, examples can be found of post-industrial landscapes that are been successfully transformed into healthy land-

scapes. Within the context of South Africa, there are not many examples of successful post-industrial landscape developments, but the same problem experienced world wide is also present here, and the need to address these sites are becoming more eminent.

In South Africa, the old apartheid spatial legacy allowed for industries to act as buffers to separate different racial suburbs, resulting in prominent industrial zones between residential suburbs. Over the course of time technology developed to such an extent that manufacturing processes have been optimised and old technology, processes, and machinery has been left behind. This caused for a majority of existing industrial sites to be upgraded, resulting in a costly transformation that in some cases it was beneficial and necessary to move to a new, safe premises.

This is a problem that is on the rise within the context of South Africa, where these vast industrial sites are decommissioned, leaving post-industrial sites, locked in between residential suburbs. What is to happen to the vast post-industrial land that is left behind from industries?

This is exactly the case with the chosen site for this dissertation. The Era Bricks factory and quarry was established in 1954 and

has been actively used for the production of bricks in the last 50 years. The quarry has been depleted of clay. The kiln structures used to bake the bricks are dangerously unsafe, the coal imported to manufacture the bricks is too expensive and the whole process has become too labour intensive. The decision was made for the Era Brick Works to apply for decommissioning and to establish a new, modern factory elsewhere, as the upgrade of the existing factory is nearly impossible and too costly.

For many years, the Era Bricks factory has been a landmark for the communities of Eersterust, Jan Niemand Park and the Silverton area in Pretoria. Now that the factory is on the brink of being decommissioned, what is to happen to the tangible and intangible heritage of the industrial landscape?

The National Environmental Act 107 of 1998, states that “Everyone has the right to have the environment protected, for the benefit of present and future generations.” To be achieved through measures that: prevent pollution and ecological degradation; promote conservation and; secure ecological sustainable development and use of natural

resources while promoting justifiable economic and social development.

Kirkwood (2011:xiv) states that the land left behind by industry can be optimally developed to meet the current needs of the surrounding community in terms of climate change, disaster management, food security and social inequity. After the decommissioning of Era Bricks, the little used, economically and environmentally degraded factory, quarry and surrounding servitude areas poses a great opportunity to be adapted into a landscape that can better the lifestyles of the surrounding communities, in order to address current and future needs of urban society.

Landscape architecture’s role will be explored in the integration between humankind, nature and industry. By introducing natural industries and ecosystem services with a significant public interface, landscape architecture has the potential to act as a mediator between humans and nature. With the aim to restore humankind’s identity within nature.



01.02_problem statement

Industrial development has disregarded the apparent and non-apparent relationships with nature that forms the basis for human identity.

01.03_hypothesis

In order to establish an identity of place for human well-being, apparent and non-apparent relationships between humans and nature can be introduced through the concepts of ecosystem services and commemorative landscape design.

01.04_project intent

Through a commemorative design intervention, this project aims to reveal and celebrate the apparent and non-apparent relationships between humans and nature. By making non-apparent relationships more apparent within the post-industrial landscape, humans can be made aware of their unity with nature. Humans can interact with nature in new ways allowing reflection on their estranged relationship with nature, ultimately reconnecting humans with their own identity as part of nature.

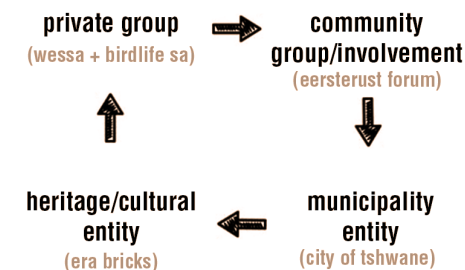
01.05_research questions

1. What is a post-industrial landscape (within the context of the world, South Africa and Silverton)?
2. What are typical apparent and non-apparent relationships between humans and nature (in general and in Silverton)?
3. How can the connection between humans and nature be restored to establish identity?
4. What is commemoration, what is the role thereof (how does it apply to natural systems and industrial heritage)?
5. How can the concept of ecosystem services be applied to adapt the landscape to establish identity?

01.06_client & user

Due to the scope of the project and with all the different programmes involved, it is proposed that an institution is created that will consist of a number of stakeholders that will all benefit from taking ownership of this project.

For this project, an institution called Friends of Era Regional Park is proposed. The institution will consist of four types of stakeholders that will be able to work together to ensure the success of the park (Figure 01.02.).



01.02. Client Stake Holders Relations

Currently the site is not open to the public as it is privately owned by the Rosema Group and until the end of 2013 was used actively for industrial purposes. It is proposed that Rosema Group, trading as Era Bricks becomes the cultural stake holder of the institution. It is in their best interest for the site to be adapted into a post-industrial use as it will generate income and will give the site a closure programme.

The Eersterust Forum is proposed to become involved as the community group. They are actively working in the surrounding neighbourhoods of the site to transform the suburb into a safer, better place for their residents.

Two private groups are suggested for the institution. The first, WESSA (the Wildlife and Environment Society of South Africa) is an environmental NGO that aims to implement high impact environmental and conservation projects that promote public participation (WESSA 2014). When working in conjunction with the Eersterust Forum, individual goals can be met together.

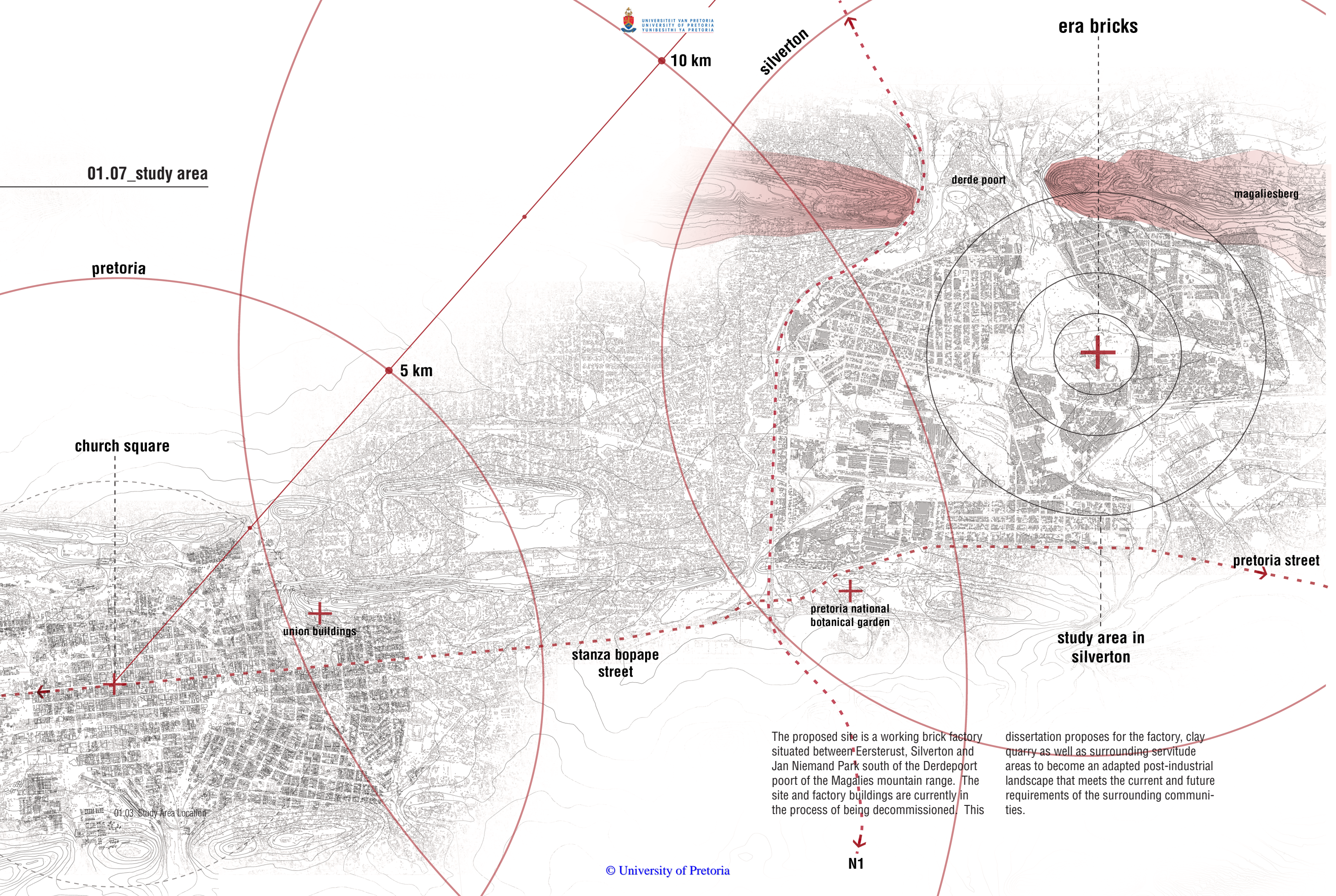
BirdLife South Africa, the second proposed private group aims to promote the enjoyment, conservation, study and understanding of wild birds and their habitats in South Africa (BirdLife SA 2014).

The Department of Environmental Affairs (Republic of South Africa) is suggested as the national government entity as they aim to ensure the protection of the environment and conservation of natural resources, balanced with sustainable development (Environmental Affairs 2014).

The site should attract local residents, regional visitors and should aid the national and international tourism of South Africa.

Visitors who visit the adapted factories and quarry, would experience the landscape intervention first hand as the site becomes part of a regional park.

01.07_study area



era bricks

silvertown

10 km

derde poort

magaliesberg

pretoria

5 km

church square

union buildings

stanza bopape street

pretoria national botanical garden

pretoria street

study area in silvertown

The proposed site is a working brick factory situated between Ersterust, Silvertown and Jan Niemand Park south of the Derdepoort of the Magalies mountain range. The site and factory buildings are currently in the process of being decommissioned. This

dissertation proposes for the factory, clay quarry as well as surrounding servitude areas to become an adapted post-industrial landscape that meets the current and future requirements of the surrounding communities.

N1

01.03 Study Area Location

01.08_methodology

01.08.01_research method

The research method and design approach applied in this study is illustrated below. The diagram illustrates how the two methods overlap and ultimately result in the final design proposal.

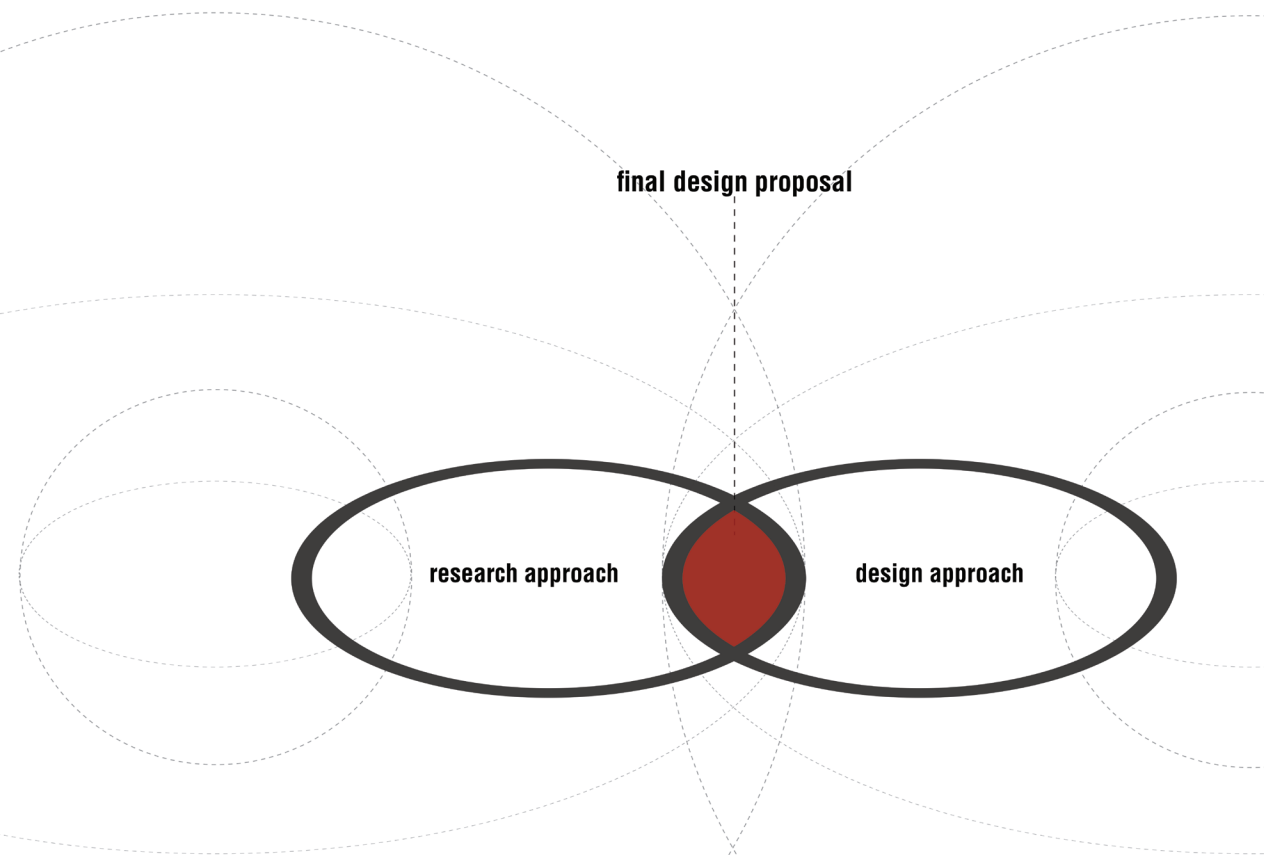
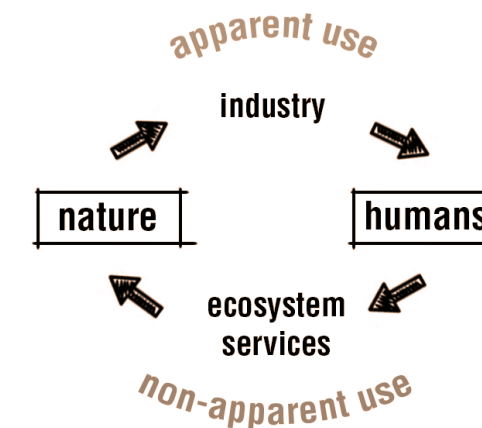
In order to achieve a successful exploration of the study, a quantitative and qualitative research methodology is used.

The research intent is illustrated in Figure 01.04, which shows how the relationships of the different entities will be investigated.

Quantitative data was gathered through a desktop study of the historic content and comprehensive literature.

Qualitative information was gathered through site visits, observations, photographs and informal discussions with applicable individuals.

The investigation will look at the past, present and future relationship that humankind has with nature. In the past, humans had a direct connection with nature, presently humankind has an indirect connection with nature. Industry has become the middleman between the two entities.



01.04. Methodology Diagram

01.05. Research Investigation

01.08.02_design method

The theoretical discourse defines the design informants and principles, which leads into design development process, illustrated in Figure 01.05.

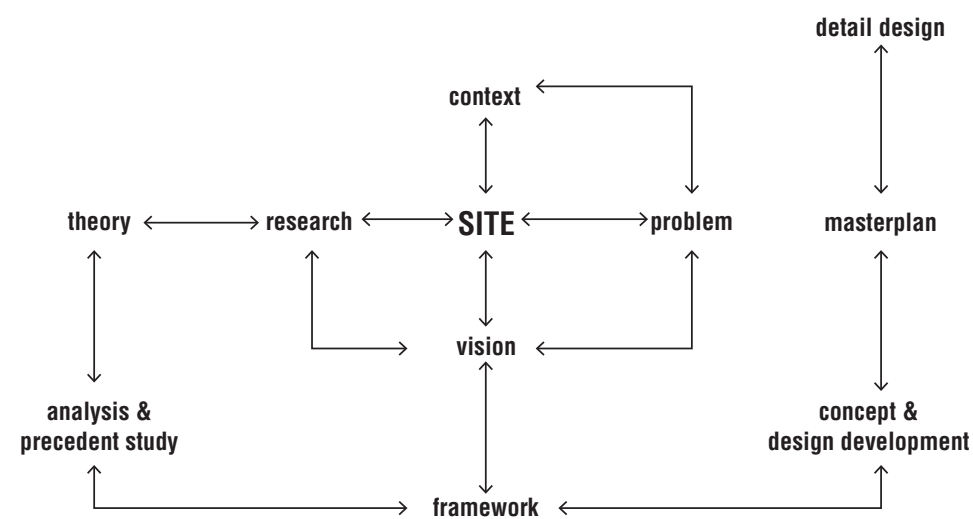
The design development process starts with the development of a Framework for the green network strategy for the larger context of the area in order to determine the best use for the site. The aim of the framework is to provide context for the site surroundings to respond to.

To further understand the apparent and non-apparent relationships of the post-industrial landscape and natural aspects, an indepth site analysis is completed.

This leads to the next phase in the design development process which is the Master

Plan development. The systems introduced at Master Plan scale to achieve the research objectives are explained.

The final phase is communicated through the Sketch Plan proposal and technical resolution. A section of the Master Plan is developed into a Sketch Plan that is designed and resolved on a technical level, indicating detailed resolution of research objectives.



01.06. Design Approach

01.09_chapter descriptions

CHAPTER 1	INTRODUCTION Introducing the project to the reader. A clear problem is defined that frames the hypothesis and formulates the research questions.
CHAPTER 2	THEORETICAL DISCOURSE By answering the proposed research questions, clear theory and design principles are defined.
CHAPTER 3	CONTEXT Industrial development, context analysis and previously proposed frameworks are discussed; concluding with a framework proposal.
CHAPTER 4	SITE INFORMANTS Site analysis and precedent studies are presented in order to provide the masterplan intervention with sufficient context.
CHAPTER 5	MASTER PLAN Concept, programme proposal, design development, master plan and systems are explained. Selecting a sketch plan area that guides the detailed design.
CHAPTER 6	TECHINAL RESOLUTION Sketch plan and technical resolution presented.
CHAPTER 7	CONCLUSION Concludes the project and summarizes the outcomes of the project.

01.10_objectives

The projects aims to:

- Commemorate the industrial heritage of the post-industrial landscape.
- Restore human connection with nature through apparent and non-apparent relationships.
- Re-establish identity for the post-industrial landscape and surrounding community.
- Propose guidelines for rehabilitating the quarry.
- Find contemporary solutions and appropriate contextual uses for the site.
- Introduce systems-thinking and processes.
- Enhance and introduce multiple ecosystem services.

01.11_limitations

The following limitations have been found:

- The 100 year flood lines could not be obtained, therefore, where needed, the 50m flood lines with an extra buffer of 30m will be used.
- No information could be gathered on the state of pollution on the site.
- The site is in the process of being decommissioned and is estimated to be finished at the end of 2014. Due to this, the existing fabric is constantly changing. The site conditions of February 2014 were

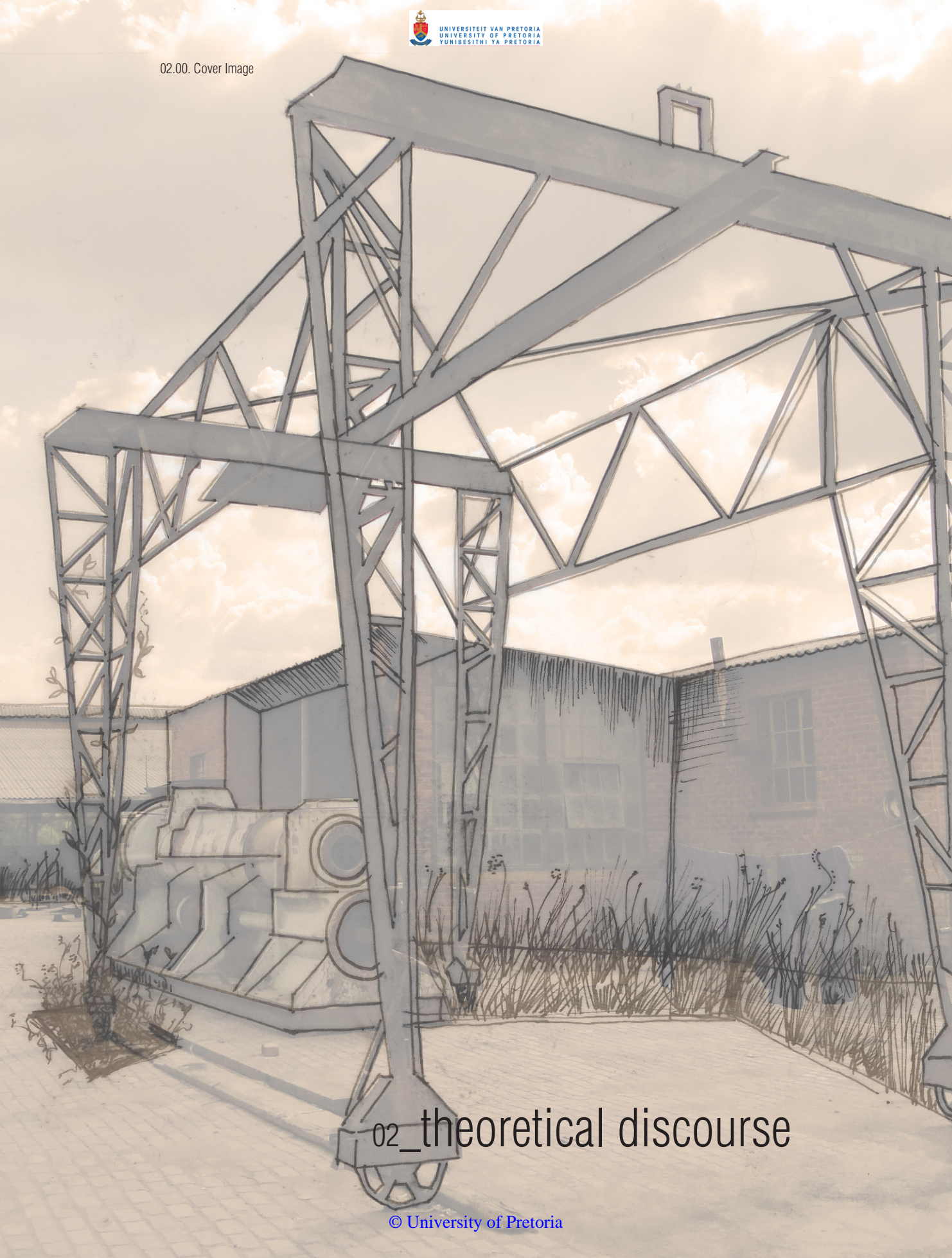
used in the study.

01.12_assumptions

During the course of the project, the following assumptions were made:

- Site context such as building footprints and programmes will be taken from the Era Regional Park proposal by the Eersterust Urban Vision Group 2013. This is assumed as correct and will be adapted and implemented.
- Plans and proposals by the City of Tshwane Metropolitan Municipality will be assumed as sure to happen in the future, especially a proposed new mobility road on the eastern edge of the site.
- Where uncertainty was found in terms of the levels of the site and the previous project proposals, the height will be adapted from the 2014 GIS contour map.
- During site visits and informal interviews it was decided that no harmful chemicals were dumped on site and no traces of harmful toxins were found.

02.00. Cover Image



02_theoretical discourse

TIPPING THE SLAG - DEPICTING THE INDUSTRIAL LANDSCAPE
 EDWIN BUTLER BAYLISS
 1900-1945
 OIL ON CANVAS
 61 x 92 CM

02_theoretical discourse

The study is focussed around industry and the way that industries have influenced the landscape, as well as the people dependant on both.

Originally, nature provided humankind directly with everything needed to survive, creating a strong connection between humans and first nature. As our consumer culture grew, humankind lost their connection with nature and became dependant on the industries that adapt natural resources into taylor made objects for human use, providing the means to survive. As industries and consumerism grows, more and more resources are taken from nature, leaving nat-

ural resources depleted and eco-systems disrupted.

In the theoretical discourse, methods are investigated to restore the connection between humans and first nature through adapting the post-industrial landscape and restoring the natural ecosystems that once provided humankind directly with all the resources needed to survive.

This is seen as a way to stop ecosystem depletion and ultimately reconnect man with nature through the post-industrial landscape.

02.01_industries and the landscape

Industries became a permanent addition to cities during the industrial revolution in the 1800's, in order to deliver larger quantities of products to an ever growing population.

The Encyclopedia Britannica (2014) defines industries as a group of productive organizations that produce or supply goods for the purpose of a source of income.

When considering industries through an economic perspective, the different types are classified as primary, secondary and tertiary. Primary industries are classified as extracting minerals and includes agriculture, mining, forestry, fishing as well as quarrying. The secondary industries are classified as the manufacturing industry, and is further divided into heavy and light industries. Secondary industries generally processes raw materials that was supplied by the primary

industries, into consumer goods. Secondary industries also includes energy producing industries. Tertiary industries can be described as the service industry and includes all services that a city requires, from banking and finance to repair and maintenance services (Encyclopedia Britannica 2014).

Industries have been transforming the landscape since the 18th century due to the fact that primary industries can only mine raw materials until the source is practically depleted, and that, technology improves resulting in manufacturing methods to be upgraded and mechanised. These scenario's leads to the decommissioning of industrial sites, leaving an altered and disrupted natural landscape behind.



02.01. Tipping the Slag by Edwin Butler Bayliss 1900-1945

02.01.01_what is a post industrial landscape

In the book, *Manufactured Sites: Rethinking the Post-Industrial Landscape*, Niall Kirkwood states that the way cities have been designed, was determined by history, social values and the fundamental laws of change and adaption guidelines (Kirkwood 2011:xii). This means that industrial landscapes, usually the primary and secondary industries, have been located outside cities, close to water sources, transport nodes and affordable labour.

Our fast developing cities cause residential areas to be integrated into industrial areas, meaning that the two land uses clash. When these industrial landscapes are decommissioned, a diverse abandoned space is left behind. These sites are everywhere in evidence, and can be seen along urban water systems, the wastelands associated with natural rivers and the outlying areas of our cities (Kirkwood 2011:xii). These sites have become known as post-industrial landscapes.

A major problem with these derelict and abandoned landscapes is that they can become a source of pollution. The potential harm to the surrounding environment can be caused by the chemicals used in the manufacturing process, quarries causing erosion into the natural water systems, etc. But, over the past years efforts are emerging to address the legacy of these contaminated and derelict landscapes, left behind by industrial activity (Kirkwood 2011:xii).

In the context of South Africa, there are specific zoned areas for industrial land uses. These zones are where most of SA's primary and secondary industries can be found,

located in the outlying areas of the CBD.

The location of industrial zones mostly stems from the historical phenomena of apartheid (Breed 2012:43). As illustrated in Figure 02.02, the basic spatial logic behind the layout of the apartheid city in South Africa can be seen.

The figure clearly shows the racial segregation of residential areas by means of main routes, railway lines and industrial areas. The white neighbourhoods were considered to be prime location, close to the CBD and natural resources. The residential townships created on the periphery of the city for black residents, located the furthest from the CBD and buffered from it by means of industrial zones. Also shown in the figure is that by placing the non-white townships on the periphery of the city, space is available for expansion. Access from these townships to the CBD is mainly by means of the rail system (Breed 2012:43-44).

With the passing of time, the informal settlements got formalized and the residential suburbs expanded and developed into tight-knitted communities. At the same time, a large number of the industries that used to enforce an old apartheid legacy are closing down. Resulting in a post-industrial area with little active industries located between different historically racially divided residential communities.

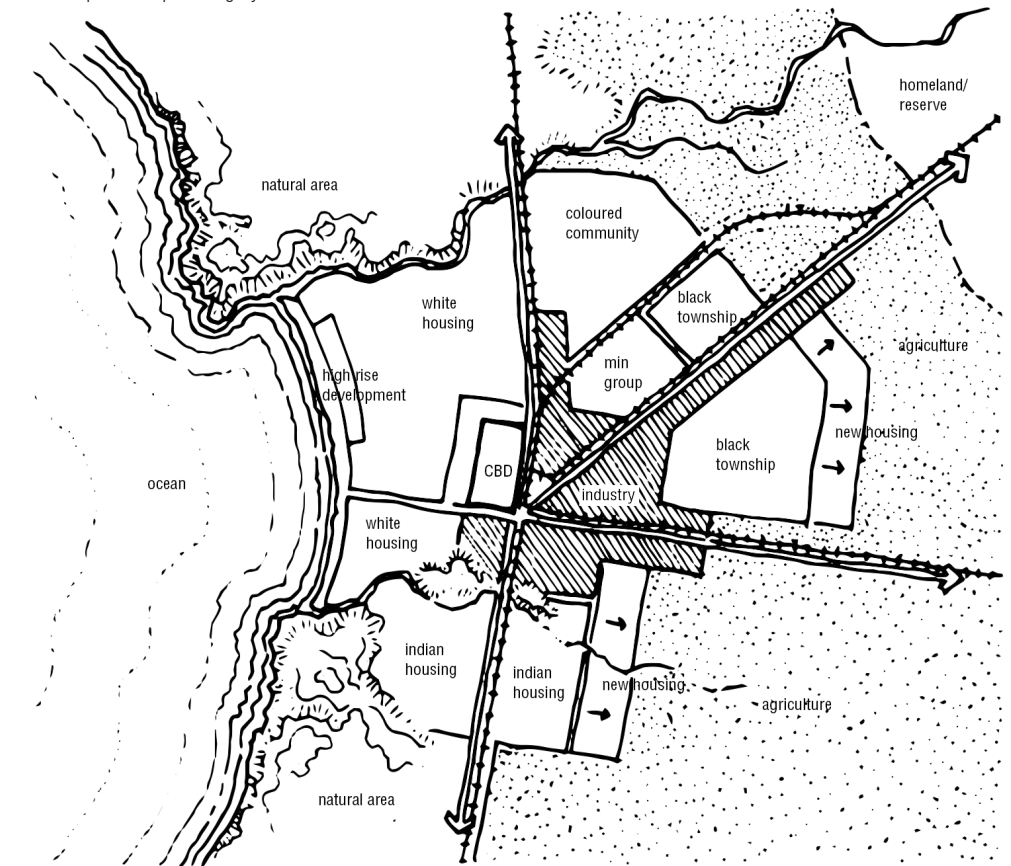
In spite of efforts since democracy to integrate racially segregated areas, most areas still are racially dominated as per apartheid time for historical and economical reasons.

The same applies to the study area under investigation. Industrial Silverton was used to buffer Eersterust (coloured community) and Mamelodi (black community) out of the city and white neighbourhoods. As illustrated in Figure 02.03, the industries created a definite divide between the white residential areas and non-white townships.

apartheid spatial segregation, but the potential arises to accommodate these changes into developing a post-industrial landscape that can bring the different communities together.

Today, abandoned post-industrial landscapes in Silverton reminds one of a heritage of

02.02. Apartheid Spatial Legacy



02.03. Industrial Divide

white housing

industry

coloured community

02.01.02_industrial heritage

A CIVILISATION UNABLE TO RECOGNIZE ITSELF WOULD BE A FRIGHTNING THING.
 - JUDITH ALFREY & TIM PUTNAM (1992:1)

Industrial structures become dilapidated once the function for which they were constructed is discontinued due to economic or outdated technological reasons. Industrial sites are generally developed for a single use, when the manufacturing process comes to the end of its life-cycle, it has no more use. It has been seen that over the past few years, and surely for many years to come that the structures and integrity of these empty sites are being revived (Pansegrouw 2013:16).

Alfrey and Putnam states that a few years ago, the concept of industrial heritage was practically unknown within the academy as well as in practice, but the benefit thereof was quickly realised. The preservation of industrial heritage became evident in the regeneration of areas shattered by the decline of industries (Alfrey & Putnam 1992:2).

In the book *The Industrial Heritage: Managing Resources and Uses* (1992), industrial heritage is questioned and the entirety thereof is summarised as follows:

- Piecing together pieces of lost industry in order to understand the functioning thereof.
- Conservation of factory buildings, sites and machinery in order to protect their aesthetic, historic or technical value.
- Identifying irreplaceable elements of the industrial landscape and adapting them for new uses.
- Restoring redundant machinery

and working practices.

- Using the knowledge, skills and experience of earlier industrial populations to inform new age decision making.

These mentioned activities will demonstrate how past generations lived and worked through different industrial processes. (Compiled from Alfrey & Putnam 1992:1-3).

All the described activities involves establishing a resource within the post-industrial landscape and adapting it to one or more uses. In order to preserve the industrial heritage a relationship between potential resources and their possible uses needs to be managed (Alfrey & Putnam 1992:1).

Figure 02.04 - 02.07 shows examples of some of the preserved industrial sites in South Africa. The conservation of these sites formed landscape landmarks that contributes towards the industrial heritage of the country.

RICHARDS BAY MINERALS

Location: Richards Bay, KwaZulu-Natal.

History: The mining company established a restoration programme ahead of time, allowing for a phased approach to rehabilitate while the mine is still active. Rehabilitated forest is handed over to the neighbouring community to better their socio-economic situation (Pearman 2009:102).



02.04. Richards Bay Forest Restoration

THE BIG HOLE

Location: Kimberley, Northern Cape.

History: The Kimberly Hole represents the mining rush era experienced in South Africa. It is described as the birthplace of the modern diamond industry and is celebrated through a diamond history museum, authentic diamonds display, viewing platforms over the Big Hole and underground tours (Pearman 2009:49).



02.05. The Big Hole

WEST COAST FOSSIL PARK

Location: Langebaanweg, Western Cape.

History: A phosphate mine operated from 1943 until 1993 when miners discovered one of the world's richest fossil deposits from the pre-Pliocene period approximately 5 million years ago. The closure plan of the mine aimed to preserve the fossil deposit to serve for educational, scientific and eco-tourism opportunities (Pearman 2009:20).



02.06. West Coast Fossil Park

JOHANNESBURG MINE DUMPS

Location: Johannesburg, Gauteng.

History: In 1886, gold was discovered in the now called Johannesburg area. Due to early processing technology, steep sand dumps were produced and became significant sources of pollution. With the improvement of technology, these dumps are being re-processed and removed. It has shown that addressing sources of environmental pollution can produce socio-economic benefits (Pearman 2009:103).



02.07. Johannesburg Mine Dumps

In some of the examples of industrial heritage commemoration, it can be seen that the beauty of industry is celebrated. The other examples show how the after effects of the mining processes are portrayed through the landscape, buildings and recreational activities. The examples prove Alfrey and Putnam's statement of identifying a resource and adapting its future uses within a post-industrial landscape (Alfrey & Putnam 1992:2-3).

In a sense the landscape should express the effects of time whilst capturing the memory of a lost tradition or process. An evident example of this can be seen in the small town Brugge, Belgium. Wind mills were used extensively a few generations ago to maintain the towns water levels as well as for producing flower, etc.

On a visit to Brugge in 2013, residents said that over 20 mills used surround the town. Today only three still exist and are open to the public. Figure 02.08 shows the Sint Janshuis Mill in the landscape, which is today used as a recreational park with a strong reminder of the industrial heritage that made Brugge's existence possible.

It has been said that there is a drastic need all over the world for representation of the past in order for people to recognize themselves in the future. This results in established resources to be over exploited and hidden histories are hunted out for public consumption. This is why heritage management is most commonly concerned with defining types and levels of use, with the ultimate objective to improve and adapt the resources available for a cultural enriching

experience (Alfrey & Putnam 1992:2-3).

Our heritage is all around us, and the responsibility for recognising it, maintaining it and sharing the uses with others becomes evident. The aim for managing heritage is to satisfy the demand for access to heritage resources and their adapted uses, while maintaining the integrity of the resource (Alfrey & Putnam 1992:2-3).



02.08. Sint-Janshuis Mill

02.01.03_decommissioned era bricks

MINING LANDSCAPES, PARTICULARLY THOSE THAT ARE ACTIVE, ARE NOT KNOWN FOR THEIR BEAUTY - AND YET, OVER TIME, THEIR INDUSTRIAL NATURE OFTEN BECOMES SOMETHING TO BE CELEBRATED.

- GEORGINA PEARMAN (2009:15)

According to research done by Jacques Pansegrouw, since Era Bricks was officially opened in 1954, it has served as a landmark for the surrounding communities of Eersterust, Jan Niemand Park and Silverton (Pansegrouw 2013:90).

A landmark is a prominent and well-known object in a specific landscape (HarperCollins 2005:155). When viewing the post-industrial landscape from the surrounding communities, the visual impact consist of the factory structures and their 30m high chimneys (Figure 02.09.), as well as a double row of Eucalyptus (bluegum) trees that surrounds the factory and quarry. The public has found a visual connection to the high chimneys and tall bluegum trees.

The quarry is not visible to the surrounding communities, and the public had no interaction with it, but it represents the starting point of the clay brick production process. It shows that clay has been mined from the earth in the primary industrial phase and provided the secondary manufacturing phase with the needed raw materials to produce clay bricks.

In many cases it is difficult to see the industrial culture as heritage, but it is said that the industrial heritage of a factory can be declared as significant when there is interest in the aesthetic value of technical, functional or historic elements (Alfrey & Putnam

1992:9-10).

It is assumed that the chimneys, factory structures and bluegum trees have remained in the peripheral views of the surrounding communities for almost half a century and therefore have gained intangible significance.

The full cultural and historical value of the decommissioned Era Bricks is described in the Chapter 4 under the Cultural and Historical Analysis.



02.09. Hoffman Kiln Chimney

02.02_commemorative landscapes

EVERYONE IS OCCUPIED CONSCIOUSLY OR UNCONSCIOUSLY WITH IDENTITY, ONE'S ORIGIN, AND THE QUESTION OF ONE'S PLACE IN HUMANKIND AND SOCIETY, THE PAST, PRESENT AND FUTURE.
 - JOACHIM WOLSCHKE-BULMAN (2001:1)

As a result of industrialization, a fragmented connection between humans and nature became a reality. Humankind has forgotten that they are dependant on nature to survive and without nature as a frame of reference humankind questions their identity.

02.02.01_the search for identity and the need to commemorate

Natural landscapes and designed gardens makes up a substantial part of our physical environment and generally, when dealing with these landscapes, one deals with unspoken questions of identity. According to Joachim Wolschke-Bulman in the book; *Places of Commemoration: Search for Identity and Landscape Design*, commemoration and identity are two terms that refer to fundamental concerns of human existence (Wolschke-Bulman 2001:1).

The aim of this theoretical investigation is to answer the question of how identity and

commemoration relates to landscape design. The departure point is to define commemoration and identity within the context of this investigation.

COMMEMORATION

COMMEMORATION IS CLOSELY LINKED TO MEMORY - HONOURING THE MEMORY THROUGH A REMINDER/OBSERVANCE.

MEMORY IN THIS CONTEXT IS DEFINED AS THE ABILITY BY WHICH THINGS ARE REMEMBERED/PARTICULAR RECOLLECTION OF PAST EVENTS. IT CAN REFER TO THE MEMORIES OF INDIVIDUALS, GROUPS OF PEOPLE, OR EVENTS AND PLACES.

IDENTITY

IDENTITY REFERS TO PERSONAL IDENTITY AS WELL AS GROUP IDENTITY, AND SHARES A STABLE SET OF QUALITIES, PASSING THROUGH THE SAME STAGES OF DEVELOPMENT.

WHEN DETERMINING IDENTITY, IT WILL ALWAYS BE PARTICULAR TO THE QUALITIES UNDER CONSIDERATION, AND MAY BE DEFINED AS BELONGING TO A SPECIFIC POLITICAL, ETHNIC, RELIGIOUS, ETC, GROUP.

compiled from (Wolschke-Bulman 2001:1) and (Hinchman & Hinchman 1997:119).

Wolschke-Bulman states that the celebration of independence days by many different countries worldwide, serves as an excellent example of commemoration, and in many cases these memories are commemorated through the erection of monuments/memorials in the landscape (Wolschke-Bulman 2001:1-2). The following examples explain how national commemoration is executed for the purpose of national identity:

INDEPENDENCE DAY

Country: United States of America

Date: 4 July

Origin: Independence Day, also known as Fourth of July, is a national holiday in the USA and commemorates the acceptance of the Declaration of Independence on 4 July 1776. It is remembered that the USA declared independence from the United Kingdom.

Memorial: The Statue of Liberty was a gift from France to the USA, intended to commemorate the lasting friendship between the two nations. Today the statue stands as a symbol of freedom and democracy and form part of the nations identity (History.com 2014).



02.10. Statue of Liberty

FREEDOM DAY

Country: South Africa

Date: 27 April

Origin: Freedom Day commemorates the first democratic elections held on 27 April 1994. It celebrates the freedom of South African citizens and pay tribute to the men and women who sacrificed their lives to gain liberation on behalf of the suffering masses.

Memorial: Freedom Park stands as a monument to celebrate democracy. It is a memorial and sanctuary that commemorates those who made the ultimate sacrifice for freedom and human rights in South Africa (Freedom Park 2014).



02.11. Freedom Park

These two memorials are just examples of memories and events being commemorated. They show that places of commemoration and memorials help to preserve memories and in this way a national identity is celebrated. Memorials remind people of who they are as individuals, groups or as a nation.

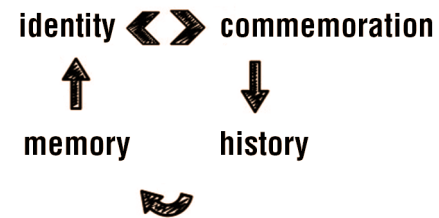
The concept of identity has such an encompassing scope that it sometimes can be difficult to pin-point exactly what it is constructed of. Identity and memory are representations or constructions of reality, meaning they are not stable and objective things (Wolschke-Bulman 2001:1-2). When analysing these representations of reality, it is important to keep in mind that:

- Members of a specific community can share the same history, but not necessarily the same identity.
- The way in which an individual will classify himself as a member of a specific group depends on their own understanding of history, own ideas about the future as well as political, religious and other ethics.
- Identity and memory is determined by specific interests, for example class, gender or power relations. (Wolschke-Bulman 2001:2)

The described power relations and interests determines the memory of what is remembered and not, by whom and for what reasons. These aspects are key in deciding whether to construct a place of commemoration and how to design it (Wolschke-Bulman 2001:2).

The concepts of commemoration and identi-

ty are connected to each other, meaning the one is dependant of the other. This connection is illustrated in Figure 02.12. and shows that an identity can't be constructed or represented without history and past events that is remembered and commemorated. It can be said that identity is orientated to-



02.12. The Connection between Commemoration and Identity

ward the future, but it is based on a history shared by individuals, and the method for creating a memory of the history is most likely through the act of commemoration (Wolschke-Bulman 2001:2).



02.13. Memory: Author's Own Representation of Cultural Identity

The continuous search for identity and the demonstrated need for commemoration is of definite importance to political and social revolutions and their outcomes (Wolschke-Bulman 2001:2). Power relations all over the world is known to determine the history that should be remembered and what should be forgotten, by whom and to what level of detail.

Generally, after every new radical revolution change, the new direction shows a certain apprehensive drive to launch the new power image to gain public support. The launch can include the erection of new commemorative monuments, symbols, public celebrations together with new national days (Wolschke-Bulman 2001:2). This is again explained with two examples, one international and one domestic.

THE BERLIN WALL

Country: East Germany.

History: The wall was used to separate West Berlin from East Germany and East Berlin. The wall served to prevent emigration from the communist movement of that time. After a series of radical political changes in East Germany and several weeks of civil unrest, it was decided that German reunification was in order. The people started to destroy the wall by means of hammer and chisel and later on the government supplied machinery to finish the demolishing of the wall (Berlin Wall Memorial 2014).



02.14. New Perspectives

NAME CHANGES

Country: South Africa.

History: Hans Strijdom was the Prime Minister of South Africa from 1954 - 1958, and part of the segregation that led to the establishment of Apartheid (Remembered.co.za 2013). Solomon Mahlangu was a dedicated member of the African National Congress and was executed by the white minority racist regime, seen as an act of political murder (ANC 2011). This is just one example of one of the many street names changes in 2012. A hero of a previous revolution is replaced with a hero from the new revolution.



02.15. Pretoria Street Names Changes

These changes generally cause for heated debates in terms of what should be commemorated and what should be forgotten, as different selections are made of what parts of history should be commemorated. There will always be cases where parts of the nation want to forget their painful past, and others believe that it should be remembered as it forms part of their history.

This is also a concern within the context of industrial heritage. Commemorating industrial landscapes may seem contradicting due to assumptions made during the industrial revolution. Industrialisation transformed familiar landscapes into manufactured landscapes, where natural habitats were disrupted and social values challenged. Alfrey & Putnam states that most of what is celebrated today as heritage has been chosen within an industrialised society as pre-industrial, older, more traditional, more beautiful, more spiritual, more significant (Alfrey & Putnam 1992:2).

Wolschke-Bulmahn explains, there was a debate on whether to destroy the Berlin Wall or to preserve parts of it as a commemorative landscape, with the aim to remind people of this historical time in German history (Wolschke-Bulman 2001:3). After the demolishing of the Berlin Wall, almost nothing remained of the wall that once divided the country. But over time, parts of it have been preserved, and other memorials were designed for where the wall once stood for the purpose of commemoration, that will aid in the future search for identity.

It comes down to the fact that all memorials will provoke positive or negative emo-

tions within the visitors in terms of what is commemorated in which manner. Care should be taken when making decisions of what should be commemorated to ensure that all the people affected would be equally remembered and honoured. The ultimate goal would be for painful history to influence the creation of commemorative social spaces where positive social events could take place.

Death plays one of the most significant roles in the process of establishing identity. Figure 02.16. shows the commemoration of former president Nelson Mandela, by means of a statue revealed soon after his passing.



02.16. Former South African President Nelson Mandela Statue

The commemoration of death (the ceremony as well as the memorial environment) is very important in establishing and maintaining identity. These places and events that commemorate the dead are extremely important to society in terms of commemorating history, whether it is burial sites of masses or distinct individuals, battlefields or graveyards (Wolschke-Bulmahn 2001:3).

The 'death' of Era Brick Works should be interpreted in a similar way. The site should be adapted in order to establish a new, while maintaining an old identity.

02.02.02_landscape design and memory

LANDSCAPE, TANGIBLE OR INTANGIBLE, PROVIDES THE SETTING FOR NARRATION, WHETHER IT'S THE STORY OF THE SELF, THE STORY OF A PLACE OR THE STORY OF PEOPLE.

- LIANA MÜLLER (2012:8)

Wolschke-Bulmahn states that issues of commemoration and identity have been investigated and gardens and landscape design have been investigated, but they have not yet been investigated in the same comprehensive manner (Wolschke-Bulmahn 2001:3).

This part of the theoretical investigation aims to bridge the gap between the two theories, to create an integrated theoretical approach that can be followed for the design process.

In the essay; *Landscapes of Memory: Interpreting and Presenting Places and Pasts*, the role of landscape architects are discussed within the context of designing commemorative landscapes (Müller 2012:8).

LANDSCAPE ARCHITECTS ARE UNIQUELY POISED TO INFLUENCE THE DESIGN OF MEMORIAL LANDSCAPES. IN DOING SO, THEY CAN TRANSFORM SPACE INTO A PLACE OF SIGNIFICANCE, A PLACE OF STORYTELLING, A PLACE OF LESSONS.

- JUDITH WASSERMAN

In order for landscape architects, as well as this theoretical investigation to accomplish the described duty towards commemorative landscape design, the meaning of landscape and the role of memory within the landscape needs to be clearly defined and understood (Müller 2012:8).

LANDSCAPE
LANDSCAPE IS UNDERSTOOD AS A PERCEPTION DETERMINED AND INFLUENCED BY CULTURAL CONSTRUCTS. IT IS SUBJECT TO CHANGE AND WILL INVARIABLY BE EITHER MISUNDERSTOOD OR NOT UNDERSTOOD AT ALL BY THOSE THAT ARE NOT FROM THE LANDSCAPE.
- DEFINITION BY LIANA MÜLLER

(Müller 2012:11).

Over the course of time, gardens have served various uses such as food production, recreational and preserving activities, demonstration of power and wealth as well as for the purpose of commemorating (Wolschke-Bulmahn 2001:3). Focusing on the commemorative role that gardens and landscapes play in the process of identity formation, the following examples (Figure 02.17. - 02.20.) shows the different types of commemorative landscapes.

They all show that the initial intention for the landscapes created (wealth, burial, industrial) was adapted and re-used for commemorative purposes.

Most of these landscapes have survived for hundreds of years, and the reason for this is that individuals as well as communities have developed a significant connection with the place and this is passed on from generation to generation.

ELITE GARDENS

Garden: Gardens of Versailles, France.
History: To Louis XIV, the garden played just an important role as the palace, and was the home of the French Kings, until evicted by revolutionaries. Today used recreationally while walking in the footsteps of royalty (National Geographic 2014).



02.17. Gardens of Versailles

INDUSTRIAL LANDSCAPES

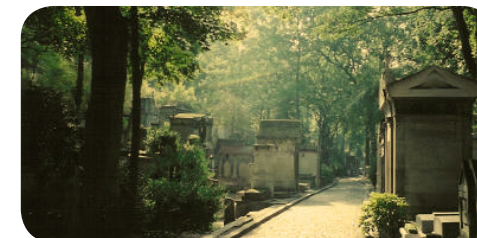
Garden: Fresh Kills Park, Staten Island, New York.
History: Fresh Kills, which operated from 1948 to 2001 as the world's largest landfill was re-engineered over time into a self-sustaining ecosystem. This 'lifescape' is now considered one of the largest and most visited parks in New York (Field Operations 2006:6-12).



02.18. Fresh Kills Park

CEMETERIES

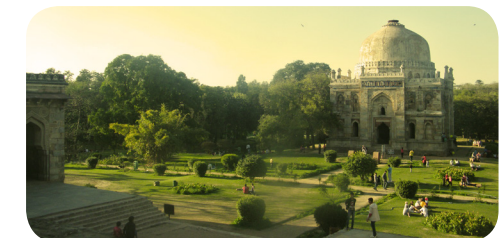
Garden: Père-Lachaise Cemetery, Paris.
History: The cemetery was opened in 1804, and is seen today as one of the world's largest and most visited cemeteries. The cemetery consist of a selection of war memorials and tombs of some of the greatest names in art, sciences, history and literature. Today the cemetery is visited for recreational and commemorative purposes (Les Cimetières de Paris 2014).



02.19. Père-Lachaise Cemetery

TOMB GARDENS

Garden: Lodhi Garden, New Delhi, India - also known as the Mughal Tomb Garden.
History: The initial purpose of the garden was a funeral landscape, with the first tomb build in 1444, portraying the Mughal Culture. Today the garden is used for cultural events, but most visitors enjoy picnic's, walks, yoga and other leisurely activities (Wescoat & Wolschke-Bulmahn 1996).



02.20. Lodhi Garden

Müller writes that the only way to understand the relationship individuals and communities have to a place is through emotional significance from one individual to another (Müller 2012:7).

It is stated that this emotional significance is communicated by means of a story. The narration of the landscape is used to transform the intangible into perceived memories. When narrating a story, it is fundamental to know all the facts thereof. These details will become the anchoring points that guide one through the narrative of the landscape, triggering points to bring memory to mind (Müller 2012:7-8).

This phenomenon whereby different social groups construct their own awareness of the past through the passing on the landscape narrative from one generation to another is known as 'collective memory' (Müller 2012:9-10).

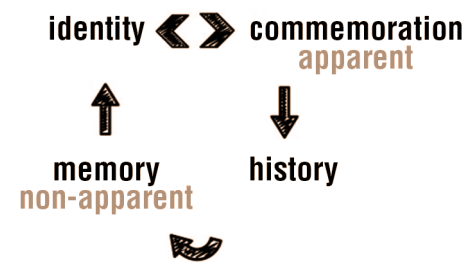
This shows that the way an identity of an landscape is constructed, is seated in the perceptions of the individuals that surround it. Müller states that the perception of landscapes aids individuals in the construction of an identity through the process of creating memories (Müller 2012:9-13).

When the narration of the landscape is experienced by users, memories are triggered that will locate individuals within a familiar place. This leads to the establishment of identity and a sense of belonging.

It is necessary to trigger memory through landscape design. The best way to do so is through experiences. Physical elements in

the landscape can be symbolic and has the ability to trigger memory. Design can then make use of archetype symbols and senses that can evoke memories through the process of experiencing the landscape (Müller 2012:9-14).

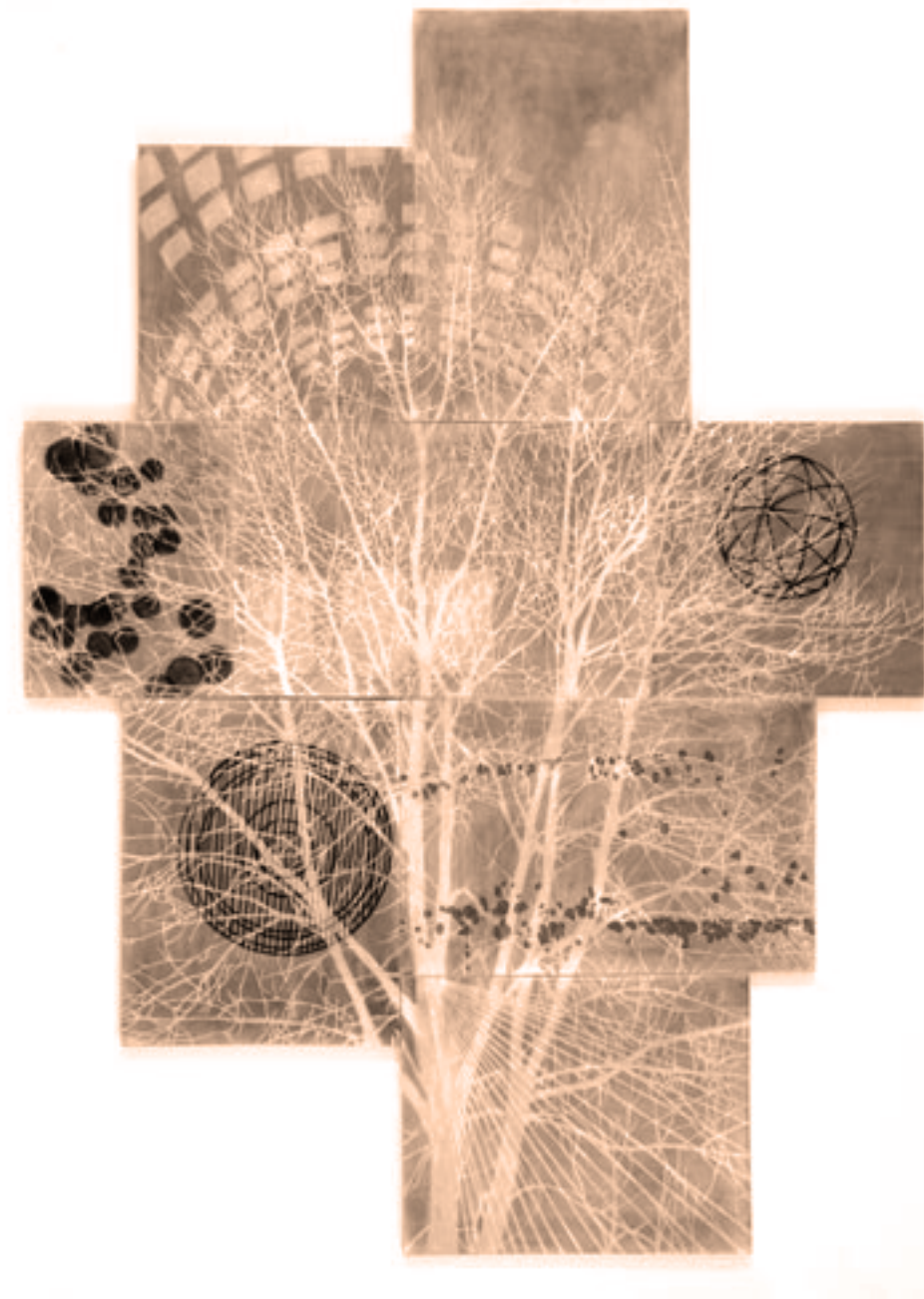
As discussed per Müller (2012), when looking at the landscape, some aspects are perceived as tangible and are more apparent to the visitor. Other aspects are intangible, meaning that the non-apparent aspects only resides in the mind of the user. Symbols and sensory experiences can trigger memory in direct as well as indirect ways, as illustrated in Figure 02.21. below:



02.21. Apparent and Non-Apparent Experiences

LANDSCAPE AND MEMORY - DEPICTING THE APPARENT AND NON-APPARENT SYMBOLS IN THE LANDSCAPE

TRINE BUMILLER
2009
OIL ON CANVAS
108 x 78 INCHES



02.22. Landscape and Memory by Trine Bumiller 2009

STALKER - DEPICTING THE ESTRANGED CONNECTION BETWEEN HUMANKIND AND NATURE
 ANDREI TARKOVSKY
 1979
 MOVIE SCREENSHOT

02.03_first nature vs. constructed nature

IT WAS PART OF THE WORKER'S FOURFOLD ALIENATION UNDER CAPITALIST MODERNITY: HIS ESTRANGEMENT FROM NATURE, FROM THE PRODUCTS OF HIS LABOUR, FROM OTHER PEOPLE, AND FROM HIMSELF.

- ROSS WOLFE (2011)

In 1844 Karl Marx Economic and Philosophical Manuscripts were published. According to Ross Wolfe, the article on Karl Marx theory of alienation, focussing on nature, explains the estrangement of humans from nature. Marx was especially concerned with the relationship between nature and humankind as the worker (Wolfe 2011).

The importance of nature is not realized by a capitalist society, but as Marx states that nothing can be created by the worker without 'nature and the the *sensuous external world*'. He gives credit to materials (taken from nature) with which man creates an end-product and only then is the effort and labour a reality (Marx 1992:325).

The capitalist modernity allows for the products produced by the worker's labour to be seized and pushed into the commercial world, then repeating the production cycle. This means that nature is extensively exploited and eventually allows for nature to be reduced to an idea of existence. The problem with nature becoming an idea of existence is that it causes for nature to seem subordinate in the eyes of humankind - deviating from an intrinsic harmony between two sides of the same entity (Pansegrouw 2013:21).

The process at place is for nature to source the worker, and the worker's labour to result in a product, a product that will eventually cater to the needs of humankind. This pro-

cess shows that there is a mediator between humans and nature. Marx states that the origin of all products can be traced back to nature, and it is from these natural products that humankind is dependant of, wether it is for food, electricity or housing (Marx 1992:328).

With nature presenting itself only in a mediated form, the natural world is further and further removed from the worker. This encourages the concept of humans and nature to stay apart. Nature has lost its role in the commercial world, leaving humankind alienated from the natural world (Wolfe 2011).

As time passed, the manufacturing process of natural materials, adapted by the worker into products has been industrialised. The industrial revolution allowed for the estrangement connection to evolve and to disregard nature as the most important resource to humankind, leaving humans with a misunderstanding of nature.

The industrial revolution assured for natural landscapes to be transformed into factories and natural materials to be taken from nature with no prosperity of returning. Resulting in an unbalanced system with the rise of a new social world - the capitalist world.



02.23. Stalker by Andrei Tarkovsky 1979

In the social context of today, the capitalist world has led to a global crises. Pollution is destroying natural life, food is becoming scarce and natural disasters are more severe. It has been realized that nature can provide relief for these crisis situations. Realizing the importance of the natural environment, humankind has awaked to, and is responding to the inherent urge for a relationship with nature (Pansegrouw 2013:21).

Since industrialisation, humans now exists in a nature that has been constructed by himself, for himself. First nature has been reproduced in urban cities as parks, urban agriculture, constructed wetland systems, etc. giving humankind the idea that they are living in harmony with first nature within a constructed nature. Realizing only too late that the constructed nature only symbolizes first nature. The constructed nature allows people to come into contact with nature, but provides few of the beneficial functions that first nature has to offer, such as flood control and water filtration, climate control and reducing CO² emmissions, etc (Wolfe 2011).

Humankind has realized that within time and nature lies the definition of his being (Pansegrouw 2013), and a well known effort has come to restore first nature. A major part of this effort is to adapt the industrial landscapes that took nature away into gateways back to first nature. Humankind has started to realize that survival isn't possible without nature and the functional benefits it provides.

The re-use of industrial landscapes to bring back first nature is an iconic reversal

of history: industry (capitalism) removed humankind from nature and now provides the ability to re-use the post-use landscape in order to bring nature back. Humans with and within nature will re-establish their identity that will allow for a sustainable relationship between humankind, nature and industry.



02.24. Factory Landscape Mountains by Francis Lee 2013

WE ENJOY THE FRUITS OF THE PLAINS AND OF THE MOUNTAINS, THE RIVERS AND LAKES ARE OURS, WE SOW CORN, WE PLANT TREES, WE FERTILIZE THE SOIL BY IRRIGATION, WE CONFINE THE RIVERS AND STRAIGHTEN OR DIVERT THEIR COURSES. IN FINE, BE MEANS OF OUR HANDS WE ESSAY TO CREATE AS IT WERE A SECOND WORLD WITHIN THE WORLD OF NATURE.

– CICERO (IN 1933:153)

Edward O. Wilson suggests that there is an instinctive bond between humankind and natural living systems, this is called biophilia. He argues in the book Biophilia that humankind has the urge to affiliate with other forms of life (Wilson 1984).

As the statements by both Cicero and Wilson indicates, humans have the basic need to connect with nature. The current ongoing urbanisation, industrialisation, as well as commercialization results in this connection to become more estranged.

With this lost connection, and natural areas being adapted into alternative programmes, humankind has started to construct their own types of natures. These constructed natures have become part of our reference to what nature is.

As Figure 02.25. illustrates, nowadays there are four types of nature known to humankind. They are perceived by humankind as follows:

- The ‘world of nature’ that Cicero refers to is perceived to be first nature. Humankind recognizes this nature to be wilderness and typically have things in mind like nature reserves and national parks.
- The second type of nature that

humankind refers to is formal ornamental gardens. This is typically residential gardens that consist of lawn, trees and occasionally a pool/pond or water-feature. Although this is not natural, nature is still apparent in this case as birds and insects will call the garden home.

- Productive landscapes have become a major part of our reference to nature. Although it transformed first nature into large areas that produces humankind with fresh produce food, it is seen as nature to humankind.
- The last constructed nature that is probably the most common known nature to humankind. Cityscape refers to the small parks, street trees and other small vegetated areas in the urban landscape.

wilderness



ornamental formal garden



productive landscape



cityscape



02.25. Identity: Different perceptions/representations of nature

02.04_ecosystem services

CONSERVING AND RESTORING ECOSYSTEM SERVICES IN URBAN AREAS CAN REDUCE THE ECOLOGICAL FOOTPRINTS AND THE ECOLOGICAL DEPTHS OF CITIES WHILE ENHANCING RESILIENCE, HEALTH, AND QUALITY OF LIFE FOR THEIR INHABITANTS.

– B. V. ELSEVIER (2012:1)

02.04.01_ecosystem services

As realized, nature is an extremely valuable resource to humankind and in effect to cities, especially cities located in poor/industrial areas. According to the *TEEB Manual for Cities: Ecosystem Services in Urban Management* (2011), cities are dependent on a healthy environment that endlessly provides the cities with a range of benefits for humankind. These benefits are known as ecosystem services (TEEB 2011:1).

Healthy ecosystems are the foundation for sustainable cities due to the benefits that they provide. Some examples of ecosystem services includes; purified water, clean air, healthy food and flood controls. These services are found to have a direct influence on human well-being and economic activity within a city (TEEB 2011:1).

When ecosystem services are incorporated into the planning and management processes of cities, the outcomes will result a reduction of municipal cost, economic growth, improving social standards as well as securing livelihoods (TEEB 2011:1).

In many instances, the value of natural systems aren't realized due to a lack of information and understanding about the effects of planning decisions have on the environment. This will lead to the loss of vital as well as beneficial ecosystem services that could contribute to the development of

sustainable cities. This can be prevented by identifying the benefits that nature provides and understanding the value thereof. The TEEB Manual states that in the long run, maintaining functioning ecosystems is the most cost-effective solution in order to meet human needs (TEEB 2011:1).

Almost all resources that humanity uses on a daily bases for survival, relies on apparent or non-apparent relationships of nature. These benefits, known as ecosystem services can be divided into four categories, as illustrated in Figure 02.26. known as:

- Provisioning Services
- Regulating Services
- Supporting Services
- Cultural Services

Within the study area of the Era Bricks, an understanding, consideration and valuation of the existing ecosystem services is necessary in order to address the challenges faced by the surrounding communities.



02.26. Ecosystem Services and Categories

02.04.02_ecosystem services in urban areas

Urban planning is generally associated with development of cities. Over the course of time, there is a number of environmental challenges that have arisen, the planning method has now shifted towards sustainable development (Colding 2011:228).

With sustainability as the main goal in mind, these days when considering the design of roads, buildings, etc. it is clear that there is a disregard towards the natural landscape. This causes for natural habitats to become fragmented, altered or completely lost, costing us a loss of ecosystem services.

The urban sprawl pattern of growth leads to the loss of ecosystem services. According to Johan Colding, there are two effective ways to combat the congestion of urban sprawl. The first is the smart growth theory and the second is green infrastructure planning (Colding 2011:228-229).

Green infrastructure planning is mostly promoted by ecologists and has been used as a guideline in most conservation planning around the world, as this approach is used to combat the negative effects of urban sprawl (Colding 2011:229-230).

Green infrastructure can be described as an interconnected network of green spaces that conserves natural ecosystem values and functions that provides benefits to human populations through ecosystem services (Landscape Institute 2013:1-3).

Benedict & McMahon argues that the theory of green infrastructure emphasizes the importance of open and natural green space as parts of interconnected systems

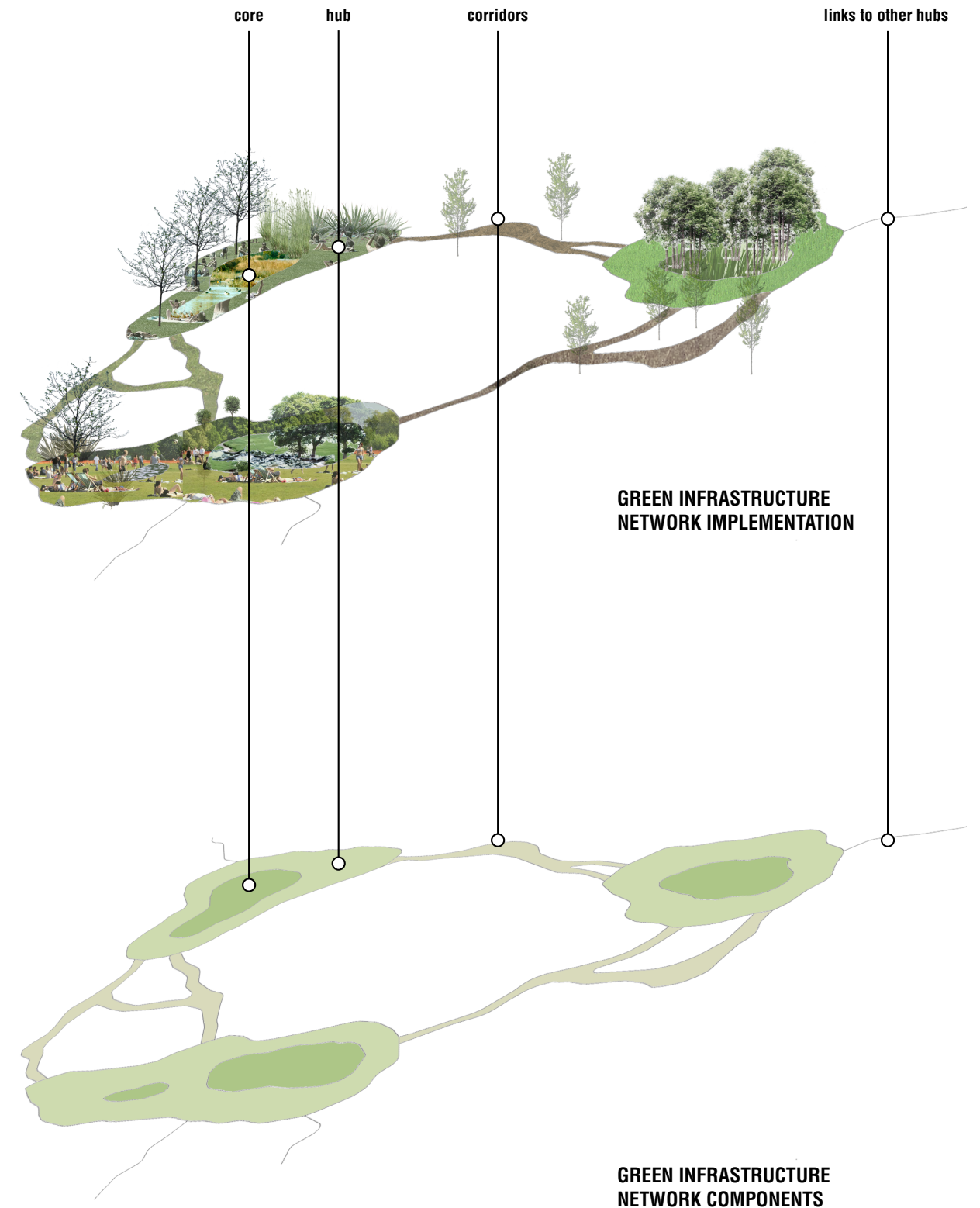
that are protected and managed for the ecological and ecosystem services benefits they provide such as producing clean air and water, controlling flooding and maintaining healthy soils for the production of food, etc. (Benedict & McMahon 2012:1-2). As Figure 02.27. illustrates the size, connectedness and heterogeneity of habitats in green islands are important for green infrastructure.

The illustrated green infrastructure network consists of core's that are larger green islands that supports more species. The core's are surrounded with green hubs that support fewer species. The core's and hubs are connected with one another by means of corridors (Landscape Institute 2013:1-3). These are usually green- or blue-ways that allows specie movement from one island to the next.

The approach to green infrastructure will be taken to guide the framework in terms of the land conservation that needs to be determined within the Moreletta Catchment.

The ultimate goal is to integrate the Era Brick Works into the surrounding environment through the application of green infrastructure theory. The green infrastructure approach is grounded on the concept of creating an environment that will mutually benefit people and nature at the same time. The connection of green spaces and natural areas will ensure that the functions of natural ecosystems are managed and conserved (Benedict & McMahon 2012:1-4).

The natural elements such as rivers and forests are individually known as green assets and the role that these assets play in the



02.27. Example Illustration of a Green Infrastructure Framework

environment can be described and their function. When appropriately planned, designed and managed as described in the previous paragraph, these assets have the potential to deliver a wide range of benefits such as sustainable transport links and mitigating climate change. Connectivity between the different assets will help maximise the benefits that they generate (Landscape Institute 2013:3-6).

Understanding multi-functionality is central to the green infrastructure approach to land use planning. Underpinning the multiple functions that green infrastructure assets perform is the concept of ecosystem services. The health and well-being of the integrated landscape will be provided by ecosystems and their constituent parts; water, soil, nutrients and organisms (Landscape Institute 2013:6).

Gómez-Baggethum & Barton translates the ecosystem services given by the TEEB (illustrated in Figure 02.25) into the ecosystem services as they provide benefits in urban areas. They are as follows:

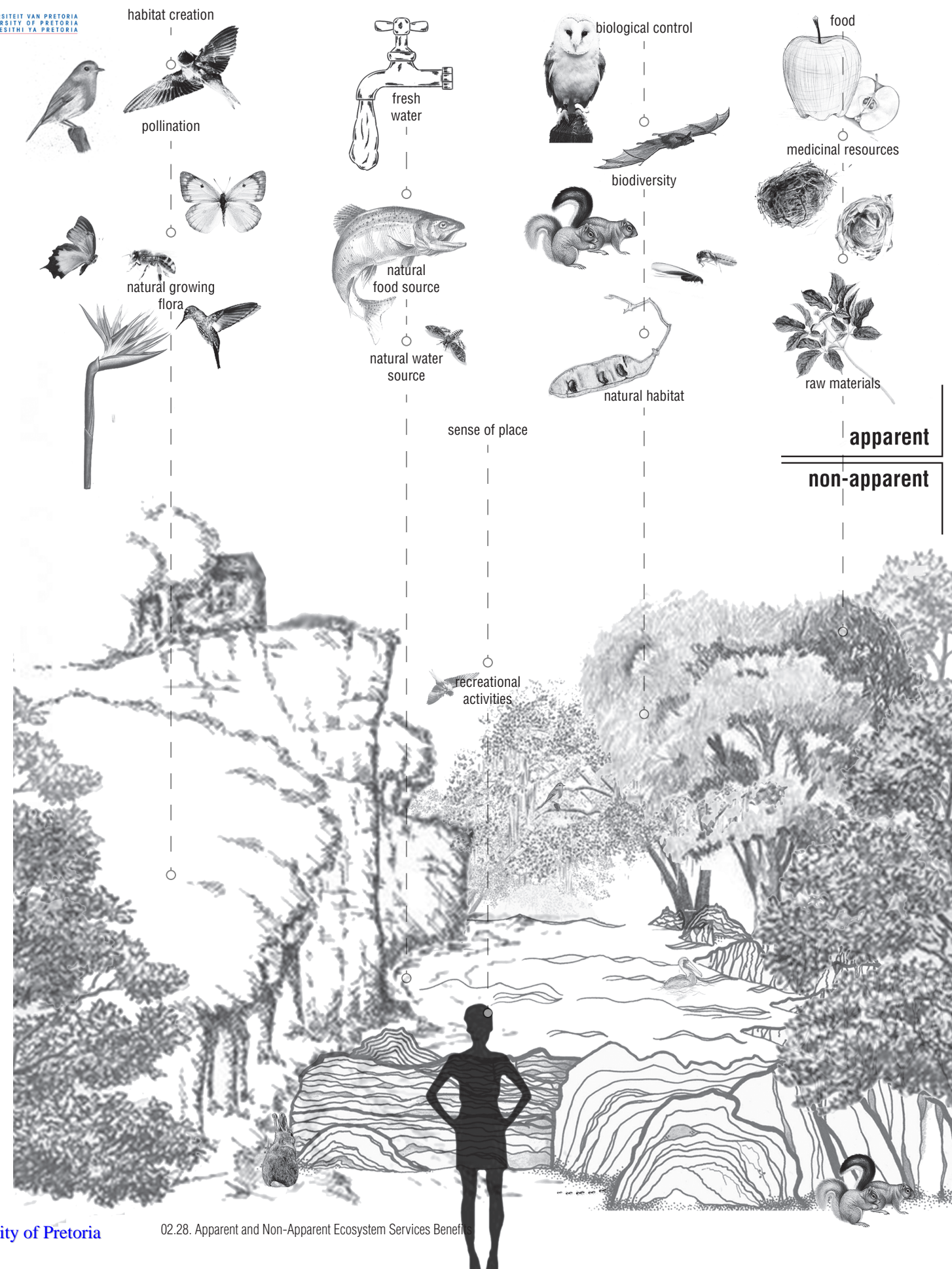
- Food Supply
- Water Flow Regulation and Runoff Mitigation
- Urban Temperatures Regulation
- Noise Reduction
- Air Purification
- Moderation of Environmental Extremes
- Waste Treatment
- Climate Regulation
- Pollination and Seed Dispersal
- Recreation and Cognitive Development

- Animal Sighting
- Ecosystem Disservices (Gómez-Baggethum & Barton 2012:236-238).

If the ecosystem services classified in an urban area are maintained and restored, the values becomes beneficial to the human population. In the article, *Classifying and Valuing Ecosystem Services for Urban Planning*, it is stated that ecosystem services are analyzed in terms of economic, socio-cultural and insurance value through the distinct value they add (Gómez-Baggethum & Barton 2012:238).

By realising the value of ecosystem services, the benefits they provide transforms from non-apparent to apparent. This will aid in the process of restoring humankind's connection to nature by transforming nature into a tangible reality - making nature part of human identity.

Humankind will start to see themselves as one with nature as it is realized that nature is a fundamental part for survival and human well-being.



02.05 conclusion

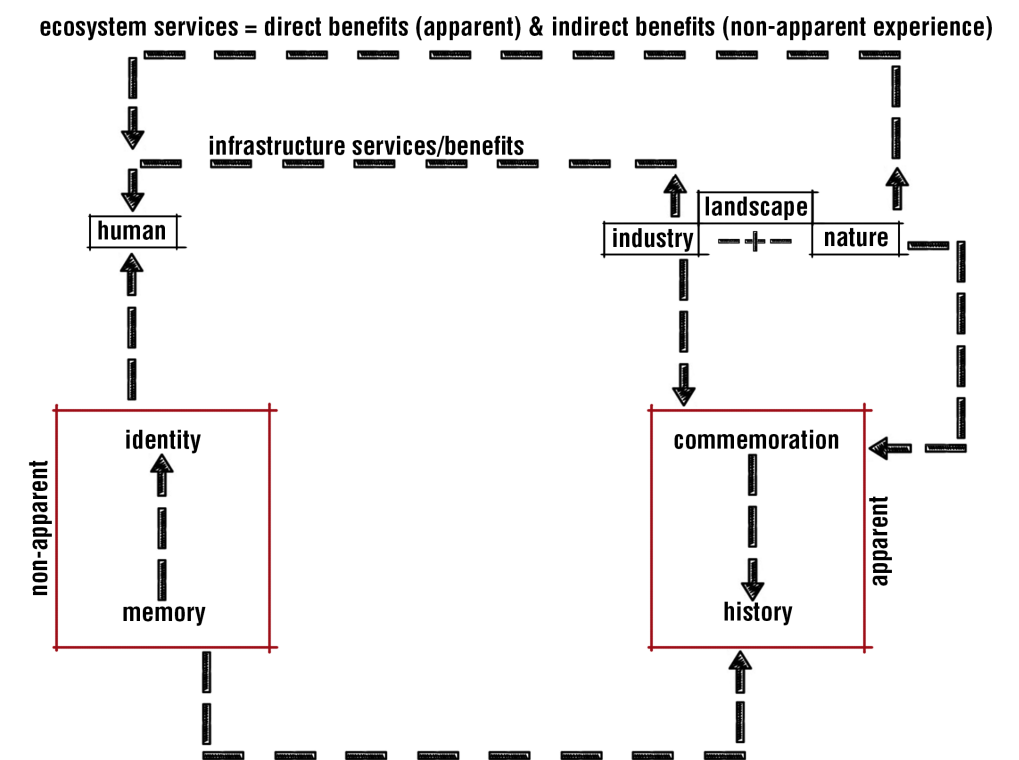
The theoretical discourse can be synthesized to the following guidelines that will support the design proposal.

1. Post-industrial landscapes are problematic due to the fact that they are only temporary and therefore leave an altered and disrupted natural landscape behind that can become sources of pollution to the natural environment.
2. Post-industrial landscape development in South Africa should be used to bridge the gap between different racial communities.
3. By celebrating the 'beauty of industry', the commemoration of industrial heritage will provide memory for the visitor, that will aid in the creation of identity. A resource should be identified from which potential use are developed without harming the integrity of the heritage.
4. Identity is orientated toward the future, but is based on a history shared by individuals, and the method for creating memory of history is most likely through the act of commemoration. Therefore shared aspects of collective identity should be pursued in South Africa.
5. The design intervention should consist of elements that will generate memory for the visitors. This can be achieved by means of visual and physical (apparent) as
6. pects, as well as, sensory and symbolic (non-apparent) aspects.
7. The post-industrial landscape can be adapted in order to re-establish humankind's connection to nature, since industry severed humans from nature. This can redefine humankind's identity.
8. Ecosystem services will be used to reconstruct nature in apparent and non-apparent ways. Nature manifested as the second, third and fourth nature, but they all are representations of first nature. By making the ecosystem services the four natures provides apparent, it can remind humankind of his dependance on nature.
9. The benefits of ecosystem services realized and the needs of the community should be identified in order to establish which of these services should be promoted in the design intervention. Green infrastructure on the site must be maximised to create multi-functional spaces that houses ecosystem services that can correct harmful industrial practices of the past and connect humans with nature.

This conclusion of the theoretical discourse answers the 5 research questions set out in Chapter 1, and is therefore summarised in an illustrated diagram (Figure 02.29.) that shows how the four main theories investigated, influence one another.

memory (non-apparent) to ultimately fostering identity.

This diagram summarizes the theory components and indicates how ecosystem services (that are apparent and non-apparent) can reconnect humans with nature through acts of commemoration (apparent) that triggers



02.29. Theory Diagram



03_context

03_context

The study area, which includes parts of Eersterust, Jan Niemand Park and Silverton forms part of the industrial areas surrounding Pretoria City Central.

The following chapter explores the industrial context of Pretoria and surrounding areas, as well as previously completed frameworks and vision proposals for the study area, concluding the chapter on a vision proposal for the described study area.

03.01_industrial context

The first industries in Pretoria were established around 1866, meaning that the industrial heritage of Pretoria dates back to almost 150 years, as illustrated in the timeline in Figure 03.02.

According to Naudè & Naudè (2007) the first steam train entered Pretoria in 1893, connecting an easterly trade route from Pretoria to Nelspruit and Maputo, called the Easterline (Naudè & Naudè 2007:46). The Easterline supported industrial expansion to the east, as manufactured goods could be transported and traded.

In 1890's silver is discovered on the farm Koedoespoort, located approximately 2km south of Derdepoort. The discovery of this metal caused a mitigation of prospectors to the farm. It is in this time that the town, Silverton is established and named after the silver mine (Kritzinger 1980:11).

The developing of the mining and other small industries caused for a portion of the farm Derdepoort no. 469 to be laid out into

'erwe', now called Eersterust, and mostly bought by residents that were skilled in Afrikaans and trade, to provide sufficient labour sources (Kritzinger 1980:30).

Although the silver rush was short-lived due to insubstantial silver reserves, a legacy of trade and industry was left behind in the small town called Silverton (Urban Vision Group 2013).

Rumours of opportunity lead to the mitigation of a number of industries to Silverton. Land could be purchased for cheap prices, an abundance of labour forces were available and the town was located on the existing, well connected trade routes. This lead to the establishment of large industries, such as the Silverton Tannery in 1915. Existing industries in this area made it possible for a number of smaller industries to establish in the following years (Naudè & Naudè 2007).

With the fast residential and industrial areas expansions, the Pretoria Municipality started to supply electricity to Silverton (Kritzinger

1980:12). The ability to power factories and some machinery, local industries such as engineering and motor works facilities were established (Naudè & Naudè 2007).

Around 1950 the owner of the corn farm called Derdepoort started to produce hand-made clay bricks. Considering the location of the farm, between the Moreletta River and the Riet Spruit, an abundance of clay was available to supply the manufacturing of the hand-made bricks and in 1954 Era Bricks was established (Van Dijkhorst 2014).

Four years later, Eersterust is formalized into a suburb and known as a coloured community. New 'erwe' was laid out and a number of community facilities were established (Kritzinger 1980:30).

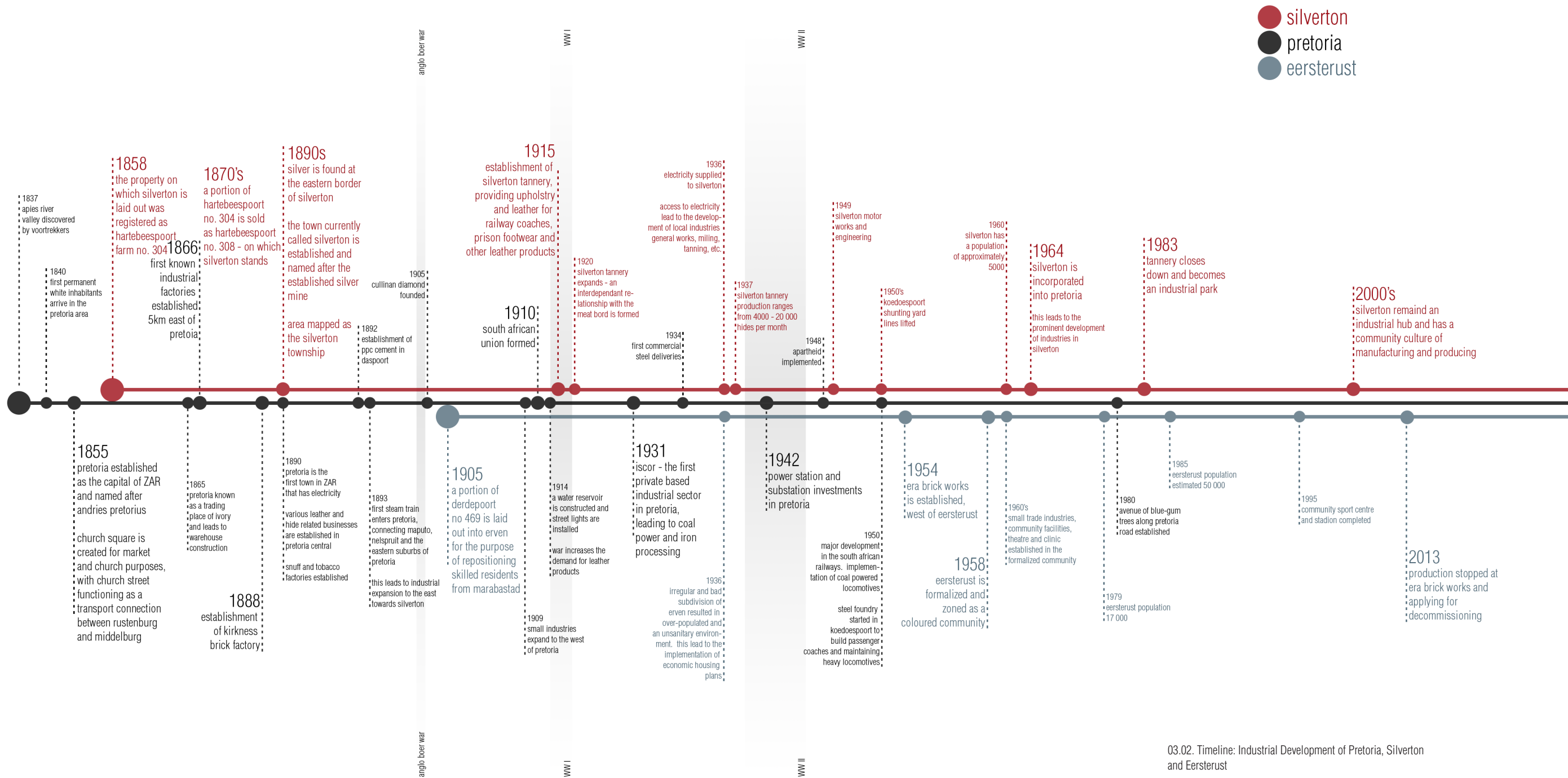
In 1964 Silverton is incorporated into Pretoria, increasing the production of products consumed by the city (Kritzinger 1980:8)

Till this day, Silverton and its surrounding suburbs are known for trade and industry. The diverse industries available provides the City of Tshwane with a large majority of its industrial services needed (Urban Vision Group 2013).

The manufacturing and production identity created over the years through the described industrial development is still evident in the community. This can still be experienced at the well-known Boeremark, where locally manufactured products and fresh produce are traded weekly (Figure 03.01).



03.01. Silverton Boeremark Culture



03.02. Timeline: Industrial Development of Pretoria, Silverton and Eersterust

03.02_era bricks

Approximately sixty years ago the owner of the maize farm, Derdepoort, started to produce hand-made clay bricks from clay mined on the farm between the Moreletta River and the Riet Spruit.

In 1954 Era Bricks was established and became profitable through supplying bricks to the fast developing industrial and residential surroundings. Rosema and Klaver bought the company in the 1980's and ensured the yield of bricks that was produced to increase (Van Dijkhorst 2014).

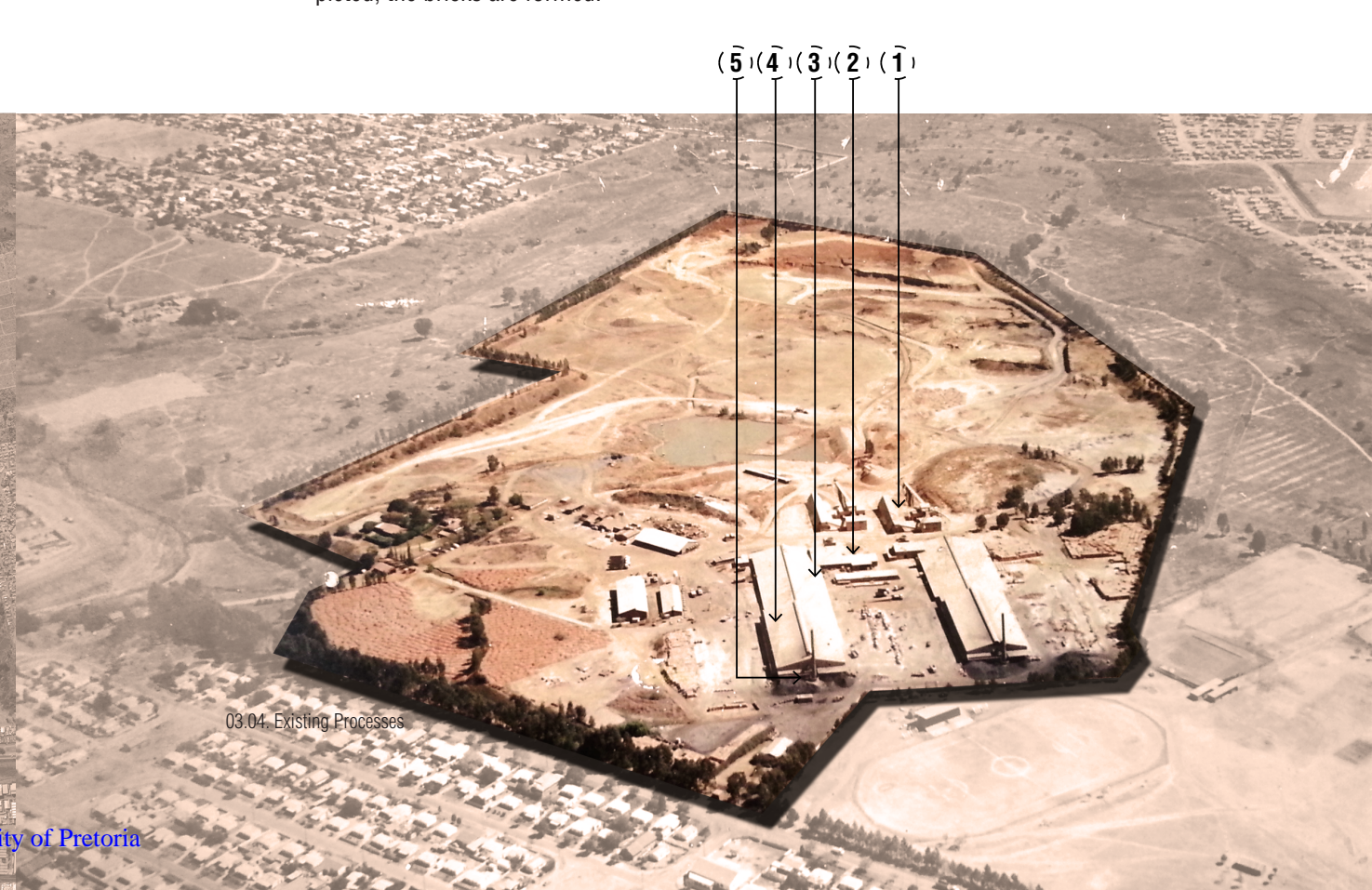
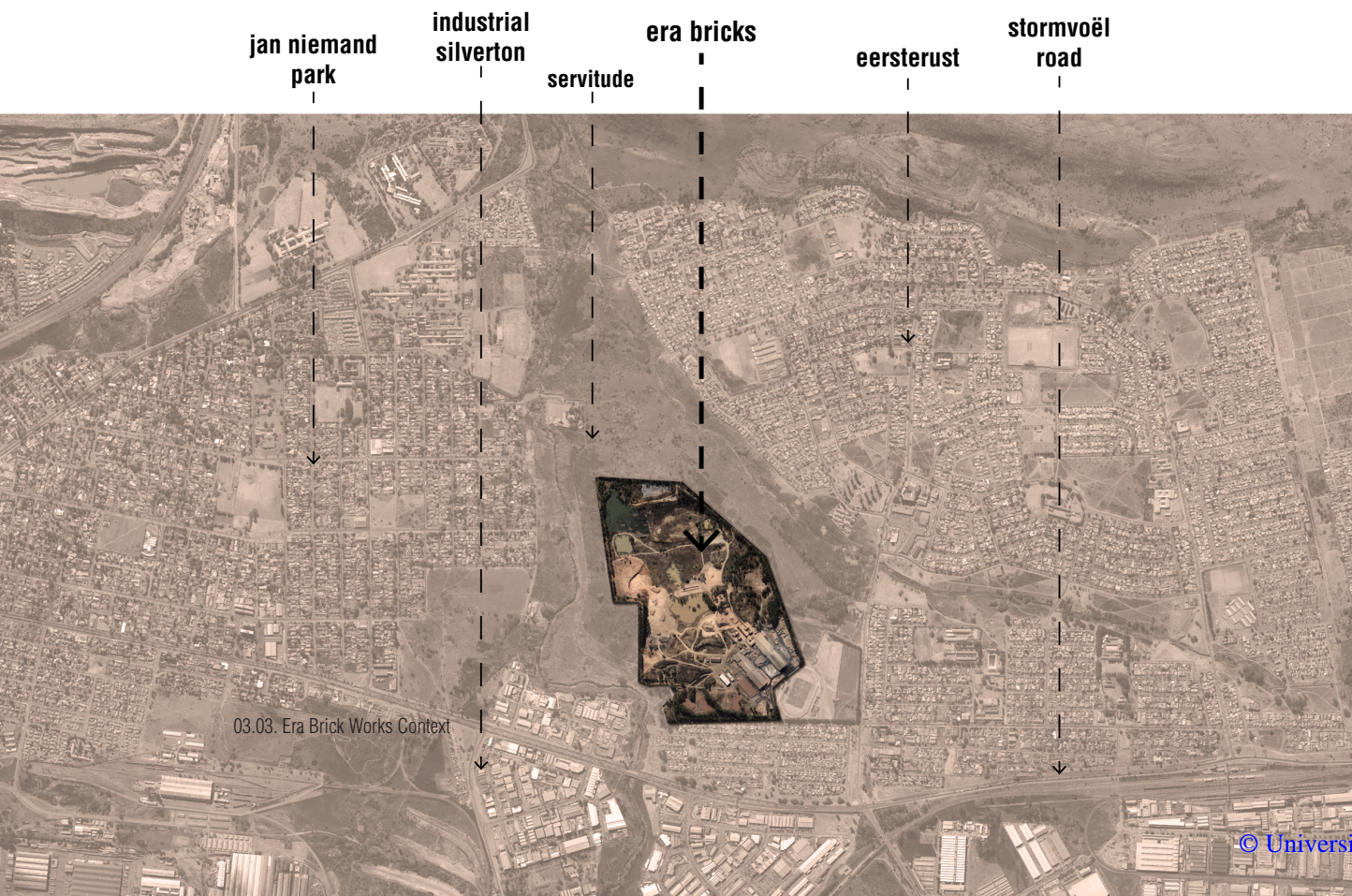
According to Jan van Dijkhorst (2014), Era Bricks has become a landmark for the surrounding communities, such as Eersterust due to its tall, 30m high bulging chimneys.

Figure 03.03. shows Era Bricks within context. As seen from the diagram, the brick works is located between Eersterust, Jan Niemand Park and the industrial Silverton. The diagram also shows the extension of the clay quarry that has been excavated. The natural land surrounding the quarry site is zoned as municipal servitude.

03.02.01_existing processes

The Era Bricks factory consist of two identical production lines. The production process is linear and comprises of the following five main phases (refer to Figure 03.04.).

1. Clay is excavated from the quarry and is transported by means of an endless conveyor belt.
2. Clay is crushed and refined, then water is added. The clay mass is then entered into a pan mill to grind the mass down to the desired particle size. The mass is then screened to prevent oversized pieces from entering the shaping process. After the screening is completed, the bricks are formed.
3. The wet bricks are then placed on flat rail trolleys and pushed into tunnel driers, where they will be dried to the desired moisture content.
4. The bricks are then moved to the Hoffman Kilns where they will be fired. The kilns are coal fired.
5. The smoke and heat produced by drying and firing are extracted using a duct system that is connected to the 30m tall chimney. (Van Dijkhorst 2014) & (Clay Brick Association 2002)



03.02.02_decommissioning era bricks

It is safe to say that modern clay brick manufacturing is a capital intensive ceramic process that requires long-term planning due to the availability and costing of materials, as well as the sensitive cyclical nature of the construction industry (Clay Brick Association 2002:6).

That being said and considering the current state of the Era Bricks manufacturing plant, the owners of the company have applied for a decommissioning certificate for the following reasons:

- The available clay on site has been depleted and the importation of clay has become too costly.
- The quality and cost of importing coal to fire the kilns has proven unworthy.
- The technology used for manufacturing is outdated.
- The kilns have become a safety risk for all employees.
- The kilns have become too costly to maintain or even upgrade.
- The whole manufacturing process has become unsustainable as a production process.

The Urban Vision Group (2013), stated that decommissioned industrial sites are generally perceived to be of low value and potential, but are in fact sites of transition. These forgotten landscapes can be re-arranged into a new, productive use. These properties offer specific potentials in the form of easy access, cheap available land, and they are generally well connected to existing transport routes, business sectors, and residential areas.

Era Bricks is exactly such a transitional site, bulging with developmental possibilities and recreational potential. Although the clay sources are depleted and the factory buildings abandoned leaving the terrain altered - the site offers an environment of infrastructure that can easily be adapted into the surrounding context.

03.03_era regional park proposal 2013

In 2013, a collaborative Urban Vision framework was proposed for the study area by three M(Prof) Architecture students, with Era Bricks as the main intervention site. The following section explores observations and discusses the founding of the Eersterust Urban Vision Group (EUVG).

The urban vision group mapped Silverton and its surrounding context historically, theoretically and graphically. The group's context of intervention, which borders on Silverton and Eersterust, is introduced and mapped in terms of an urban vision proposal.

They proposed a framework for the decommissioned brickworks and quarry site, called the Era Regional Park. It is stated that social and ecological value is introduced within an industrial heritage context, and becomes integral in a holistic rehabilitation process. This allows for industrial, ecological and social functions to co-exist, making these relationships apparent.

This study will adopt the proposal of a regional park for the greater programme of the intervention. As previously stated, the name Era Regional Park, created by the EUVG will be used throughout this dissertation.

03.05. Era Bricks being Decommissioned



03.06. Era Regional Park Proposal 2013



03.03.01_proposal approach

After the EUVG completed the mapping and analyzing of all the previously mentioned aspects, they came to the conclusion that within the study area, various avenues of flow exists (EUVG 2013).

The EUVG interpreted the apparent and non-apparent relationship in terms of avenues of flow. Meaning that the relationship of plants reworked into textiles is an avenue of flow from nature to mankind. Figure 03.07. illustrates the avenues identified by the EUVG from the natural environment through industries to the user.

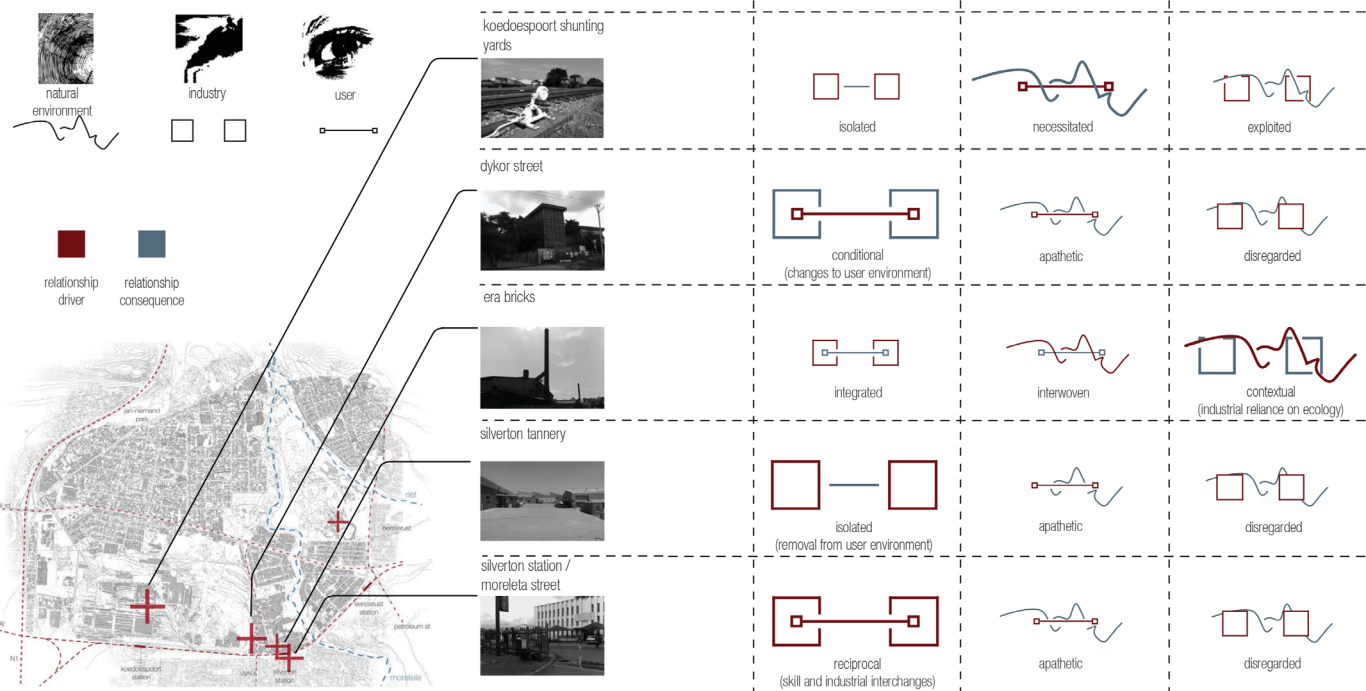
As described in the Eersterust Urban Vision proposal, currencies in the context of Silverton and Eersterust were found to be either apparent, for example the flow of labour and raw materials, or non-apparent, for example

human capital and natural systems (EUVG 2013).

The EUVG states that after the decommissioning of industrial sites, apparent currencies should act as informants for new interventions, but instead they are destroyed or lost. Non-apparent currencies, for example social and ecological exchanges are usually just disregarded and not even considered before, during or after industrial activities.

This study will adopt the avenues of flow identified by the EUVG, as the acknowledgement and consideration of these apparent and non-apparent currencies will prevent the decommissioning industrial site from resulting in a social and spatial void. This study aims to investigate these relations further.

silverton - apparent // non apparent relationships



03.07. Apparent and Non-Apparent Avenues of Flow

03.03.02_currencies

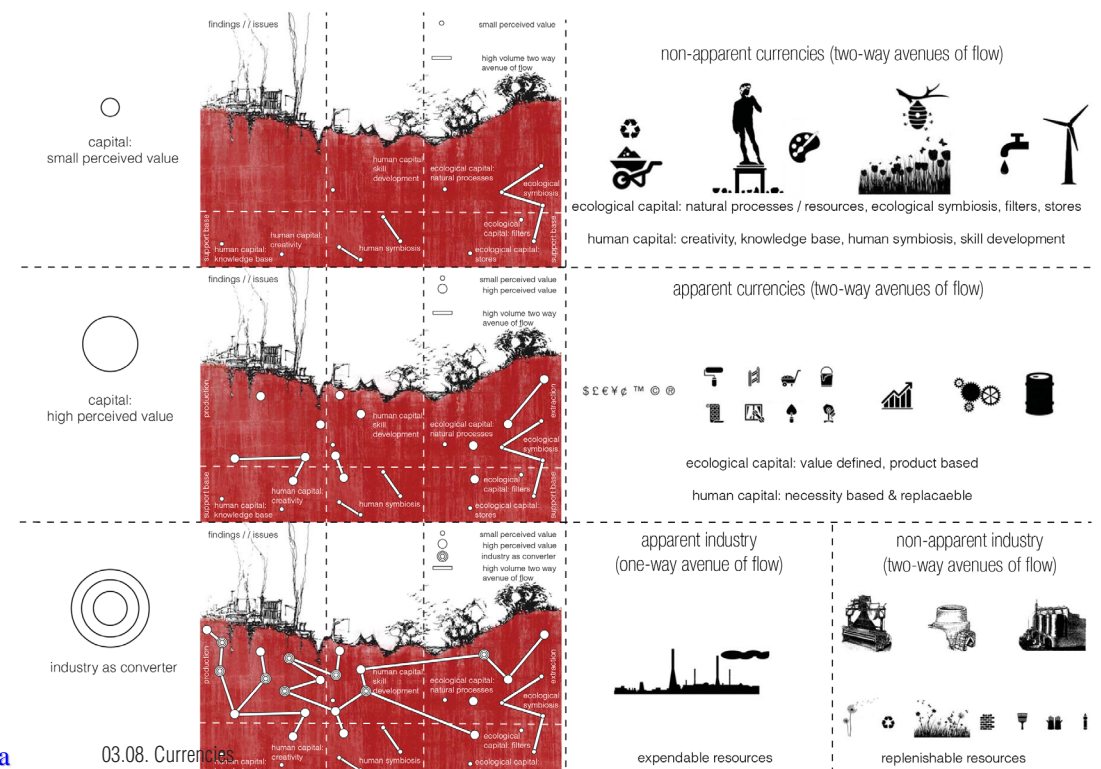
The Urban Vision for Era Bricks is approached in a manner which considers the apparent and non-apparent networks of the site and its surrounding context.

Non-apparent currencies, such as the exchanges between natural resources are considered of low value, yet they support and are dependent of the apparent currencies that are perceived as high value (EUVG 2013).

skills (EUVG 2013).

The focal point of the Urban Vision is the relationships between industries, ecologies and compromised environments. Through anchoring itself into and re-addressing the processes and physical premisses of the site, opportunities are gained and imbalances are addressed.

Figure 03.08. by the EUVG attempts to show that industries may be seen as converters between non-apparent and apparent currencies. But it is stated that the underlying issue with this is that the value perception of apparent currencies is internally defined. This results in a disregard, depletion and exploration of natural resources and human



03.08. Currencies

03.03.03_natural industrial ecology

This study accepts the EUVG 2013 proposal, which aims to address the altered landscape through natural industries. These industries are directly emergent from the identified apparent and non-apparent currencies, like the naturally occurring processes or existing industries which extract and work with raw materials in a mutually beneficial manner.

The aim of the Urban Vision proposal was to include the status-qua of Era Bricks, which is a process driven industry dependent on natural resources in a compromised environment. This is achieved through the implementation of various programmatic proposals based on natural industries to further the potential of Era Bricks as a premise of natural industries (EUVG 2013).

In effect, the urban vision allows for interaction between social, industrial and ecological currencies. The industrial premise, realized as Era Regional Park, becomes an industrial and ecological catalyst, which manages and activates the site through exploration and reinterpretation of the currencies identified on site (EUVG 2013).

This created the main intervention principle, that any proposed design interventions should be based on apparent and non-apparent natural industries which foster human and ecological symbiosis, and therefore provide long term social, industrial and ecological opportunities. Additionally, the Era Regional Park proposes to introduce social and ecological value within the broader industrial heritage context of Silverton and Eersterust (EUVG 2013).

The proposal includes three architectural

interventions, located within a proposed framework for the Era Bricks precinct. All three proposals deal thematically with industrial ecologies, and form part of an interdependent cycle that allows for constant adaptation and evolution of the site.

The programmatic collaboration of the Era Regional Park vision proposal includes the following architectural interventions:

1. A natural fibre processing plant that acts as a facilitator and creates spaces of interaction with old, new and natural industries, enhancing the significance of each other.
- by Jacques Pansegrouw (Figure 03.09.)
2. An incubator for ceramic-based industries becomes an architectural solvent for natural, industrial and cultural endeavours.
- by Carla Taljaard (Figure 03.10.)
3. An apiary and honey processing facility becomes a transitional exploration from enclosure to opening, revealing the totality of the post-industrial terrain.
- by Carlheinz von Geysso (Figure 03.11.)

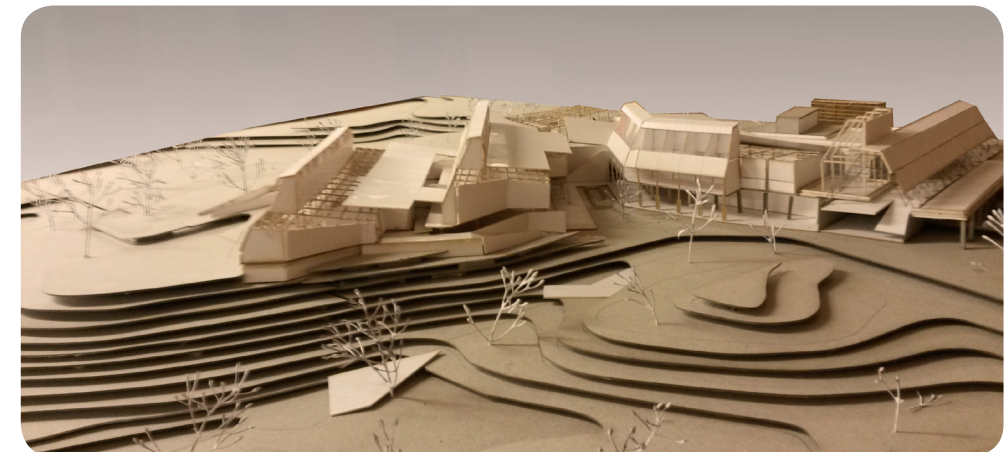
These described programmes for the post-industrial buildings of Era Bricks will be adopted into this this dissertation and is assumed to be existing. The design intervention will respond to these programmes where necessary. Figure 03.12. illustrates the framework proposal by the EUVG 2013.



03.09. The Fibre Processing Plant



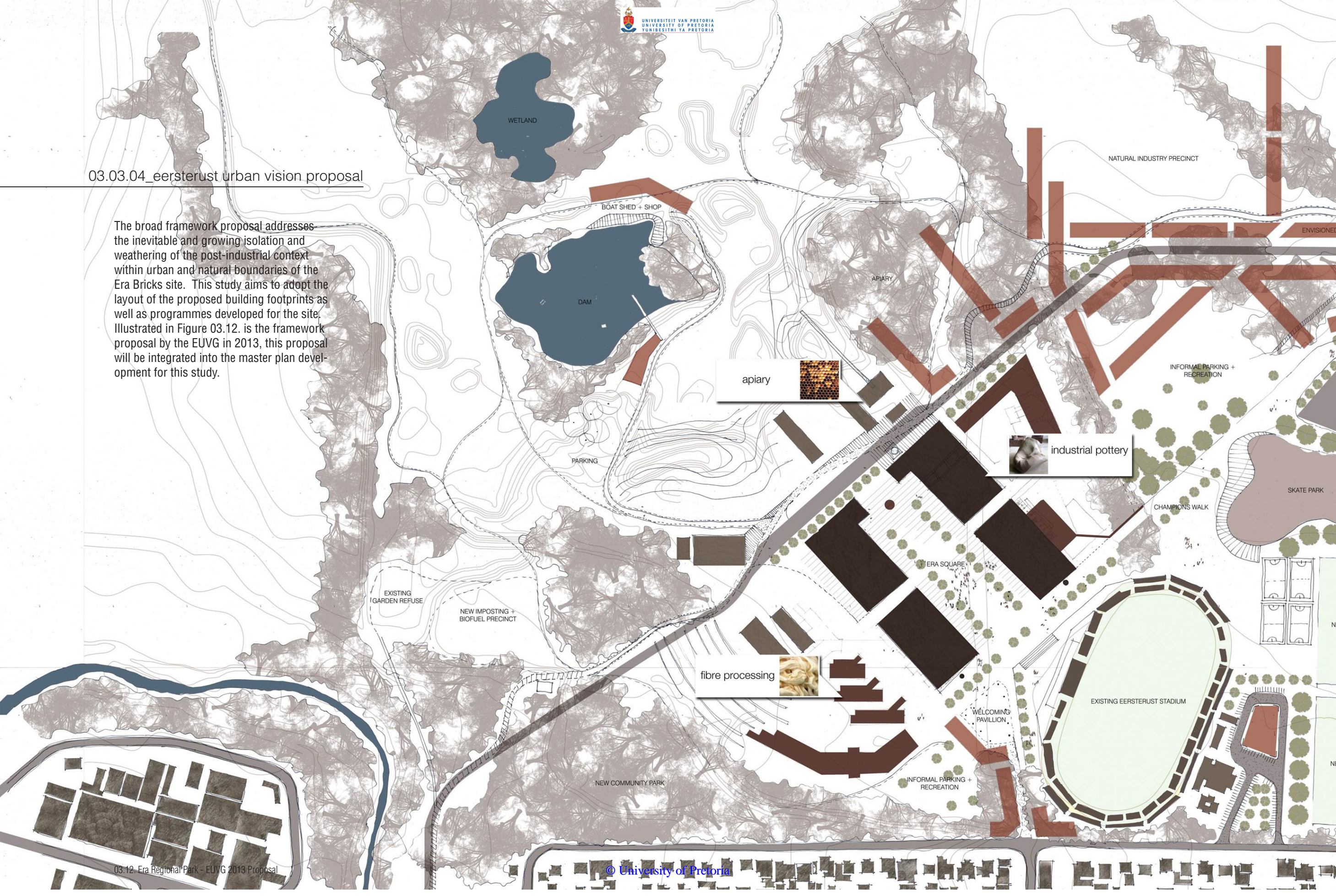
03.10. The Ceramics Factory



03.11. The Apiary

03.03.04_eersterust urban vision proposal

The broad framework proposal addresses the inevitable and growing isolation and weathering of the post-industrial context within urban and natural boundaries of the Era Bricks site. This study aims to adopt the layout of the proposed building footprints as well as programmes developed for the site. Illustrated in Figure 03.12. is the framework proposal by the EUVG in 2013, this proposal will be integrated into the master plan development for this study.



03.04_the multi-functional landscape

This dissertation will further address and expand the landscape component of the proposal, as it was not fully explored by the EUVG in 2013.

This study adopts to the concept of identifying apparent and non-apparent avenues of flow within the landscape, but will focus in detail on the apparent and non-apparent uses in nature that is provided through the concept of ecosystem services.

as well as natural and man-made vegetated areas can be better integrated, in order to make cities more habitable and resilient in terms of the ecosystem services created.

of the mapping and the context location of the study area within the ecosystem services analysis.

In order to assess the natural assets of the City of Tshwane, the existing natural water systems and protected vegetated areas were mapped. Figure 3.13. illustrates the result

03.04.01_ecosystem services analysis

Referring back to the theoretical discourse, it was reasoned that ecosystem services have direct and indirect benefits. This means that as with the EUVG currencies, there are apparent and non-apparent relationships. The relationships investigated from this point forward will be ecosystem services and their direct and indirect benefits.

It is well known that by focussing on the multi-functional nature of ecosystem services, especially with regards to urban planning and service delivery, cities can benefit from a diverse range of benefits delivered by the surrounding natural environment.

According to the *Position Statement* (2013) published by the Landscape Institute, these are the main benefits resulting on a focus and appreciation of ecosystem services, provided by the natural environment.

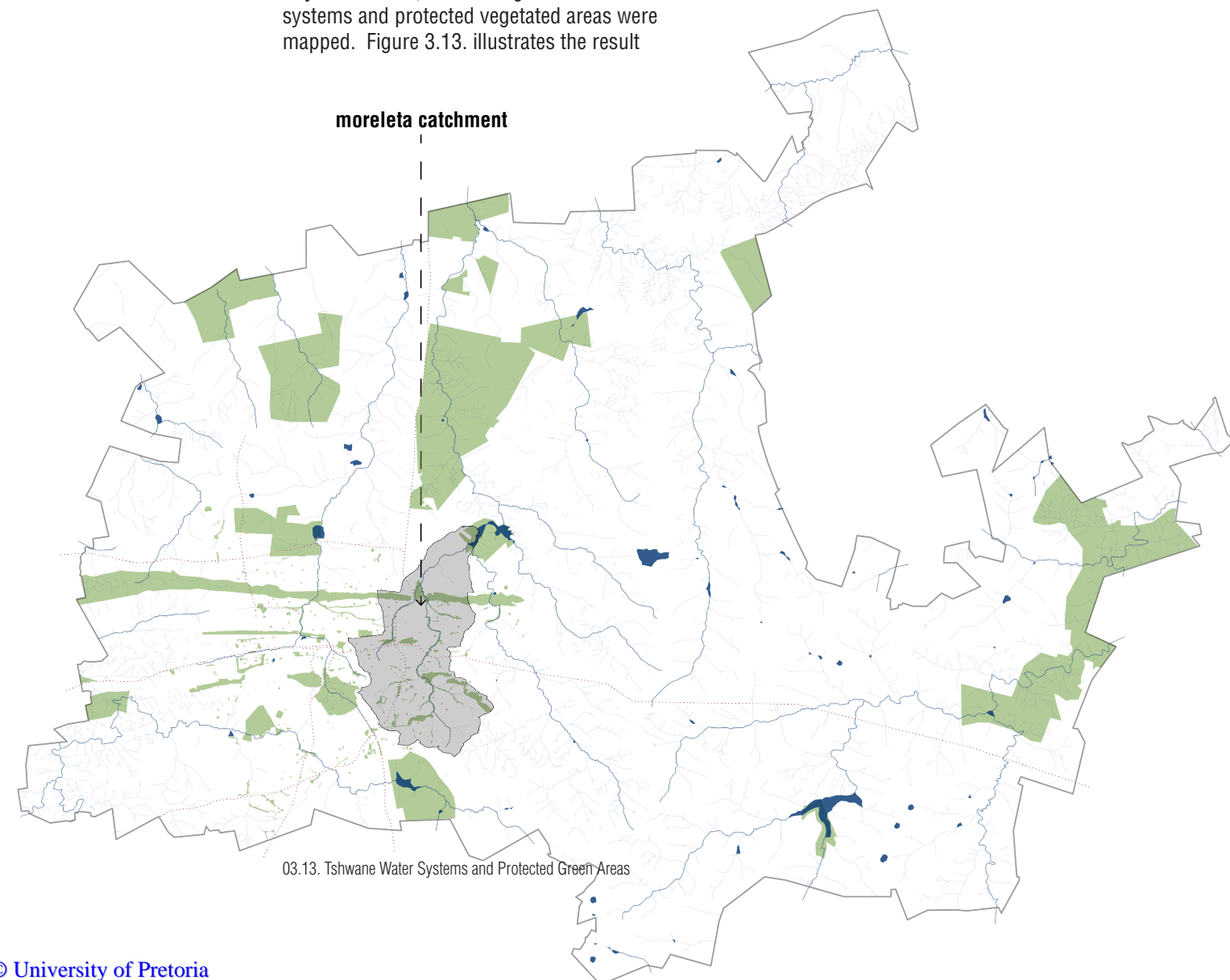
- Building resilience to climate change.

- Cost-effective infrastructure provision.
- Ecological enhancement.
- Increasing health.
- Economic growth and investment.
- Improving social standards.

As soon as these benefits are realized, the conservation of natural space will be imminent and will result in an effective way to create and maintain sustainable and healthy cities.

The dramatic increase in temperatures and the extreme weather conditions experienced over the past few years in the City of Tshwane, together with the urban sprawl, are the main causes of urban heat islands, flooding, as well as a decline in size of the natural environment that supply the city with the needed ecosystem services to survive.

The answer to this problem is to consider how natural and man-made water systems



The large scale analysis of Tshwane showed that the study area is located within the Moreleta Catchment, meaning that all the stormwater that enters this area would go through the same water systems and vegetated areas to eventually end up in the Roodeplaat Dam.

For this reason the Moreleta Catchment is seen as one main ecosystem, and the benefits will directly influence the communities located in this catchment.

The following challenges have been identified within the Moreleta Catchment:

1. Major flooding occurs within the natural water systems (Figure 03.14).
2. Informal agriculture takes up natural vegetated areas (Figure 03.15).
3. Parks and natural vegetated areas are not connected, resulting in heat islands and a lack of accessible recreational space (Figure 03.17).
4. No sense of place exists, meaning that a lack in overall community identity occurs.
5. Natural habitats for fauna and flora are declining, resulting in the loss of ecosystem services.

These challenges can be solved through the consideration of ecosystem services. According to the *TEEB Manual for Cities: Ecosystem Services in Urban Management* (2011), the most relevant ecosystem services that can solve the challenges should be identified and prioritized (TEEB 2011:15). The most relevant systems in this case are the services that are lacking or disrupt-



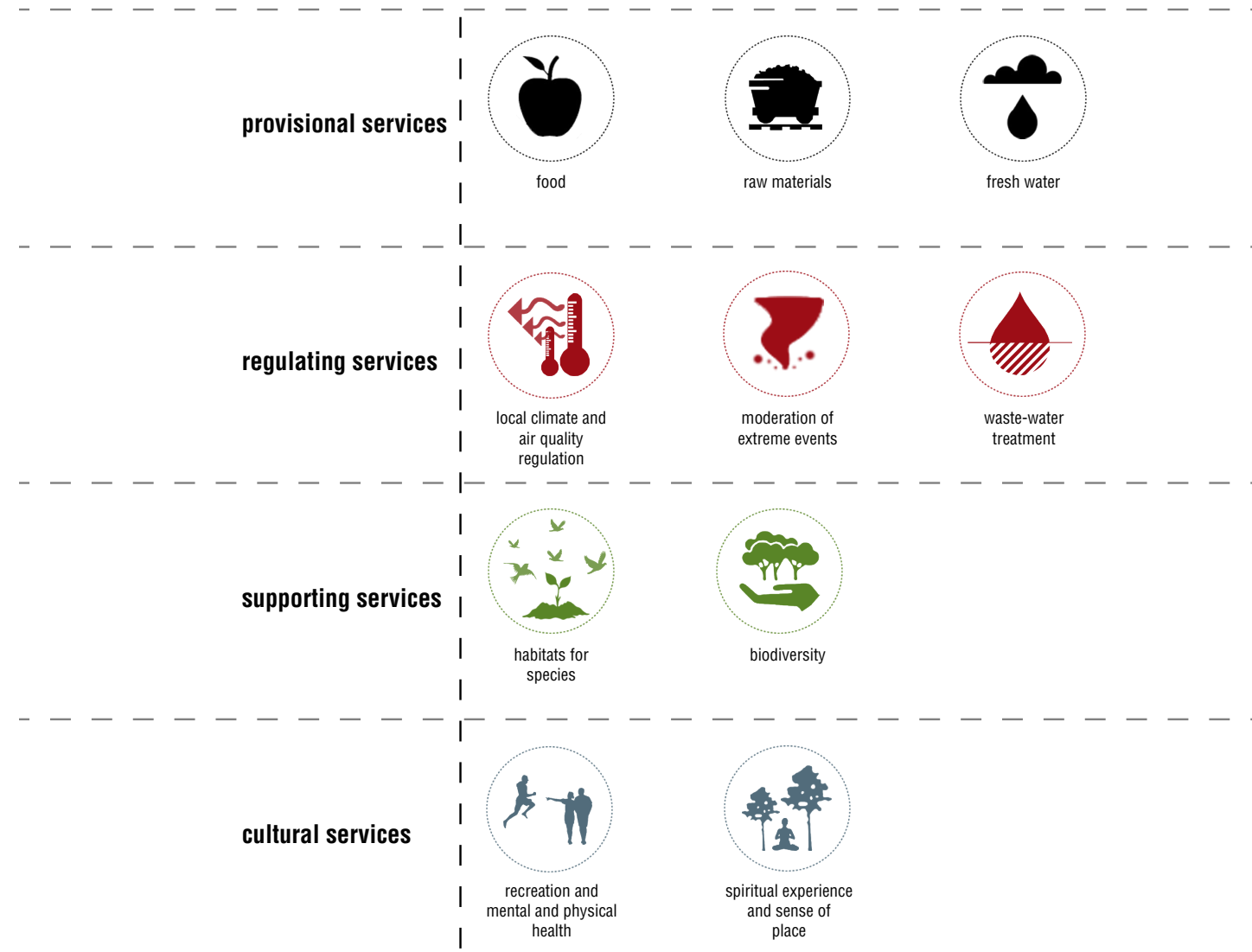
03.14. Moreleta River after Floods in April 2014



03.15. Informal Agriculture

ed. Resulting in the challenges previously discussed.

Figure 03.16. illustrates the ecosystem services identified that will better the challenges identified and the second reason as the main apparent and non-apparent relationships of nature. These identified ecosystem services will be prioritised at a framework scale and carried through to the master plan and sketch plan interventions.



03.16. Identified Ecosystem Services for the Multi-Functional Landscape

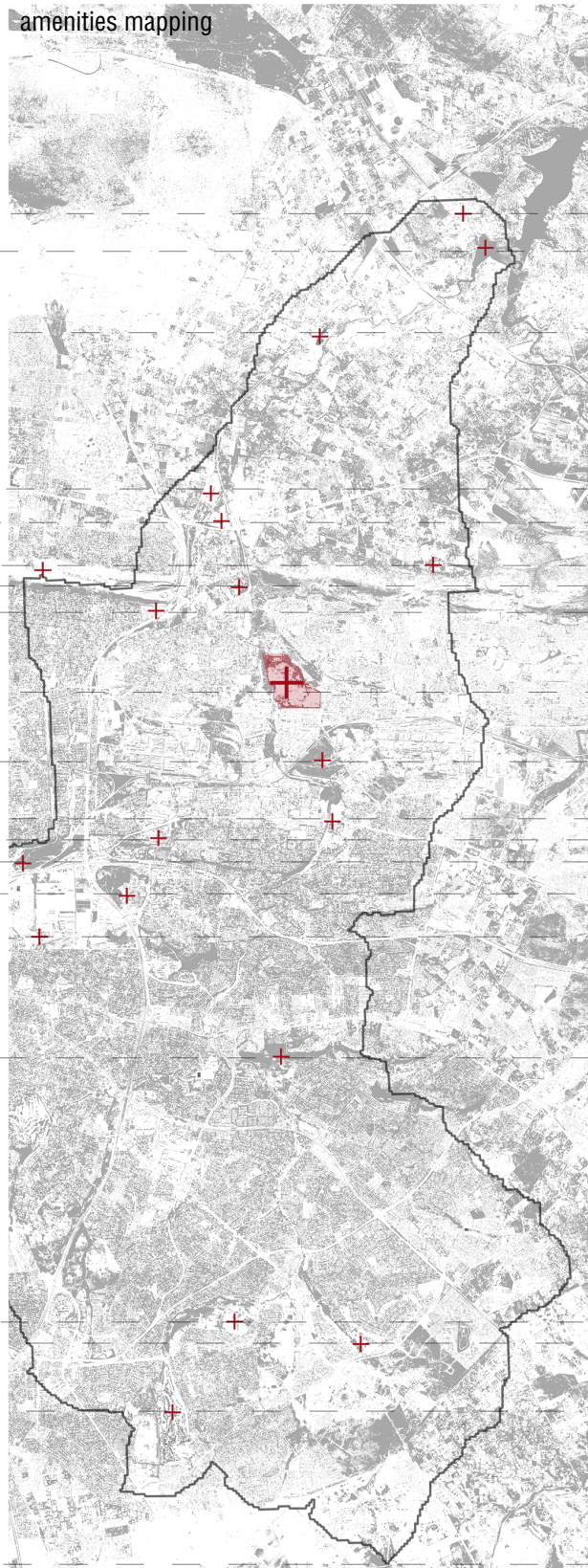
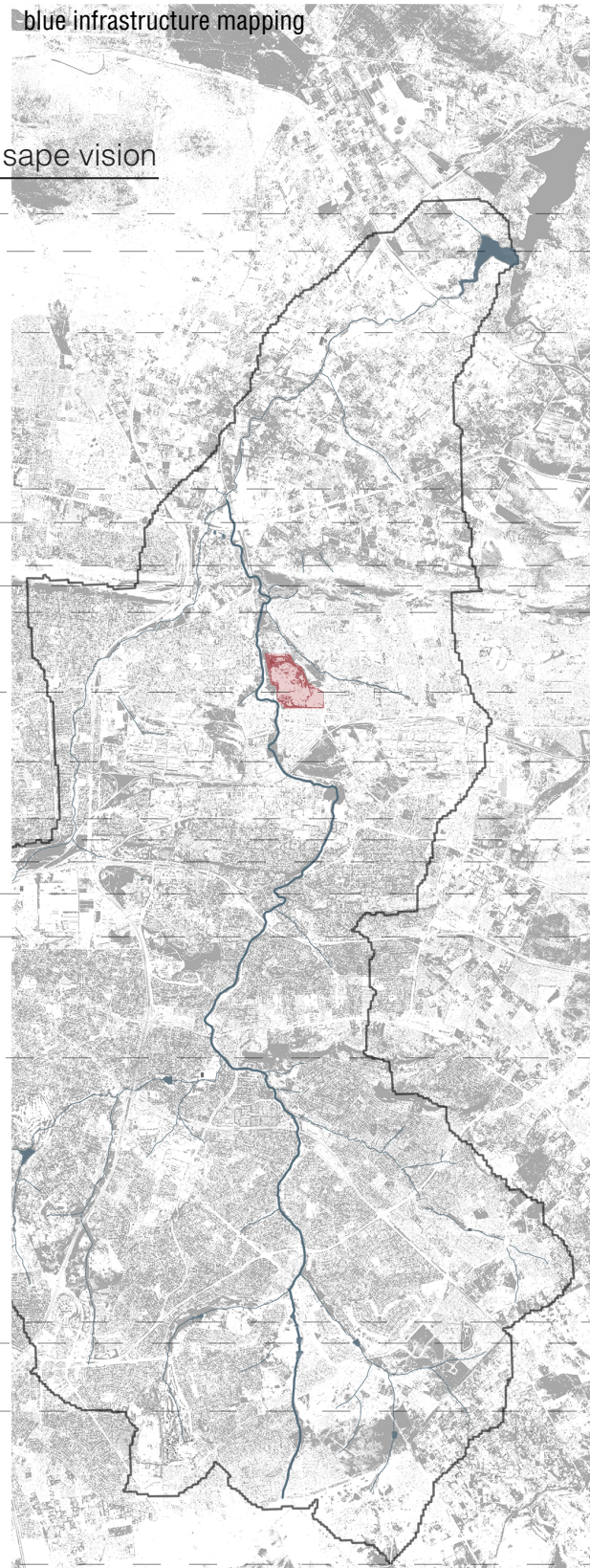
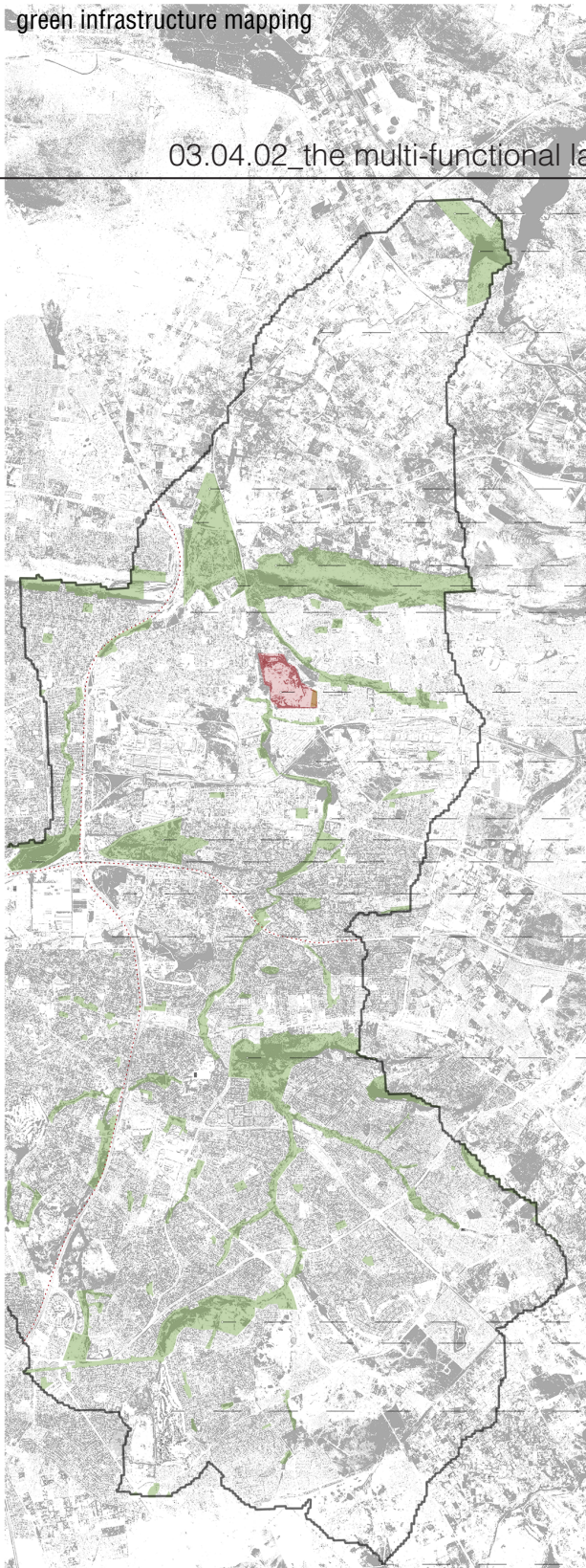
green infrastructure mapping

blue infrastructure mapping

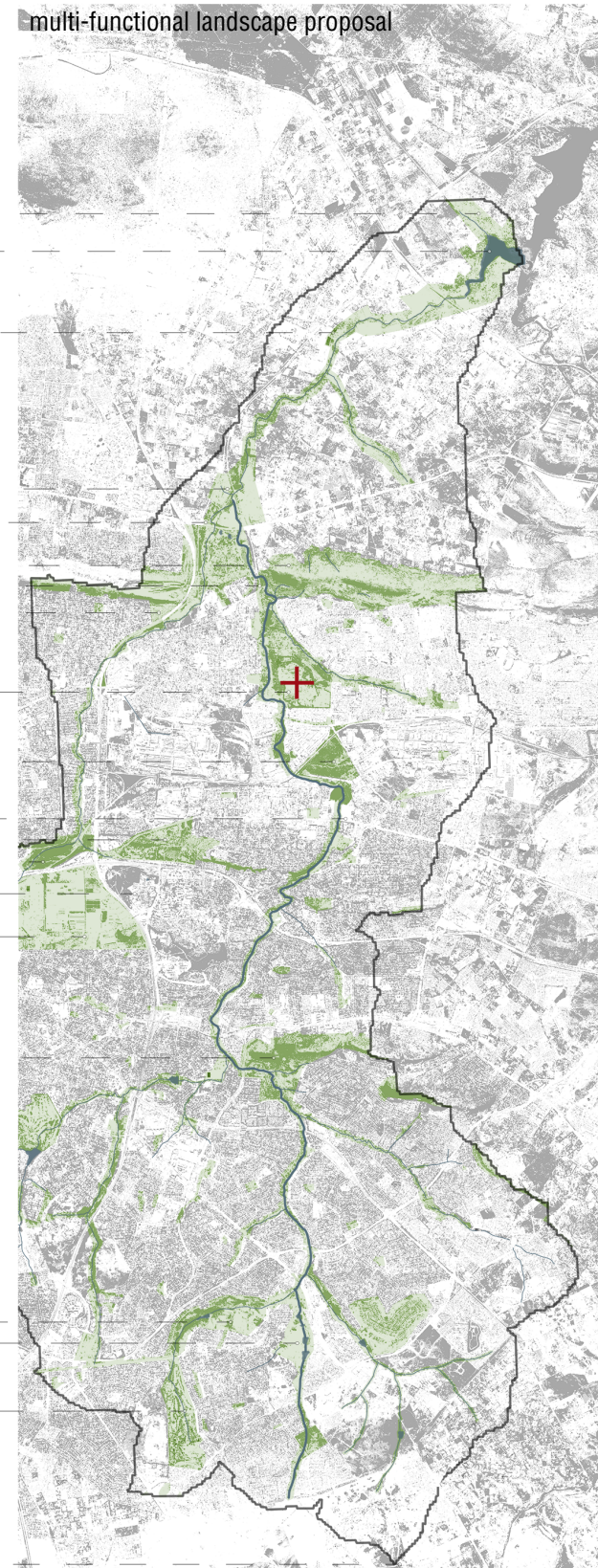
amenities mapping

multi-functional landscape proposal

03.04.02_the multi-functional landscape vision



- roodeplaat nature reserve
- roodeplaat dam
- large scale agriculture
- closed derdepoort landfill
- small scale agriculture
- magaliesberg nature reserve
- derdepoort recreational park
- active quarry
- decommissioned era brickworks & quarry
- watloo municipal grounds
- boere mark
- national botanical gardens
- colbyn valley
- csir
- lc de villiers sport & experimental grounds
- faerie glen nature reserve
- constantia park
- woodhill golf course
- wingate golf course
- moreleta/hartebeesspruit catchment



Taking the above mentioned challenges and ecosystem services opportunities, as well as the discussed proposed Era Regional Park framework into consideration, an analysis was completed of all the existing green infrastructure, blue infrastructure and amenities were completed in order to create a multi-functional landscape proposal for the Moreletta Catchment.

The proposal (Figure 03.17.) aims to connect the Era Bricks site with the Roodeplaat Dam Nature Reserve, via the protected Magaliesberg Mountain Range. This will result in a regional park consisting of various recreation activities, conservation areas, sport facilities and social undertakings.

The proposal by the EUVG (2013) will be the main social intervention, and will become the main entrance to the Era Regional Park. This area will be investigated and developed in the analysis and master plan development chapters.

04.00. Cover Image



04.00. Cover Image

04_site informants

04_site informants

In Chapter 3, the industrial background and influential frameworks of the study area were discussed. This was concluded with the multi-functional landscape proposal that determines the larger context surrounding the Era Bricks site.

The next step is to zoom in on the Era Bricks site and its immediate surroundings. This chapter focus on the site analysis in detail. The findings inform the design of the site. Through this analysis process the opportunities and constraints are identified, that ensure the design is responsive to existing and future site conditions.

The capter is concluded with the summaries of the precedents studied for this dissertation, in order to complete the site informants.

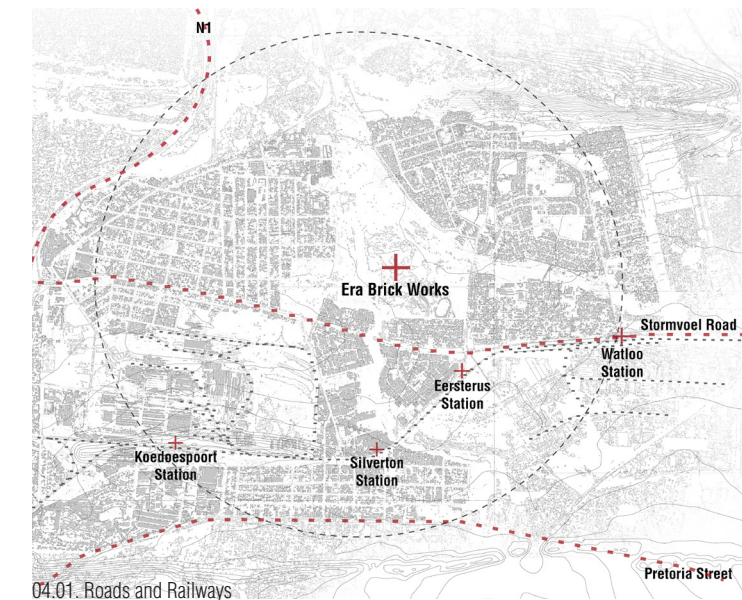
04.01_region analysis

Firstly, the immediate surroundings of the site are investigated in order to determine the context surrounding the site. Context to which the design should respond to.

The study area is well connected to major roads within the City of Tshwane. From the N1 highway the Stormvoël Road (east) offramp can be taken that runs through the study area.

The study area is also well serviced in terms of the railway system, with two stations that are connected to Stormvoël Road as well as the Koedoespoort Shunting yards.

The roads and railway systems that surround the site will make Era Regional Park accessible to local, regional and international visitors. Figure 04.01. illustrates the major roads and railway system in relation to the Era Bricks site.



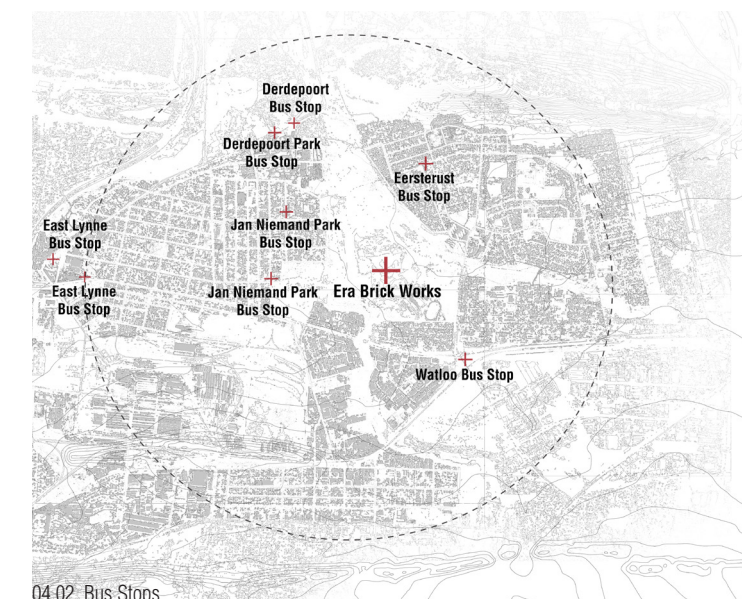
04.01. Roads and Railways

04.01.02_bus routes

A well developed bus route exists within the Jan Niemand Park residential suburb, west of the Era Bricks site. As illustrated in Figure 04.02. there is only one bus stop located within the community of Eersterust.

A bus stop is also located in between the two noted train stations, which means that people commuting via railway will have access to the public bus services.

The public transport within the community of Eersterust should be addressed within the design intervention to allow better accessibility for local visitors to Era Regional Park.



04.02. Bus Stops

04.01.03_educational institutions

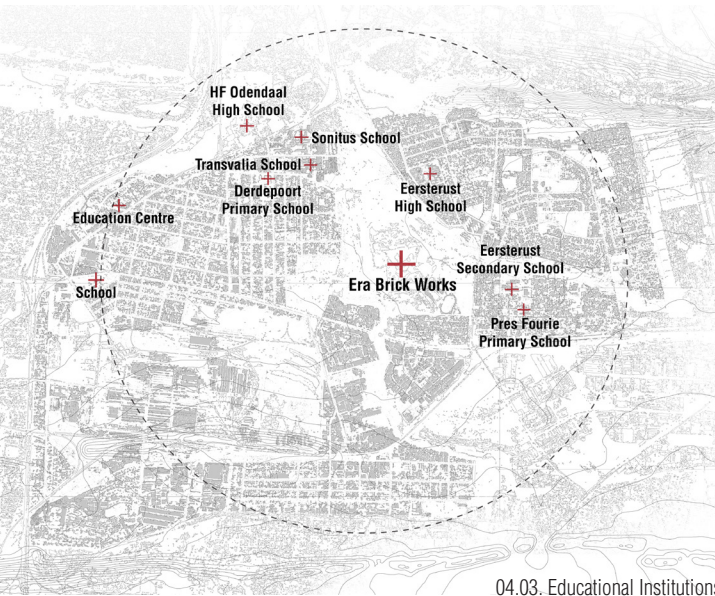
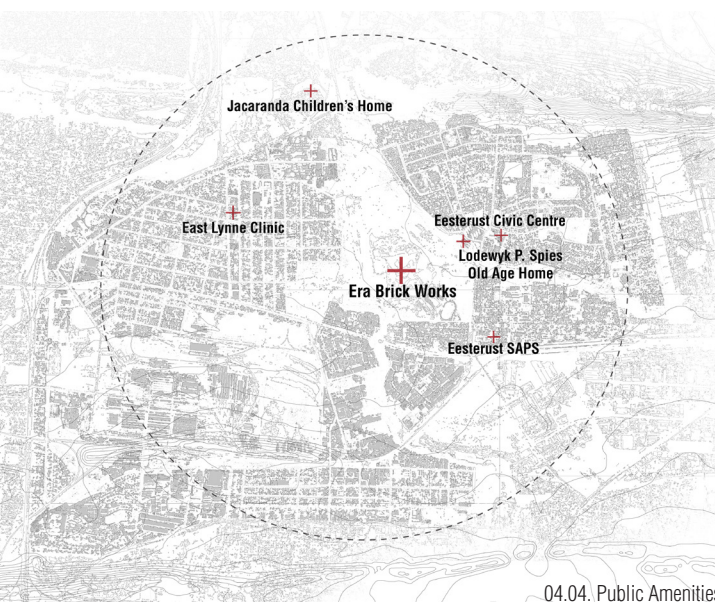


Figure 04.03. shows that a large number of educational facilities are located within the study area. The educational facilities available ranges from pre-school all the way through to small colleges for higher education diplomas.

A number of these educational facilities borders the site that will become the Era Regional Park. This gives opportunity for the landscape intervention to accommodate interventions for educational purposes.

04.01.04_public amenities



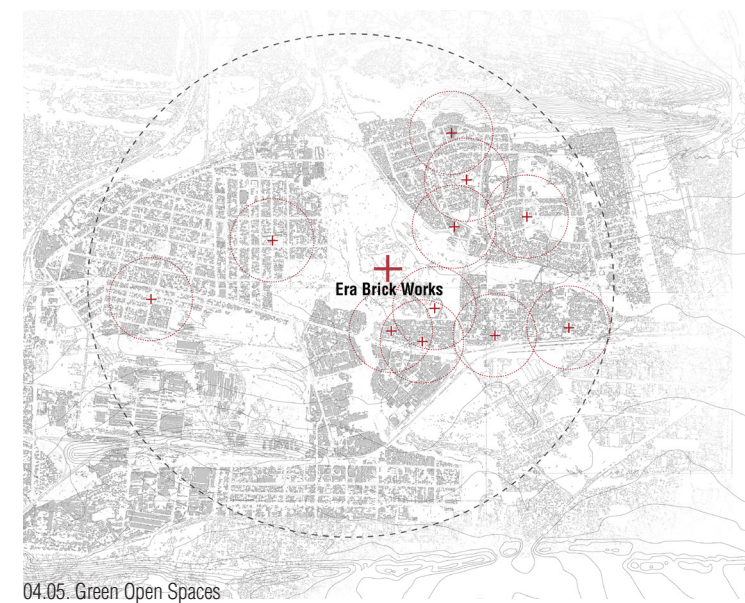
Within the study area all the basic public amenities could be identified within a well accessible distance.

The Civic Centre located in Eersterust consists of a library, a community hall, post-office and a small clinic.

04.01.05_green open spaces

A large number of open green spaces have been identified within the study area. The problem is that only about 10% of these open spaces are zoned as public parks. The majority of them are open fields that cause safety problems within the communities.

As suggested in Chapter 3, a multi-functional landscape is proposed that would connect all these open green spaces for the benefit of ecosystem services. By increasing the corridors of the green infrastructure landscape, ecosystem services can function at an optimum rate, meaning that the surrounding communities can benefit directly from this intervention.



04.02_site analysis

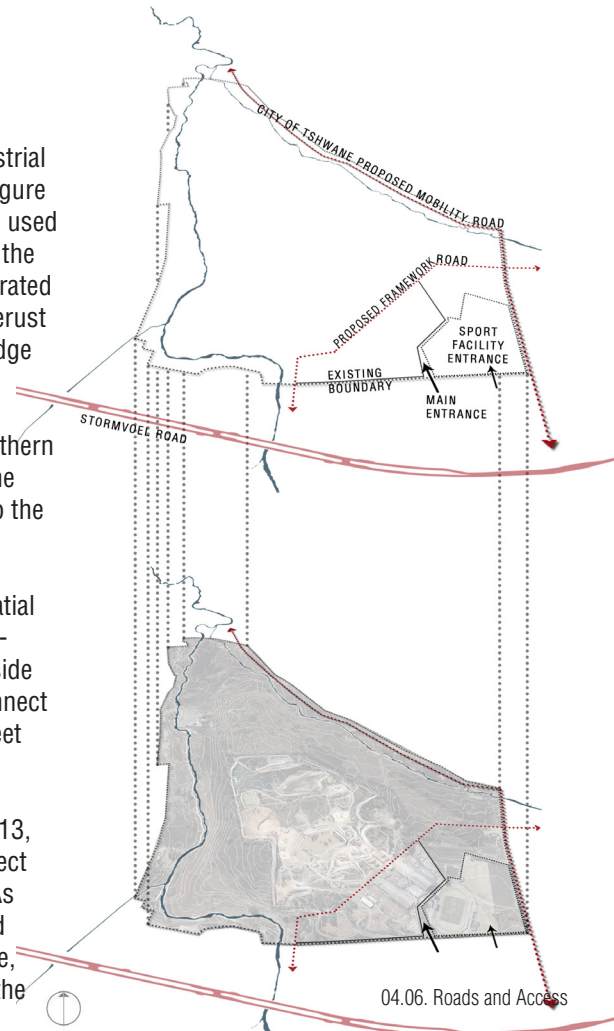
04.02.01_roads and access

In the site's current condition it is not accessible to the public. Being an industrial site, there is only one main entrance (Figure 04.08.) to the site that would have been used for vehicular and pedestrian access, on the southern boundary of the site. As illustrated in Figure 04.06 the entrance to the Eersterust Sport Ground is also on the southern edge of the site.

The site is only accessible from the southern boundary as the Moreletta Spruit and the Riet Spruit prevents any other access to the site.

According to the Tshwane Regional Spatial Development Framework, there is a proposed mobility road that will run alongside the eastern edge of the site that will connect the Baviaanspoort Road to Pretoria Street (The City of Tshwane 2010:65).

The Eersterust Urban Vision Group 2013, proposed an access road that will connect Daniel Avenue with Veldman Avenue. As illustrated in Figure 04.06. the proposed framework road will run through the site, separating the industrial buildings and the quarry.



04.06. Roads and Access



04.07. Boundary Fence



04.08. Site Entrance



04.09. Road Conditions

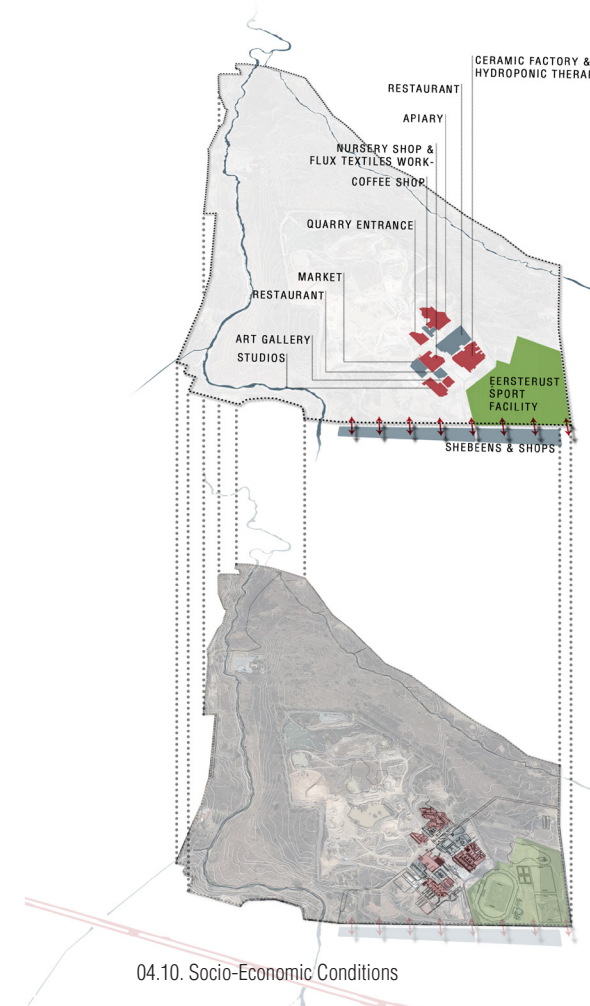
04.02.02_socio-economic conditions

On various visits to the communities it became clear that there are a socio-economic contrast. A number of residents within the community live quite comfortable lives, while other community members undergo hardship and poverty.

After informal conversations with community members, it became clear that the community struggles with major social issues such as: drug and alcohol abuse, teenage pregnancies, petty crimes and rape incidents. A community culture of support and friendship cannot be missed. The sense of community is very strong around the Era Bricks site.

Figure 04.10. illustrates the location of the existing Eersterust Sport Facility, which is used a lot by the community but has some security issues and the proposed programmes for the Era Regional Park by the EUVG.

The southern edge of the site is met by a small residential community that makes a living from small shops and shebeens, as illustrated in Figure 04.12. and 04.13.



04.10. Socio-Economic Conditions



04.11. Sports Facility



04.12. Shebeen in Eersterust



04.13. Shebeen and Shop

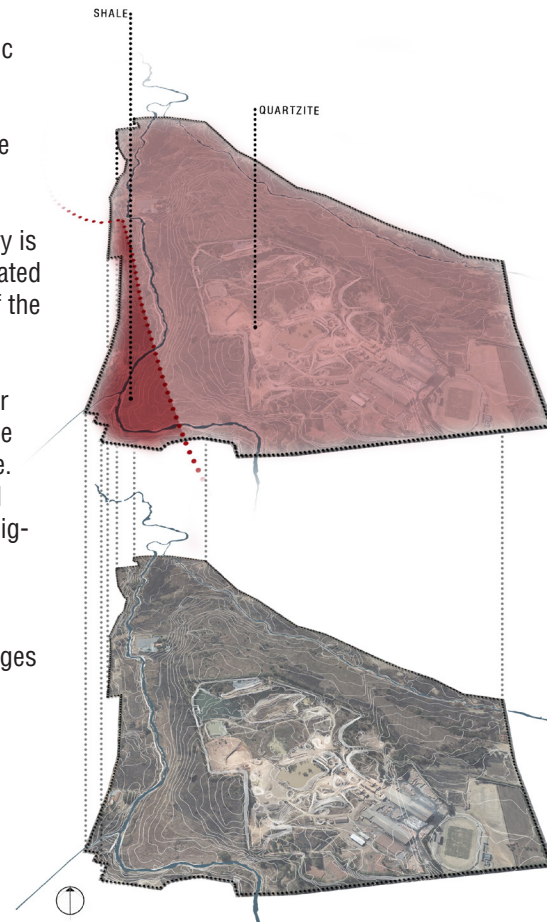
04.02.03_geology and soil conditions

Information obtained from the Geographic Department of the University of Pretoria showed that the Era Bricks site is mostly located in quartzite soil conditions (Figure 04.14).

Clay did exist where the Era Bricks quarry is located, but this soil type has been depleted (Figure 04.18) up to the quartzite layer of the soil profile.

Quartzite is a soil type that occurs all over the City of Tshwane, especially around the foot of the Magaliesberg Mountain Range. The vegetation is well adapted to this soil condition, with the emphasis on local indigenous plants.

Figure 04.14. illustrates that west of the Moreletta Spruit, the soil properties changes to shale soil conditions.



04.14. Soil Conditions



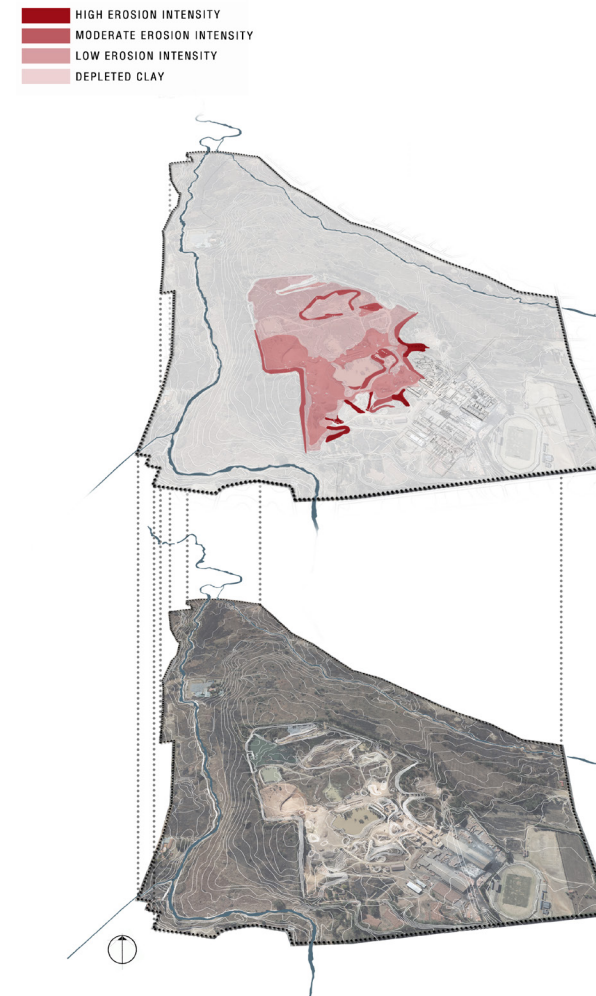
04.15. Quartzite Bottom



04.16. Excavated Quartzite



04.17. Traces of Clay



04.18. Erosion Intensities



04.19. Sheet Erosion



04.20. Erosion Gullies



04.21. Topsoil Loss

Erosion problems have been identified on the site, but is limited to the quarry area. Figure 04.18. illustrates the different intensities of erosion as documented on site visits.

Sheet erosion, observed in the bottom of the quarry (Figure 04.19.) which is classified as moderate erosion intensity. On the edges of the quarry, high erosion intensity was observed in the form of gullies (Figure 04.20.) and major top soil lost after rain.

The erosion problems will be addressed through a proposed rehabilitation plan in Chapter 5. The aim is to use a planting strategy to address these problems, since vegetation cover will stop the erosion. Where soil conditions are highly disrupted and vegetation alone wont be sufficient, alternative products will be investigated like gabion slopes or hessian blankets.

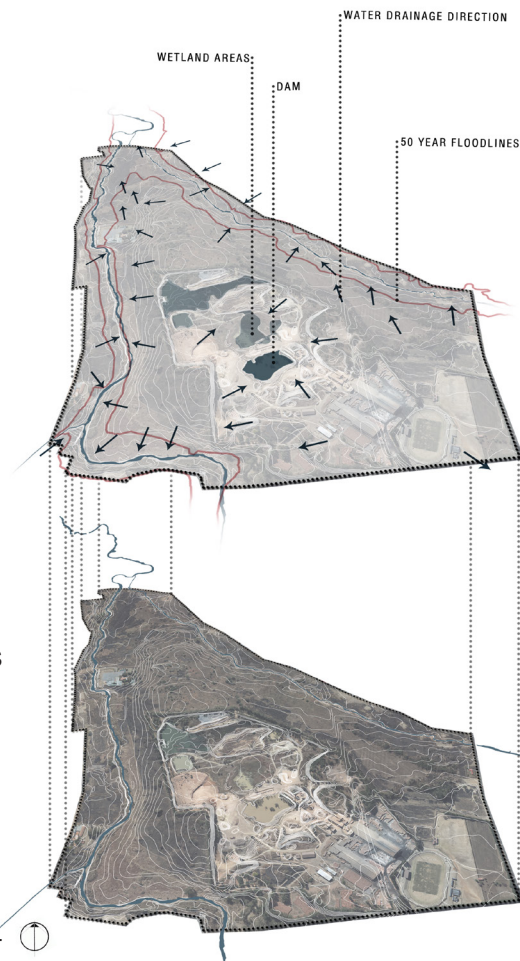
04.02.04_hydrology conditions

Two constantly flowing rivers borders the site, as seen in Figure 04.22. The Moreletta River edges the site on the western side. This is the larger river of the two and is difficult to cross in the summer months. The Riet Spruit is a smaller river that borders the site on the eastern side.

These rivers serves as main blue infrastructure corridors that provides habitat connectivity and transports stormwater to the Roodeplaat Dam within the Moreletta Catchment.

Within the quarry, a number of water bodies have established over the course of time. Runoff water enters the quarry at different places and eventually ends up as water body. A dam and a wetland has formed at the bottom of the quarry and is thriving in its current condition. The wetland is functional and is home to a number of water fauna and flora.

The problem however is that when water exits the wetland, no connection for water to the natural rivers is provided. These stagnant water pools have accumulated at the northern end of the quarry, creating poor water quality conditions.



04.22. Hydrology Conditions



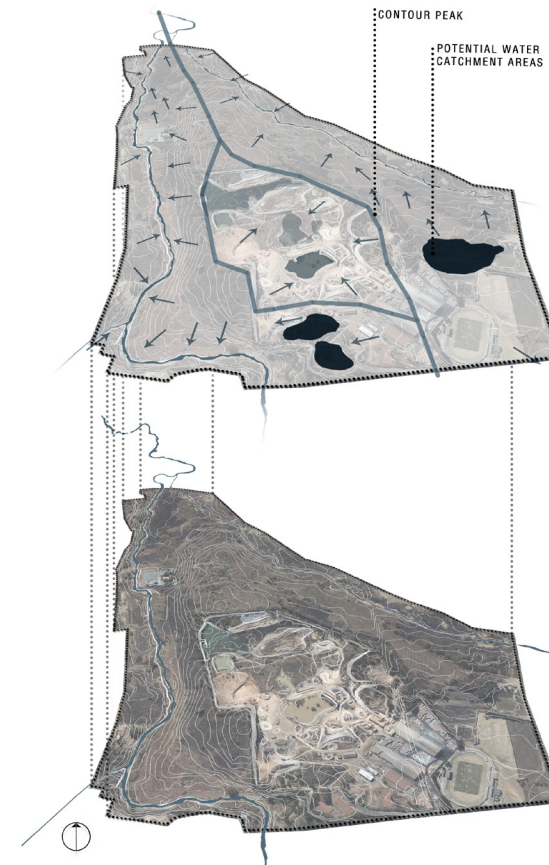
04.23. Riet Spruit



04.24. Quarry Dam



04.25. Quarry Wetland



04.26. Potential Water Catchment Locations

After the completion of the surface flow of stormwater runoff analysis (Figure 04.22.) and the indepth exploration of the existing contours and slope conditions, possible locations for water capturing has been identified.

The site has a contour peak (Figure 04.26.) that results in the runoff going either to the western river, the quarry or the eastern river.

Considering the existing dam in the quarry, the opportunity arises for water to be harvested on western and eastern slopes as indicated in Figure 02.26. Meaning that 3 small water catchment basins occurs within the site (Figure 04.26).

The water captured in the basins can be used for sustainable irrigation purposes, recreational purposes as well as for the sustaining of ecosystem services that requires water, like habitat creation.



04.02.05_vegetation analysis

Biomes are regarded as high-level hierarchical units that have similar vegetation structures and are exposed to similar macroclimate conditions (Mucina & Rutherford 2010:32).

The study area is located within the Savanna Biome. Biomes are further divided into different bioregions, where the site is located within the Central Bushveld Bioregion. The vegetation of the study area has been severely disrupted by mining activities, as well as the industrial activities that took place on the site. This leaves only patches of the natural vegetation behind. Alien species like eucalyptus are common in the area, and no scarce, endangered or protected plants have been observed within the study area.

To restore the study area and reclaim the ecological patterns of the Savanna Biome, the vegetation types of the area needs to be determined. The vegetation type of the specific area will provide a good indication of the flora composition that existed on the originally untouched site. The site was identified to fall within the Moot Plains Bushveld vegetation type. According to the book *Vegetation of South Africa, Lesotho and Swaziland*, the Moot Plains Bushveld vegetation type occurs in a main belt immediately south of the Magaliesberg on an altitude typically between 1050 - 1450 m (Mucina & Rutherford 2010:465).

The typical vegetation and landscape features of Moot Plains Bushveld can be described as open to closed, low, thorny savanna (Figure 04.27). The plain is often

dominated by various Acacia species and the herbaceous layer is dominated by grasses (Mucina & Rutherford 2010:465). Some of the key indicator species are illustrated in Figure 04.27. Refer to Appendix 09.02. for the complete Moot Plains Bushveld vegetation type species.

The conservation status of the Moot Plains Bushveld vegetation type is vulnerable. A small percentage is conserved in the Magaliesberg Nature Area, but the most of it have been disrupted by urban and built-up areas (Mucina & Rutherford 2010:466). Figure 04.28. illustrates the intensities of disruption within the study area as well the location of alien invasive plant species.

Alien invasive plants are pest species that have established outside of their native habitats. These plants are known as environmental weeds, due to the fact that they flourish, where they don't belong. These plants pose a great danger to the natural rangelands as they alter the functioning of natural ecosystems and can prevent indigenous plant species from regeneration (Coetzee 2005:92).

HERBACEOUS CLIMBER	LOW SHRUBS	SMALL TREES	TALL SHRUBS	SUCCULENT SHRUBS	HERBS	GRAMINOIDS
<i>Lotononis bainesii</i>	<i>Aptosimum elongatum</i> <i>Felicia fascicularis</i> <i>Lantana rugosa</i> <i>Teucrium trifidum</i>	<i>Acacia nilotica</i> <i>A. tortilis</i> subsp. <i>heteracantha</i> <i>Searsia lancea</i>	<i>Buddleja saligna</i> <i>Euclea undulata</i> <i>Olea europaea</i> subsp. <i>africana</i> <i>Grewia occidentalis</i> <i>Gymnosporia polyacantha</i> <i>Mystroxylon aethiopicum</i> subsp. <i>burkeanum</i>	<i>Kalanchoe paniculata</i>	<i>Achyroopsis avicularis</i> <i>Corchorus asplenifolius</i> <i>Evolvulus alsinoides</i> <i>Helichrysum nudifolium</i> <i>H. undulatum</i> <i>Hermannia depressa</i> <i>Osteospermum muricatum</i> <i>Phyllanthus maderaspatensis</i>	<i>Heteropogon contortus</i> <i>Setaria sphacelata</i> <i>Themeda triandra</i> <i>Aristida congesta</i> <i>Chloris virgata</i> <i>Cynodon dactylon</i> <i>Sporobolus nitens</i> <i>Tragus racemosus</i>

04.27. Moot Plains Bushveld Vegetation Type



04.02.06_climatic conditions

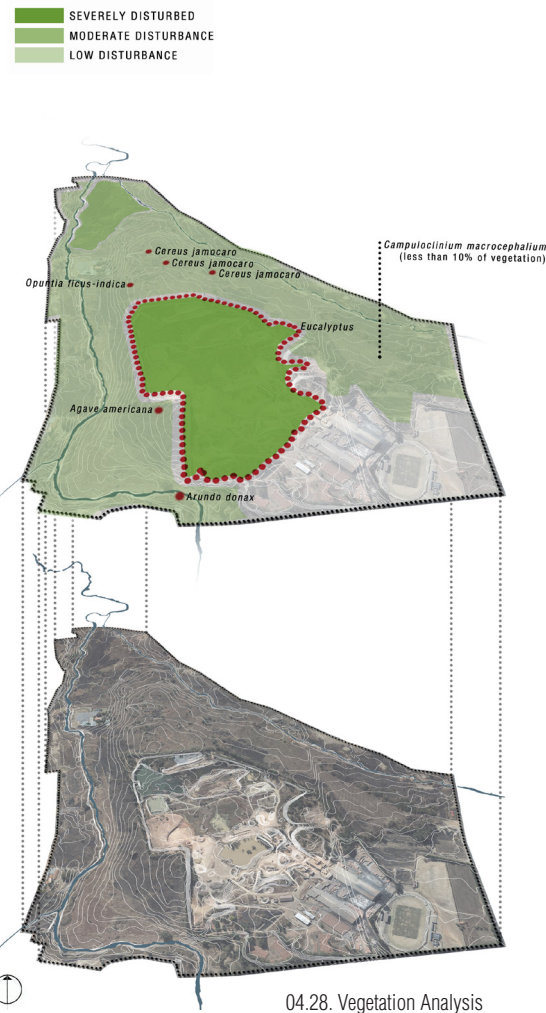
Figure 04.28. illustrates the alien invasive plant species that have been identified within the study area.

According to Ken Coetzee (2005) in Caring for Natural Rangelands, the mapping of invasive alien plants should be assessed and classified in terms of density and maturity. The following classes should be used:

- Light infestations (only occasional plants are encountered).
- Intermediate infestations (the occurrence of plants ranges from occasional to frequent).
- Dense infestations (plants are a dominant feature of the landscape). (Coetzee 2005:98)

The alien invasives identified within the study area are classified in Table 04.01. as follows:

SANBI states that, *Campuloclinium macrocephalum*, is classified as a Category 1b alien invasive plant species according to NEMA, meaning that they should be removed by law (SANBI 2014).



04.28. Vegetation Analysis

light infestations		intermediate infestations		dense infestations	
<i>Opuntia ficus-indica</i>		<i>Campuloclinium macrocephalum</i>		<i>Eucalyptus grandis</i>	
<i>Cereus jamacaru</i>		<i>Agave americana</i>		<i>Arundo donax</i>	

Table 04.01. Alien Invasive Plants Infestation Classification

The site is located on the Highveld of South Africa in the subtropical high pressure belt, indicating that the area has a moderately dry subtropical climate.

According to Munica & Rutherford (2010) this means that it is in an area that has a summer rainfall with very dry winters. The lowered elevation of the quarry can result in frost to be more frequent throughout the winter.

As it is located in the summer rainfall region of South Africa, the site will receive most of its rain between October and March. This needs to be taken into consideration when doing water calculations for catchment areas as well as irrigation demands.

Tables 04.02. and 04.03. shows the average high and low temperatures as well as the average rainfall. This data will be interpreted into further calculations and design decisions.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average High Temp	30°C	30°C	28°C	26°C	24°C	21°C	21°C	24°C	28°C	29°C	29°C	30°C
Average Low Temp	18°C	18°C	16°C	13°C	8°C	5°C	5°C	8°C	12°C	15°C	16°C	17°C

Table 04.02. Average Temperatures

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Rainfall (mm)	103.8	113.1	82.8	44.1	17.8	8.6	3.6	3.2	20.5	71.4	108.1	107.7
Average Rainfall Days	17	14	12	8	4	3	1	2	3	12	16	18

Table 04.03. Average Rainfall

04.02.07_sun study

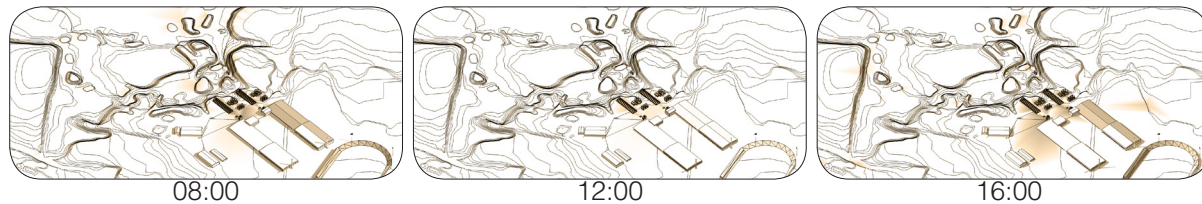
Figure 04.29. illustrates a shadow analysis that was done over the site. The reason for the completion of this study is to ensure that the solar properties of the site is used optimally.

The soccer stadium is located at a north-south axis, which will allow optimal use of the fields and ensuring that the sun won't interrupt play. Future sport field developments will be based on this axis.

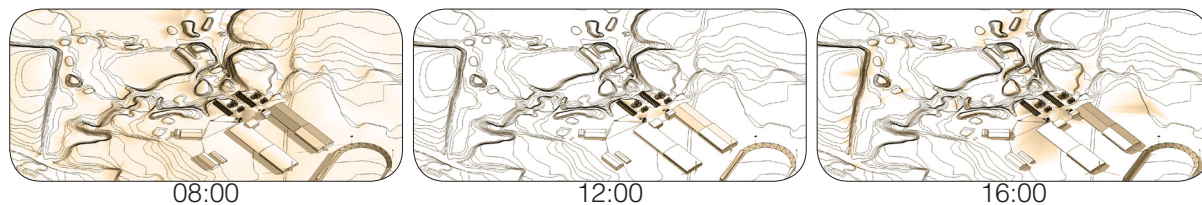
The restaurant deck located by the apiary receives sun from the west. The design intervention should propose a solution to prevent uncomfortable site conditions.

The dam and quarry in the wetland receives optimal sun, creating conditions for recreational activities and desired conditions for habitat creation.

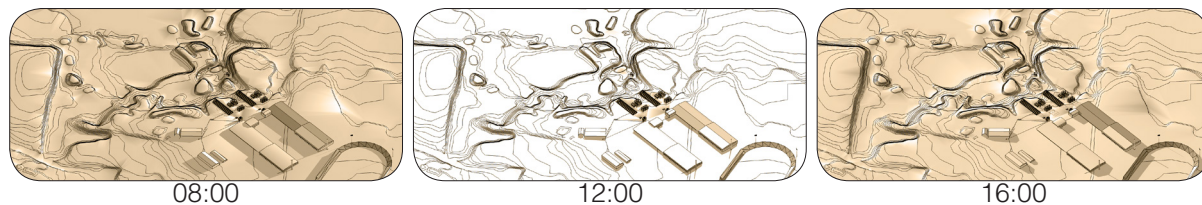
21 DECEMBER



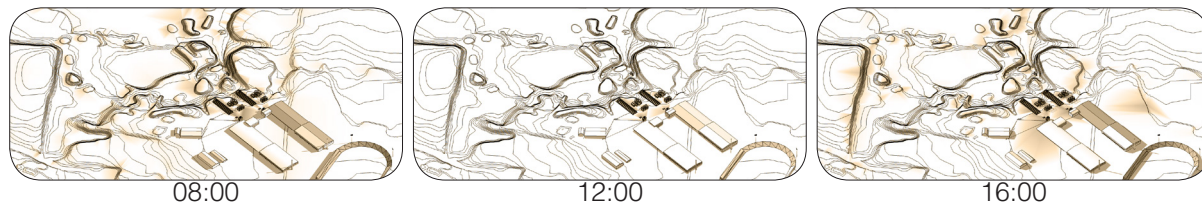
21 MARCH



21 JUNE



21 SEPTEMBER



04.29. Shadow Analysis

04.02.08_cultural and historic analysis

In 1954, Era Bricks was established on the Derdepoort agricultural farm. In the 1980's Rosema and Klaver bought the company, devoting themselves to the creation of the factory as it is today. The established Rosema Group trades as Era Bricks and specialises in the supply of clay face bricks.

As the buildings, including the Hoffman

Kilns, are not older than sixty years, there is no legal prohibition against the demolition of the industrial structures (National Heritage Resources Act 25 of 1999). However, the author feels the industrial structures carry significant weight in heritage value. As this is an apparent reminder of the industrial past, it should be accommodated and adapted in the design intervention.

A double row of *Eucalyptus grandis* are planted on the quarry edge, to control dust pollution generated from mining clay. These trees are classified as a Category 2 invasive plant species according to SANBI (2014). Category 2 invasive plant species are regulated by area, meaning that a demarcation permit is required for their existence. Although these trees are exotic they have become home to a number of African bee colonies and therefore should be kept if possible.

The ecological value of the site is of great importance to the surrounding community and larger city. Consisting of two rivers and a vegetation type classified as vulnerable, it is a site that should be protected and enhanced to provide optimal ecosystem services and benefits.

Two informal graveyards have been discovered on the edges of the site (Figure 04.30). It was established around the 1950's and is most likely to be deceased farm workers. As discussed in the theoretical discourse, death plays a significant role in the act of commemoration. These areas should be incorporated into the design intervention, but treated with respect and preventing large scale disruptions around these graveyards.



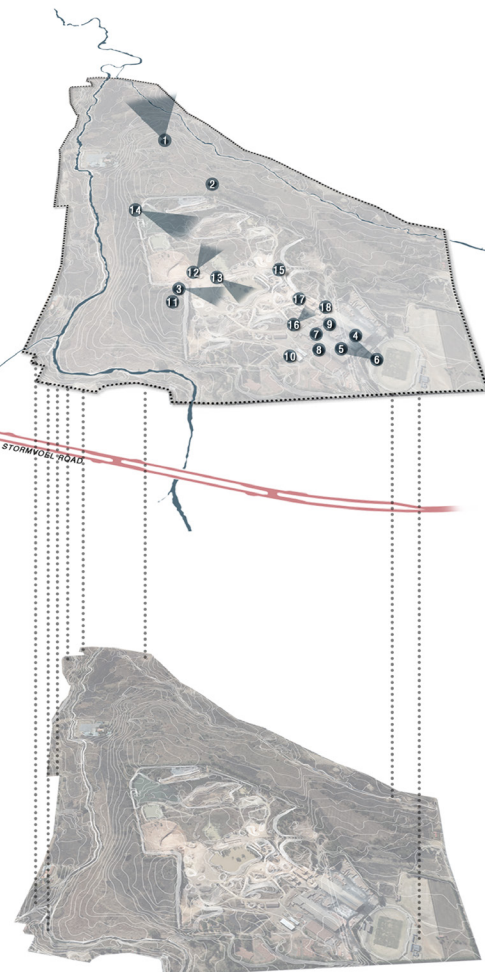
04.30. Cultural and Historical Analysis

04.01.09_visual study

The following analysis shows important vistas and visual aspects of the site.

Figure 04.31. illustrates where these aspects and vistas are located within the site and the following images (taken by the Author in 2014) illustrates the views or objects of importance. They are named and described below, while photographs are provided on the next pages:

1. View over the natural Moots Plains Bushveld Vegetation type towards the Derdepoort and the Magaliesberg Mountain Range.
2. Informal graves.
3. View from quarry edge towards dam and Era Bricks factory buildings.
4. Hoffman Kiln arches, where the bricks are fired.
5. Hoffman Kiln 30m high chimney to extract smoke.
6. Vista of the linear Hoffman Kilns and open square where bricks are left to cool.
7. Kiln trolleys used to transport the bricks in the manufacturing process.
8. Kiln trolley rails where bricks are placed to dry.
9. Industrial machinery.
10. Workshop building.
11. Informal graves.
12. View of the bottom of the quarry towards wetland.
13. View from bottom of the quarry over the dam towards the Era Bricks factory buildings.
14. Stagnant water pools at the end of the quarry.



04.31. Visual Study

15. Half-brick heaps. These bricks are used as infill, etc. This material is available to use in the design intervention.
16. Conveyor belt structure.
17. View from factory over quarry and water bodies.
18. Brick constructed water tanks that supplies the Hoffman Kilns with water.



1



2



3



4



5





04.02.10_ecosystem services quality

The site analysis process made it clear that the site was altered by the industrial processes that took place there. Referring back to the theoretical discourse, this means that the natural ecosystems services have been severely disrupted.

It was decided to execute a rating of the quality of the ecosystem services. For this purpose the SITES v2 Rating System, by the Sustainable SITES Initiative (SSI) was used. The rating of the ecosystem services were repeated after the the proposal of the design intervention to see if these services have been ultimately restored.

The SITES v2 Rating System is modeled after and aligned with the Leadership in Energy and Environmental Design (LEED) Green Building Rating System (SSI 2014:ii).

The SITES v2 Rating System has developed site-specific performance benchmarks that is based on the concept of ecosystem services. It is stated that if a project achieves these benchmarks, it will contribute to maintaining, supporting, and enhancing natural systems and the essential benefits that they provide (SSI 2014:ix).

The SSI has consolidated all the research regarding ecosystem services into a list of ecosystem services that a sustainable site can protect or regenerate through a sustainable design approach. They are as follows:

- Global climate regulation
- Local climate regulation
- Air and water cleansing
- Water supply retention
- Erosion and sediment control

- Hazard mitigation
- Pollination
- Habitat functions
- Waste decomposition and treatment
- Human health and well-being
- Food and renewable non-food products
- Cultural benefits

The SITES v2 Rating System is made up of 200 points with four certification levels of achievement, named below:

SITES v2 Certification Levels	200 Points Total
Certified	70 Points
Silver	85 Points
Gold	100 Points
Platinum	135 Points

Table 04.04. SITES v2 Certification Levels

The existing site conditions were rated, giving the site an rating of 52 estimated points. This means that the site scored below the level of being certified as a sustainable site. Please refer to Appendix 09.01. for the rating calculations.

As the site is not currently open to the public, little appreciation is given to cultural benefits and human well-being. This ecosystem service benefit can be improved on significantly within the design intervention. The same applies to other sustainable services such as material use, educational performance and the design of a functional stormwater system.

04.02.11_conclusion

The site analysis has indicated the relevant opportunities and constraints that guided the design intervention. These are sythezised into the Table 04.05. below:

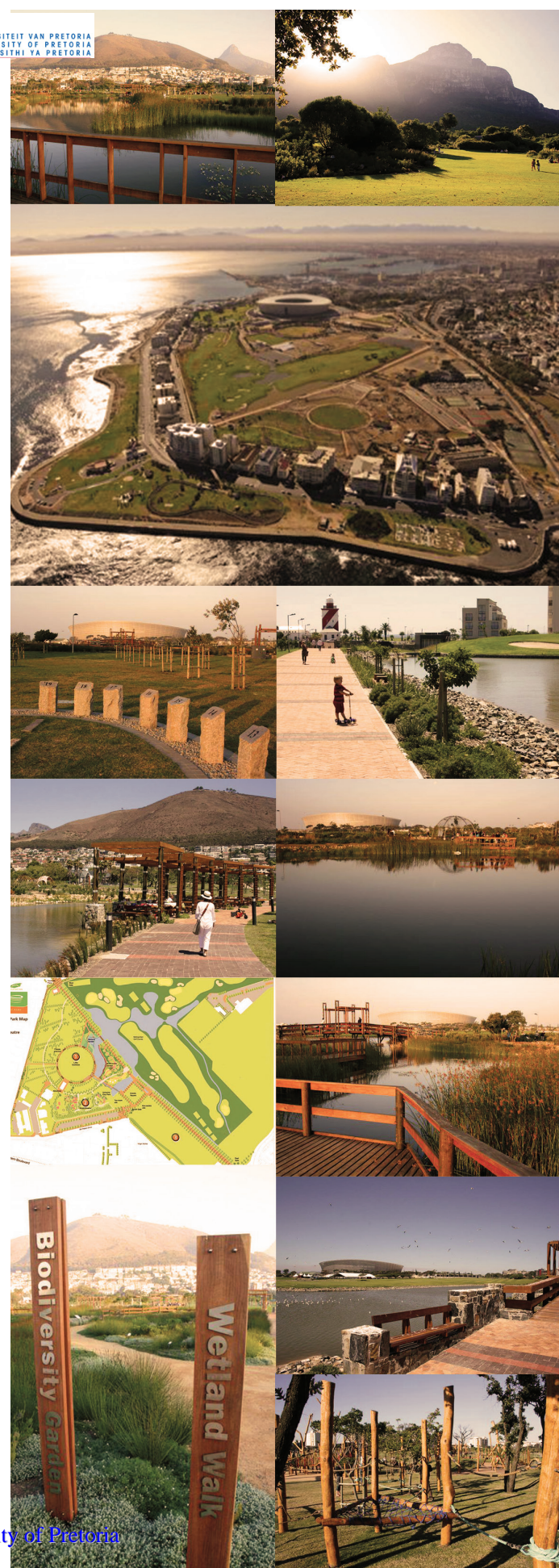
OPPORTUNITIES	CONSTRAINTS
The lack of public transport within the Eersterust community creates the opportunity for an transport node on the eastern edge of the site that will increase the accessibility of the site.	The safety and security of the communities are at risk and this should be accommodated when considering fence lines and lighting strategies.
Educational programmes within the landscape intervention will allow visitors to learn about the services nature provides, aiding in the process of communicating the apparent and non-apparent relationships within the landscape.	Rehabilitating the quartzite slopes of the quarry by means of structural interventions will prove costly. This should be limited as much as possible, alternatively vegetation re-establishment is proposed.
The intervention will create a number of jobs and will increase the socio-economic conditions of the surrounding communities. Ultimately increasing the quality of life of the surrounding residents.	Resolving the stagnant water problem will result in a large ecological disruption. Care should be taken to conserve as much ecosystem services and functions as possible without being too costly (balance cost with benefits).
The existing fauna and flora is well adapted to the climatic conditions, creating the opportunity to propagate seedlings within the desired environment.	The removal of alien invasive plants are expensive and time-consuming. Doing it by hand is less expensive and provides jobs. Alien invasives are bad for biodiversity and ecosystem services quality. By removing them, more space is created for natural habitat.
Cultural and historical value of the site are visually valuable and can be commemorated through the landscape intervention in order to establish identity.	The integrity of the post-industrial landscape should be respected as far as possible without constraining the design and the multi-functionality of the landscape.
The disrupted ecosystem services can be restored to such an extent that a sense of ecology can be established. Ultimately making the non-apparent apparent, educating the user in beauty of nature.	

Table 04.05. Opportunities and Constraints

Throughout the course of the site analysis process it has become clear that there are contrasting elements that relate directly to the site. Described below are relationships that sustain the contrasting character of the site.

- **The Familiar and Unfamiliar**
People are familiar with the Era Bricks factory and know of its existence, alternatively the quarry and graves are unfamiliar and not known by many people.
- **The Noticed and the Unnoticed**
The factory is noticed every day by users and visitors, but the industrial heritage goes unnoticed.
- **The Tangible and the Intangible**
Tangible is interpreted as the physical elements within the site and the intangible is seen as the memories of histories, resulting in loss of identity.
- **The Apparent and Non-apparent**
Nature is seen and it is apparent, but the benefits it provides is not known, making them non-apparent.

These were identified as additional opportunities that will be considered in the design intervention.



04.03_precedent exploration

04.03.01_green point park

Project Location: Green Point Common, Cape Town

Landscape Architect: OvP Associates

Year of Completion: 2010

Client: City of Cape Town

Project Description: Throughout the history of Cape Town, the Green Point Common has always played an important role in people's lives. This is a culturally rich site with many histories which eventually developed into a neglected sport facility. The decision was made to locate the new stadium on the 107-year old metropolitan golf course, aiming to provide a park for passive recreation resulted in the development of a new master plan for this precinct (Cape Info 2012).

Today this is a thriving park that consist of the stadium precinct, golf course, sport fields and a public park for recreation and concessional use areas.

Why this Precedent: Green Point Park was investigated as a site informant precedent due to the similarities in the multi-functional landscape programmes.

The Era Bricks site is also considered to be of historic value which borders the Eersterust Sports Facility. Movement, connections and hierarchy of programmes were specifically focussed on when the Greenpoint Park precedent was studied.

The passive recreation park was developed as a biodiversity garden with a large wetland system that ultimately became home to a large bird sanctuary within the City of Cape
04.33. Green Point Park

Town. Care was given to understand their approach to ecology and ecosystems.

The park also has a strong educational focus and childrens play area that draws visitors and school groups. The park focusses on creating awareness of the environment and the benefits it provides us with.



04.03.03_natur-park südgelände

Project Location: Berlin, Schöneberg-Tempelhof.

Landscape Architect: Planning Group Öko-Con & Planland

Year of Completion: 2000

Client: Grün Berlin Park and Garten GmbH

Project Description: According to Kowarik & Körner (2005), the Cold War had a significant impact on the development of nature within the cityscape. After the war, many of the destroyed areas were set aside as reserves for future planned developments (Kowarik & Körner 2005:287).

Nature started invading these unused fragmented areas, including a number of rail yards that was abandoned due to the war, allowing natural succession to begin on these areas (Kowarik & Körner 2005:287).

It is argued that within these sites, specific urban-industrial ecosystems developed that are currently being identified as a type of nature. After the war, construction started on many of these new wilderness areas. Although it was a symbol of joyful change, it disrupted the social, ecological and cultural functions created by these sites within the cityscape (Kowarik & Körner 2005:287-288).

The Schöneberger Südgelände is an exception, as its condition has been secured. Originally a freight rail yard it stood abandoned for four decades, today an untouched new wilderness became the first official urban-industrial nature conservation area (Kowarik & Körner 2005:288).

The 18ha Südgelände is a component of a much larger freight rail yard that was con-
 04.34. Natur-park Südgelände

structed in 1880, and was decided that this new wilderness will become a natur-park (Kowarik & Körner 2005:289).

The master plan development Natur Park Südgelände had to find a solution for major conflicts in the landscape.

- The conservation vs. recreation conflict.
- The wilderness vs. biodiversity conflict.

It was decided to base the approach of the master plan on the model of combined culture and wilderness. The position of the visitor was perceived to be distant and/or near resulted in zoned spaces in which natural and social processes were partially controlled and partially left to their own dynamics (Kowarik & Körner 2005:291).

Why this Precedent: This precedent study focussed on how different goals have been achieved and how the conceptual and design principles have opened up access to the park and its new ecosystem.

The following aspects was important for the design, and influences the Era Regional Park master plan proposal:

- The concept of access: the movement system is based on the linear structure of the rail yard, acknowledging the industrial heritage. Existing train tracks were made into pathways, resulting in a hierarchy of movement.
- The concept of transformation: a clear transformation is visible from the rail yard to the urban wilderness. This

resulted in creation of different spaces within the landscape.

- The conservation and recreation: as most of the natur park is protected, a clear distinction was made between the area designated as a nature reserve and the rest of the landscape zoned as a conservation area where recreation takes place.
- The cultural layers concept: to maintain the industrial heritage, visibility was created towards the remnants of the railway history. Creative tension is created within the landscape between old, existing industrial relics in contrast with new artistic elements, nature and the landscape intervention.



05_master plan

05_master plan development

This chapter contains the master plan proposal for the Era Bricks site. The masterplan development process is explained from concept interventions, design development through to the proposal and the systems explanations.

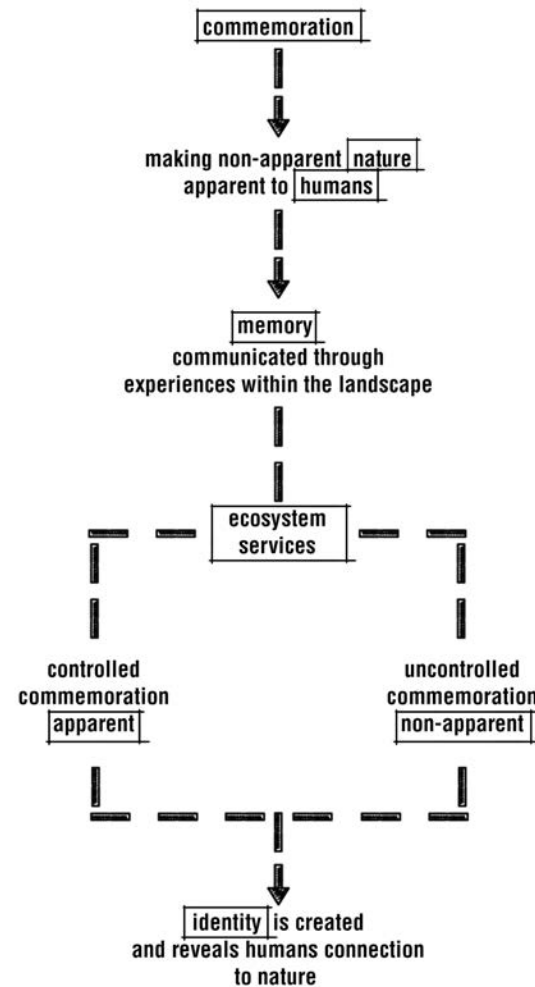
Figure 05.01. illustrates the conceptual landing (entrance) of the adapted post-industrial site into the Era Regional Park.



05.01. Master Plan Concept Vision

05.01_master plan concept

The development of a concept for the master plan design started off with the adaption of the findings of the theoretical discourse into a design approach. Figure 05.02. illustrates the diagrammatic development of the theoretical findings into an approach for the design intervention.

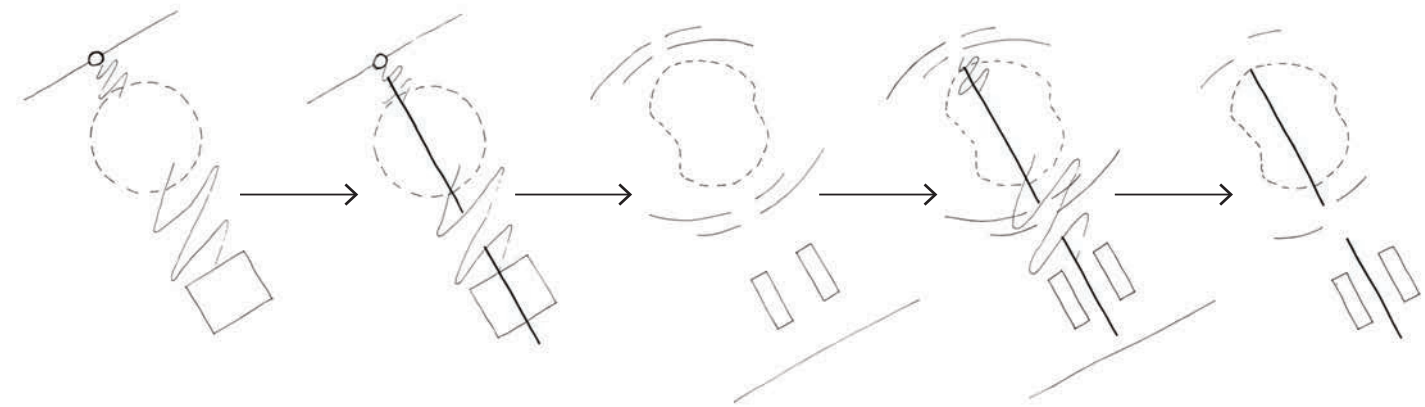


05.02. Theoretical Discourse Adapted to Design Approach

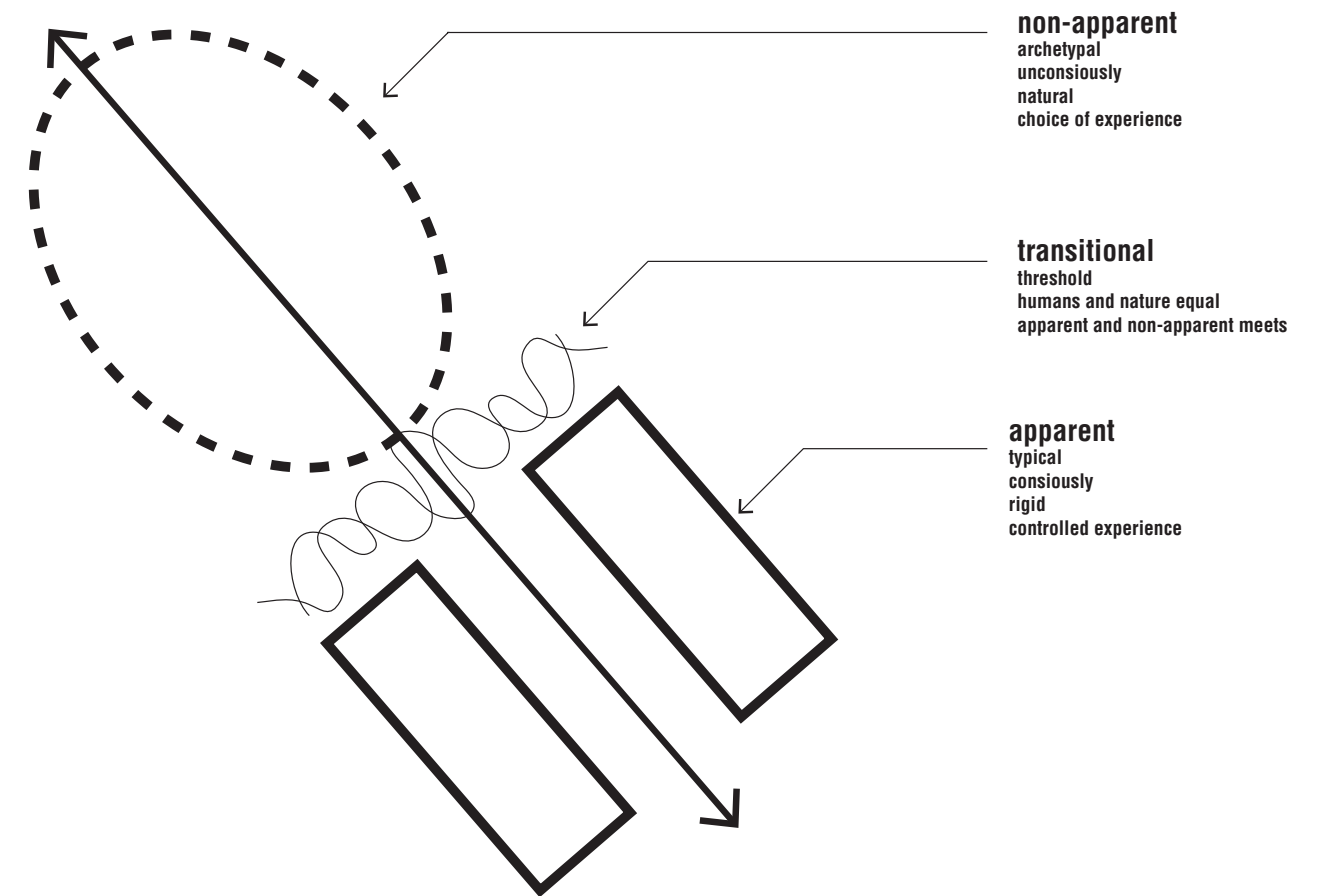
The theoretical investigation shows that some benefits provided by ecosystem services are apparent and some experiences it provides are non-apparent. By commemorating these relationships within the heritage of the post-industrial landscape, the visitor will be able to construct memories in order to re-establish their connection to nature.

As it is difficult to always control the memories experienced by an individual user, the design concept will adapt the landscape through two types of commemorative designs. The first is controlled commemoration where apparent features will be used to create conscious experiences for the visitors. The second type is uncontrolled commemoration where non-apparent features will be used to create unconscious memories and impressions for the visitors.

The described theoretical design approach is developed (Figure 05.03.) into the master plan concept diagram (Figure 05.04). The diagram illustrates the main axis of movement through the apparent to the non-apparent. A clear threshold was developed between the two types of commemoration, which is a transitional space between the apparent and the non-apparent features.



05.03. Concept Development



05.04. Master Plan Concept Diagram

05.02_concept and programme development

After the master plan concept has been developed, the next step is to relate the concept to the Era Bricks site. Figure 05.05 illustrates the development process from concept to programme.

The development process is connected to the theoretical discourse, as the theories developed are applied to the programme development of the site.

The main intention of the programme is to

create experiences for the user in order to understand their connection with nature. By making the non-apparent ecosystem services apparent, humans can learn more about their relationship with nature. The more they learn about these relationships through connection and understanding, the more beautiful nature will become.

Focussing on the main axis of the site, the user will enter the apparent landscape, where features should be used to communi-

cate the benefits nature can provide through the post-industrial landscape. Moving deeper into the landscape towards the quarry, the user would move through a transitional space where the apparent and non-apparent meets. Once the user has moved through this threshold, the non-apparent landscape would be entered.

A strong contrast between the apparent and the non-apparent landscape should be communicated through the design interven-

tion to make the user aware of the change in relationship towards these features.

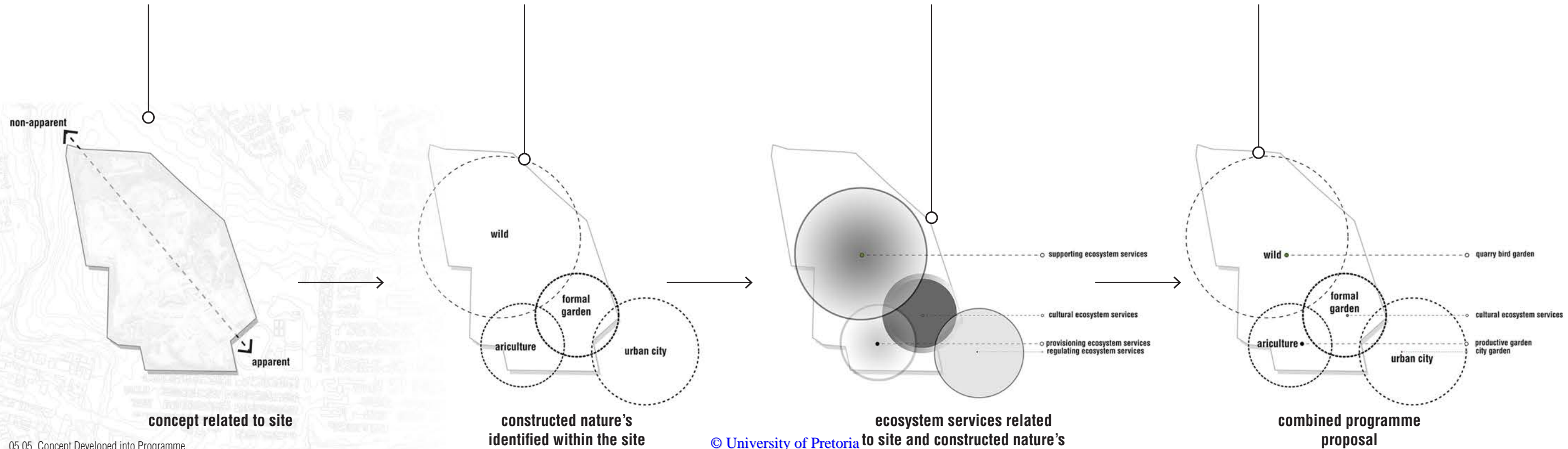
The second phase of the programme development is to relate the theory developed in section 02.03: *first nature vs. constructed nature* to the site and concept. The four natures that humankind has constructed was identified within the site as they would be perceived. The relation of the constructed natures to the site resulted in an initial programme zoning.

the developed concept is related to the Era Bricks site, defining the locations of the apparent and non-apparent designs along the main axis of the site.

the four constructed nature's are identified within the site by connecting them to existing and proposed (EUVG 2013) programmes.

the four identified nature's can be directly linked to the ecosystem services. ecosystem benefits identified will be incorporated into the design.

ecosystems services benefits identified, corresponds directly with the four natures and translates into four different programmes for the site.



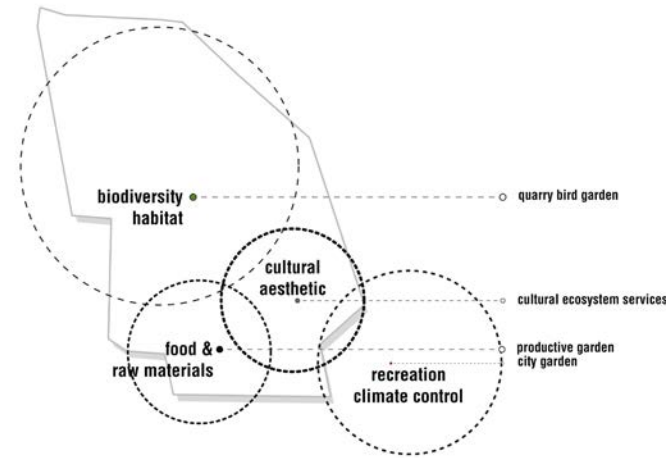
05.05. Concept Developed into Programme

The theoretical discourse showed that ecosystem services are divided into four categories, based on the benefits that they provide.

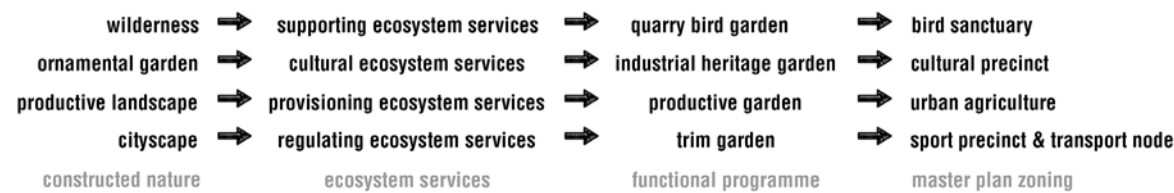
In the third phase (Figure 05.05.) of the concept to programme development, each of the constructed natures were linked with a ecosystem services category, based on the typical functions that would be found in that nature. This allowed for the initial programme zoning to develop into a functional feature.

It was stated in Chapter 3, that ecosystem services were identified that would service the multifunctional landscape proposal. The ecosystem services identified were re-evaluated to attend to the specific needs of the master plan development. Figure 05.08. illustrates the ecosystem services that were chosen to be integrated into the master plan design proposal. The ecosystem services identified are not mutually exclusive, meaning that they can co-exist within the landscape intervention.

These identified ecosystem services, together with the four constructed natures and the apparent, non-apparent concept related to site resulted in the development of four initial programmes for the master plan intervention (Figure 05.06. & 05.07).



05.06. Ecosystem Services Related to Programme



05.07. Programme Development

provisional services



food

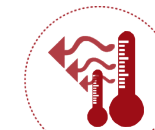


raw materials

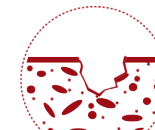


fresh water

regulating services



local climate and air quality regulation



soil maintenance



waste-water treatment



pollination

supporting services



habitats for species



biodiversity

cultural services



recreation and mental and physical health



spiritual experience and sense of place



tourism

05.08. Re-evaluated Ecosystem Services for Master Plan Development

05.03_design development

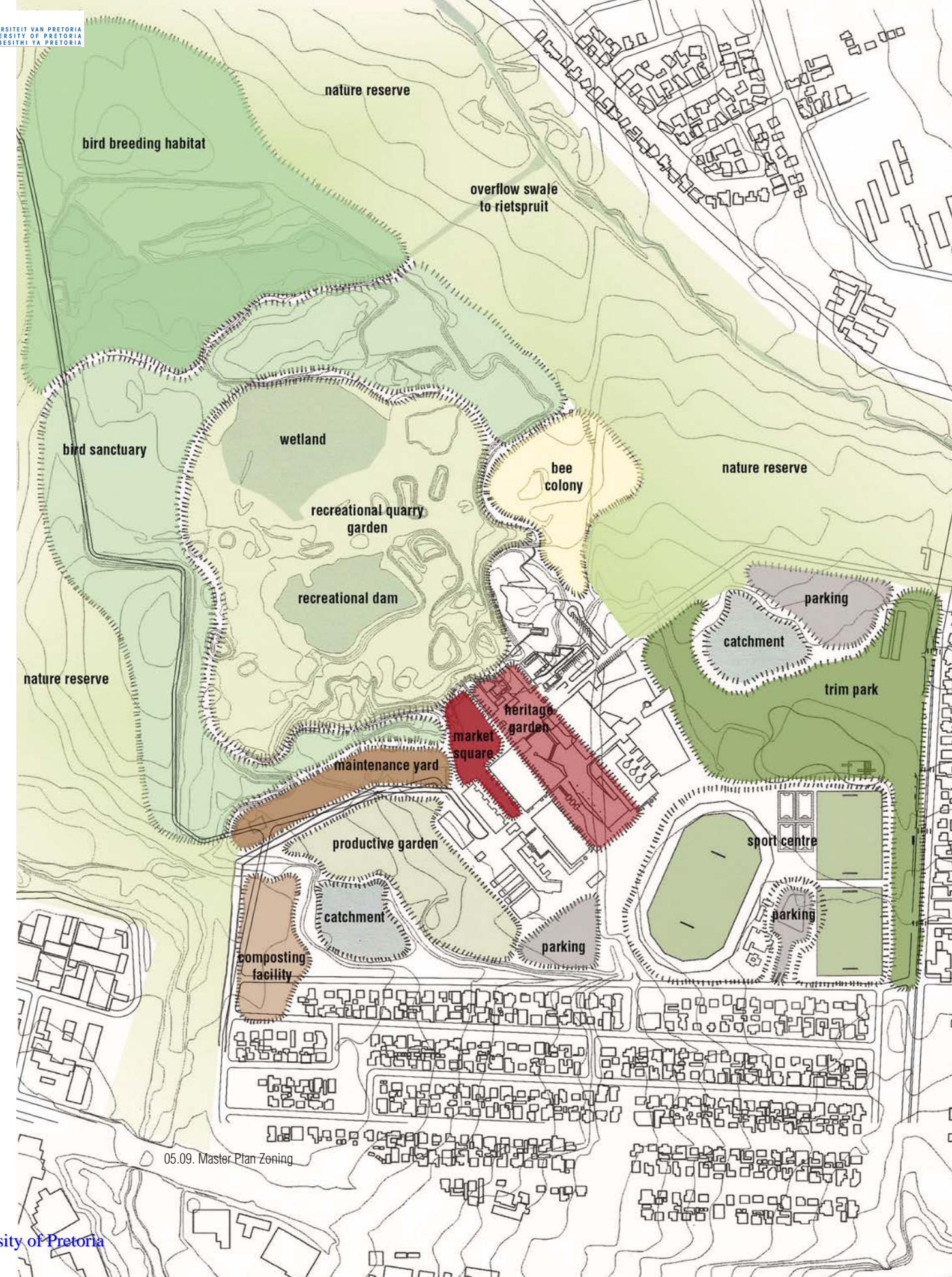
Taking the previously described programme into consideration and relating it to the framework proposed by the EUVG 2013 a master plan zoning (Figure 05.08.) was developed.

From this initial zoning created, the design development process (Figure 05.09.) started. The main systems developed on master plan levels is as follows:

- Movement Strategy
- Hydrology Strategy
- Planting Strategy
- Ecosystem Strategy
- Rehabilitation Strategy

Other systems were taken into consideration and developed on a master plan level. But for the purpose of communicating the transition from apparent to non-apparent relationships these systems were prioritized as they would best illustrate/guide the user through the landscape.

These identified systems are explained in detail after the master plan proposal.



master plan zoning



master plan revision 1



master plan revision 2



In the first design revision the hydrology strategy was developed to ensure that the existing contours are used optimally.

The second design revision addressed the sport precinct and transport node.

The urban agriculture component and the bird sanctuary was addressed during the fourth design revision.

The cultural precinct and entrance was added in master plan revision three.

The final integration of experiences and ecosystem services were joined in master plan revision 5.

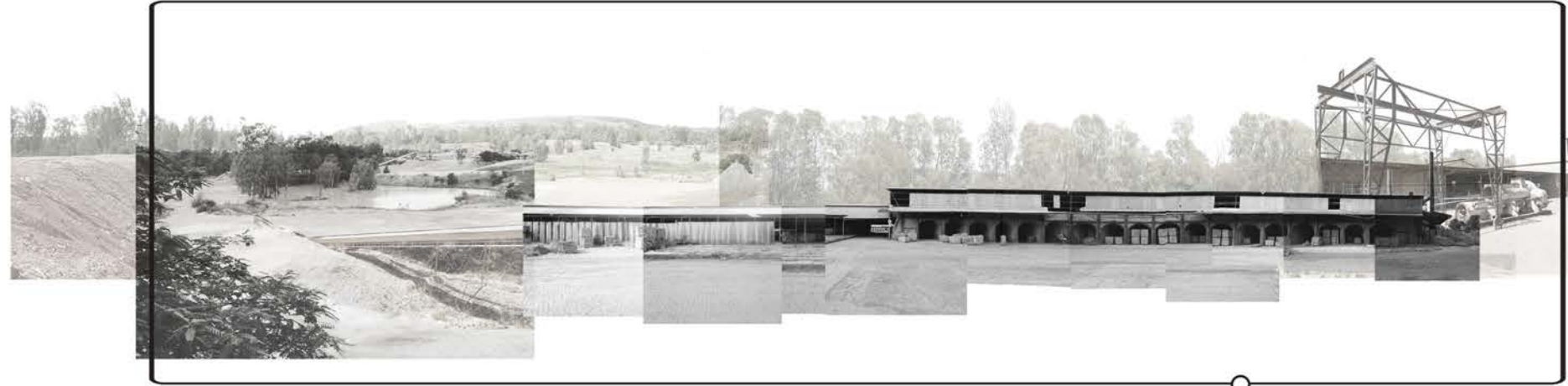


master plan revision 5

master plan revision 4

master plan revision 3

05.04_master plan proposal



05-11 Concept Section of Master Plan

The master plan proposal aims to transform non-apparent aspects of nature into the apparent. By doing so visitors to the landscape can be educated about the benefits nature provides us with. The post-industrial Era Bricks site is transformed into a multi-functional landscape that becomes the biggest amenity to the Regional Park proposed in Chapter 3.

The master plan illustrated in Figure 05.12. The labels are explained below:

1. Eersterust transport node located on the proposed municipal mobility road.
2. The Eersterust Sports Facility is integrated into the Era Regional Park, creating a well accessible multi-functional landscape.
3. A parking system is developed around a one-way road to ensure that visitors can park closest to the amenity they want to use. The parking is surrounded by a vegetated stormwater retention system that will capture runoff water and slowly release it to the catchment dam (4).
4. This catchment dam will capture all the stormwater runoff from the trim park and will be repurposed as irrigation for the sport fields.
5. The quarry is transformed into the Era Regional Park Bird Sanctuary, to ultimately rehabilitate the quarry.
6. This area is allocated to urban agricultural systems such as companion planting and food forests. Making the natural system of food production apparent within the landscape.
7. On-site indigenous nursery to provide the landscape with the plants

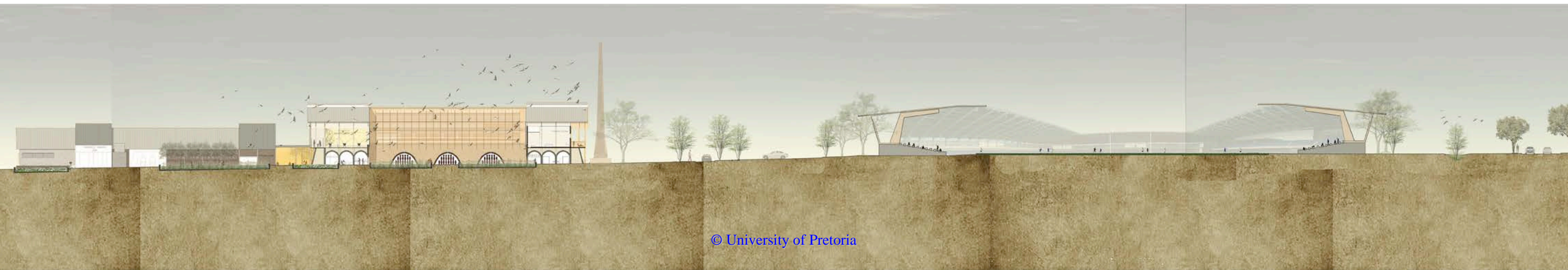
needed to adapt and rehabilitate.

8. Catchment dam to retain all stormwater runoff from the western part of the site, to be re-used for agricultural irrigation.
9. Flax crops to provide the natural industry with sufficient material to produce textiles.
10. Medicinal garden to form part of the cultural landscape, making the variety of plant uses apparent.
11. Market square that spills out from the proposed market shed by the EUVG 2013. The market shed will be managed like a fresh produce market during weekdays and large market events on weekends.
12. Main cultural landscape is transformed into a square that allows movement between the two heritage buildings (east to west) and between the apparent and the non-apparent (north to south).
13. Recreational clay quarry to be incorporated into the ceramic factory.
14. Grey water wetland to run along the apparent, non-apparent axis of the master plan concept. Waste water will be treated by means of ecosystem services and is made apparent within the landscape.
15. Main entrance to the recreational quarry garden.
16. Recreational dam with canoeing activities.
17. Quarry wetland.
18. Breeding grounds for the bird sanctuary.

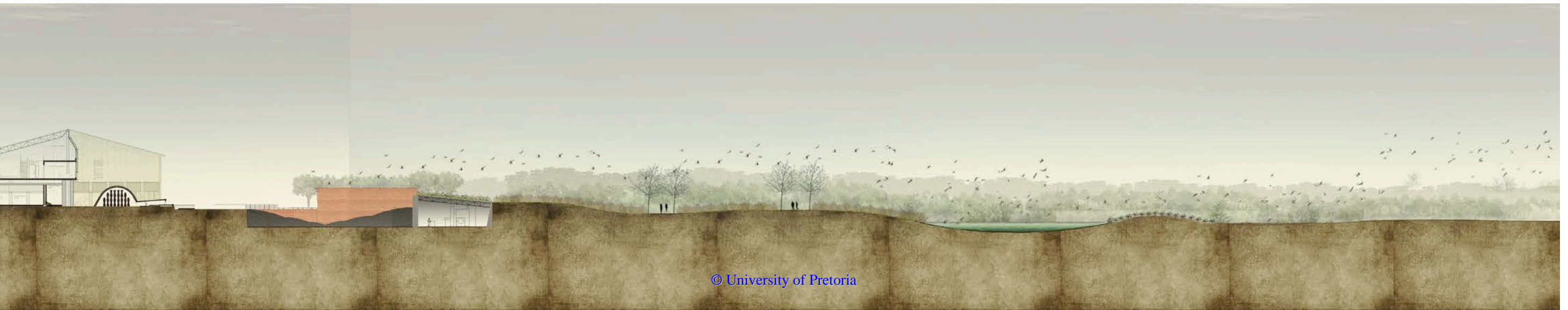
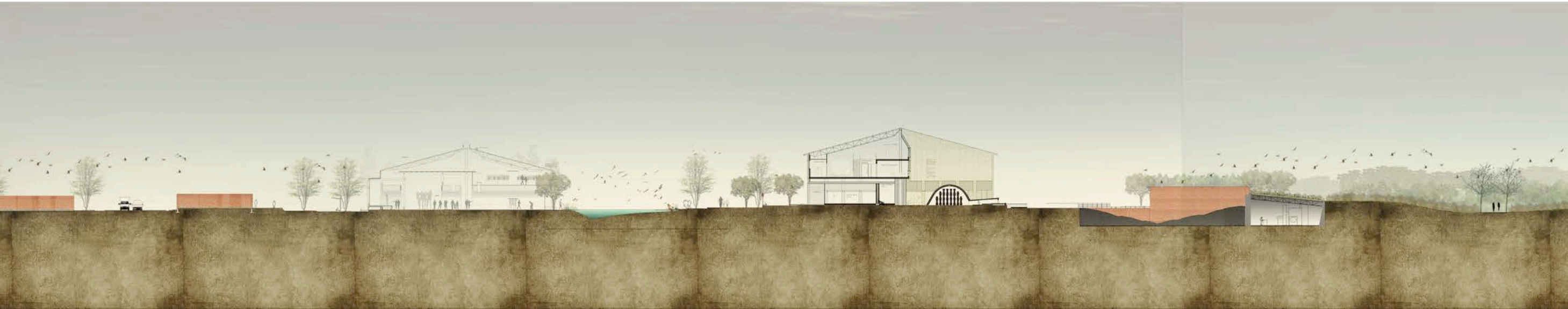
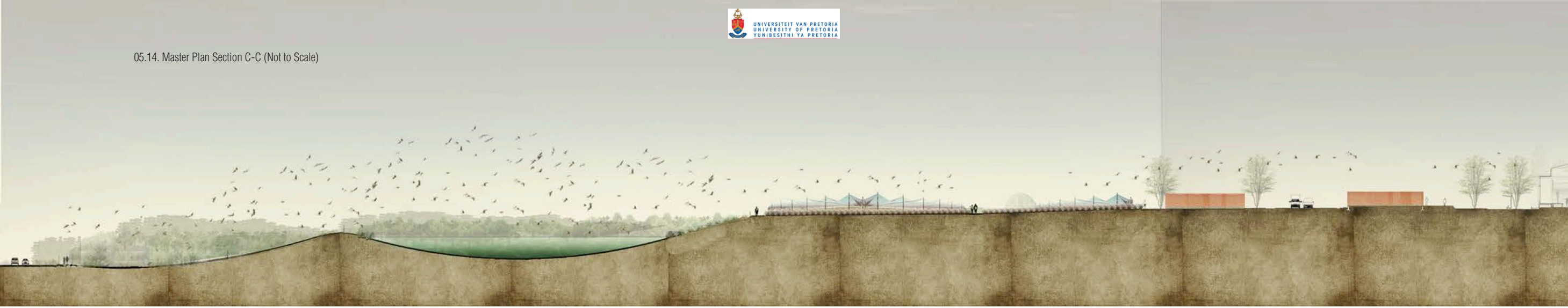


05.12. Master Plan (Not to Scale)

05.13. Master Plan Section A-A (Not to Scale)



05.14. Master Plan Section C-C (Not to Scale)



05.05_masterplan explained

The four systems identified earlier in this chapter are described in detail.

These systems are key in creating a successful landscape design for both nature and humankind.

05.05.01_movement strategy

In order to create the ultimate outdoor accessibility the movement strategy was approached in terms of three major circulation types. They are explained as follows and numbered on plan:

- Vehicular Circulation
- Bicycle Circulation
- Pedestrian Circulation

The first type of circulation needed is vehicular circulation, to ensure that the Era Regional Park is accessible to local as well as regional users. The vehicular circulation, as illustrated in Figure 05.15, incorporates the proposed mobility road by the City of Tshwane on the eastern facade of the site. This created the opportunity to address the public transport issue in Eersterust (as identified in Chapter 4) as a major bus stop was accommodated on this road, adjacent to the Trim Park (1).

The vehicular circulation within the site is divided into public and private access. The public are allowed to enter the site through a one-way street that allows entrance to different parking pockets, closest to the desired location (2).

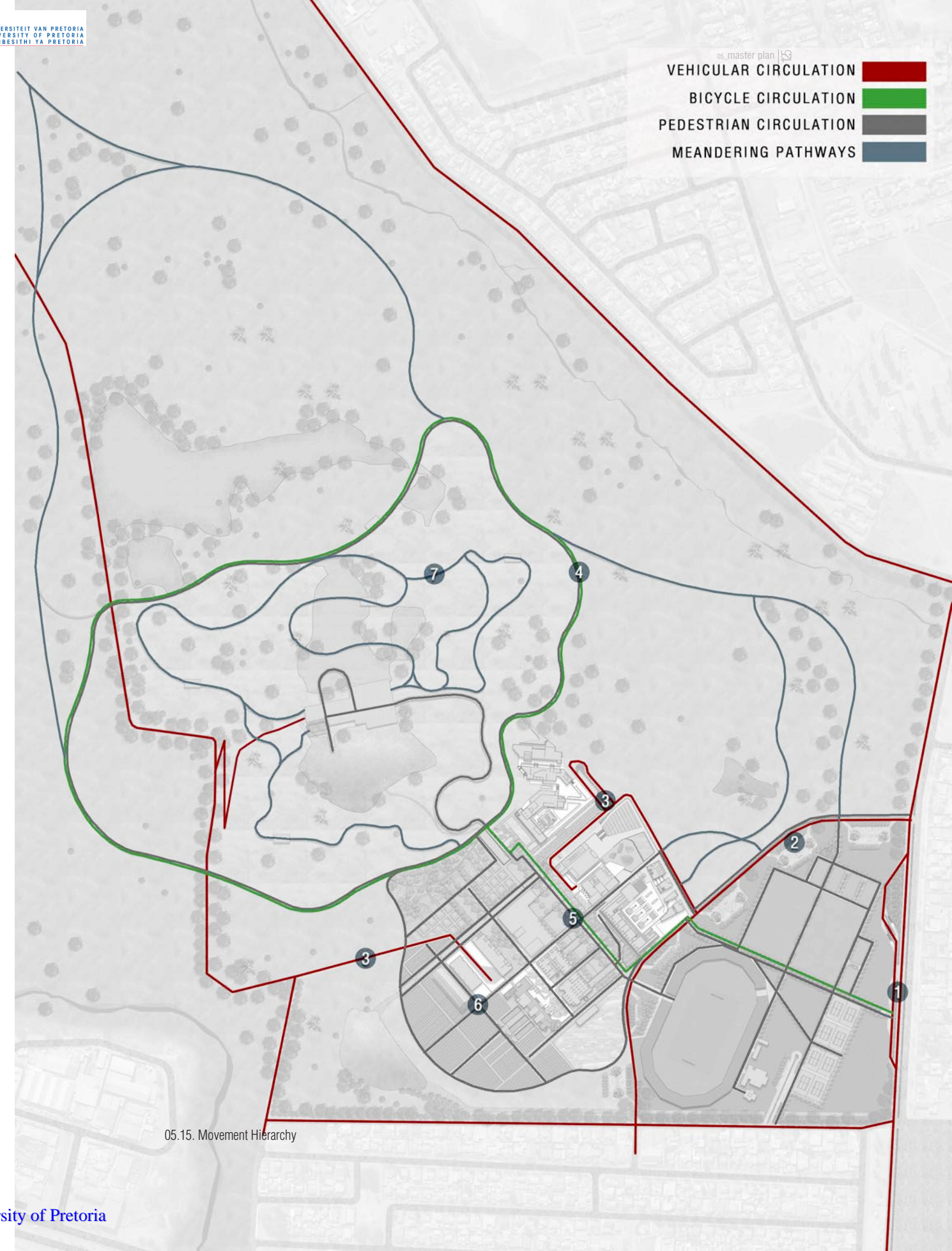
Based on the proposed road by the EUVG

2013, two smaller private roads will be accommodated to allow deliveries and staff entrance to the site (3).

Bicycle circulation is accommodated within the landscape to increase the number of recreational activities. Although bicycles are not allowed at the bottom of the quarry (due to the disturbance it would cause to the bird sanctuary) it is accommodated in all the other parts of the landscape. A ring-road is provided around the quarry to ensure views into the quarry with minimal disturbance to the bird sanctuary (4).

Pedestrian circulation is probably the movement strategy that would be used the most by visitors. Large 'boardwalk' walkways are provided in areas that will endure high pedestrian traffic (5). Smaller walkways are provided in areas that will have lower traffic, guiding people to important elements/programmes within the landscape (6).

Meandering pathways are provided within the natural landscape that will allow the user to explore the natural vegetated areas of the Era Regional Park (7).



05.05.02_hydrology strategy

Most of the programmes and functioning ecosystem services proposed for the master plan intervention requires water to function.

The possible catchment areas identified in Chapter 4 were developed into two main catchment dams that will be used for the purpose of irrigation.

The catchment dam (illustrated in Figure 05.18.) on the western side of the master plan will harvest water to be used for the irrigation of the flax fields, the nursery as well as some of the urban agricultural fields. The water will be pumped to a water tank from where it will be irrigated by means of a pressure system.

The catchment dam created on the eastern side of the master plan will also serve as irrigation purposes, but will specifically attend to the needs of the sport precinct. Water will be irrigated directly from the retention dam onto the sport fields.

A grey water wetland (Figure 05.16.) is accommodated within the landscape to recycle the grey water produced from restaurant kitchens, facility bathrooms as well as the hydro-therapy centre proposed by the EUVG 2013. The grey water will enter the wetland at different points where the water will be filtered and cleaned by specially chosen wetland plants, further described in the planting strategy section of this chapter. The clean water produced by the grey water wetland will flow into the existing dam in the quarry to ensure a constant water supply to the recreational dam.

To ensure the survival of the artificial wet-

land established at the bottom of the quarry. An overflow from the recreational dam will supply the wetland with a constant water supply to maintain the ecosystem service as well as the natural habitat that will have established over time.

The wetland connects naturally with the water bodies located on the northern edge of the quarry. A vegetated swale is proposed that will connect the hydrology system of the master plan with the Riet Spruit. This is to prevent water from becoming stagnant within the quarry and it also prevents the quarry from flooding during precipitation periods.

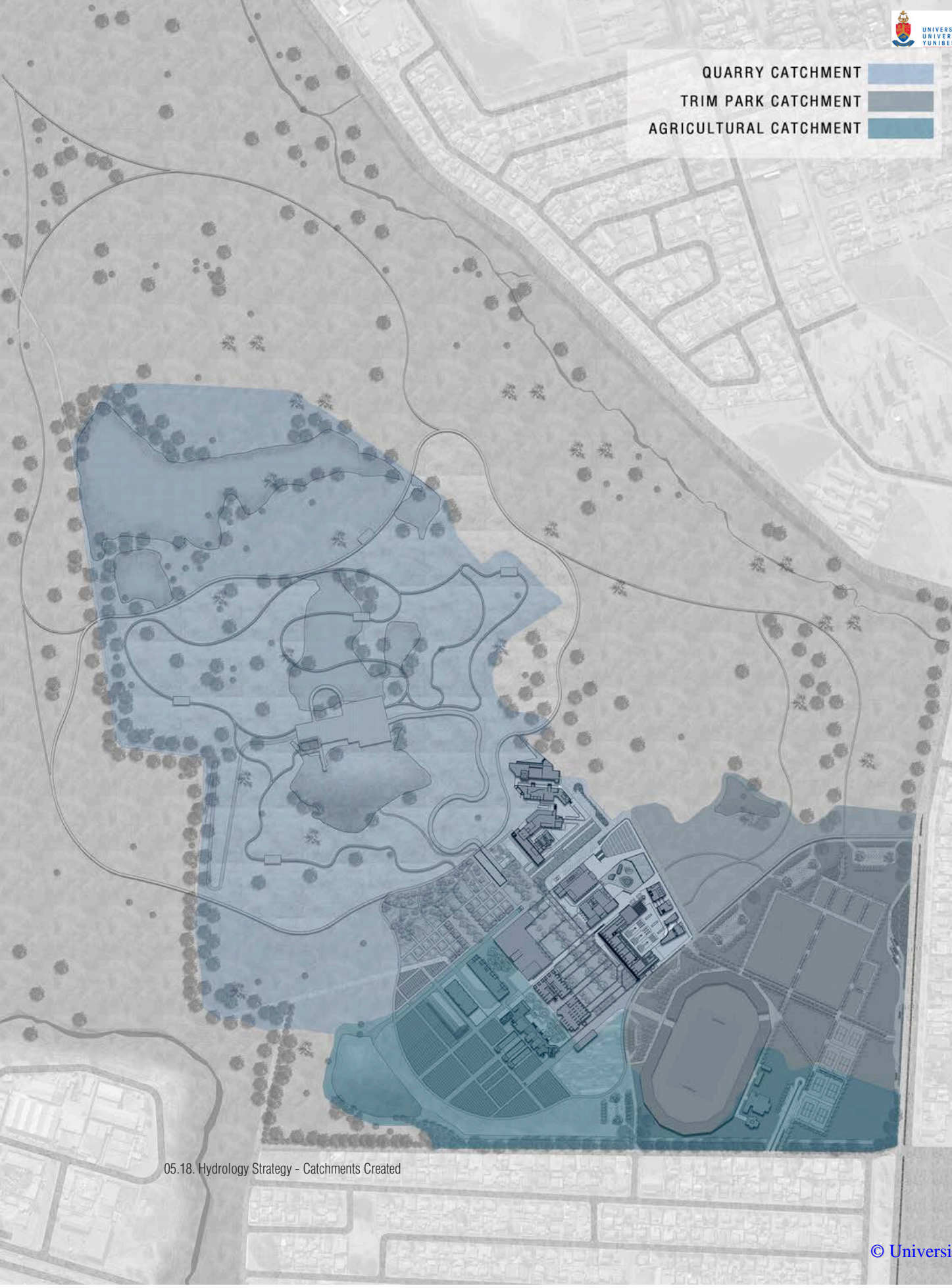


05.16. Hydrology Strategy - Grey Water Wetland



05.17. Hydrology Strategy - Direction of Flow

QUARRY CATCHMENT
TRIM PARK CATCHMENT
AGRICULTURAL CATCHMENT



05.05.03_ecosystem services strategy

The ecosystem services evaluation in Chapter 4 showed that ecosystem services within the site are severely disrupted and damaged.

Rating the quality of the existing ecosystem services of the landscape in Chapter 4, it became clear that little systems are still functioning within the landscape.

After the completion of the master plan design intervention, another Sites v2 Rating exercise was completed to see if the ecosystem services have been restored to the site and that the benefits quality has been increased.

The initial rating of the site, scored the ecosystem services quality of the landscape a low 52 points, meaning it doesn't even qualify to be certified by the SII.

The second rating, based on the proposed master plan intervention scored 136 out of 200 total possible points. Making it a platinum certified project.

This shows that a large number of ecosystem services have been restored and their functioning optimised within the landscape. Please refer to Appendix 09.01. for the Sites v2 Rating Scorecard.

05.04.04_planting strategy

With the design concept aimed at making the non-apparent, apparent. Planting will play an important role as it is the main material used to transform the landscape into the apparent and non-apparent ecosystem services that the visitor should experience.

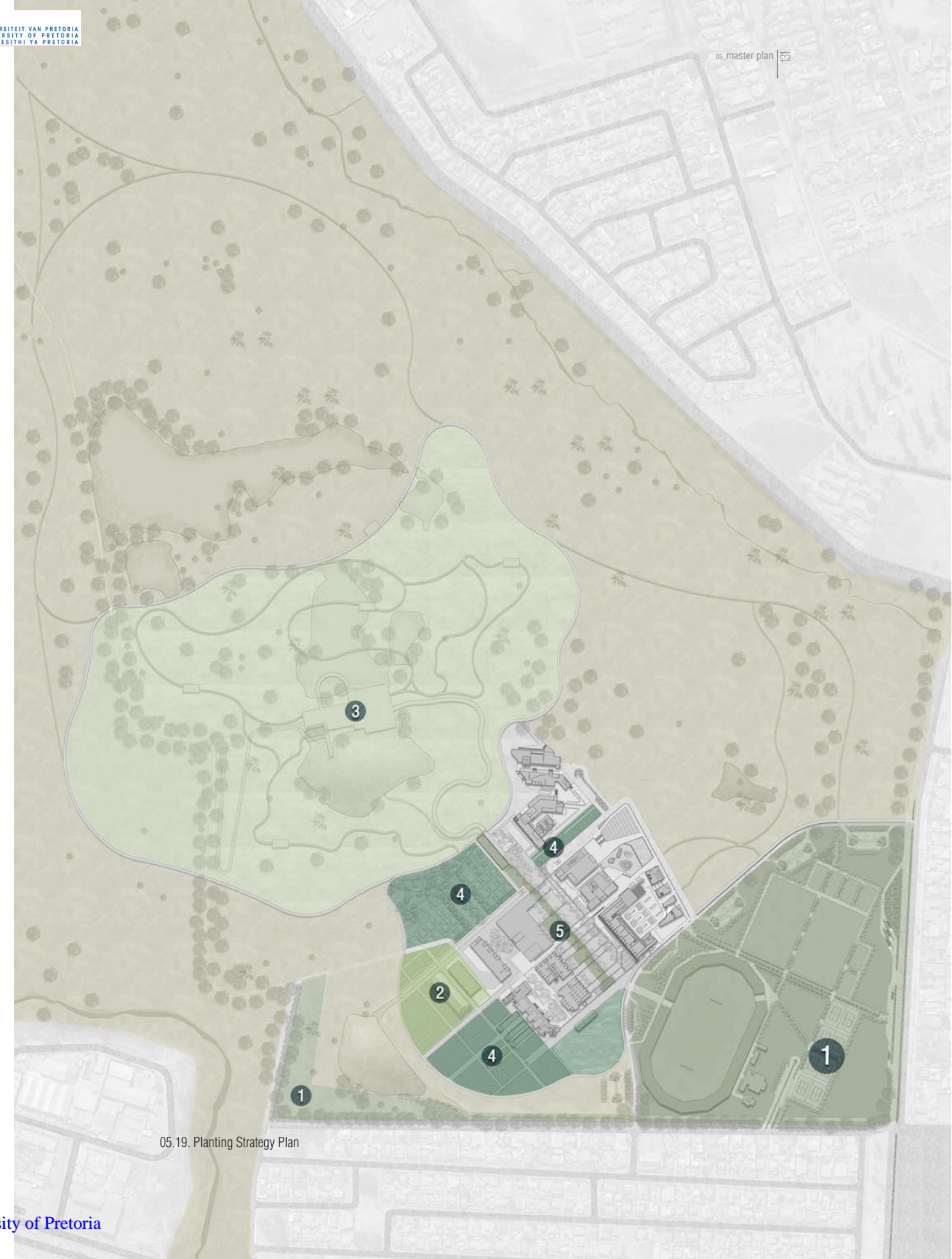
As the visitor moves through the landscape the design reveals relationships, the visitor will become more intrigued. The more of nature you see, understand and learn, the more beautiful it becomes.

With the focus on the different types of nature created within the landscape, different planting systems and strategies are required to achieve the desired landscape experience. The planting strategy consist out of 5 main vegetation zones (illustrated on Figure 05.19.), they are as follows:

1. Urban Trim Park
2. Indigenous Nursery
3. Bird Sanctuary
4. Grey Water Wetland
5. Urban Agriculture

One of the objectives for the Era Regional Park is to restore the severely disrupted areas, which mainly comprise of the quarry which will be developed into the Bird Sanctuary. The planting strategy proposed for the Bird Sanctuary will be developed into a rehabilitation strategy, as it is the main intervention within the quarry area.

The remaining natural landscape surrounding the quarry, will be cleared from alien invasives and rehabilitated where needed.



05.19. Planting Strategy Plan

URBAN TRIM PARK

The programme of the Urban Trim Park is based on the functioning of regulating ecosystem services.

Plants were chosen to accommodate the benefits it should provide for the regulating ecosystem services and for desired conditions for a recreational park.

All the plants chosen (Appendix 09.02.) for the Urban Trim Park are all indigenous, drought resistant, low maintenance and durable plants. The *Celtis africana* trees will be used along walkways and bicycle routes (illustrated in Figure 05.20.) as it provides shade in the summer and lets sun through in the winter.

EXPERIENCE

MENTAL AND PHYSICAL HEALTH
APPARENT DESIGN
RECREATIONAL
CLIMATE REGULATION

TREES
Celtis africana
Searsia Lancea
Combretum molle

CLIMBERS
Jasmin multipartitum

LAWN
Cynodon dactylon

GROUND COVER
Agapanthus praecox

INDIGENOUS NURSERY

An on-site nursery will be established. They can harvest seeds and grow plants from the Moot Plains Bushveld vegetation unit. The nursery will grow and prepare all required plants and seeds to restore the landscape with, as well as the other functional plants required by the landscape.

When the restoration and establishing process has reached a desired point, the nursery can trade to the public as well. This should encourage the growth of indigenous gardens in private homes, benefitting the natural ecosystems and habitats by extending the green infrastructure network.

EXPERIENCE

TOURISM
BIODIVERSITY
HABITAT CREATION
POLLINATION



05.20. Urban Trim Park Vegetated Walkway

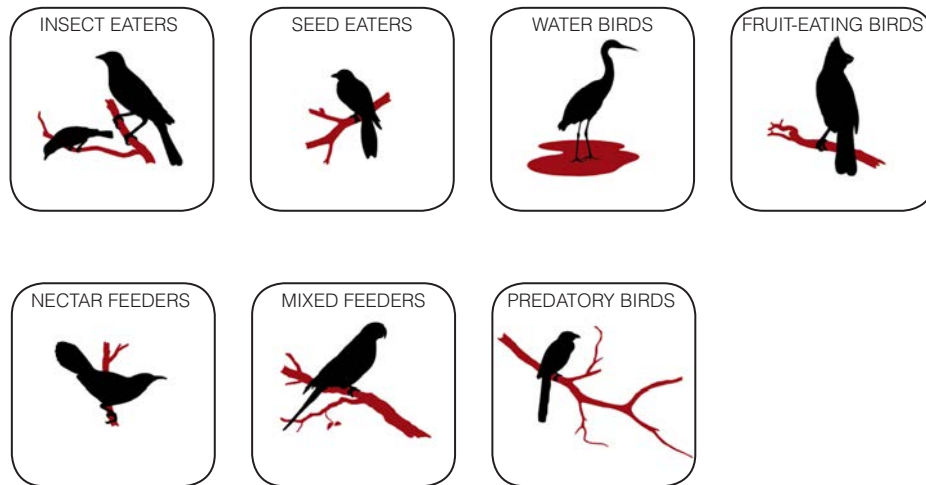
BIRD SANCTUARY

According to the National Research Foundation, bird species of South Africa can be divided into seven functional groups. In order to attract the different specie types, the different requirements for each group needs to be carefully acommodated (NRF 2014).

The seven bird specie groups that is accommodated within the Bird Sanctuary is illustrated in Figure 05.21.

Plant will be planted in communities tree canopies, shrubs, grasses and ground covers. Appendix 09.02. provides the plant lists for the communities created to attract the different functional bird specie groups.

EXPERIENCE
EDUCATIONAL
NON-APPARENT DESIGN
RECREATIONAL
BIODIVERSITY AND HABITAT CREATION



05.21. Attracted Bird Species



05.22. Bird Sanctuary Experience

URBAN AGRICULTURE

The urban agricultural landscape consist of a number of agricultural types to ensure the success of the landscape.

Linum usitatissimum (Flax), lavender bush and *Eucalyptus grandis* are used in the natural industries proposed by the EUVG 2013 for the production of textiles and honey. These are accommodated within the planting strategy.

The agricultural landscape (Figure 05.24.) starts of with companion planting plots that are sized 10m x 10m for easy access and to be worked by hand. Ten different companion grouped plants have been developed (Table 05.01.) that consist of vegetables. These can be harvested and sold on market days.

As illustrated in Figure 05.24. moving through the productive landscape (apparent) towards the quarry (non-apparent) the companion planting plots progresses into a food forest, where the non-apparent services ensures the successful functioning thereof.

EXPERIENCE

*EDUCATIONAL
DISCOVERY
CULTURAL - SENSE OF PLACE
APPARENT NON-APPARENT DESIGN
FOOD PRODUCTION
BIOLOGICAL CONTROL*

The food forest is based on the concept of permaculture, but focusses on the relationships different plants have on one-another.

Appendix 09.02. provides a list of eight productive plant communities developed for the food forest.

Type	Companion
Potatoes <i>Solanum tuberosum</i>	Green Beans <i>Phaseolus spp</i>
Beetroots <i>Beta vulgaris</i>	Onions <i>Allium cepa</i>
Brinjals <i>Solanum melongena</i>	Carrots <i>Daucus carota</i>
Cabbages <i>Brassica oleracea</i>	Green Beans <i>Phaseolus spp</i>
Carrots <i>Daucus carota</i>	Lettuces <i>Lactuca spp</i>
Green Beans <i>Phaseolus spp</i>	Cabbages <i>Brassica oleracea</i>
Lettuces <i>Lactuca spp</i>	Carrots <i>Daucus carota</i>
Butternuts	Carrots <i>Daucus carota</i>
Onions <i>Allium cepa</i>	Beetroots <i>Beta vulgaris</i>
Tomatoes <i>Lycopersicon esculentum</i>	Onions <i>Allium cepa</i>

Table 05.01. Vegetable Companion Groups

A herb garden is also included in the urban agricultural planting strategy. The herb garden will provide the restaurants and coffe shops within the Era Regional Park with all the aromatic plants needed.

The aromatic lavenders provided in the food forest and herb garden, ensures that there is enough plant materials to sustain the bee colonies for the apiary. Some of the aromatics and herbs listed in Appendix 09.02. is also harvested for the flavouring of honey, wax candles and tectiles.



05.24. Urban Agriculture Experience

BARK
Withania somnifera

BULBS
Boophane disticha
Crinum macowanii
Bowiea volubilis

FOLIAGE/LEAVES
Artemisia afra
Asclepias fruticosa
Cotyledon orbiculata
Helichrysum species
Pallaea calomelanos
Vernonia oligocephala
Catharanthus roseus
Scabiosa columbaria
Senecio serratulooides

RHIZOMES/ROOTS
Agapanthus inapertus
Aster bakerianus
Ehretia rigida
Gnidia kraussiana
Hypoxis hemerocallidea
Pelargonium luridum
Rhoicissus tridentata
Pentanisia prunelloides

The medicinal garden will show visitors that although plants are used for aesthetic purposes, it can also serve a much deeper purpose - medicine. By creating this type of appreciation for nature a non-apparent function of nature is made apparent for the visitor.

Due to the fact that this an educational garden, the medicinal plants will be planted in groups of usefulness. Indigenous medicinal plants are used for the medicinal communities. Some of the species chosen occur naturally within the Moot Plains Bushveld vegetation type.

This urban agricultural system serves as a plant exhibit of plants that can be used for medicinal purposes. It provides a discovering experience as one walks through the garden (Figure 05.25.), as the planting will be communicated through natural senses.

Scents can be smelled, textures can be touched, flowers and other colours can be seen, the birds that will inhabit the garden will be heard and if wated, plants could be tasted. Appendix 09.02. lists the plants chosen for the medicinal garden.



05.25. Medicinal Garden Experience

05.05.05_rehabilitation strategy

As the Moot Plains Bushveld Vegetation type is classified as vulnerable, it is important to control the alien plant investigations in the natural rangeland.

According to Ken Coetzee, to aim to completely eradicate alien invasive plant species in the short term is unrealistic. The objective should rather be to prevent further spreading and set realistic goals for controlling alien plants in a particular area (Coetzee 2005:96).

A strategy of control has been developed for the Era Regional Park that will aim to control and ultimately completely eradicate the alien plant species.

Coetzee states that dense, mature infestations can not really get worse, but they can get bigger and become a source of seed for further infestation. Sparse infestations and other occasional plants within the natural vegetation area are a bigger threat than the dense infestations due to the fact that they can mature, reproduce and eventually growing dense enough to alter the existing ecosystem (Coetzee 2005:96).

Therefor the control and eradication strategy developed will aim to control and clear the plants within the sparse infestation category first and from there on to work through the various degrees of investigation, all the way up to dense (Coetzee 2005:96).

Referring back to the alien investigation analysis in Chapter 4 (Figure 04.28 and Table 04.01.), the three classes (light, intermediate and dense), needs to be prioritised. The prioritisation is based on the urgency of the control needed.

The choice of control method for the alien invasive plant species within the Era Regional Park is manual. Which means that the eradication and control will be by hand. Chemical pesticides should only be used where the environmental impact is smaller than the manual removal of alien invasive species.

Priority of Control	Infestation Rating	Vegetation Type	Follow-up Action	Time Frame
1	Intermediate	Savanna Shrubland	Every three months after initial control	Year 1 - 5
2	Light	Savanna Shrubland	Every three months after initial control	Year 1 - 3
3	Dense	Riverine and Savanna	Every six months after initial control	Year 1 - 10

Table 05.02. Alien Vegetation Control Schedule



Eucalyptus saligna

Due to the fact that it is extremely costly to remove mature trees and to the heritage value the trees add to the site, they won't be eradicated all at once. Trees five years and younger will be removed. All new growth will be removed by means of a slasher or a tree puller. When a mature tree dies, it will not be replaced with an invasive specie.



Agave americana, Cereus jamacaru and Opuntia ficus-indica

To remove these plants without the use of chemicals is a labour intensive process, but worthwhile the effort. The plants will be removed by hand by using slashers and where needed power-brush cutters. The removed plants need to be transported off-site to prevent any further infestation.



Campuloclinium macrocephalum

The only way to eradicate Pom-pom weed is to use herbicides, uprooting or burning. Due to the fact that this weed is still less than 10% of the natural vegetated area, the method used to remove them will be by means of hand-pulling.

Arundo donax

To remove the spanish reed by hand will do extreme damage to the existing river banks. It is proposed to use an environmentally friendly herbicide to help eradicate the plant that would not be harmful to existing ecosystems or the natural water system.

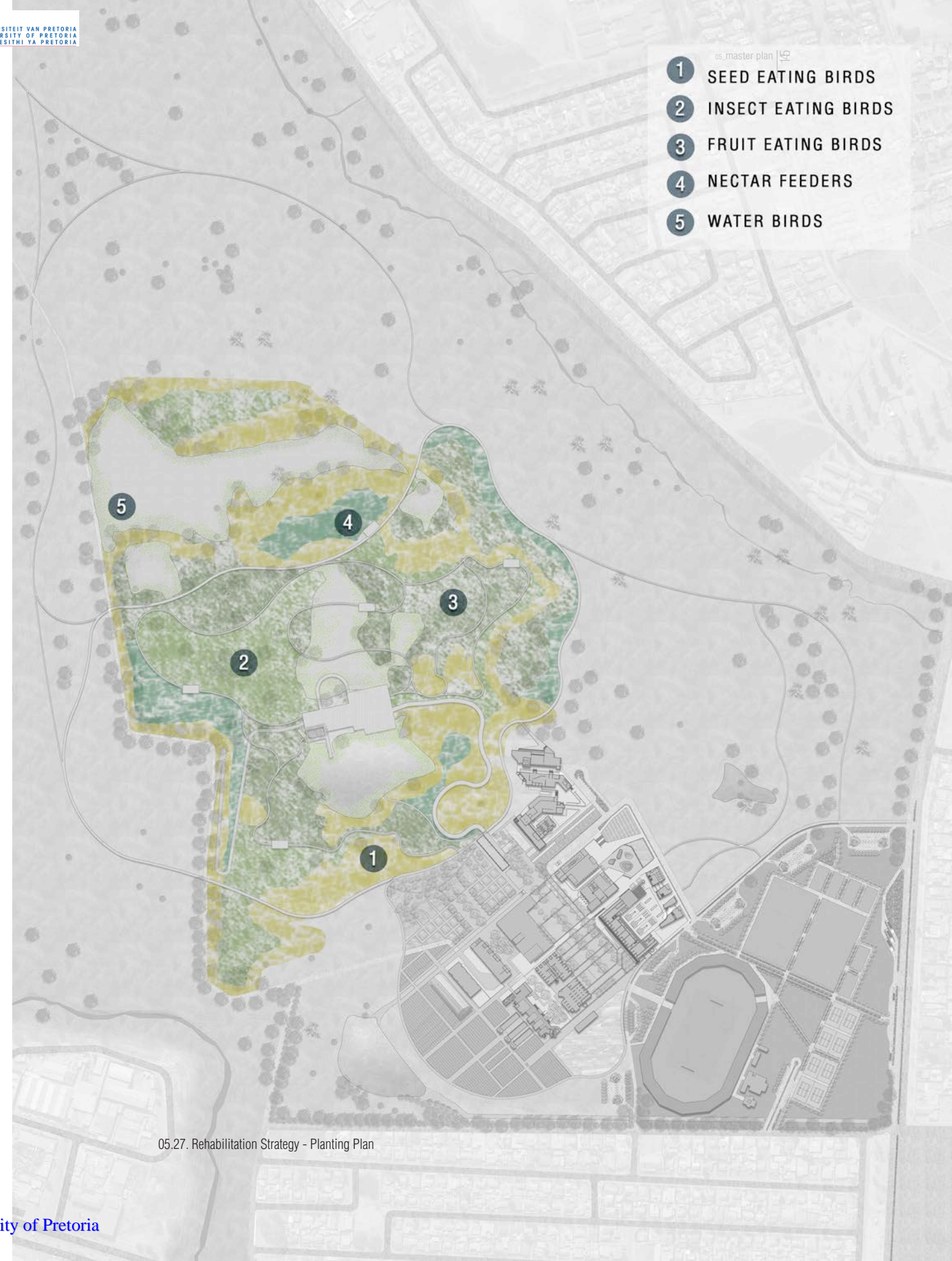


05.26. Manually Removing Alien Invasives

The quarry rehabilitation process is addressed through the planting strategy. The bird sanctuary, which is mostly allocated within the disrupted quarry will be used to guide the rehabilitation process.

The different bird species attracted to the sanctuary, each requires different planting communities. The plants communities created will be placed in the quarry in such a way that rehabilitation is possible without major intervention.

Figure 05.27. illustrates the allocation of the different plant communities within the quarry to allow for rehabilitation through succession and the functioning of ecosystem services.



05.27. Rehabilitation Strategy - Planting Plan



06_technical resolution

06 technical resolution

This chapter focus on the detailed development of the identified sketch plan area. The sketch plan will be technically resolved through the course of this chapter.

The area identified for the sketch plan development is visible in the concept diagram (Chapter 5) as the transitional threshold between the apparent and non-apparent landscape interventions, illustrated in Figure 06.01.

06.01 technical concept and programme development

The most important thing that the design of the sketchplan area should resolve is the transition from the apparent landscape to the non-apparent landscape.

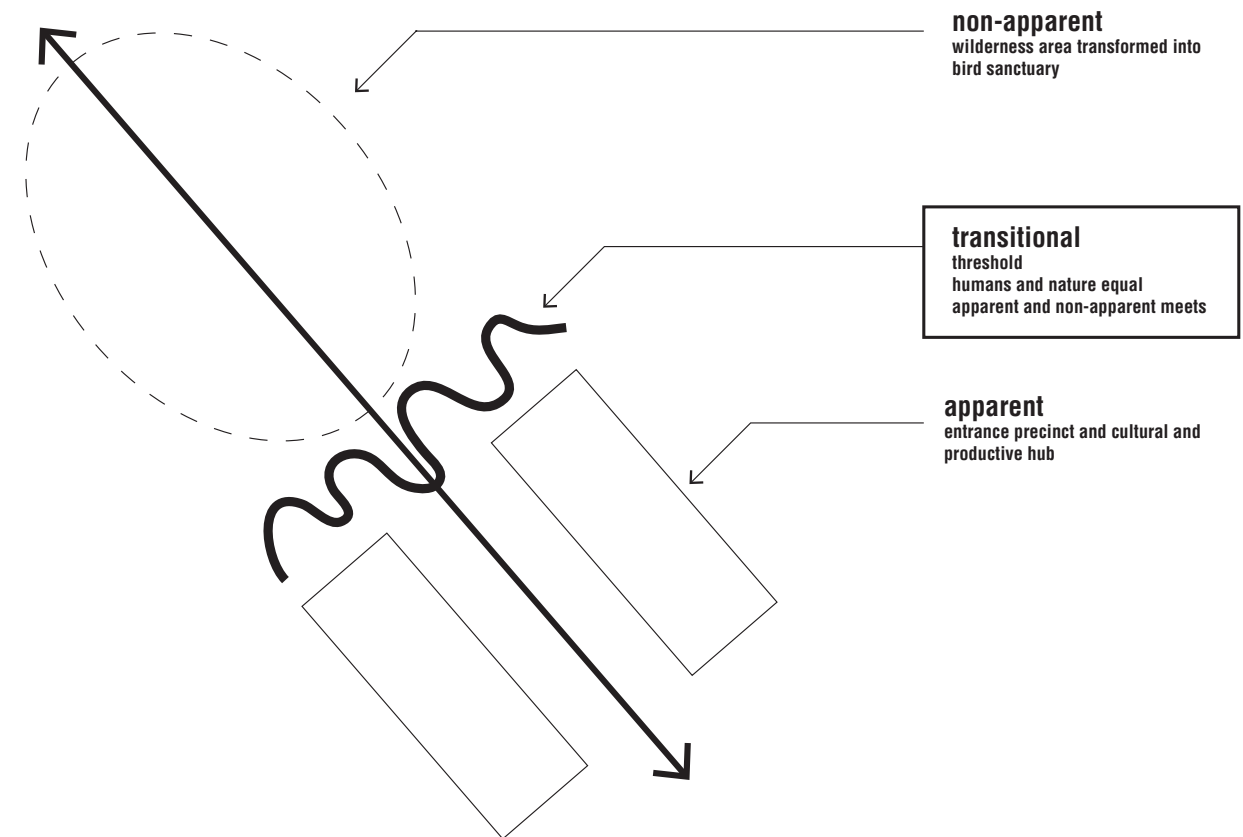
The user should consciously be aware of the fact that the apparent (hardscape) is being left behind and knowingly moving into the non-apparent (natural) landscape.

The identified sketch plan area (Figure 06.01.) is where the apparent and non-apparent meets, resulting in a threshold space between the two entities.

The identified sketch plan area is related to the proposed concept, from where the programme for the threshold space is developed. Figure 06.02. illustrates the development from concept, into intervention types, into human experiences in order to communicate the different types of relationships that humankind has to nature.

The concept was also related back to some of the ecosystem services identified to be accommodated within the design intervention.

- The area allocated for the benefit of humankind was linked with food and raw material production ecosystem services.
- The area allocated for the benefit of both focuses on spiritual well-being as well as habitat creation.
- The area allocated for the benefit of nature is related to ecosystem services such as habitat creation, pollination and biodiversity.



06.01. Sketch Plan Concept Diagram

These concept and ecosystem services were taken further and developed into intervention types. Three questions were asked in the programme development process, adapted from the ecosystem services, they are:

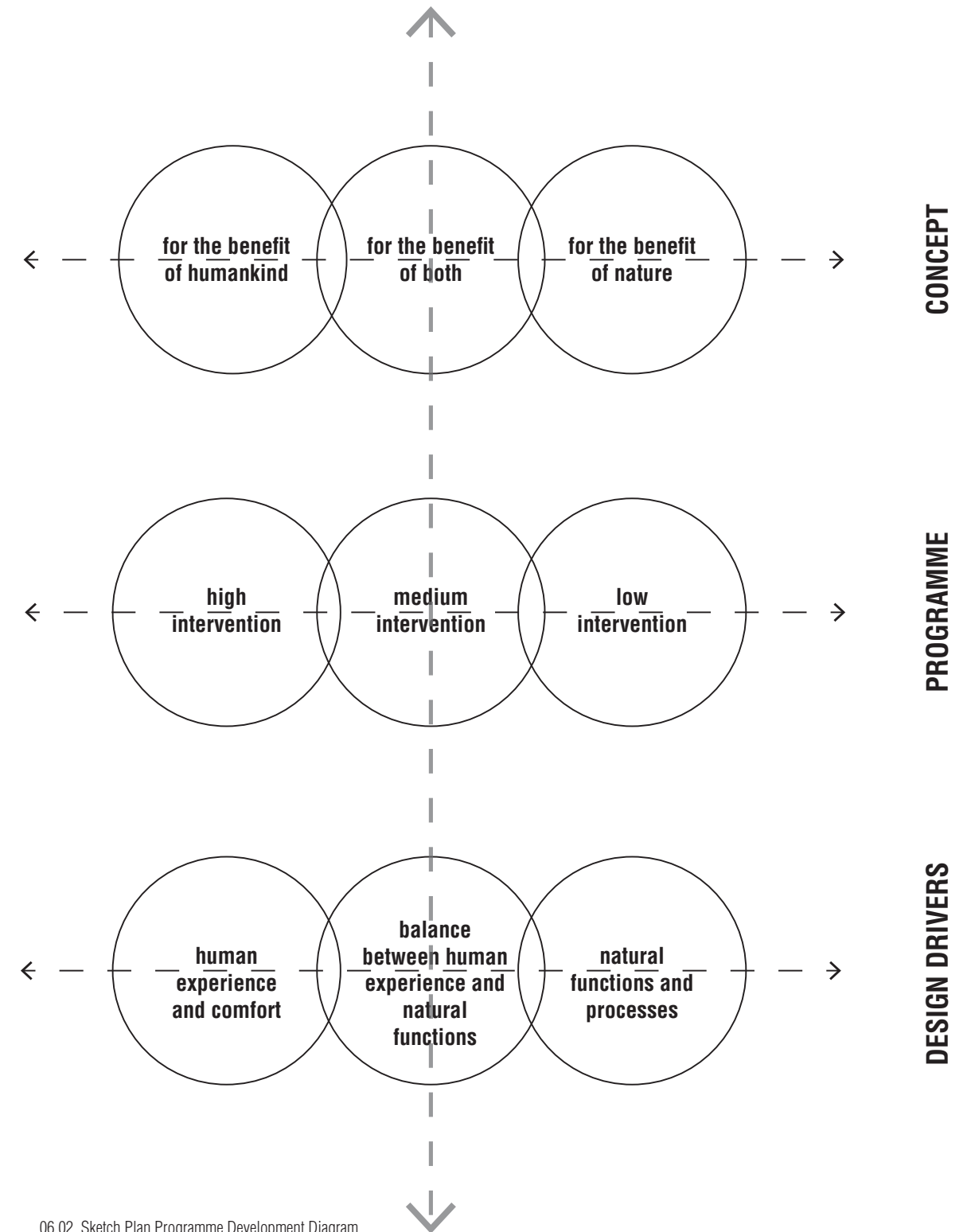
- Can old industrial structures be adapted to fulfill new contemporary functions, like much required urban food production?
- How can nature and humankind habitate old industrial structures in order to create a space where these entities become one?
- Will nature thrive through spontaneous natural succession if the space and primary species are provided?

Referring back to the theoretical discourse, through the creation of experiences within the landscape intervention, users will be able to create memories which will ultimately help them to restore the broken connection with nature.

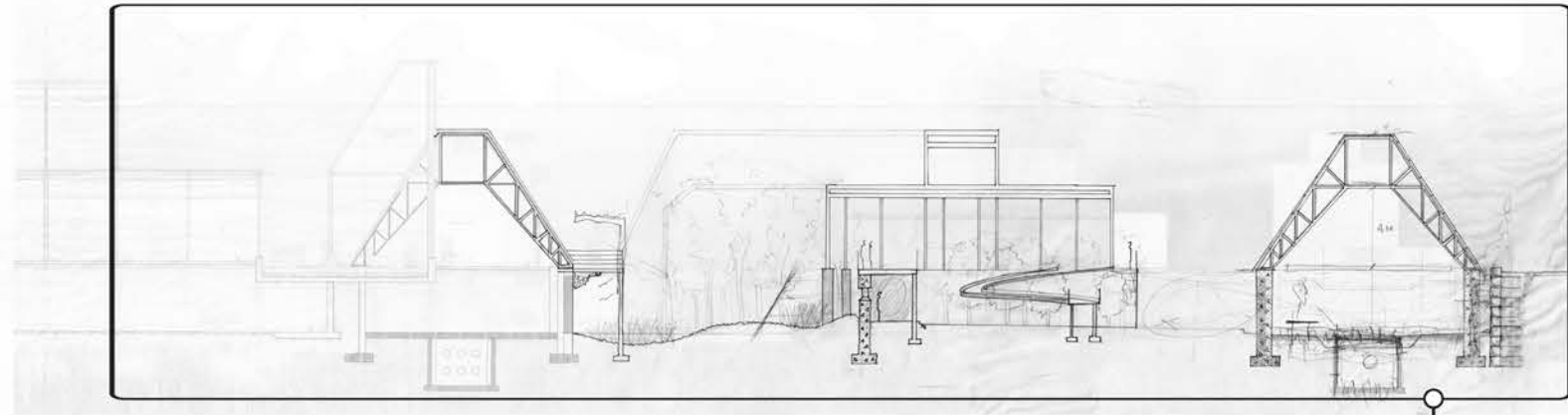
Experience was used as the main design driver for the sketch plan development, as the experience created within the landscape (visually, sensually, and emotionally) creates awareness within the user with regards to possible relationships to nature. The experiences identified are as follows:

- Human experience and comfort: humans should feel self-sufficient, apart of nature.
- Balance between human experience and natural functions: humans should feel part of nature.
- Natural functions and processes:

man should feel seperated from nature.
Transitional experiences are used to guide the user through the landscape.



06.02_sketch plan development



06.03. Sketch Plan Section Development



The first design revision of the sketch plan looked at programme allocation, levels and movement. These are explained below and illustrated in Figure 06.04.

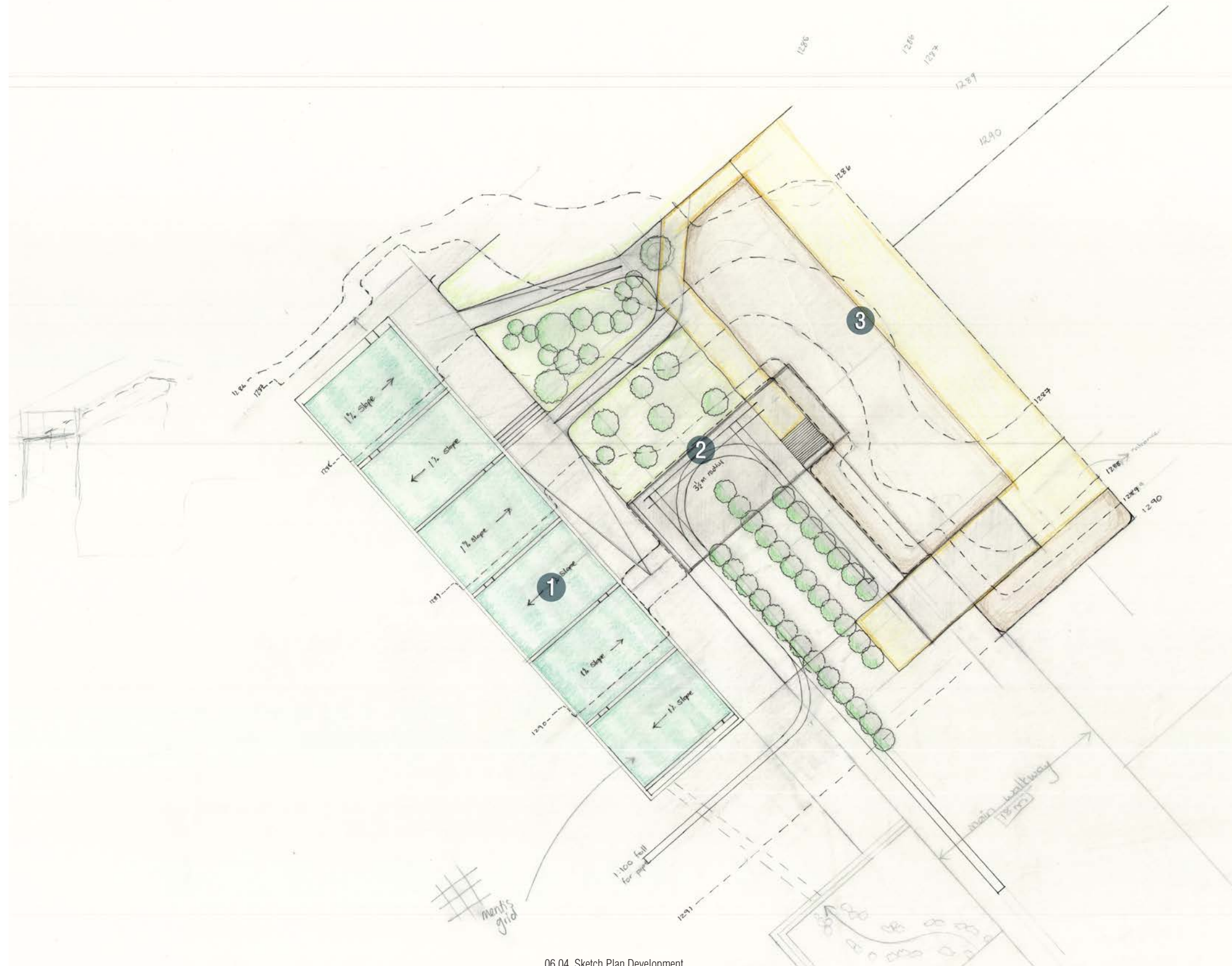
The first identified area of the sketch plan design is the existing conveyor belt with the proposed grey water wetland running through it (1).

The opportunity arises for this feature to be developed into a greenhouse wetland that will produce food in order to benefit humankind. This area within the sketch plan became the area allocated to human experience and comfort.

An old industrial shed (2) has been stripped from its sheeting and stands promptly in the middle of the sketch plan area. This is developed into the main entrance to the non-apparent landscape.

This section of the sketchplan will be developed into a transitional space that creates a balance between human experience and natural functions.

The last area developed for the sketch plan is for the purpose of natural functions and processes (3). This space is allocated for the benefit of nature and will prohibit humans from physically entering the space.

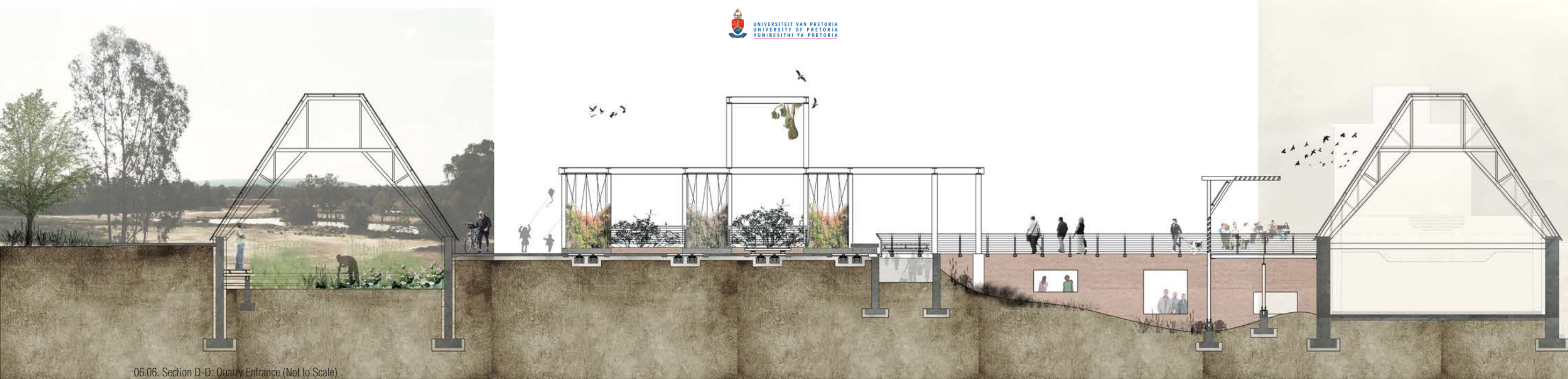


06.04. Sketch Plan Development

06.03_sketch plan



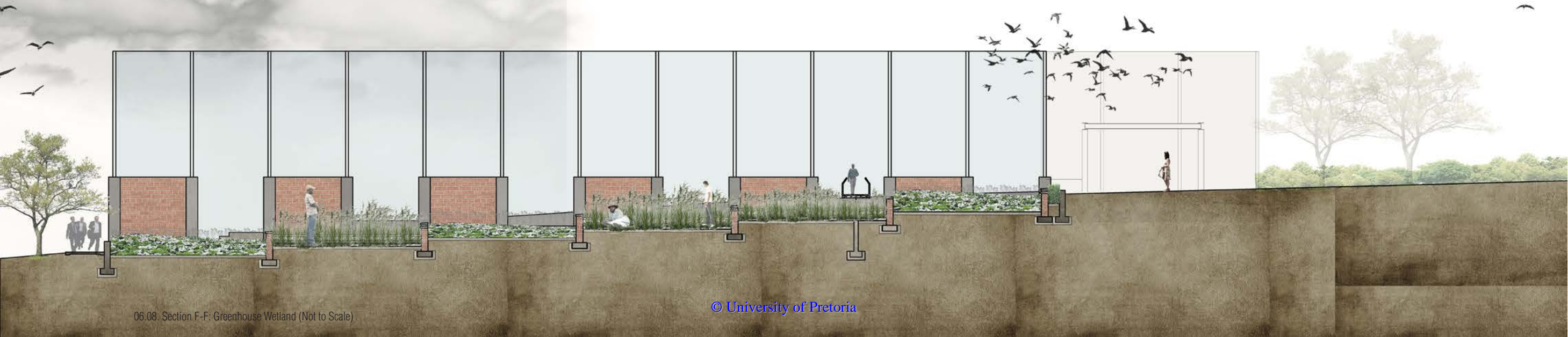
06.05. Sketch Plan (Not to Scale)



06.06. Section D-D: Quarry Entrance (Not to Scale)



06.07. Section E-E: Transitional Landscape (Not to Scale)



06.08. Section F-F: Greenhouse Wellland (Not to Scale)



06.04_sketch plan strategies

06.04.01_planting strategy

The sketch plan is divided into three main planting areas, linked directly with the concept explained in the beginning of this chapter.

As illustrated in Figure 06.12, the greenhouse wetland is the first planting area investigated in order to answer the question asked in the concept development. The same applies to the transitional landscape planting area and the natural succession experiment.

This section will explain the planting communities created within the sketch plan intervention.



06.12. Sketch Plan Planting Strategy

CAN OLD INDUSTRIAL STRUCTURES BE ADAPTED TO FULFILL NEW CONTEMPORARY FUNCTIONS, LIKE MUCH REQUIRED URBAN FOOD PRODUCTION?

HUMAN EXPERIENCE AND COMFORT

The constructed wetland passes through the old conveyor belt structure towards the quarry. The opportunity arises to create a greenhouse that has a constant supply of clean water, called the Greenhouse Wetland.

The main aim for the greenhouse wetland is to benefit the people. Food producing plants are chosen. People will be taught to use a natural ecosystem as a food producing beneficiary. This will teach people the importance of growing their own food and how to achieve this by means of a natural ecosystem service.

After completing research in terms of food producing plants in water, three main species were identified to grow in the greenhouse wetland.

Grains are one of the most important food sources all over the world. Rice was investigated as an option for a grain producing plant.

Currently in Africa there is a programme called New Rice For Africa (NERICA) which aims to increase domestic rice production as well as improving food security (Figure 06.12. & 06.13). Nerica is a hybrid between *Oryza sativa* and *Oryza glaberrima* (Grain 2009). This is the grain plant that will be used in the wetland.

Taro madumbi (Figure 06.14. & 06.15.) is a root vegetable and is grown for an edible starchy corn and also as a leaf vegetable. These plants will be planted on the edges of the wetland, especially against the retaining

wall as an aesthetic barrier.

The third plant species chosen for the wetland is a water lotus; *Nelumbo nucifera* also known as Indian Lotus (Figure 06.16. & 06.17). The water lotus is an important food source to many countries as it has edible roots (primary use), stems, leaves and seed (TCPermaculture 2014).

EXPERIENCE

EDUCATIONAL
 APPARENT NON-APPARENT NARRATIVE
 FOOD PRODUCTION
 CLIMATE CONTROL
 WASTE WATER TREATMENT



06.13. Nerica Rice Plant



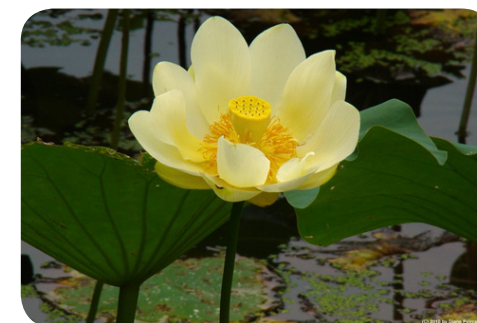
06.14. Nerica Rice Grains



06.15. Taro Plant



06.16. Taro Roots



06.17. Lotus Flower



06.18. Lotus Roots

*HOW CAN NATURE AND HUMANKIND HABITATE
OLD INDUSTRIAL STRUCTURES IN ORDER TO
CREATE A SPACE WHERE THESE ENTITIES
BECOME ONE?*

BALANCE BETWEEN HUMAN EXPERIENCE AND NATURAL FUNCTIONS

This area of the sketch plan becomes the main entrance to the quarry (non-apparent landscape) and is a multi-functional space as it should serve nature and humankind.

For this reason the planting strategy is developed according to the needs of humankind and nature.

The planting method will transform from very formal, to informal to eventually natural vegetation as one moves through the landscape towards the quarry.

The Moot Plains Bushveld vegetation type is used as the main palette of plants for constructing the multi-beneficial space.

Creepers are identified; they can be accommodated in planters eventually covering the exposed steel structures to increase habitat creation.

*WILL NATURE THRIVE THROUGH SPONTANEOUS
NATURAL SUCCESSION IF THE SPACE AND
PRIMARY SPECIES ARE PROVIDED?*

NATURAL FUNCTIONS AND PROCESSES

WE WILL PROTECT A FOREST FOR THE FUTURE PRODUCED BY TIME AND THE VAGARIES OF HISTORY; A NATURAL PROCESS HAS BEEN TRANSFORMED INTO A VERTICAL SYMBOL, COVETED AND UNREACHABLE, YET THE FOCUS OF OUR ATTENTION AND ASTONISHMENT; A FRAGMENT OF NATURE LEFT TO ITSELF IN THE HEART OF THE CITY, AN ISLAND.

- GILLES CLÉMENT (GANDY 2013:259)

This area of the sketch plan is inaccessible to humans as it is created for the natural functioning of nature's processes.

An experimental landscape is to be created. This is to identify whether nature will benefit (succeed) without human intervention. This design element is supported by the following precedent investigated.

SPONTANEOUS SUCCESSION EXPERIMENT

Precedent: Lille's Parc Henri Matisse
Landscape Architect: Gilles Clément
Project Description: The French landscape architect, created an inaccessible concrete structure in the middle of Lille's Parc Henri Matisse (Gandy 2013:259).



06.19. Clément's Inaccessible Concrete Structure

Gilles gained inspiration from the park from several sources, but the aesthetic characteristics of uncultivated ground was the greatest (Gandy 2013:259).

According to Matthew Gandy (2013), the two most important design drivers to Clément for this park was the enhancement of urban biodiversity and the symbolic reconstruction of a fragment of primary forest (Gandy 2013:259).

Clément's project shows a strong contrast between aesthetic and scientific significance, creating a tension within the landscape to make the user aware of the change that took place in the cityscape (Gandy 2013:259).

This will educate visitors on how long it takes for nature to restore itself after being disrupted by industries. Through the use of ecosystem services and in what state the quarry would have been if humankind did not intervene in the rehabilitation process.

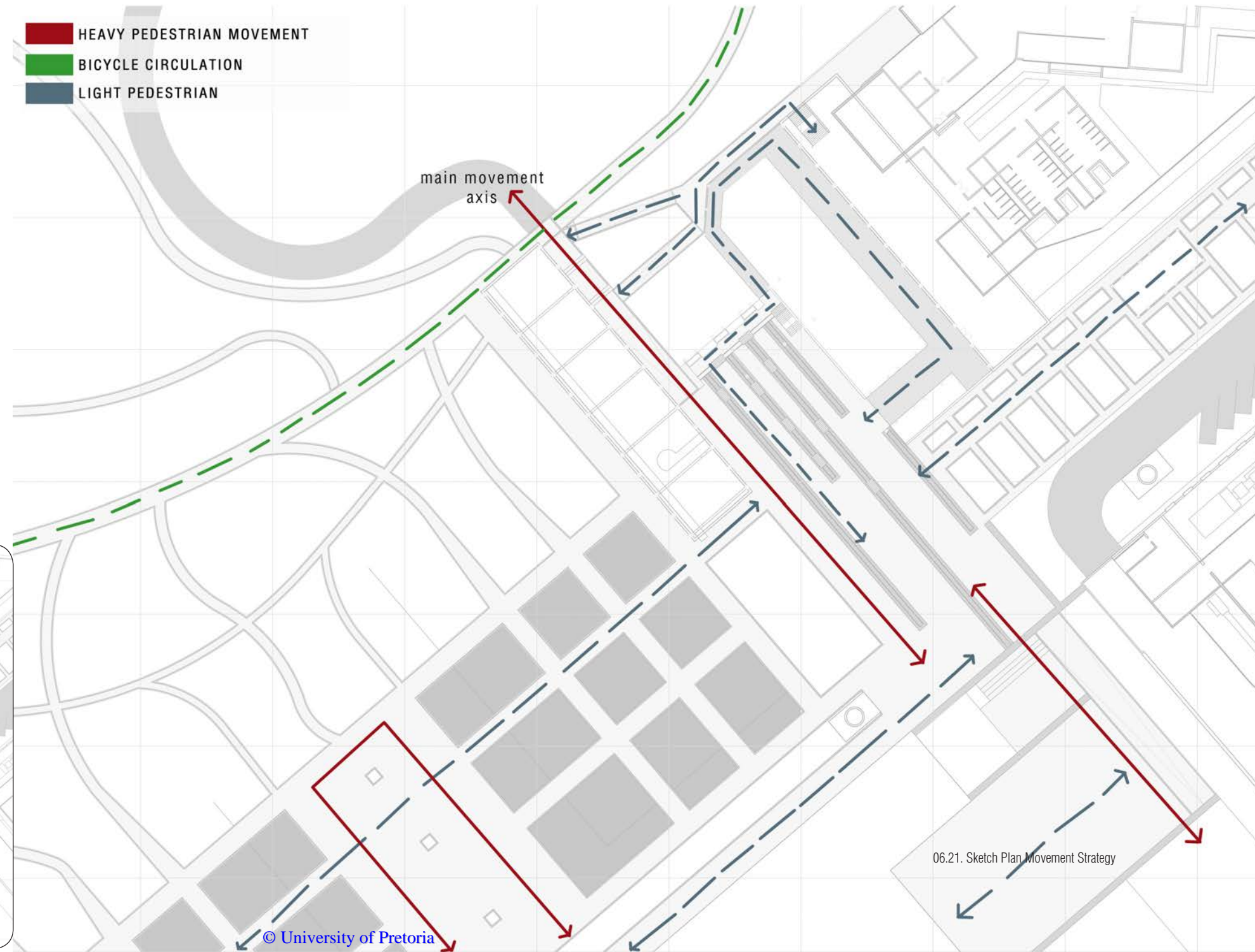
The hole created for this experiment will be seeded with the primary grass species of the Moot Plains Bushveld to start the succession process.

06.04.02_movement strategy

The sketch plan movement strategy consist of three main movement hierarchies.

The main movement is based on the heritage axis that allows the user to move from the apparent landscape to the non-apparent landscape. Figure 06.21. illustrates the different movement hierarchies developed within the sketch plan intervention.

Figure 06.20. is informed by the movement hierarchy and illustrates the human vs. nature density within the sketch plan.



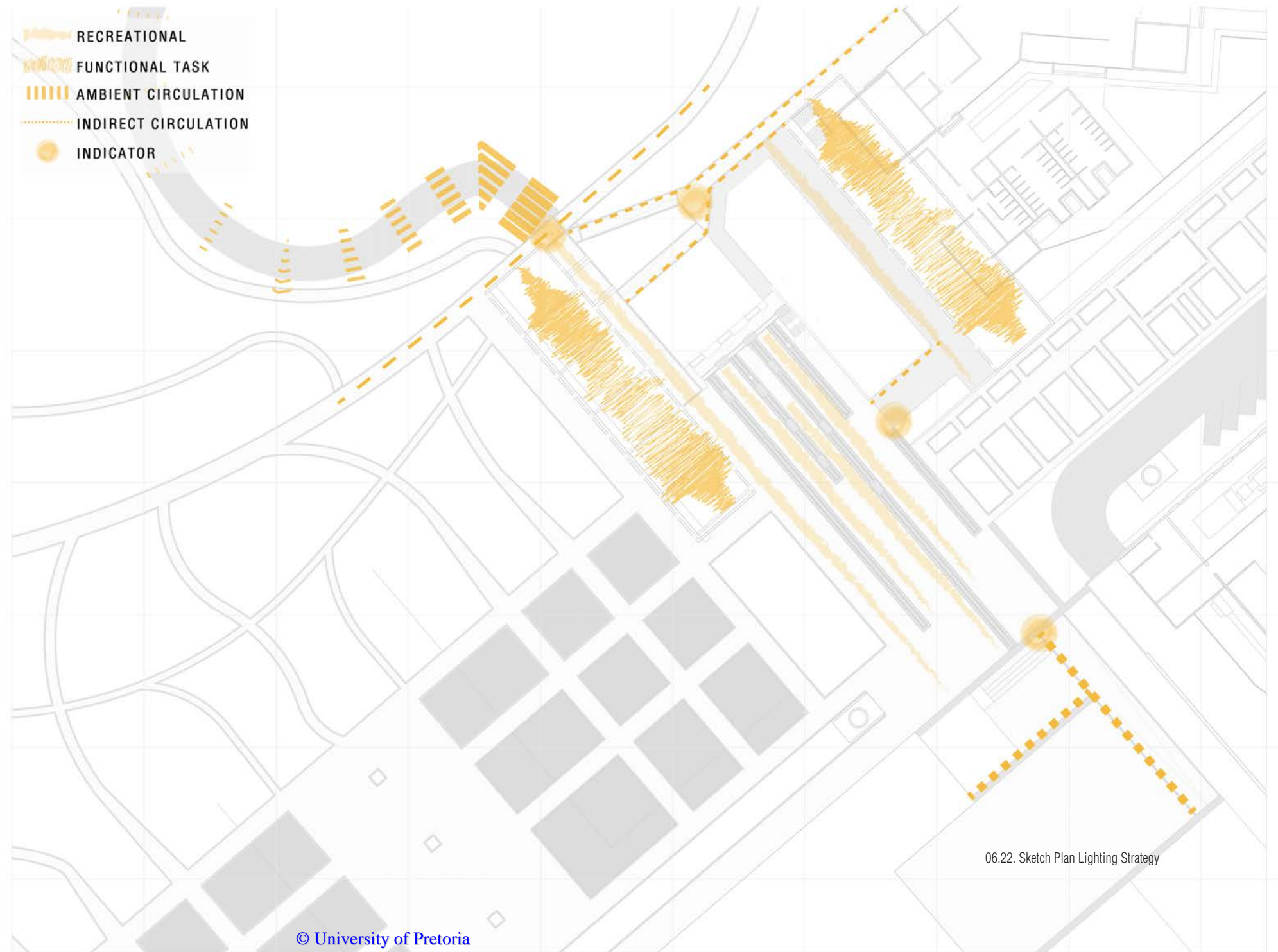
06.21. Sketch Plan Movement Strategy

06.20. Human vs. Nature Density

06.04.03_lighting strategy

The lighting strategy for the sketch plan is developed according to the needs of both humans and nature.

Main indicator lights are placed to guide human movement to important amenities. In the greenhouse lighting is applied that would create optimal conditions for the growing of plants.



06.04.04_material strategy

The material strategy for the development of the sketch plan becomes a very important strategy as it goes hand-in-hand with the approach to heritage for the development of details.

The Burra Charter was used as a guideline for handling the material selection. Old and new materials are clearly distinguishable.

The choice of materials also aid in communicating the threshold between the apparent and non-apparent landscape.

The choice of materials allows the user to experience the transition that the design is making in the landscape. The construction makes the concept a three dimensional experience.



06.23 Materials Identified and Proposed

06.05_landscape components

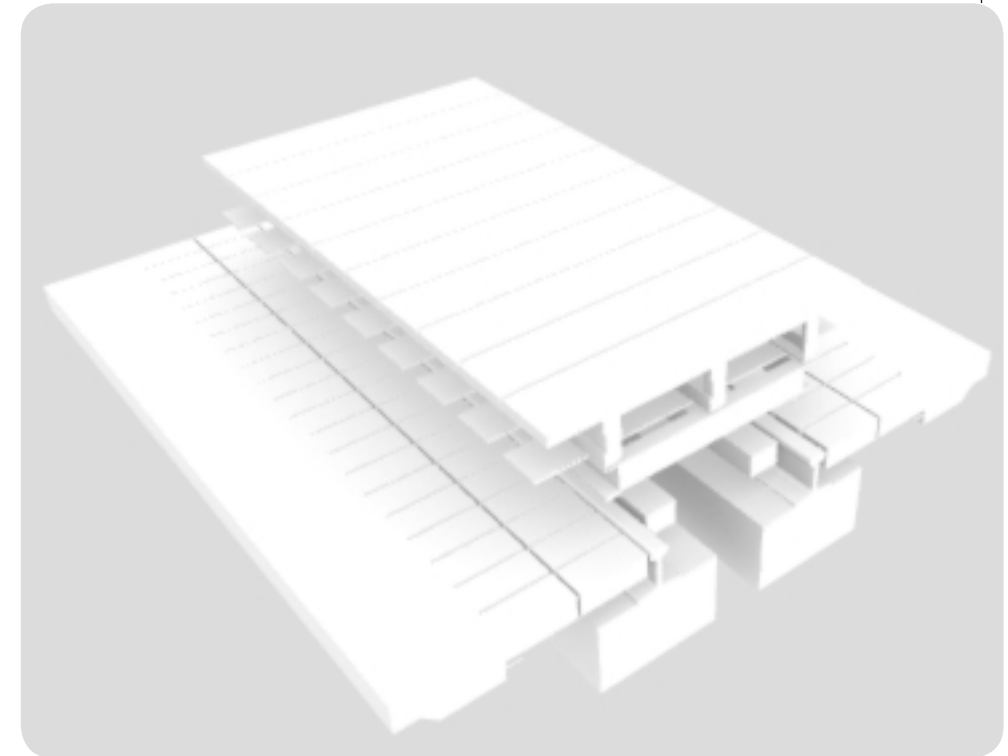
The street furniture design is seen as an approach to industrial heritage commemoration, as this will be the components used throughout the landscape to guide visitors.



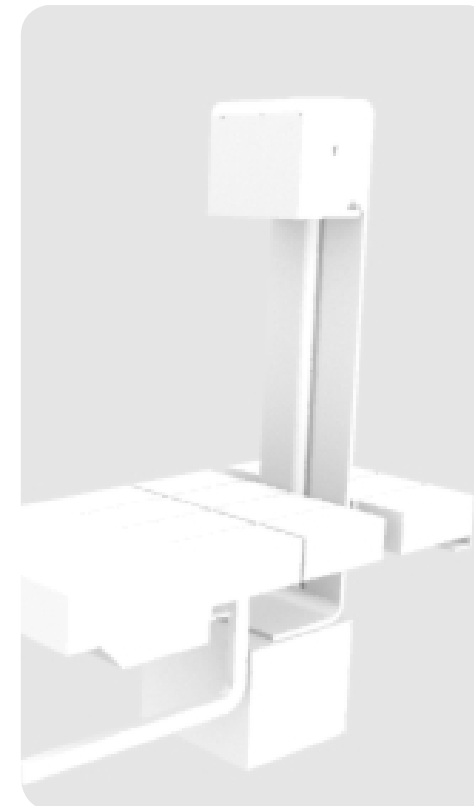
06.24. Balustrade 3D



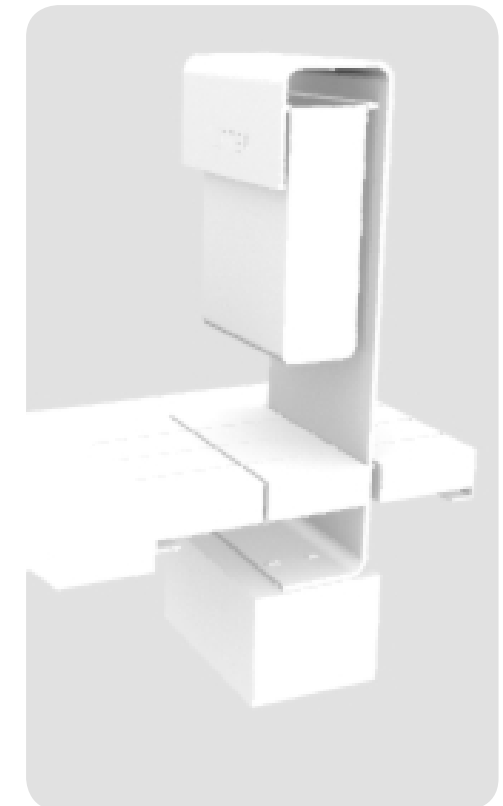
06.25. Bollard 3D



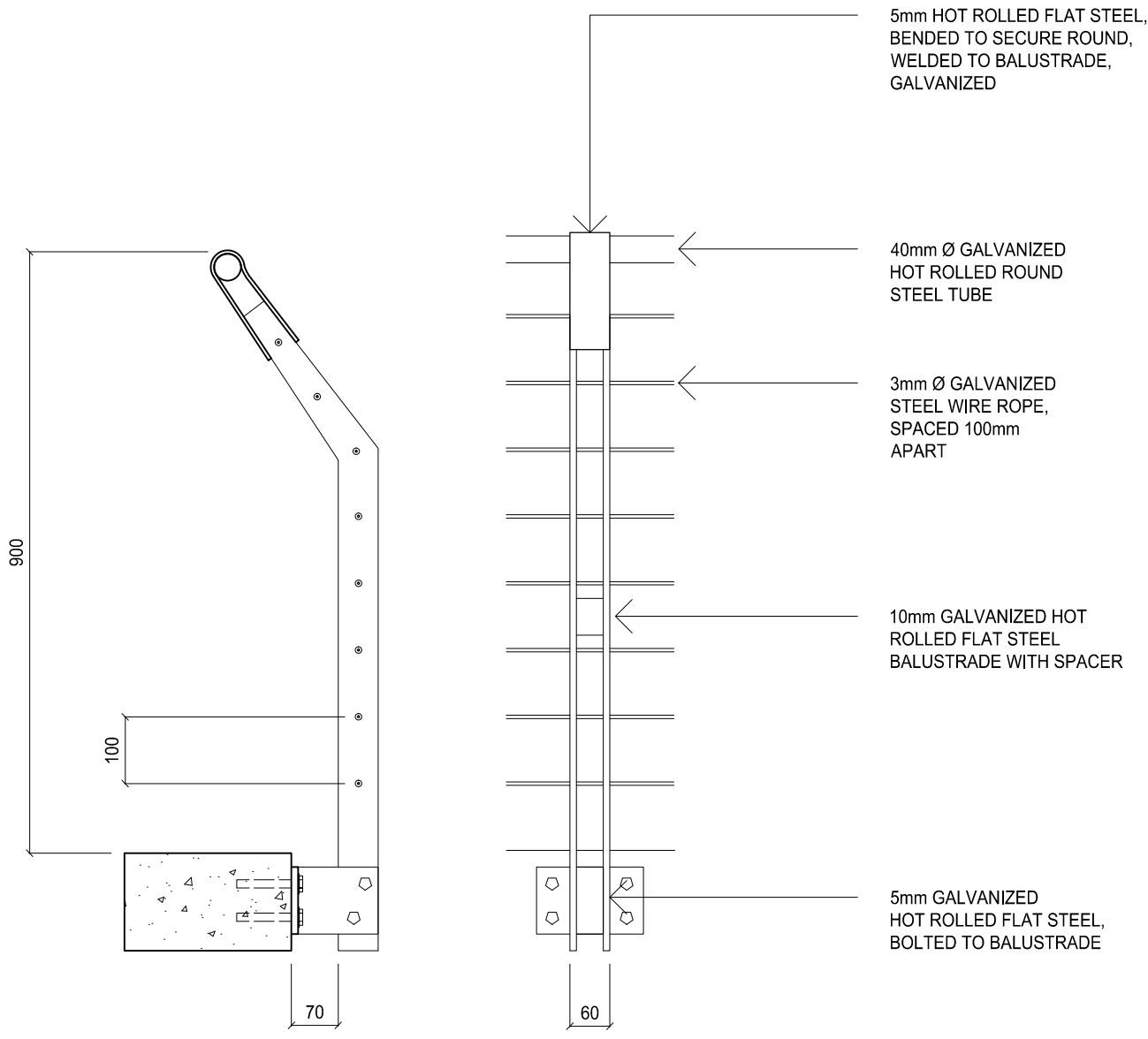
06.26. Bench 3D



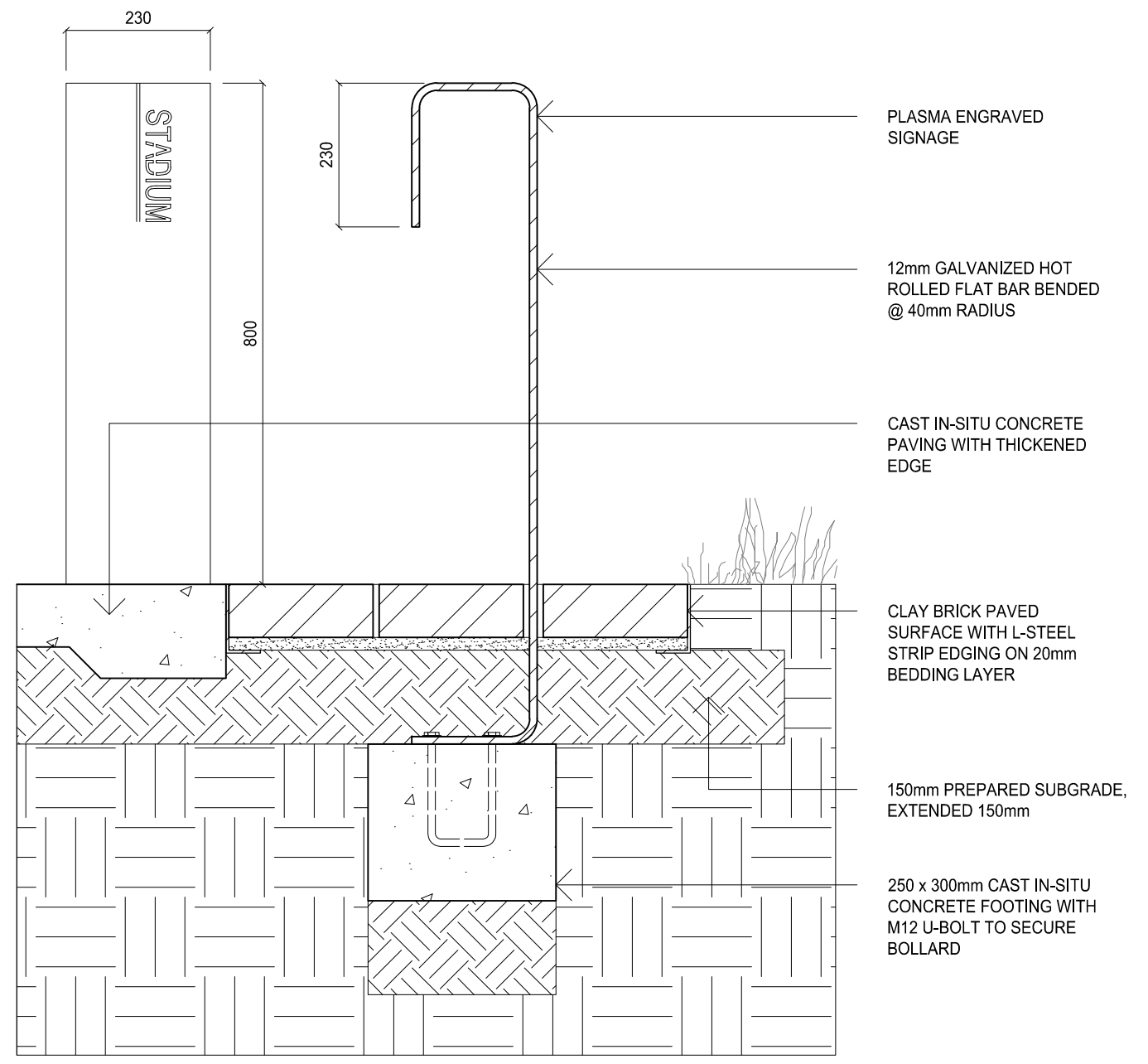
06.27. Bollard with Light 3D

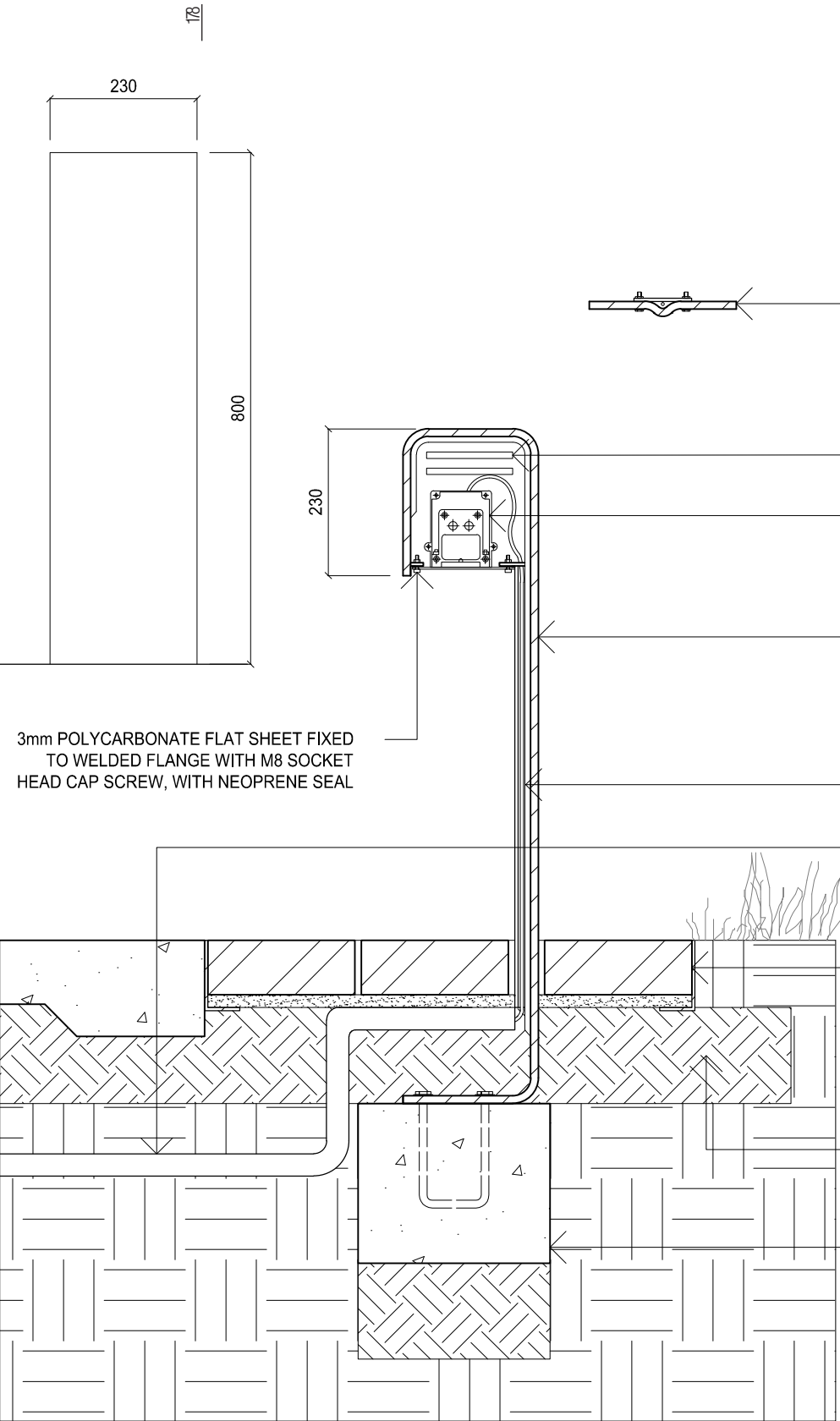


06.28. Bin 3D



06.29. Balustrade 1:10





BOLLARD STRUCTURE BENDED @ 20mm DOWN THE MIDDLE TO ACCOMMODATE ELECTRICAL WIRE, CLOSED WITH GALVANIZED HOT ROLLED FLAT BAR AND M6 HEX BOLTS AND M.S. WASHERS

PLASMA CUT VENTILATION LINES WITH MESH

92mm x 107mm STAINLESS STEEL FRAMED LED PACE LIGHT

12mm GALVANIZED HOT ROLLED FLAT BAR BENDED @ 40mm RADIUS

POWER CABLE

40mm Ø PVC PIPE FOR ELECTRIC SUPPLY

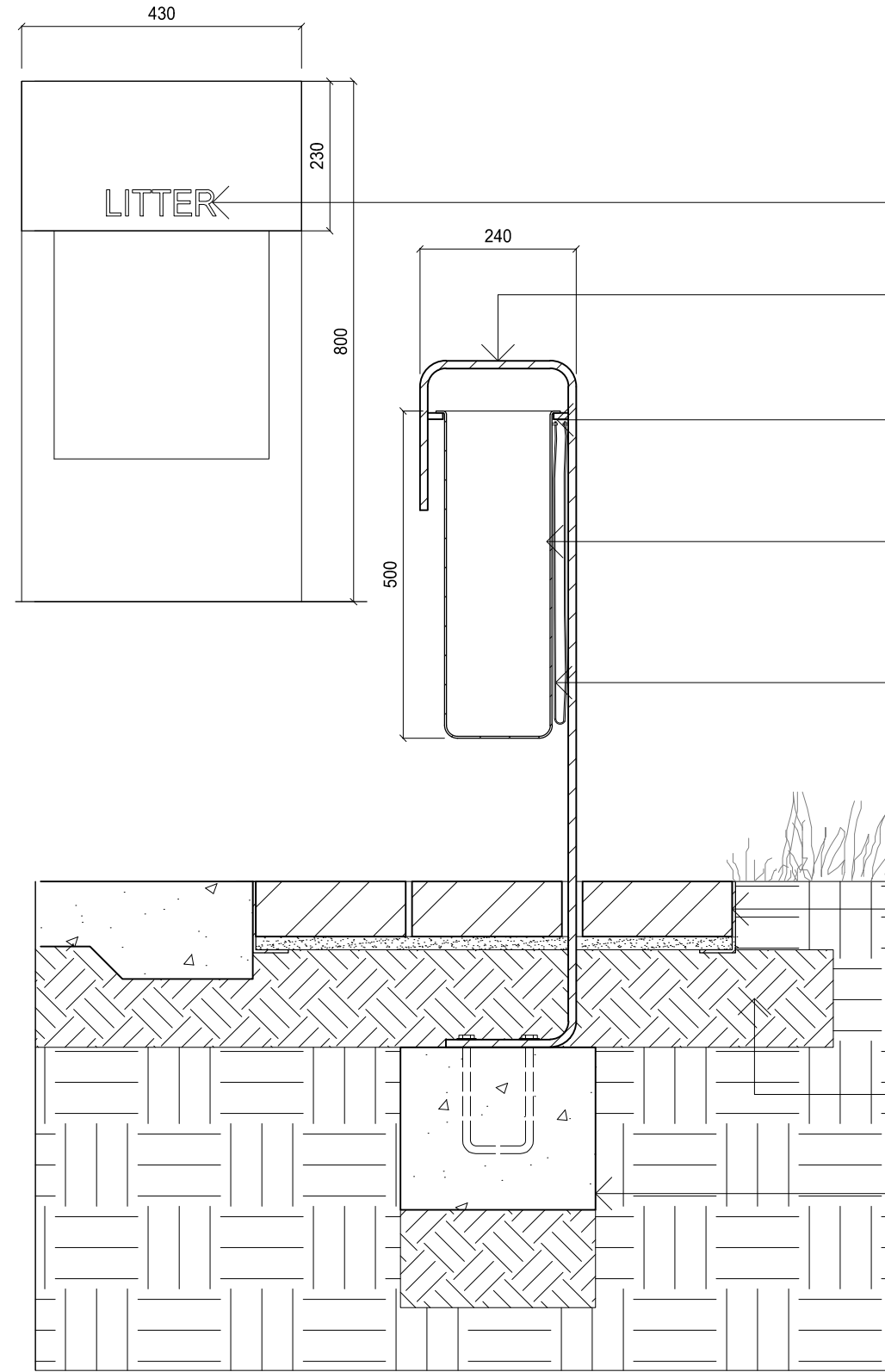
CLAY BRICK PAVED SURFACE WITH L-STEEL STRIP EDGING ON 20mm BEDDING LAYER

150mm PREPARED SUBGRADE, EXTENDED 150mm

250 x 300mm CAST IN-SITU CONCRETE FOOTING WITH M12 U-BOLT TO SECURE BOLLARD

3mm POLYCARBONATE FLAT SHEET FIXED TO WELDED FLANGE WITH M8 SOCKET HEAD CAP SCREW, WITH NEOPRENE SEAL

06.31. Bollard with Light 1:10



PLASMA ENGRAVED SIGNAGE

12mm GALVANIZED HOT ROLLED FLAT BAR BENDED @ 40mm RADIUS FOR EXTERIOR STRUCTURE

10mm GALVANIZED HOT ROLLED FLAT BAR WELDED TO THE EXTERIOR STRUCTURE

3mm GALVANIZED HOT ROLLED FLAT BAR BENDED @ 20mm RADIUS FOR BIN STRUCTURE WITH 5mm DRAINAGE HOLES

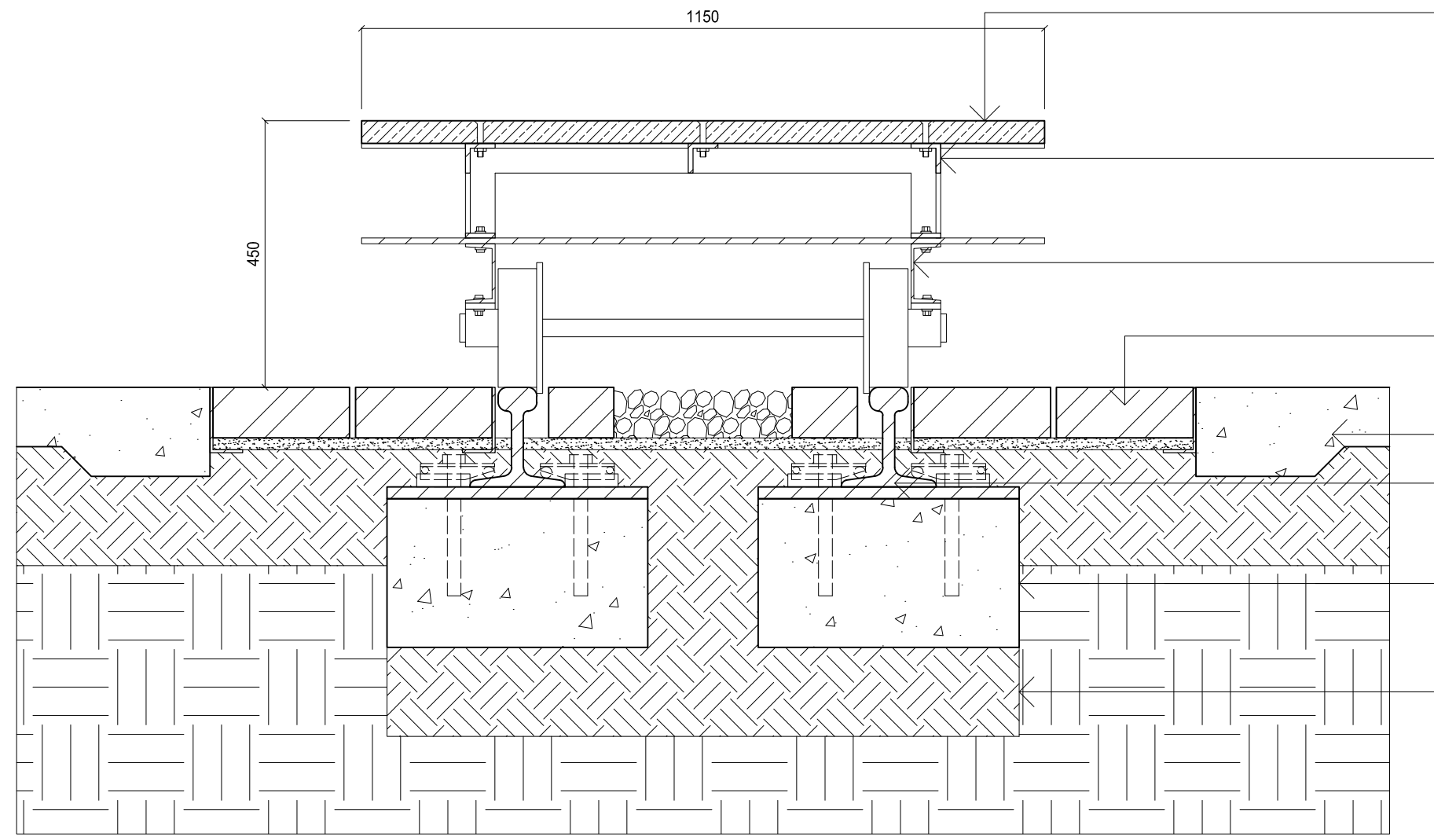
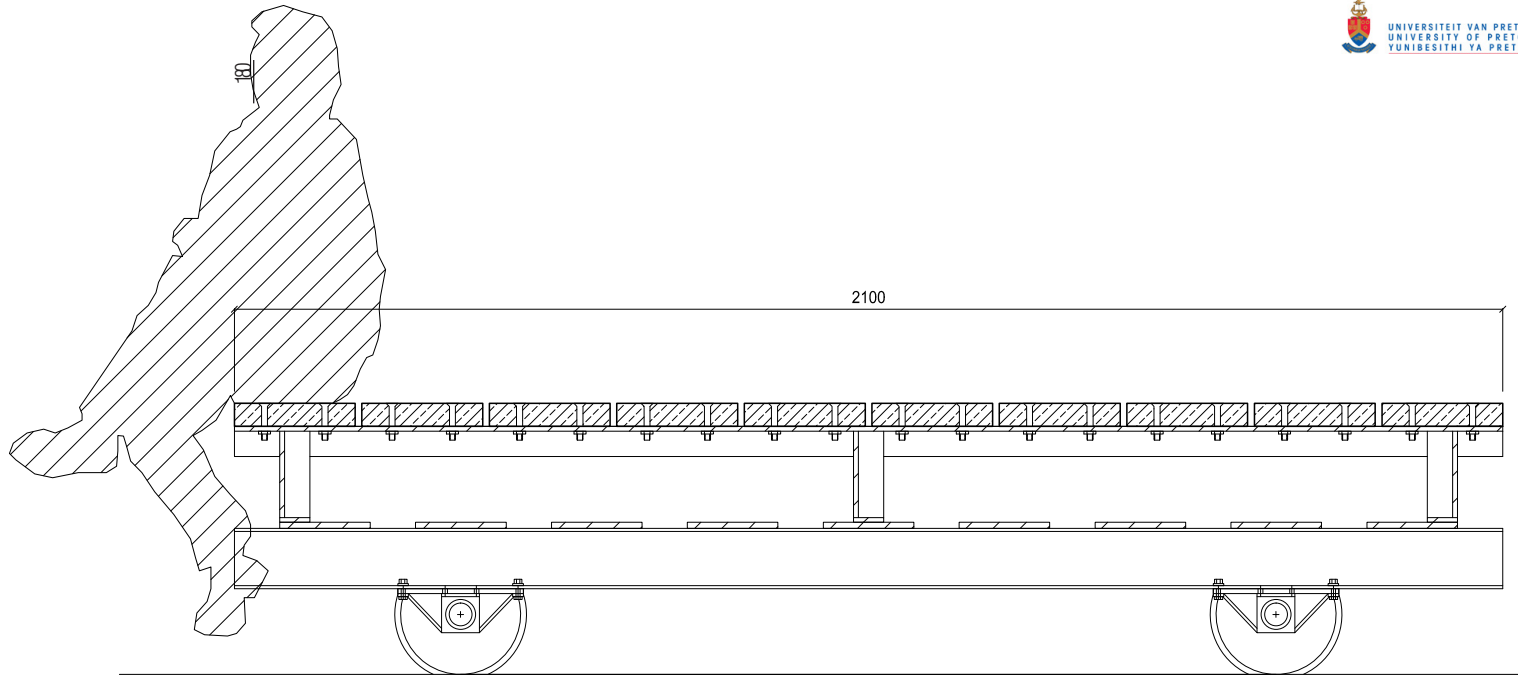
GALVANIZED CHAIN BOLTED TO BIN AND BIN STRUCTURE

CLAY BRICK PAVED SURFACE WITH L-STEEL STRIP EDGING ON 20mm BEDDING LAYER

150mm PREPARED SUBGRADE, EXTENDED 150mm

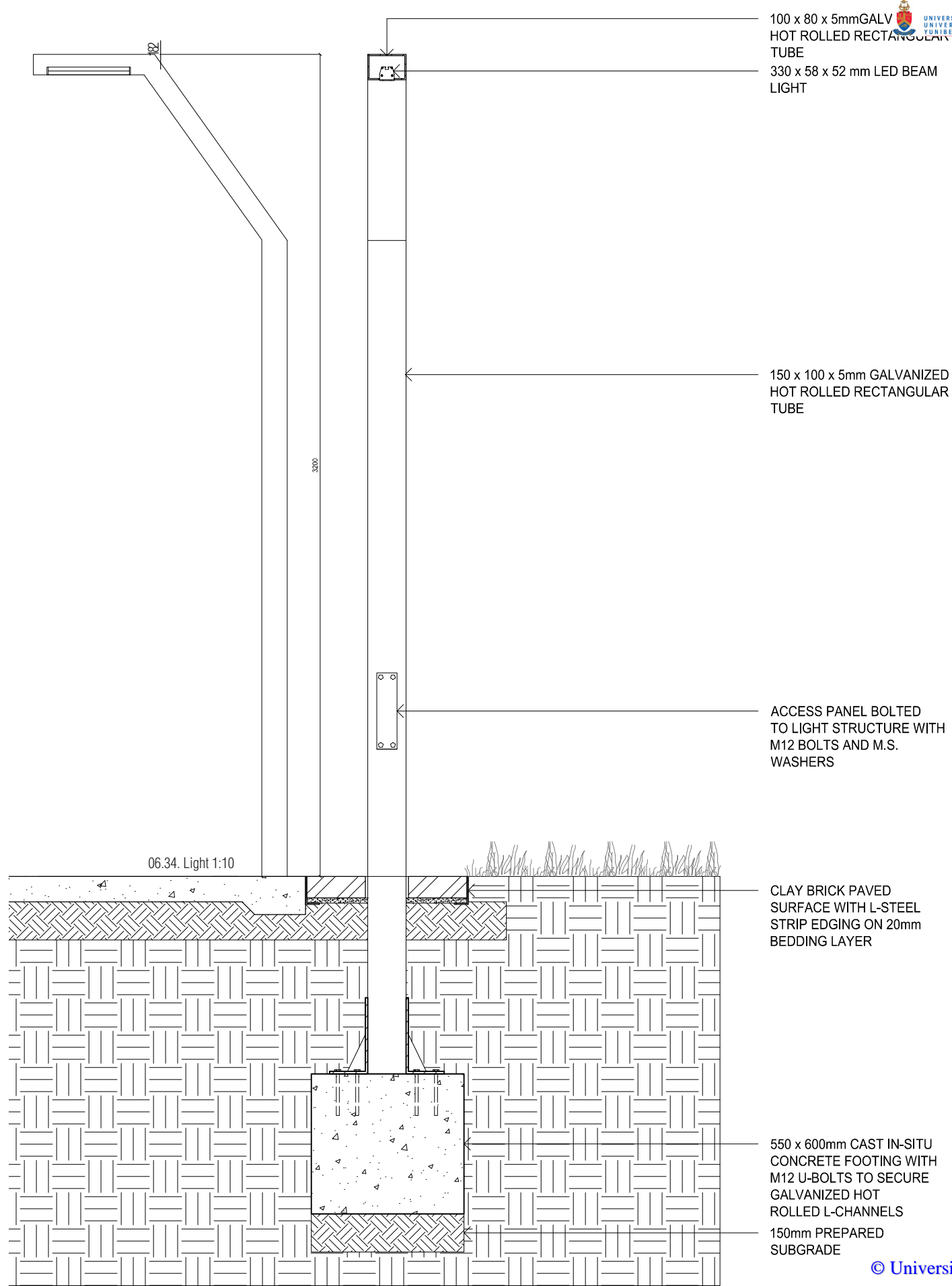
250 x 300mm CAST IN-SITU CONCRETE FOOTING WITH M12 U-BOLT TO SECURE BOLLARD

06.32. Bin 1:10

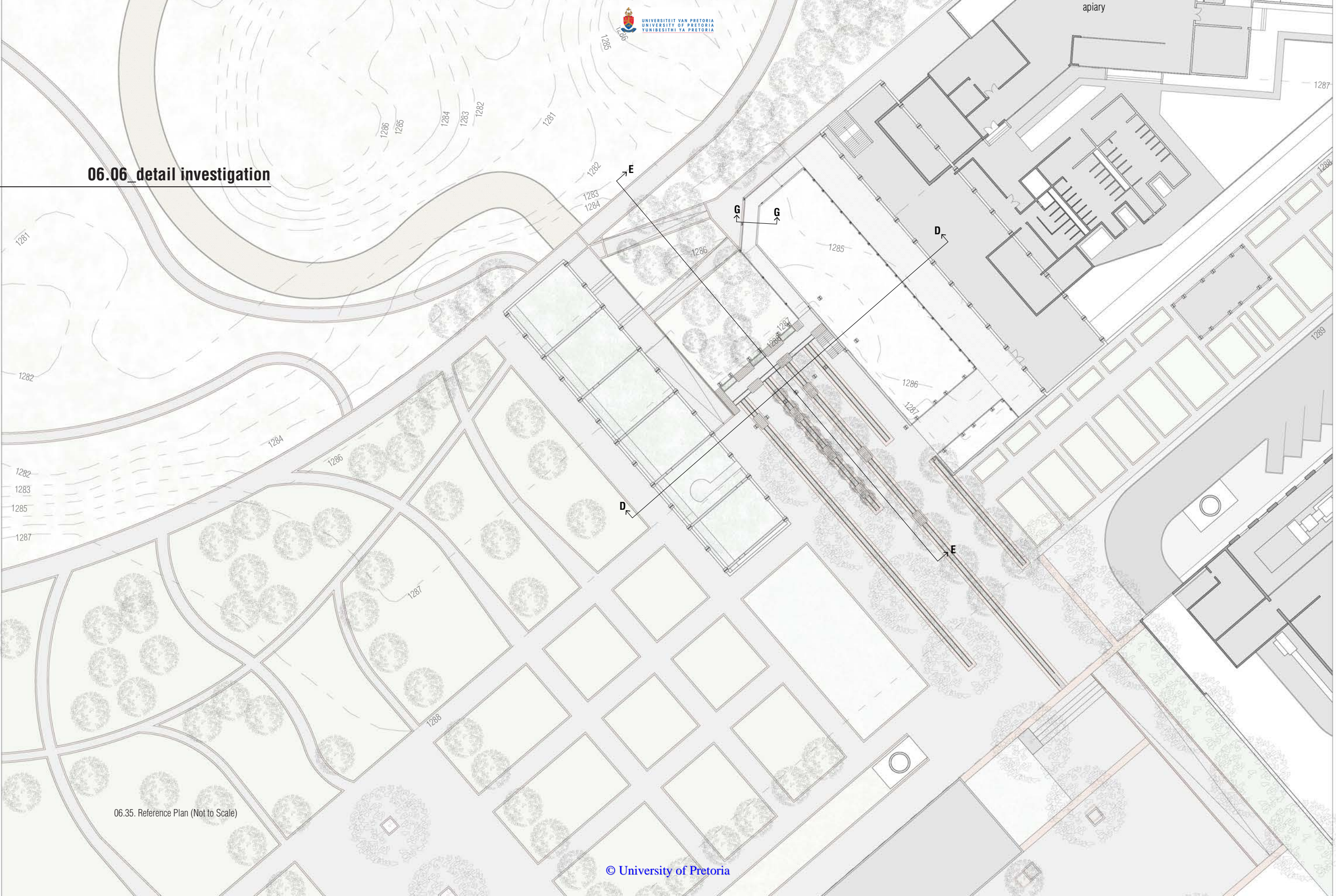


- 38 x 200 x 1150mm *Eucalyptus grandis* TIMBER PLANKS FIXED TO BENCH FRAME WITH M10 COUNTERSUNK BOLT AND NUT
- 50 x 50 x 8mm GALVANIZED HOT ROLLED EQUAL ANGLE WELDED FRAME, BOLTED WITH M10 HEXAGON BOLTS TO EXISTING TROLLEY RE-USED KILN TROLLEY TO BE ADAPTED INTO BENCH, WELDED INTO PLACE
- CLAY BRICK PAVED SURFACE WITH L-STEEL STRIP EDGING ON 20mm BEDDING LAYER
- CAST IN-SITU CONCRETE WITH THICKENED EDGE
- RE-USED EXISTING RAILS SECURED INTO PLACE WITH FLAT RAIL CLAMPS
- 250 x 450mm CAST IN-SITU CONCRETE FOOTING WITH HEX BOLT AND FLAT RAIL CLAMP
- 150mm PREPARED SUBGRADE

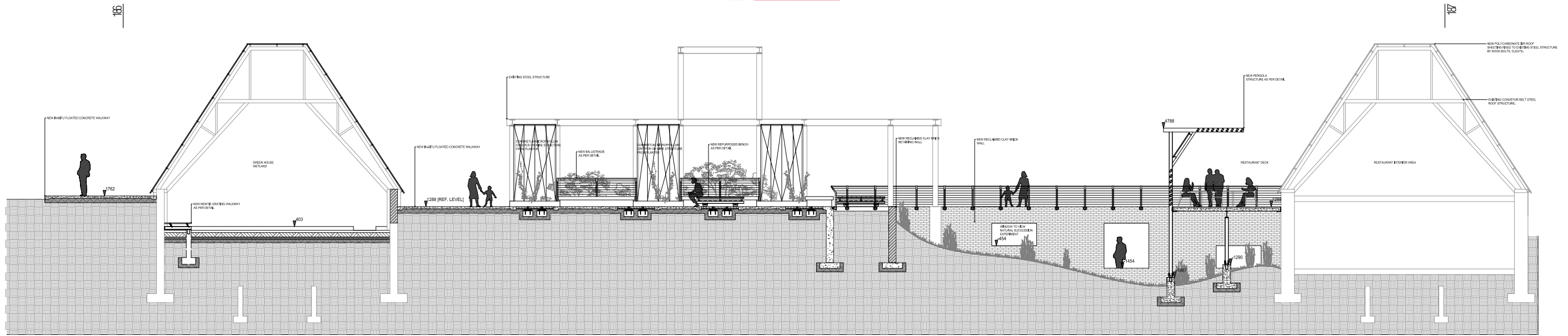
06.33. Bench 1:10



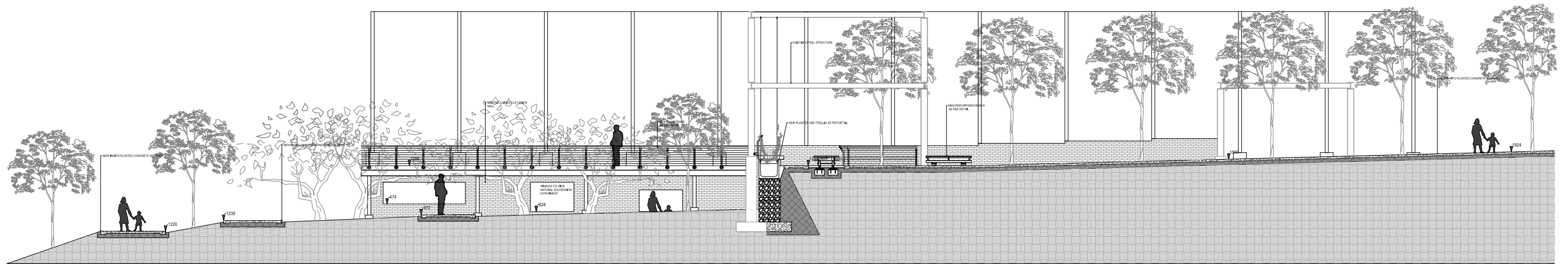
06.06_detail investigation



06.35. Reference Plan (Not to Scale)



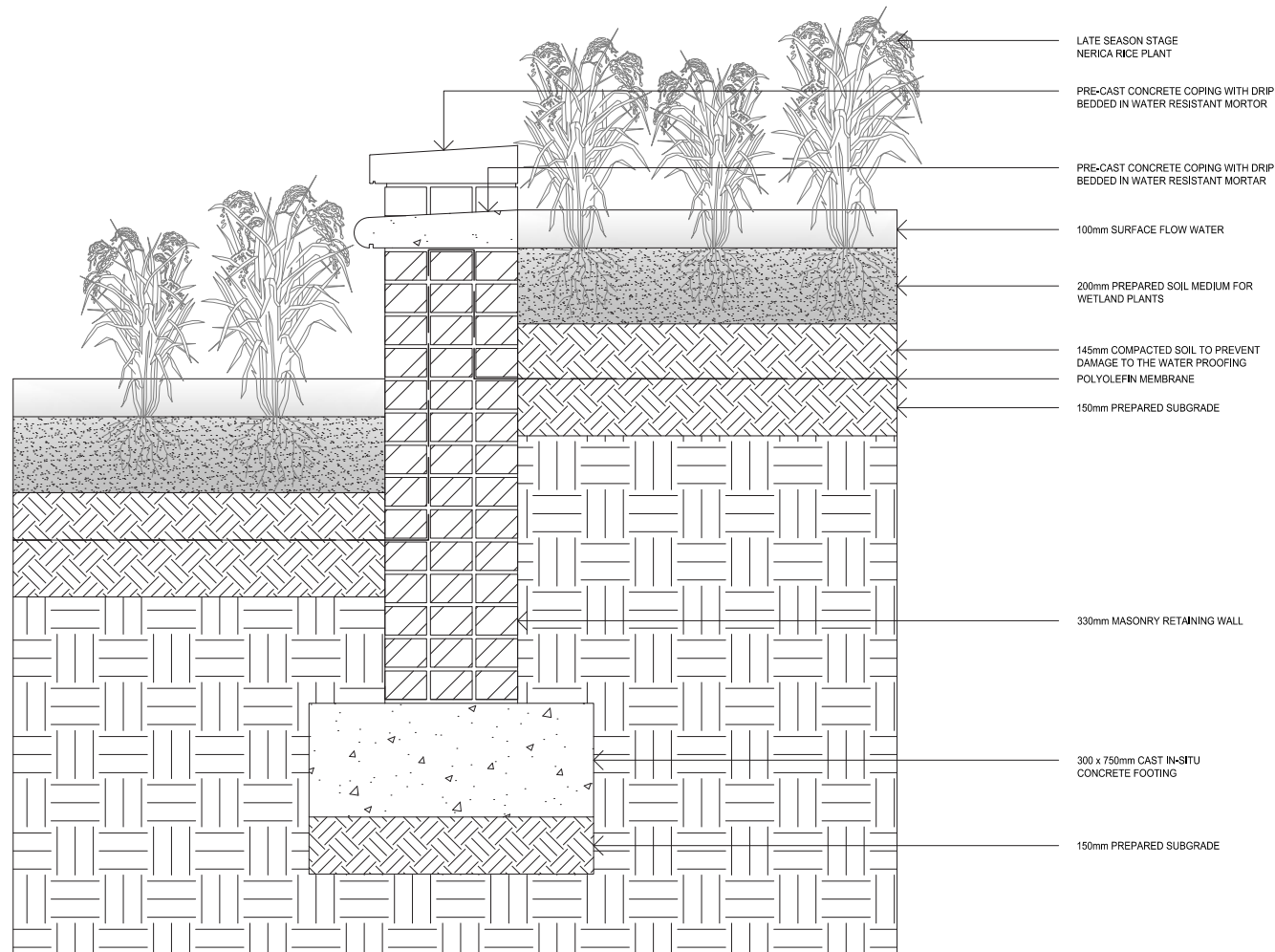
06.36. Reference Section D-D (Not to Scale)



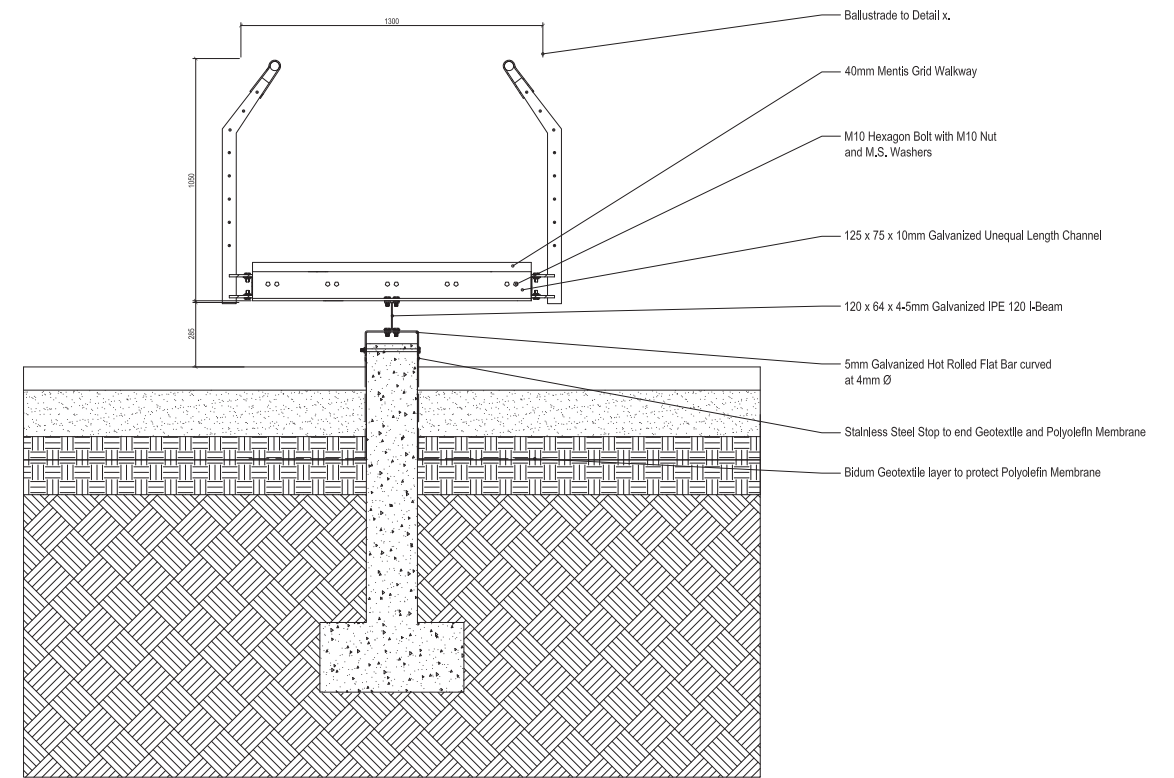
06.37. Reference Section E-E (Not to Scale)

The detail development for the sketch plan is explained in accordance with the three areas created within the design, to communicate how the experiences are created that will answer the three questions stated in the beginning of this chapter.

HUMAN EXPERIENCE AND COMFORT

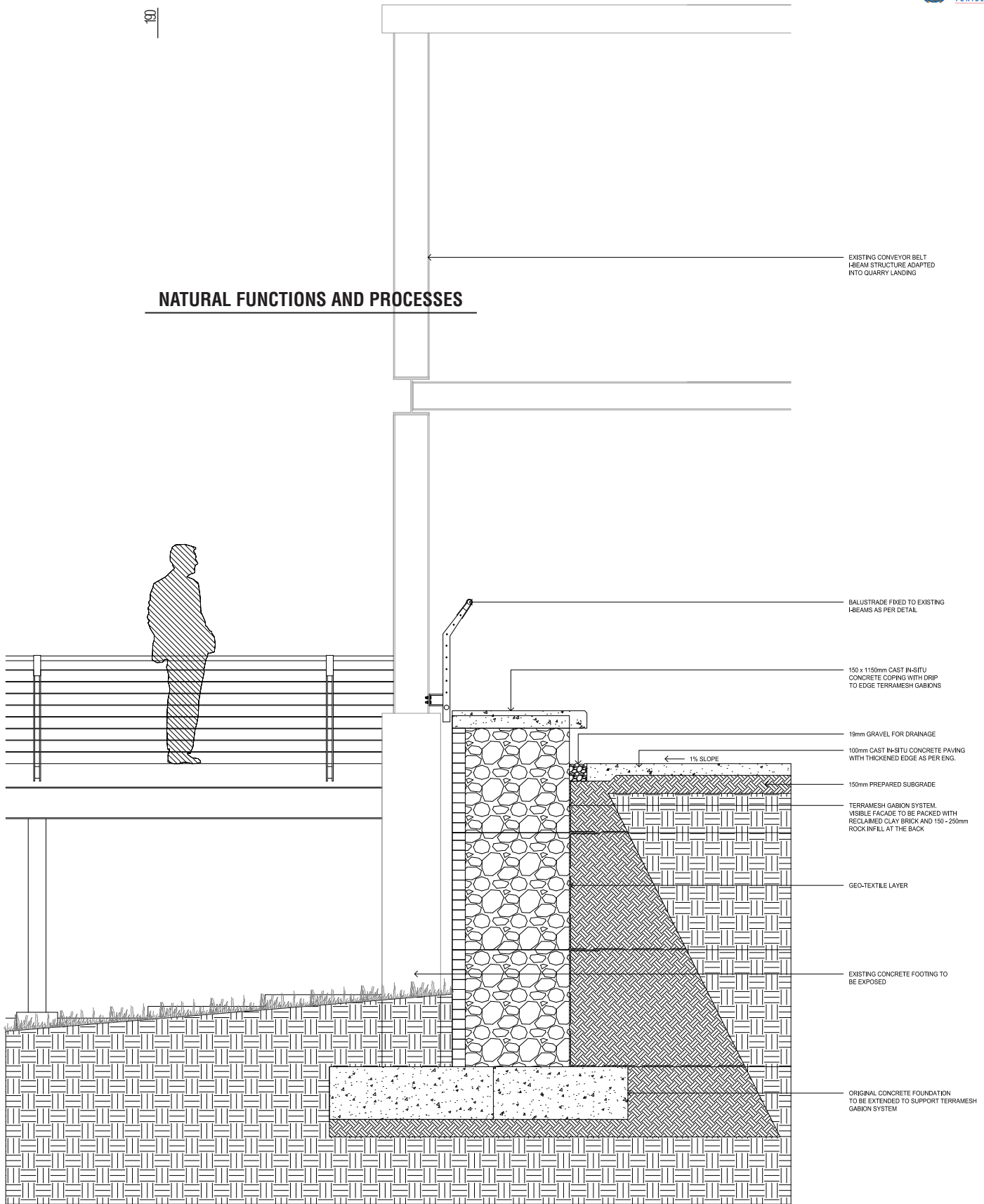


06.38. Wetland Wier and Retaining Wall (Not to Scale)

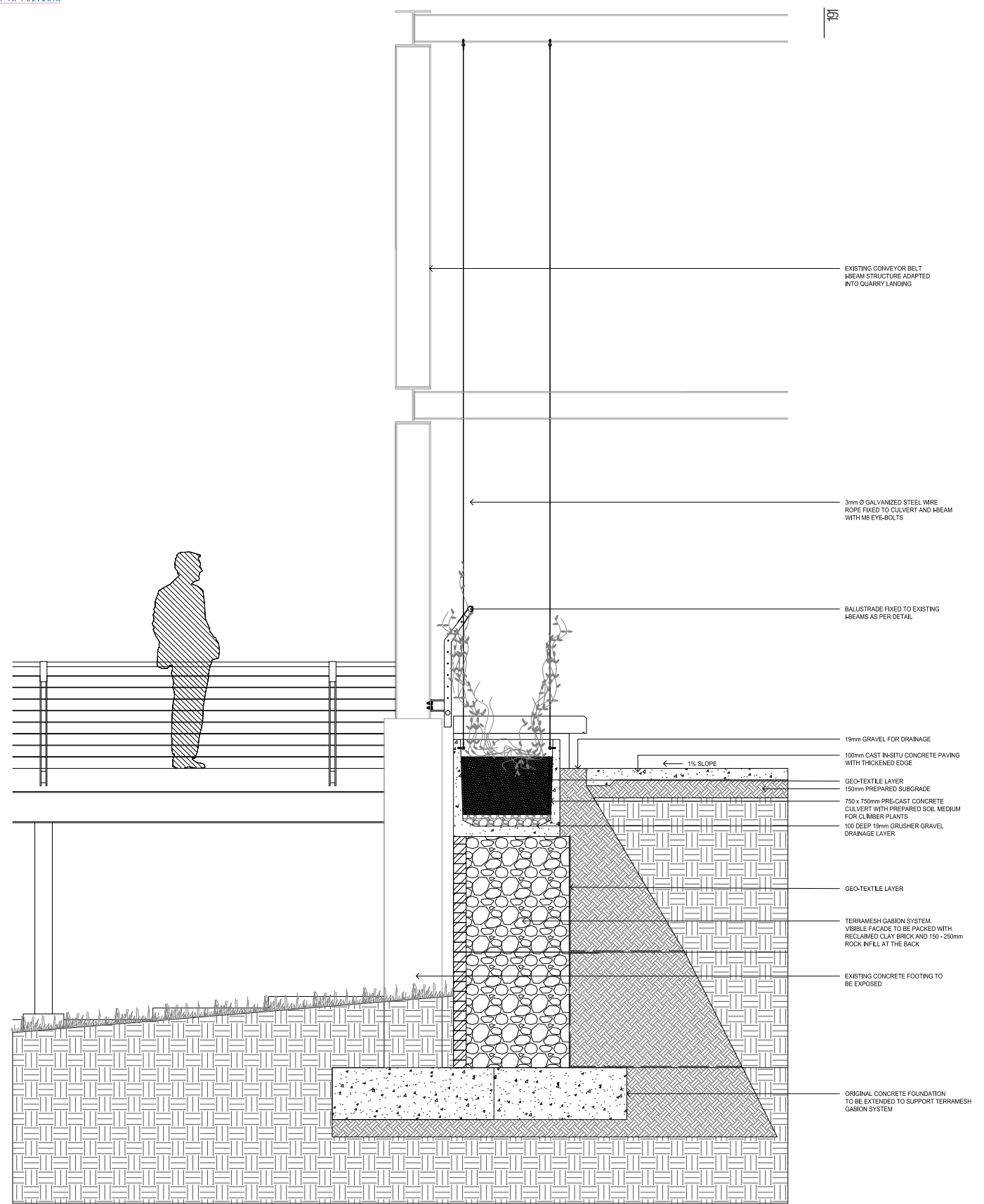


06.39. Wetland Public Walkway (Not to Scale)

NATURAL FUNCTIONS AND PROCESSES

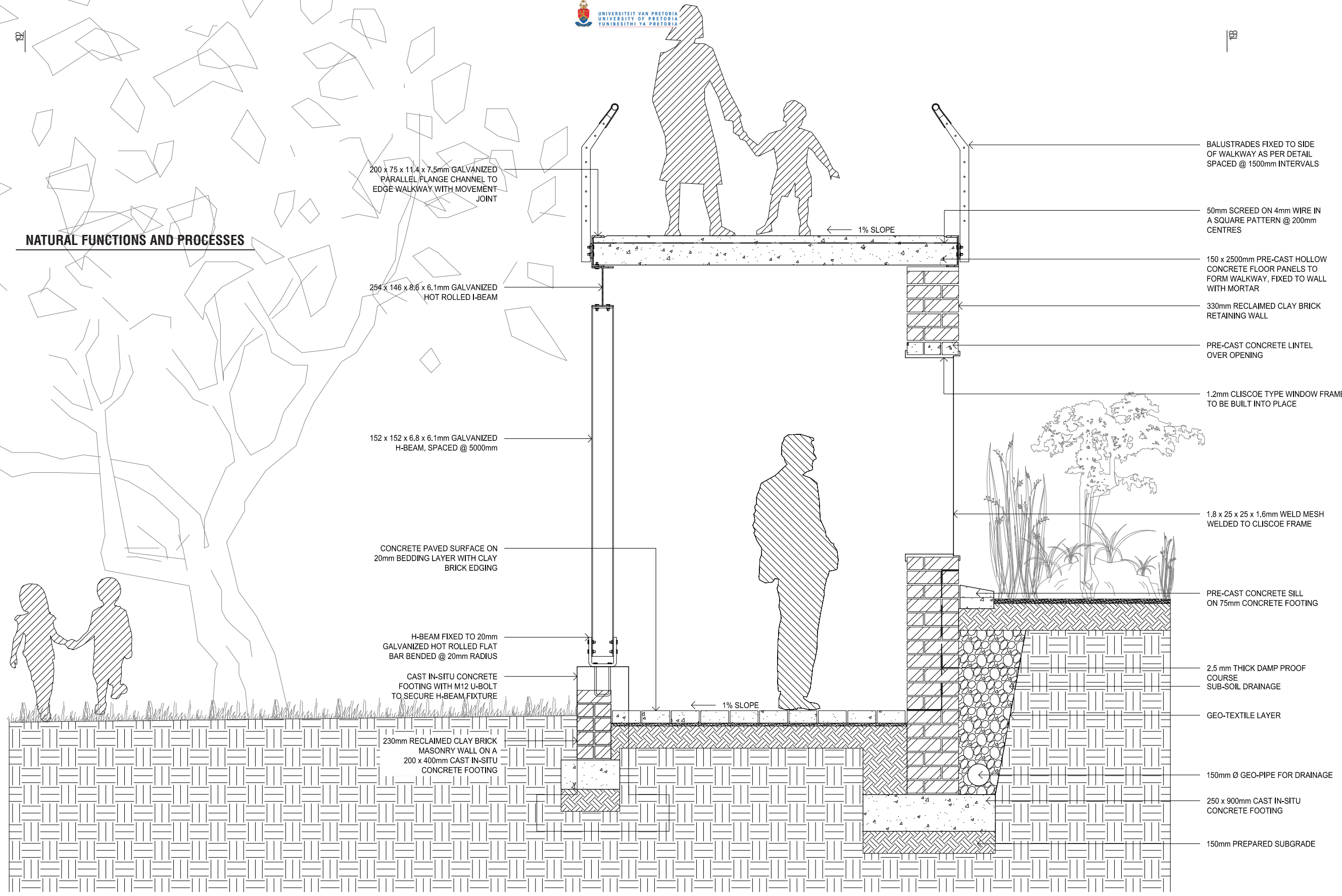


06.40. Transitional Landscape Retaining Wall (Not to Scale)



06.41. Transitional Landscape Retaining Wall with Planter (Not to Scale)

NATURAL FUNCTIONS AND PROCESSES



200 x 75 x 11.4 x 7.5mm GALVANIZED
PARALLEL FLANGE CHANNEL TO
EDGE WALKWAY WITH MOVEMENT
JOINT

254 x 146 x 8.6 x 6.1mm GALVANIZED
HOT ROLLED I-BEAM

152 x 152 x 6.8 x 6.1mm GALVANIZED
H-BEAM, SPACED @ 5000mm

CONCRETE PAVED SURFACE ON
20mm BEDDING LAYER WITH CLAY
BRICK EDGING

H-BEAM FIXED TO 20mm
GALVANIZED HOT ROLLED FLAT
BAR BENDED @ 20mm RADIUS

CAST IN-SITU CONCRETE
FOOTING WITH M12 U-BOLT
TO SECURE H-BEAM FIXTURE

230mm RECLAIMED CLAY BRICK
MASONRY WALL ON A
200 x 400mm CAST IN-SITU
CONCRETE FOOTING

BALUSTRADES FIXED TO SIDE
OF WALKWAY AS PER DETAIL
SPACED @ 1500mm INTERVALS

50mm SCREED ON 4mm WIRE IN
A SQUARE PATTERN @ 200mm
CENTRES

150 x 2500mm PRE-CAST HOLLOW
CONCRETE FLOOR PANELS TO
FORM WALKWAY, FIXED TO WALL
WITH MORTAR

330mm RECLAIMED CLAY BRICK
RETAINING WALL

PRE-CAST CONCRETE LINTEL
OVER OPENING

1.2mm CLISCOE TYPE WINDOW FRAME
TO BE BUILT INTO PLACE

1.8 x 25 x 25 x 1.6mm WELD MESH
WELDED TO CLISCOE FRAME

PRE-CAST CONCRETE SILL
ON 75mm CONCRETE FOOTING

2.5 mm THICK DAMP PROOF
COURSE
SUB-SOIL DRAINAGE

GEO-TEXTILE LAYER

150mm Ø GEO-PIPE FOR DRAINAGE

250 x 900mm CAST IN-SITU
CONCRETE FOOTING

150mm PREPARED SUBGRADE

06.42. Elevated Walkway (Not to Scale)

In order to create desired conditions for humans and nature a sun angle study was executed to determine the height and size of the desired pergola (Detail 8) on the restaurant deck.

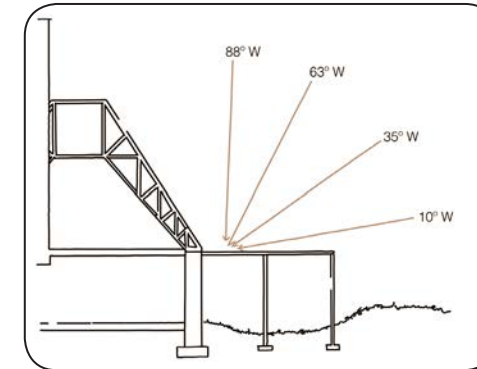
Table 06.01. shows the Sun Angles for Pretoria on a Latitude of 26° South, adapted from Enviro-Friendly Methods in Small Building Design for South Africa (Napier 2000:4.10)

Solar Times	06:00	08:00	10:00	12:00	14:00	16:00	18:00
Clock Times	06:18	08:18	10:18	12:18	14:18	16:18	18:18
Azimuth - 21 December	112 E	101 E	91 E	0	91 W	101 W	112 W
Altitude - 21 December	10	35	63	88	63	35	10
Azimuth - 21 March/September	90 E	76 E	53 E	0	53 W	76 W	90 W
Altitude - 21 March/September	0	26	51	65	51	26	0
Azimuth - 21 June	N/A	55 E	34 E	0	34 W	55 W	N/A
Altitude -21 June	N/A	14	32	40	32	14	N/A

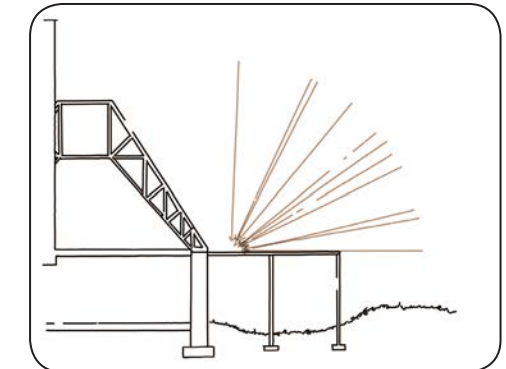
06.01. Pretoria Sun Angles

Figure 06.24 illustrates the results of the sun angle study that will be taken further into the detail development of the natural functions and processes design elements.

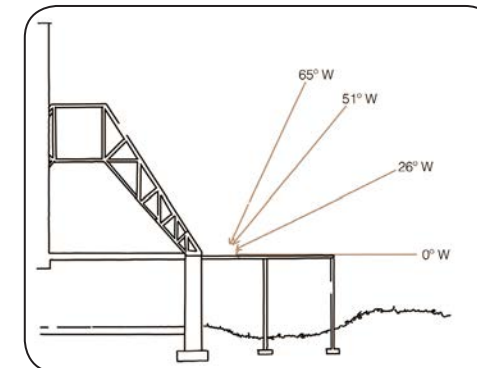
21 DESEMBER



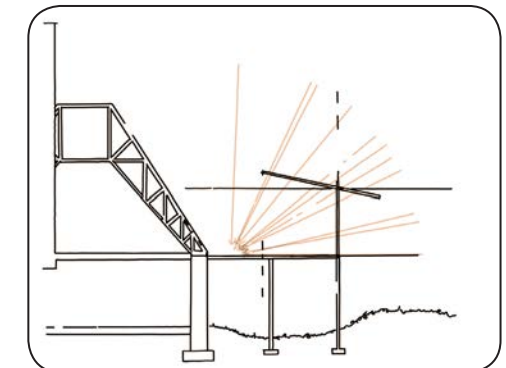
COMBINED SUN ANGLES



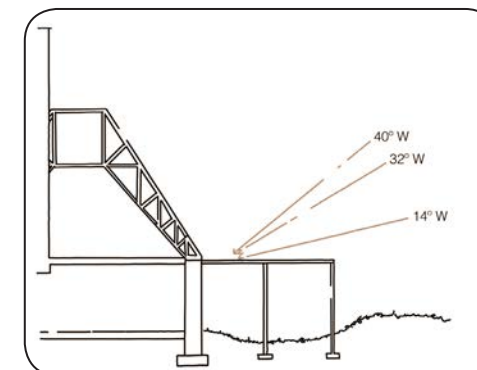
21 MARCH/SEPTEMBER



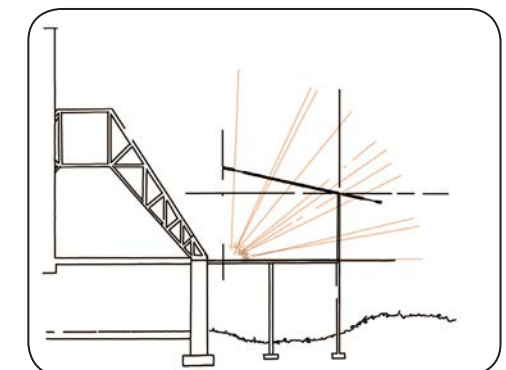
PROPOSED SHORT PERGOLA



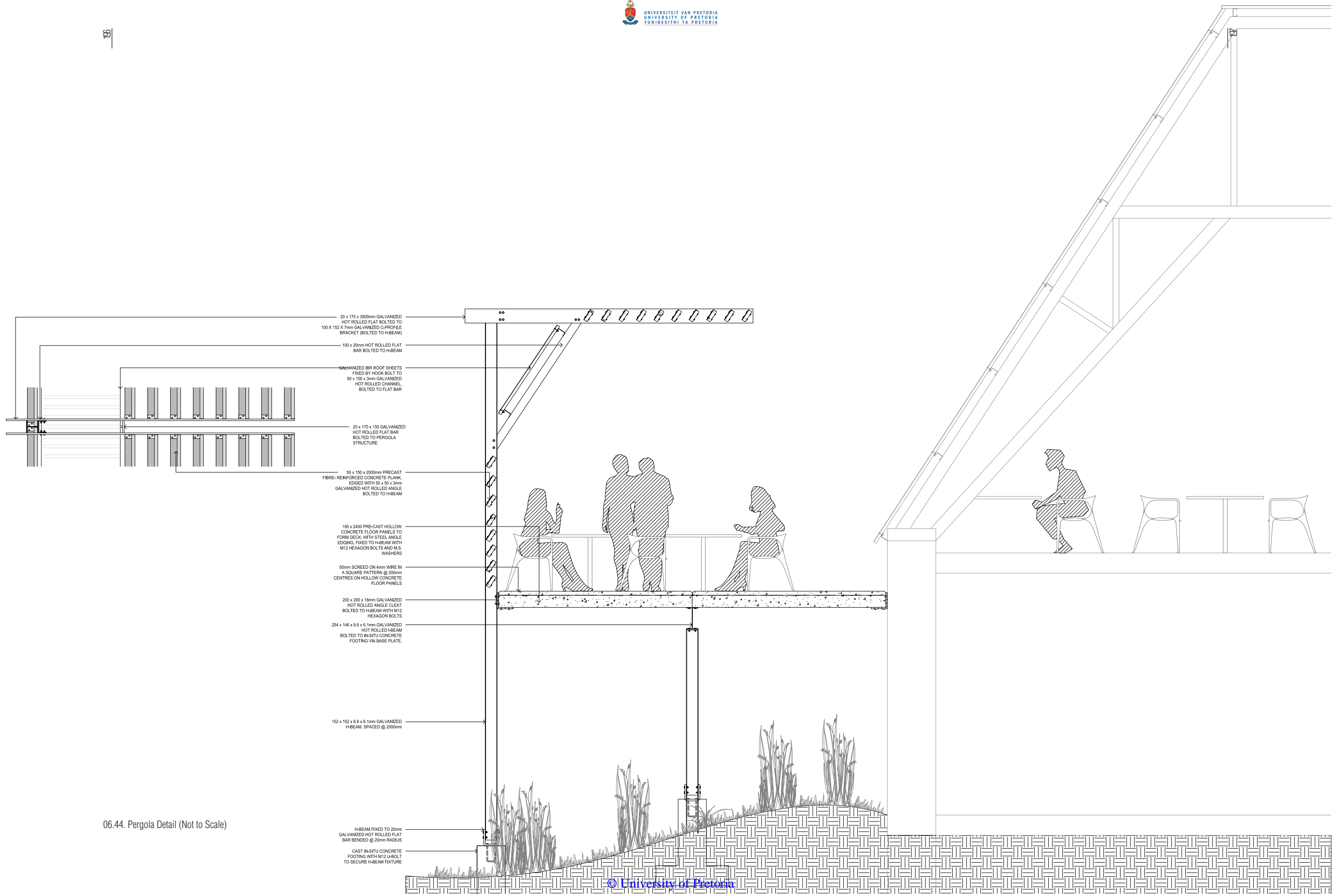
21 JUNE



PROPOSED LONG PERGOLA

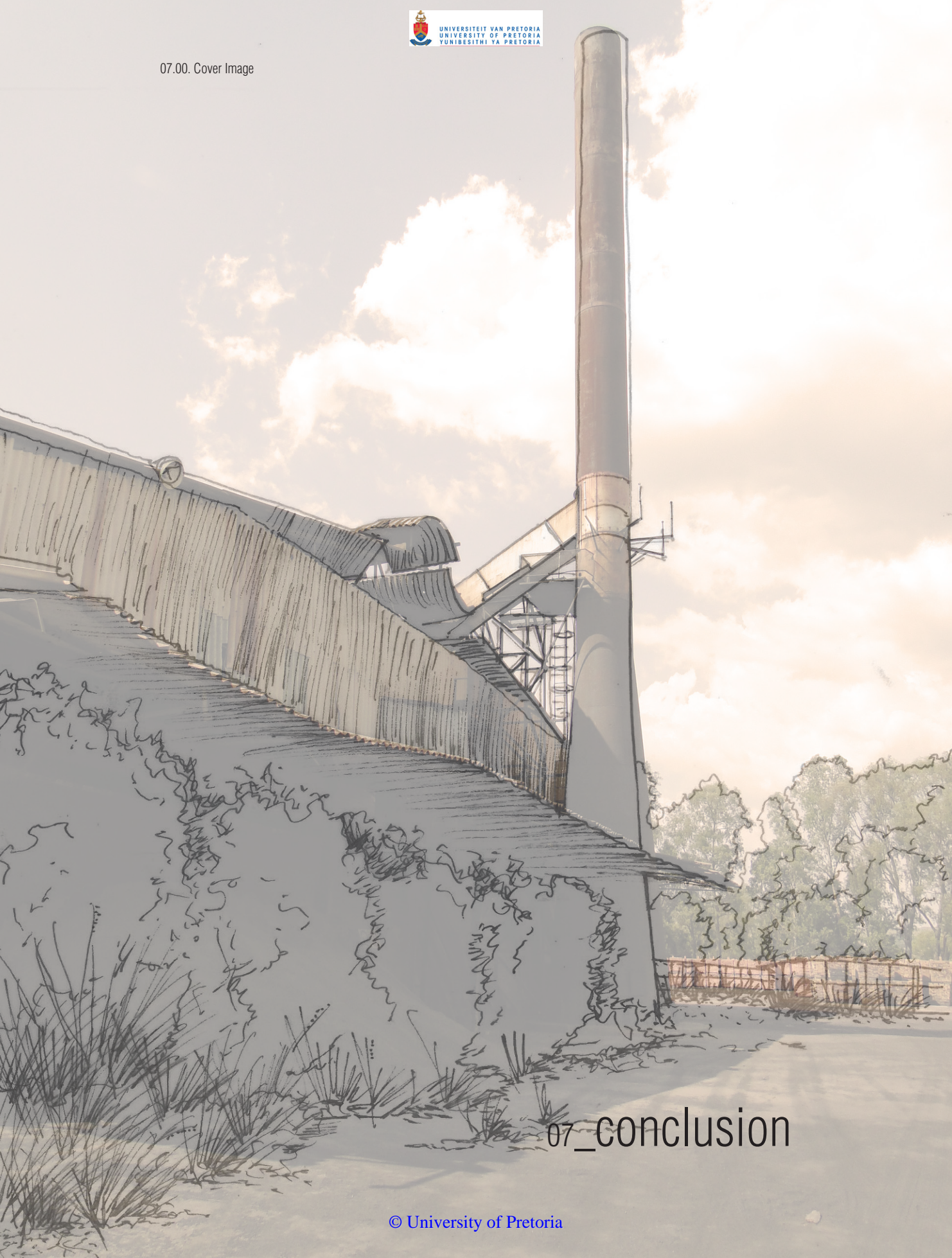


06.43. Shadow Analysis



- 20 x 175 x 3500mm GALVANIZED HOT ROLLED FLAT BOLTED TO 100 X 152 X 7mm GALVANIZED C-PROFILE BRACKET (BOLTED TO H-BEAM)
- 100 x 20mm HOT ROLLED FLAT BAR BOLTED TO H-BEAM
- GALVANIZED IFR ROOF SHEETS FIXED BY HOOK BOLT TO 50 x 100 x 3mm GALVANIZED HOT ROLLED CHANNEL, BOLTED TO FLAT BAR
- 20 x 170 x 150 GALVANIZED HOT ROLLED FLAT BAR BOLTED TO PERGOLA STRUCTURE
- 50 x 150 x 2000mm PRECAST FIBRE-REINFORCED CONCRETE PLANK, EDGED WITH 50 x 50 x 3mm GALVANIZED HOT ROLLED ANGLE BOLTED TO H-BEAM
- 150 x 2400 PRE-CAST HOLLOW CONCRETE FLOOR PANELS TO FORM DECK, WITH STEEL ANGLE EDGING, FIXED TO H-BEAM WITH M12 HEXAGON BOLTS AND M.S. WASHERS
- 50mm SCREED ON 4mm WIRE IN A SQUARE PATTERN @ 200mm CENTRES ON HOLLOW CONCRETE FLOOR PANELS
- 200 x 200 x 18mm GALVANIZED HOT ROLLED ANGLE CLEAT BOLTED TO H-BEAM WITH M12 HEXAGON BOLTS
- 254 x 146 x 8.8 x 6.1mm GALVANIZED HOT ROLLED H-BEAM BOLTED TO IN-SITU CONCRETE FOOTING VIA BASE PLATE.
- 152 x 152 x 6.8 x 6.1mm GALVANIZED H-BEAM, SPACED @ 2000mm
- H-BEAM FIXED TO 20mm GALVANIZED HOT ROLLED FLAT BAR BENTED @ 20mm RADIUS
- CAST IN-SITU CONCRETE FOOTING WITH M12 L-BOLT TO SECURE H-BEAM FIXTURE

06.44. Pergola Detail (Not to Scale)



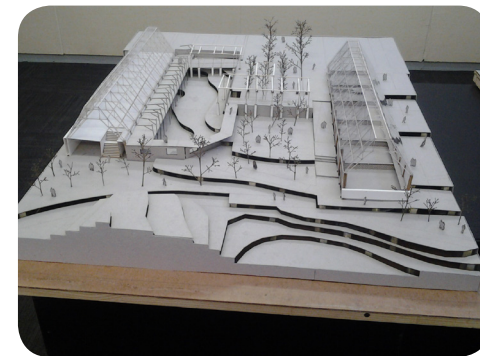
07_conclusion

07_conclusion

The aim of this dissertation was to reveal and celebrate the apparent and non-apparent relationships between humans and nature within the post-industrial landscape, so that humankind can be made aware of their unity with nature.

The theoretical discourse generated the approach that the post-industrial landscape should make non-apparent relationships more apparent to the visitor through the concepts of ecosystem services and commemorative design.

By creating a landscape intervention that create experiences to educate humans of the benefits and services the natural landscape provides, an appreciation for nature is established. The experiences gained from visiting the Era Regional Park could further establish memories within humans that could foster an identity within nature.



07.01. Final Presentation and Model Photographs



08_bibliography

08.01_list of figures

00_FRONT

00.00. The Post-industrial Vision (Author 2014)

01_INTRODUCTION

01.00. Cover Image (Author 2014)

01.01. Introducing Industry to Humankind (Author 2014)

01.02. Client Stake Holders Relations (Author 2014)

01.03. Study Area Location (Author 2014)

01.04. Methodology Diagram (Author 2014)

01.05. Research Investigation (Author 2014)

01.06. Design Approach (Author 2014)

02_THEORETICAL DISCOURSE

02.00. Cover Image (Author 2014)

02.01. Tipping the Slag by Edwin Butler Bayliss 1900-1945 (BBC 2014)

02.02. Apartheid Spatial Legacy (Image adapted from Beavon 1992:233 in Bremner 2007:20)

02.03. Land Use Section (Author 2014)

02.04. Richards Bay Forest Restoration (KwaZulu-Natal Top Business Portfolio 2014)

02.05. The Big Hole (The Big Hole: Kimberley 2014)

02.06. West Coast Fossil Park (Cape West Coast Biosphere 2013)

02.07. Johannesburg Mine Dumps (Colline Kook-Chun 2012)

02.08. Sint-Janshuis Mill (Author 2013)

02.09. Hoffman Kiln Chimney (Author 2014)

02.10. The Statue of Liberty (Wikipedia 2014)

02.11. Freedom Park (Author 2014)

02.12. The Connection between Commemoration and Identity (Author 2014)

02.13. Memory: Author's Own Representation of Identity (Author 2014)

02.14. New Perspectives, 1989/90 by M. R. Ernst (Berlin Wall Memorial 2014)

02.15. Pretoria Street Names Changes, by Gallo 2013 (Howzit MSN News 2013)

02.16. Former South African President Nelson Mandela Statue, by Thomas Mukoya 2013 (Times Live 2013)

02.17. Gardens of Versailles (Author 2013)

02.18. Fresh Kills Park (Field Operations 2006:11)

02.19. Père-Lachaise Cemetery (Cold Spring Press 2002)

02.20. Lodhi Gardens, by Rajesh Advani 2011 (R. Advani 2011)

02.21. Apparent and Non-Apparent Experiences (Author 2014)

02.22. Landscape and Memory by Trine Bumiller 2009 (Bullimer 2013)

02.23. Stalker by Andrei Tarkovsky 1979 (Wolfe 2011)

02.24. Factory Landscape Mountains by Francis Lee 2013 (Lee 2013)

02.25. Identity: Different Perception/representations of nature (Author 2014)

02.26. Ecosystem Services and Categories (Author 2014)

02.27. Example Illustration of a Green Infrastructure Framework (Author 2014)

02.28. Apparent and Non-Apparent Ecosystem Services Benefits (Author 2014)

02.29. Theory Diagram (Author 2014)

03_CONTEXT

03.00. Cover Image (Author 2014)

03.01. Silverton Boeremark Culture (Author 2014)

03.02. Timeline: Industrial Development of Pretoria, Silverton and Eersterust (Author 2014)

03.03. Era Brick Works Context (Author 2014)

03.04. Existing Processes (Author 2014)

03.05. Era Bricks being Decommissioned (Eersterust Urban Vision Group 2013)

03.06. Era Regional Park Proposal 2013 (Eersterust Urban Vision Group 2013)

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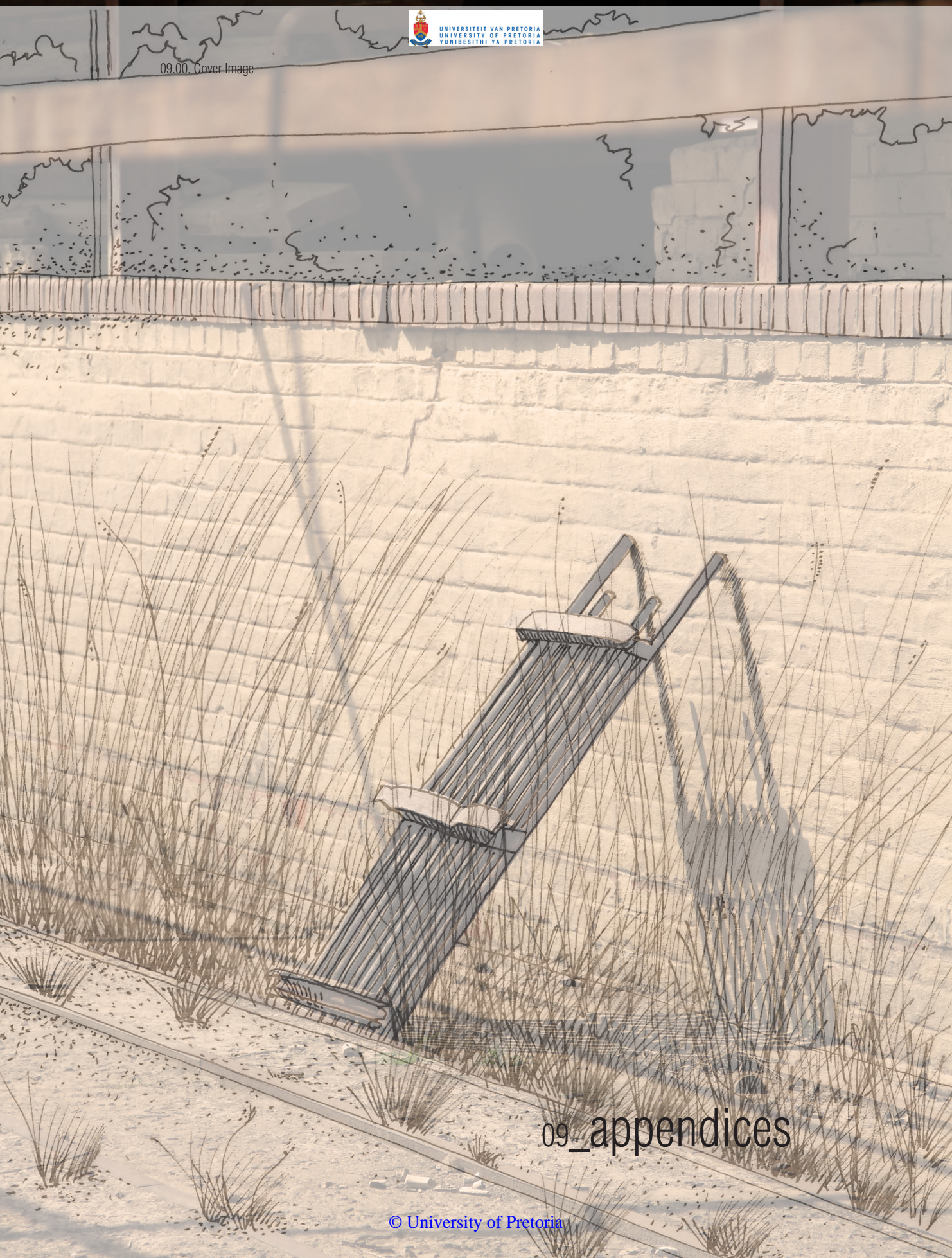
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09_appendices

09.01_SITES rating system

09.01.01_initial site rating

As described in Chapter 4, it became necessary to rate the quality and value of the remaining ecosystem services on the site.

The following illustrates the rating charts of the SITES vs. Rating System Results that was completed to estimate the value of the existing site conditions.

SITES v2 Scorecard										
Estimate points below (key at bottom)			PREREQUISITE OR CREDIT #	TITLE	CASE / OPTION / THRESHOLD	POINTS	POSSIBLE POINTS PER CREDIT			
YES	?	NO								
8	0	0	1: SITE CONTEXT				Possible Points:		13	
Y			CONTEXT P1.1	Limit development on farmland	Case 1: Sites without farmland soils Case 2: Sites with farmland soils - VSPZ Case 3: Sites with farmland soils - Mitigation					
Y			CONTEXT P1.2	Protect floodplain functions	Case 1: Sites without floodplain Case 2: Previously developed and brownfield sites within floodplain Case 3: Greenfield sites within floodplain					
Y			CONTEXT P1.3	Conserve aquatic ecosystems	Case 1: Sites without aquatic ecosystems Case 2: Sites with naturally occurring aquatic ecosystems Case 3: Sites with naturally occurring poor quality aquatic ecosystems					
Y			CONTEXT P1.4	Conserve habitats for threatened and endangered species	Case 1: Brownfields and previously developed sites Case 2: Greenfield sites					
6			CONTEXT C1.5	Redevelop degraded sites	Case 1: Previously developed sites Case 2: Brownfield sites	3	6	3 to 6		
0			CONTEXT C1.6	Locate projects within existing developed areas		4		4		
2			CONTEXT C1.7	Connect to multi-modal transit networks	Option 1: Pedestrian and bicycle network Option 2: Transit network	2	3	2 to 3		
0	0	0	2: PRE-DESIGN ASSESSMENT + PLANNING				Possible Points:		3	
Y			PRE-DESIGN P2.1	Use an integrative design process						
Y			PRE-DESIGN P2.2	Conduct a pre-design site assessment						
Y			PRE-DESIGN P2.3	Designate and communicate Vegetation and Soil Protection Zones						
0			PRE-DESIGN C2.4	Engage users and stakeholders		3		3		
4	0	0	3: SITE DESIGN - WATER				Possible Points:		23	
Y			WATER P3.1	Manage precipitation on site						
Y			WATER P3.2	Reduce water use for landscape irrigation						
0			WATER C3.3	Manage precipitation beyond baseline	80th percentile precipitation event 90th percentile precipitation event 95th percentile precipitation event	4	5	4 to 6		
0			WATER C3.4	Reduce outdoor water use	Option 1: Reduce outdoor water use Option 2: Significantly reduce outdoor water use Option 3: Eliminate outdoor water use	4	5	4 to 6		
0			WATER C3.5	Design functional stormwater features as amenities	50% of stormwater features 100% of stormwater features	4	5	4 to 5		
4			WATER C3.6	Restore aquatic ecosystems (project must have existing feature)	No aquatic ecosystems present on site 30% of the geographic extent 60% of the geographic extent 90% of the geographic extent		4	4 to 6		

YES	?	NO	PREREQUISITE OR CREDIT #	TITLE	CASE / OPTION / THRESHOLD	POINTS	POSSIBLE POINTS PER CREDIT
10	0	0	4: SITE DESIGN - SOIL + VEGETATION			Possible Points:	40
Y			SOIL+VEG P4.1	Create and communicate a soil management plan			
Y			SOIL+VEG P4.2	Control and manage invasive plants	Case 1: No invasive plants found on site Case 2: Invasive plants identified on site		
Y			SOIL+VEG P4.3	Use appropriate plants			
0			SOIL+VEG C4.4	Conserve healthy soils and appropriate vegetation (project must have existing feature)	No healthy soils and/or appropriate vegetation present on site 50% of the site's existing vegetated area 75% of the site's existing vegetated area 95% of the site's existing vegetated area	4 5 6	4 to 6
0			SOIL+VEG C4.5	Conserve special status vegetation (project must have existing feature)		4	4
3			SOIL+VEG C4.6	Conserve and use native plants	20% total native plant score 40% total native plant score 60% total native plant score	3 4 6	3 to 6
4			SOIL+VEG C4.7	Conserve and restore native plant communities	20% total native plant community score 40% total native plant community score 60% total native plant community score	4 5 6	4 to 6
1			SOIL+VEG C4.8	Optimize biomass	minimal point score low point score mid point score high point score	1 3 5 6	1 to 6
0			SOIL+VEG C4.9	Reduce urban heat island effects		4	4
2			SOIL+VEG C4.10	Use vegetation to minimize building energy use (project must have building on site)	No buildings present on site Option 1: Reduce energy use - 5% reduction Option 1: Reduce energy use - 7% reduction Option 2: Provide shade structures - 30% shaded Option 2: Provide shade structures - 60% shaded Option 3: Provide a windbreak - one row Option 3: Provide a windbreak - two or more rows	2 4 1 2 1 2	1 to 4
0			SOIL+VEG C4.11	Reduce the risk of catastrophic wildfire (project must be located in fire-prone area)	Project not in a fire-prone area Project is in a fire-prone area	4	4

YES	?	NO	PREREQUISITE OR CREDIT #	TITLE	CASE / OPTION / THRESHOLD	POINTS	POSSIBLE POINTS PER CREDIT
9	0	0	5: SITE DESIGN - MATERIALS SELECTION			Possible Points:	41
Y			MATERIALS P5.1	Eliminate the use of wood from threatened tree species			
0			MATERIALS C5.2	Maintain on-site structures and paving (project must have existing feature)	No structures or paving present on site 10% of the total existing built surface area 20% of the total existing built surface area 30% of the total existing built surface area	2 3 4	2 to 4
3			MATERIALS C5.3	Design for adaptability and disassembly	30% of total materials cost, excluding plants, rocks, and soils 60% of total materials cost, excluding plants, rocks, and soils	3 4	3 to 4
3			MATERIALS C5.4	Use salvaged materials and plants	10% of total materials cost, excluding soils 20% of total materials cost, excluding soils	3 4	3 to 4
0			MATERIALS C5.5	Use recycled content materials	20% of total materials cost, excluding plants and soils 40% of total materials cost, excluding plants and soils	3 4	3 to 4
3			MATERIALS C5.6	Use regional materials	30% of total materials cost 60% of total materials cost 90% of total materials cost	3 4 5	3 to 5
0			MATERIALS C5.7	Support responsible extraction of raw materials	Option 1: Advocate for sustainable extraction of raw materials Option 2: Support suppliers that disclose environmental data Option 3: Support suppliers that meet extraction standards	1 3 5	1 to 5
0			MATERIALS C5.8	Support transparency and safer chemistry	Option 1: Advocate for transparency and safer chemistry Option 2: Support manufacturers that disclose chemical data Option 3: Support manufacturers with chemical hazard assessments	1 3 5	1 to 5
0			MATERIALS C5.9	Support sustainability in materials manufacturing	Option 1: Advocate for sustainable materials manufacturing Option 2: Support manufacturers that disclose data on sustainable practices Option 3: Support manufacturers that achieve sustainable practices	1 3 5	1 to 5
0			MATERIALS C5.10	Support sustainability in plant production	Option 1: Advocate for sustainable plant production Option 2: Support producers that disclose data on sustainable practices Option 3: Support producers that achieve sustainable practices	1 3 5	1 to 5

YES	?	NO	PREREQUISITE OR CREDIT #	TITLE	CASE / OPTION / THRESHOLD	POINTS	POSSIBLE POINTS PER CREDIT
3	0	0	6: SITE DESIGN - HUMAN HEALTH + WELL-BEING		Possible Points:		30
0			HHWB C6.1	Protect and maintain cultural and historic places (project must have existing feature)	No cultural or historic places present on site Option 1: Historic buildings, structures, or objects Option 2: Historic or cultural landscapes	2 3	2 to 3
0			HHWB C6.2	Provide optimum site accessibility, safety, and wayfinding		2	2
0			HHWB C6.3	Promote equitable site use		2	2
0			HHWB C6.4	Support mental restoration		2	2
2			HHWB C6.5	Support physical activity		2	2
0			HHWB C6.6	Support social connection		2	2
0			HHWB C6.7	Provide on-site food production	Option 1: Food production Option 2: Food production and regular distribution	3 4	3 to 4
0			HHWB C6.8	Reduce light pollution		4	4
0			HHWB C6.9	Encourage fuel efficient and multi-modal transportation		4	4
1			HHWB C6.10	Minimize exposure to environmental tobacco smoke	Option 1: Designate smoke-free zones Option 2: Prohibit smoking on site	1 2	1 to 2
0			HHWB C6.11	Support local economy		3	3
11	0	0	7: CONSTRUCTION		Possible Points:		17
Y			CONSTRUCTION P7.1	Communicate and verify sustainable construction practices			
Y			CONSTRUCTION P7.2	Control and retain construction pollutants			
Y			CONSTRUCTION P7.3	Restore soils disturbed during construction			
3			CONSTRUCTION C7.4	Restore soils disturbed by previous development	low point score mid point score high point score	3 4 5	3 to 5
3			CONSTRUCTION C7.5	Divert construction and demolition materials from disposal	50% of structural materials + 95% of roads / infrastructure materials 75% of structural materials + 95% of roads / infrastructure materials	3 4	3 to 4
3			CONSTRUCTION C7.6	Divert reusable vegetation, rocks, and soil from disposal	100% of land-clearing materials retained for use within 50 miles 100% of land-clearing materials retained on site	3 4	3 to 4
2			CONSTRUCTION C7.7	Protect air quality during construction	50% total run-time hours from Tier 2 or higher engines 50% total run-time hours from Tier 3 or higher engines 50% total run-time hours from Tier 4 or higher engines	2 3 4	2 to 4

YES	?	NO	PREREQUISITE OR CREDIT #	TITLE	CASE / OPTION / THRESHOLD	POINTS	POSSIBLE POINTS PER CREDIT
7	0	0	8. OPERATIONS + MAINTENANCE		Possible Points:		22
Y			O+M P8.1	Plan for sustainable site maintenance			
Y			O+M P8.2	Provide for storage and collection of recyclables			
3			O+M C8.3	Recycle organic matter	100% of vegetation trimmings recycled / composted off site within 50 miles 100% of vegetation trimmings recycled / composted on site 100% of vegetation trimmings + food waste recycled / composted on site	3 4 5	3 to 5
0			O+M C8.4	Minimize pesticide and fertilizer use	Option 1: Plant health care plan Option 2: Best management practices for plant health care	4 5	4 to 5
2			O+M C8.5	Reduce outdoor energy consumption	30% reduction from baseline energy use for outdoor equipment 60% reduction from baseline energy use for outdoor equipment 90% reduction from baseline energy use for outdoor equipment	2 3 4	2 to 4
0			O+M C8.6	Use renewable sources for landscape electricity needs	Option 1: On-site - 50% annual outdoor site electricity Option 1: On-site - 100% annual outdoor site electricity Option 2: Green power - 50% annual outdoor site electricity Option 2: Green power - 100% annual outdoor site electricity	3 4 3 4	3 to 4
2			O+M C8.7	Protect air quality during landscape maintenance	Option 1: Scheduled maintenance Option 2: Low-emitting equipment Option 3: Manual or electric powered maintenance equipment	2 3 4	2 to 4
0	0	0	9. EDUCATION + PERFORMANCE MONITORING		Possible Points:		11
0			EDUCATION C9.1	Promote sustainability awareness and education	Option 1: Educational and interpretive elements Option 2: Additional education	3 4	3 to 4
0			EDUCATION C9.2	Develop and communicate a case study		3	3
0			EDUCATION C9.3	Plan to monitor and report site performance		4	4
0	0	0	10. INNOVATION OR EXEMPLARY PERFORMANCE		Possible Bonus Points:		9
0			INNOVATION C10.1 (BONUS POINTS)	Innovation or exemplary performance	Option 1: Exemplary performance Option 2: Innovation outside the SITES v2 Rating System	3 3	3 to 9
52	0	0	TOTAL ESTIMATED POINTS		Total Possible Points:		200
KEY			SITES Certification levels			Points	
YES Project confident points are achievable			CERTIFIED			70	
? Project striving to achieve points, not 100% confident			SILVER			85	
NO Project is unable to achieve these credit points			GOLD			100	
			PLATINUM			135	

Table 09.01. SITES v2 Rating System Results for Existing Site Conditions

09.01.02_site rating after intervention

As described in Chapter 4, it became necessary to rate the quality and value of the remaining ecosystem services on the site.

The following illustrates the rating charts of the SITES vs. Rating System Results that was completed to estimate the value of the existing site conditions.

SITES v2 Scorecard										
Estimate points below (key at bottom)			PREREQUISITE OR CREDIT #	TITLE	CASE / OPTION / THRESHOLD	POINTS	POSSIBLE POINTS PER CREDIT			
YES	?	NO								
13	0	0	1: SITE CONTEXT				Possible Points:		13	
Y			CONTEXT P1.1	Limit development on farmland	Case 1: Sites without farmland soils Case 2: Sites with farmland soils - VSPZ Case 3: Sites with farmland soils - Mitigation					
Y			CONTEXT P1.2	Protect floodplain functions	Case 1: Sites without floodplain Case 2: Previously developed and brownfield sites within floodplain Case 3: Greenfield sites within floodplain					
Y			CONTEXT P1.3	Conserve aquatic ecosystems	Case 1: Sites without aquatic ecosystems Case 2: Sites with naturally occurring aquatic ecosystems Case 3: Sites with naturally occurring poor quality aquatic ecosystems					
Y			CONTEXT P1.4	Conserve habitats for threatened and endangered species	Case 1: Brownfields and previously developed sites Case 2: Greenfield sites					
6			CONTEXT C1.5	Redevelop degraded sites	Case 1: Previously developed sites Case 2: Brownfield sites	3	6	3 to 6		
4			CONTEXT C1.6	Locate projects within existing developed areas		4		4		
3			CONTEXT C1.7	Connect to multi-modal transit networks	Option 1: Pedestrian and bicycle network Option 2: Transit network	2	3	2 to 3		
3	0	0	2: PRE-DESIGN ASSESSMENT + PLANNING				Possible Points:		3	
Y			PRE-DESIGN P2.1	Use an integrative design process						
Y			PRE-DESIGN P2.2	Conduct a pre-design site assessment						
Y			PRE-DESIGN P2.3	Designate and communicate Vegetation and Soil Protection Zones						
3			PRE-DESIGN C2.4	Engage users and stakeholders		3		3		
14	0	0	3: SITE DESIGN - WATER				Possible Points:		23	
Y			WATER P3.1	Manage precipitation on site						
Y			WATER P3.2	Reduce water use for landscape irrigation						
4			WATER C3.3	Manage precipitation beyond baseline	80th percentile precipitation event 90th percentile precipitation event 95th percentile precipitation event	4	5	4 to 6		
0			WATER C3.4	Reduce outdoor water use	Option 1: Reduce outdoor water use Option 2: Significantly reduce outdoor water use Option 3: Eliminate outdoor water use	4	5	4 to 6		
5			WATER C3.5	Design functional stormwater features as amenities	50% of stormwater features 100% of stormwater features	4	5	4 to 5		
5			WATER C3.6	Restore aquatic ecosystems (project must have existing feature)	No aquatic ecosystems present on site 30% of the geographic extent 60% of the geographic extent 90% of the geographic extent	4	5	4 to 6		

SITES v2 Scorecard									
Estimate points below (key at bottom)			PREREQUISITE OR	TITLE	CASE / OPTION / THRESHOLD	POINTS	POSSIBLE POINTS PER CREDIT		
YES	?	NO	CREDIT #					Possible Points: 40	
32	0	0		4: SITE DESIGN - SOIL + VEGETATION					
Y			SOIL+VEG P4.1	Create and communicate a soil management plan					
Y			SOIL+VEG P4.2	Control and manage invasive plants	Case 1: No invasive plants found on site Case 2: Invasive plants identified on site				
Y			SOIL+VEG P4.3	Use appropriate plants					
5			SOIL+VEG C4.4	Conserve healthy soils and appropriate vegetation (project must have existing feature)	No healthy soils and/or appropriate vegetation present on site 50% of the site's existing vegetated area 75% of the site's existing vegetated area 95% of the site's existing vegetated area	4 5 6		4 to 6	
4			SOIL+VEG C4.5	Conserve special status vegetation (project must have existing feature)		4		4	
6			SOIL+VEG C4.6	Conserve and use native plants	20% total native plant score 40% total native plant score 60% total native plant score	3 4 6		3 to 6	
6			SOIL+VEG C4.7	Conserve and restore native plant communities	20% total native plant community score 40% total native plant community score 60% total native plant community score	4 5 6		4 to 6	
5			SOIL+VEG C4.8	Optimize biomass	minimal point score low point score mid point score high point score	1 3 5 6		1 to 6	
4			SOIL+VEG C4.9	Reduce urban heat island effects		4		4	
2			SOIL+VEG C4.10	Use vegetation to minimize building energy use (project must have building on site)	No buildings present on site Option 1: Reduce energy use - 5% reduction Option 1: Reduce energy use - 7% reduction Option 2: Provide shade structures - 30% shaded Option 2: Provide shade structures - 60% shaded Option 3: Provide a windbreak - one row Option 3: Provide a windbreak - two or more rows	2 4 1 2 1 2		1 to 4	
0			SOIL+VEG C4.11	Reduce the risk of catastrophic wildfire (project must be located in fire-prone area)	Project not in a fire-prone area Project is in a fire-prone area	4		4	

SITES v2 Scorecard									
Estimate points below (key at bottom)			PREREQUISITE OR	TITLE	CASE / OPTION / THRESHOLD	POINTS	POSSIBLE POINTS PER CREDIT		
YES	?	NO	CREDIT #					Possible Points: 41	
27	0	0		5: SITE DESIGN - MATERIALS SELECTION					
Y			MATERIALS P5.1	Eliminate the use of wood from threatened tree species					
3			MATERIALS C5.2	Maintain on-site structures and paving (project must have existing feature)	No structures or paving present on site 10% of the total existing built surface area 20% of the total existing built surface area 30% of the total existing built surface area	2 3 4		2 to 4	
3			MATERIALS C5.3	Design for adaptability and disassembly	30% of total materials cost, excluding plants, rocks, and soils 60% of total materials cost, excluding plants, rocks, and soils	3 4		3 to 4	
4			MATERIALS C5.4	Use salvaged materials and plants	10% of total materials cost, excluding soils 20% of total materials cost, excluding soils	3 4		3 to 4	
3			MATERIALS C5.5	Use recycled content materials	20% of total materials cost, excluding plants and soils 40% of total materials cost, excluding plants and soils	3 4		3 to 4	
5			MATERIALS C5.6	Use regional materials	30% of total materials cost 60% of total materials cost 90% of total materials cost	3 4 5		3 to 5	
1			MATERIALS C5.7	Support responsible extraction of raw materials	Option 1: Advocate for sustainable extraction of raw materials Option 2: Support suppliers that disclose environmental data Option 3: Support suppliers that meet extraction standards	1 3 5		1 to 5	
0			MATERIALS C5.8	Support transparency and safer chemistry	Option 1: Advocate for transparency and safer chemistry Option 2: Support manufacturers that disclose chemical data Option 3: Support manufacturers with chemical hazard assessments	1 3 5		1 to 5	
3			MATERIALS C5.9	Support sustainability in materials manufacturing	Option 1: Advocate for sustainable materials manufacturing Option 2: Support manufacturers that disclose data on sustainable practices Option 3: Support manufacturers that achieve sustainable practices	1 3 5		1 to 5	
5			MATERIALS C5.10	Support sustainability in plant production	Option 1: Advocate for sustainable plant production Option 2: Support producers that disclose data on sustainable practices Option 3: Support producers that achieve sustainable practices	1 3 5		1 to 5	

SITES v2 Scorecard									
Estimate points below (key at bottom)			PREREQUISITE OR CREDIT #	TITLE	CASE / OPTION / THRESHOLD	POINTS	POSSIBLE POINTS PER CREDIT		
YES	?	NO							
18	0	0	6: SITE DESIGN - HUMAN HEALTH + WELL-BEING			Possible Points: 30			
3			HHWB C6.1	Protect and maintain cultural and historic places (project must have existing feature)	No cultural or historic places present on site Option 1: Historic buildings, structures, or objects Option 2: Historic or cultural landscapes	2 3	2 to 3		
0			HHWB C6.2	Provide optimum site accessibility, safety, and wayfinding		2	2		
2			HHWB C6.3	Promote equitable site use		2	2		
2			HHWB C6.4	Support mental restoration		2	2		
2			HHWB C6.5	Support physical activity		2	2		
2			HHWB C6.6	Support social connection		2	2		
3			HHWB C6.7	Provide on-site food production	Option 1: Food production Option 2: Food production and regular distribution	3 4	3 to 4		
0			HHWB C6.8	Reduce light pollution		4	4		
0			HHWB C6.9	Encourage fuel efficient and multi-modal transportation		4	4		
1			HHWB C6.10	Minimize exposure to environmental tobacco smoke	Option 1: Designate smoke-free zones Option 2: Prohibit smoking on site	1 2	1 to 2		
3			HHWB C6.11	Support local economy		3	3		
14	0	0	7: CONSTRUCTION			Possible Points: 17			
Y			CONSTRUCTION P7.1	Communicate and verify sustainable construction practices					
Y			CONSTRUCTION P7.2	Control and retain construction pollutants					
Y			CONSTRUCTION P7.3	Restore soils disturbed during construction					
4			CONSTRUCTION C7.4	Restore soils disturbed by previous development	low point score mid point score high point score	3 4 5	3 to 5		
4			CONSTRUCTION C7.5	Divert construction and demolition materials from disposal	50% of structural materials + 95% of roads / infrastructure materials 75% of structural materials + 95% of roads / infrastructure materials	3 4	3 to 4		
4			CONSTRUCTION C7.6	Divert reusable vegetation, rocks, and soil from disposal	100% of land-clearing materials retained for use within 50 miles 100% of land-clearing materials retained on site	3 4	3 to 4		
2			CONSTRUCTION C7.7	Protect air quality during construction	50% total run-time hours from Tier 2 or higher engines 50% total run-time hours from Tier 3 or higher engines 50% total run-time hours from Tier 4 or higher engines	2 3 4	2 to 4		

SITES v2 Scorecard									
Estimate points below (key at bottom)			PREREQUISITE OR CREDIT #	TITLE	CASE / OPTION / THRESHOLD	POINTS	POSSIBLE POINTS PER CREDIT		
YES	?	NO							
11	0	0	8. OPERATIONS + MAINTENANCE			Possible Points: 22			
Y			O+M P8.1	Plan for sustainable site maintenance					
Y			O+M P8.2	Provide for storage and collection of recyclables					
3			O+M C8.3	Recycle organic matter	100% of vegetation trimmings recycled / composted off site within 50 miles 100% of vegetation trimmings recycled / composted on site 100% of vegetation trimmings + food waste recycled / composted on site	3 4 5	3 to 5		
4			O+M C8.4	Minimize pesticide and fertilizer use	Option 1: Plant health care plan Option 2: Best management practices for plant health care	4 5	4 to 5		
2			O+M C8.5	Reduce outdoor energy consumption	30% reduction from baseline energy use for outdoor equipment 60% reduction from baseline energy use for outdoor equipment 90% reduction from baseline energy use for outdoor equipment	2 3 4	2 to 4		
0			O+M C8.6	Use renewable sources for landscape electricity needs	Option 1: On-site - 50% annual outdoor site electricity Option 1: On-site - 100% annual outdoor site electricity Option 2: Green power - 50% annual outdoor site electricity Option 2: Green power - 100% annual outdoor site electricity	3 4 3 4	3 to 4		
2			O+M C8.7	Protect air quality during landscape maintenance	Option 1: Scheduled maintenance Option 2: Low-emitting equipment Option 3: Manual or electric powered maintenance equipment	2 3 4	2 to 4		
4	0	0	9. EDUCATION + PERFORMANCE MONITORING			Possible Points: 11			
4			EDUCATION C9.1	Promote sustainability awareness and education	Option 1: Educational and interpretive elements Option 2: Additional education	3 4	3 to 4		
0			EDUCATION C9.2	Develop and communicate a case study		3	3		
0			EDUCATION C9.3	Plan to monitor and report site performance		4	4		
0	0	0	10. INNOVATION OR EXEMPLARY PERFORMANCE			Possible Bonus Points: 9			
0			INNOVATION C10.1 (BONUS POINTS)	Innovation or exemplary performance	Option 1: Exemplary performance Option 2: Innovation outside the SITES v2 Rating System	3 3	3 to 9		
136	0	0	TOTAL ESTIMATED POINTS			Total Possible Points: 200			
KEY			SITES Certification levels				Points		
YES	Project confident points are achievable		CERTIFIED				70		
?	Project striving to achieve points, not 100% confident		SILVER				85		
NO	Project is unable to achieve these credit points		GOLD				100		
			PLATINUM				135		

09.02_plant lists

MOOT PLAINS BUSHVELD

Small Trees

<i>Acacia nilotica</i>	Scented-Pod Acacia
<i>A. tortilis</i> subsp. <i>heteracantha</i>	Umbrella Thorn
<i>Searsia lancea</i>	Karee

Tall Shrubs

<i>Buddleja saligna</i>	False Olive
<i>Euclea undulata</i>	Small-leaved Guarri
<i>Olea europaea</i> subsp. <i>africana</i>	Wild Olive
<i>Grewia occidentalis</i>	Cross-Berry
<i>Gymnosporia polyacantha</i>	Hedge Spikethorn
<i>Mystroxydon aethiopicum</i> subsp. <i>burkeanum</i>	Transvaal Kooboo-Berry

Low Shrubs

<i>Aptosimum elongatum</i>	Bush Violet
<i>Felicia fascicularis</i>	
<i>Lantana rugosa</i>	Bird's Brandy
<i>Teucrium trifidum</i>	Koorsbossie

Succulent Shrubs

<i>Kalanchoe paniculata</i>	Rabbit Ear
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Woody Climbers

<i>Jasminum breviflorum</i>	Wild Jasmin
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Herbaceous Climbers

<i>Lotononis bainesii</i>	Lotonis
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Graminoids

<i>Heteropogon contortus</i>	Black Spear Grass
<i>Setaria sphacelata</i>	Golden Bristle Grass
<i>Themeda triandra</i>	Red Grass
<i>Aristida congesta</i>	Aristida
<i>Chloris virgata</i>	Feather Finger Grass
<i>Cynodon dactylon</i>	Couch Grass
<i>Sporobolus nitens</i>	Curly-leaved Dropseed
<i>Tragus racemosus</i>	Stalked Burr Grass

Herbs

<i>Achyroopsis avicularis</i>	IsiNama
<i>Corchorus asplenifolius</i>	Wild Jute
<i>Evolvulus alsinoides</i>	Dwarf Morning-Glory
<i>Helichrysum nudifolium</i>	Hottentot's Tea
<i>H. undulatum</i>	
<i>Hermannia depressa</i>	Doll's Roses
<i>Osteospermum muricatum</i>	Boegoebossie
<i>Phyllanthus maderaspatensis</i>	Canoe Weed

Plant list compiled from (Munica & Rutherford 2010:465) as well as (SANBI 2014).

URBAN TRIM PARK

Trees

<i>Celtis africana</i>	Wit Stinkhout
<i>Searsia Lancea</i>	Karee Boom
<i>Combretum molle</i>	Velvet Bushwillow

Climbers

<i>Jasmin multipartitum</i>	Starry Wild Jasmin
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Lawn

<i>Cynodon dactylon</i>	Couch Grass
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Ground Cover

<i>Agapanthus praecox</i>	Agapanthus
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INSECT EATING BIRDS

Large Canopy Trees

<i>Acacia siberiana</i> var. <i>woodii</i>	Paperbark
<i>Buddleja saligna</i>	False Olive
<i>Celtis africana</i>	White-Stinkwood
<i>Combretum erythrophyllum</i>	River Bushwillow
<i>Harpephyllum caffrum</i>	Wildplum

Medium Canopy Trees

<i>Acacia caffra</i>	Common Hook Thorn
<i>Acacia hebeclada</i> subsp. <i>hebeclada</i>	Candlepod Thorn
<i>Acacooia karroo</i>	Sweet Thorn
<i>Acacia robusta</i> subsp. <i>robusta</i>	Broadpodrobust Thorn
<i>Bolusanthus speciosus</i>	Tree-Wisteria
<i>Combretum molle</i>	Velvet Bushwillow
<i>Erythrina lysistemon</i>	Coral Tree
<i>Olea europaea</i> subsp. <i>africana</i>	Wild Olive
<i>Pappea capensis</i>	Jacketplum
<i>Schotia brachypetala</i>	Weeping Boerbean
<i>Searsia lancea</i>	Karee
<i>Searsia leptodictya</i>	Karee
<i>Vachellia karroo</i>	Sweet Thorn
<i>Ziziphus mucronata</i>	Buffalo Thorn

Small Canopy Trees

<i>Dombeya rotundifolia</i>	Wild Pear
<i>Heteromorpha arborescens</i> var. <i>abyssinica</i>	Common Parsley Tree
<i>Indigofera jucunda</i>	River Indigo
<i>Kiggelaria africana</i>	Wild Peach
<i>Pittosporum viridiflorum</i>	Cheesewood
<i>Rothmannia capensis</i>	Common Rothmannia

Shrubs

<i>Acokanthera oppositifolia</i>	Bushman's Poison Tree
<i>Buddleja salvifolia</i>	Sagewood
<i>Cassinopsis ilicifolia</i>	Lemon Thorn
<i>Chlorophytum saundersiae</i>	Weeping Anthericum
<i>Dichrostachys cinerea</i> subsp. <i>africana</i>	Sicklebush
<i>Dietes grandiflora</i>	Large Wild Iris
<i>Ehretia rigida</i> subsp. <i>nervifolia</i>	Puzzle Bush
<i>Erythrina humeana</i>	Dwarf Coral Tree
<i>Grewia occidentalis</i>	Crossberry
<i>Gymnosporia buxifolia</i>	Spike Thorn
<i>Halleria lucida</i>	Tree Fuchsia
<i>Leonotis leonurus</i>	Wild Dagga
<i>Leucosidea sericea</i>	Ouhout
<i>Mundulea sericea</i> subsp. <i>sericea</i>	Cork-bush
<i>Ochna serrulata</i>	Carnival Bush
<i>Orthosiphon labiatus</i>	Pink Sage
<i>Plumbago auriculata</i>	Cape Leadwood
<i>Psychotria capensis</i> subsp. <i>capensis</i>	Black Birdberry
<i>Pycnostachus urticifolia</i>	Blue Boys
<i>Tecomaria capensis</i>	Cape Honeysuckle

Groundcovers

<i>Asystasia gangetica</i>	Creeping Foxglove
<i>Felicia amelloides</i>	Blue Felicia

Graminoids

<i>Heteropogon contortus</i>	Black Spear Grass
<i>Setaria sphacelata</i>	Golden Bristle Grass
<i>Themeda triandra</i>	Red Grass
<i>Aristida congesta</i>	Aristida
<i>Chloris virgata</i>	Feather Finger Grass
<i>Cynodon dactylon</i>	Couch Grass
<i>Sporobolus nitens</i>	Curly-leaved Dropseed
<i>Tragus racemosus</i>	Stalked Burr Grass

Plant list compiled from (NZG 2014) as well as (Witkoppen Wildflower Nursery 2014).

SEED EATING BIRDS

Graminoids

<i>Melinis nerviglumis</i>	Bristle-leaved red top grass
<i>Panicum maximum</i>	Guinea grass
<i>Panicum ecklonii</i>	Small panicum
<i>Hyparrhenia hirta</i>	Common thatching grass
<i>Eragrostis superba</i>	Saw-toothed love grass
<i>Cymbopogon excavatus</i>	Turpentine grass
<i>Schizachyrium sanguineum</i>	Red autumn grass
<i>Eragrostis racemosa</i>	Narrow hert love grass

FRUIT EATING BIRDS

Canapy Trees

<i>Celtis africana</i>	White Stinkwood
<i>Ekebergia capensis</i>	Cape ash
<i>Searsia leptodictya</i>	Mountain karee
<i>Searsia zeyheri</i>	Blue currant
<i>Mimusops zeyheri</i>	Transvaal red milkwood
<i>Harpephyllum caffra</i>	Sourplum

Shrubs

<i>Englerophytum magalismontanum</i>	Stem fruit
<i>Halleria lucida</i>	Tree fuchsia
<i>Searsia chirindensis</i>	Red currant
<i>Ochna serrulata</i>	Small-leaved plane
<i>Diospyros lycioides</i>	Monkey plum
<i>Rhamnus prinoides</i>	African dogwood
<i>Ziziphus mucronata</i>	Buffalo thorn

NECTAR FEEDERS

Canopy Trees

<i>Erythrina lysistemon</i>	Coral tree
<i>Calodendrum capense</i>	Cape chestnut
<i>Erythrina caffra</i>	Coastal Coral Tree
<i>Bolusanthus speciosus</i>	Tree wisteria

Shrubs

<i>Protea caffra</i>	Common sugarbush
<i>Halleria lucida</i>	Tree fuchsia
<i>Metarungia longistrobis</i>	Sunbird bush
<i>Ochna serrulata</i>	Small-leaved plane
<i>Diospyros lycioides</i>	Monkey plum
<i>Burchellia bubalina</i>	Wild pomegranate
<i>Buddleya saligna</i>	False olive

Shrubs

<i>Leonotis leonurus</i>	Wild dagga
<i>Aloe cooperi</i>	Cooper's grass aloe
<i>Melianthus major</i>	Giant honey flower
<i>Aloe greatheadii</i>	Grassland aloe
<i>Aloe arborescens</i>	Krants aloe
<i>Agapanthus spp.</i>	Agapanthus

GREY WATER WETLAND

Indigenous

<i>Agrostis eriantha</i>	Large Panicle
<i>Andropogon eucomis</i>	Snowflake Grass
<i>Berula erecta</i>	Cutleaf Waterparsnip
<i>Berula repanda</i>	Water Parsnip
<i>Blechnum tabulare</i>	Mountain Tabulare
<i>Carex austro-africana</i>	
<i>Commelina africana</i>	Yellow Commelian
<i>Crinum bulbispermum</i>	Orange River Lily
<i>Cyperus marginatus</i>	Desert Sedge
<i>Cyperus sexangularis</i>	
<i>Cyrtanthus breviflorus</i>	Bredasdorp Lily
<i>Eleocharis dregeana</i>	
<i>Equisetum ramosissimum</i>	Branched Horsetail
<i>Eucomis autumnalis</i>	Pineapple Flower
<i>Falkia oblongata</i>	
<i>Gomphostigma virgatum</i>	River Star
<i>Gunnera perpensa</i>	River Pumpkin
<i>Hemarthrix altissima</i>	Limpo Grass
<i>Hesperantha coccineasolepsis prolifer</i>	River Lily
<i>Juncus lomatophyllus</i>	
<i>Juncus glaucus</i>	Blue Rush
<i>Kniphofia ensifolia</i>	Torch Lily
<i>Ledebouria floribunda</i>	Common Squill
<i>Leersia hexandra</i>	Southern Cutgrass
<i>Limosella major</i>	Northern Mudworth
<i>Lippia javanica</i>	Fever Tea
<i>Marsilea schelpiana</i>	Cutleaf Water Clover
<i>Melinis nerviglumis</i>	Bristle-leaved Red Top
<i>Mentha aquatica</i>	Water Mint
<i>Miscanthus junceus</i>	Okavango Delta Grass
<i>Nymphae nouchali</i>	Water Lily
<i>Nymphoides thunbergiana</i>	Floating Hearts
<i>Paspalum distichum</i>	Knotgrass
<i>Pennisetum thunburgii</i>	Bush Clover
<i>Phragmites australis</i>	Comon reed
<i>Salix mucronata</i>	Safsaf Willow
<i>Schoenoplectus corymbosus</i>	Inchoboza

<i>Scleria poiformis</i>	
<i>Setaria sphacelata</i>	South African Pigeon Grass
<i>Stipa dregeana</i>	Bushman Grass
<i>Vallisneria aethiopica</i>	

Plant list compiled with guidance from (Sampson 2014).

HERB GARDEN

<i>Angelica archangelica</i>	Angelica
<i>Ocimum basilicum</i>	Basil(sweet)
<i>Laurus nobilis</i>	Bay Tree
<i>Borago officinalis</i>	Borage
<i>Carum carvi</i>	Caraway
<i>Nepeta faassenii(N. mussinii)</i>	Catmint
<i>Chamaemelum nobile(Anthemis nobilis)</i>	Chamomile(Roman or Lawn)
<i>Allium Schoenoprasum</i>	Chives
<i>Symphytum officinale</i>	Comfrey
<i>Coriandrum sativum</i>	Coriander,Chinese Parsley or danhia
<i>Anethum graveolens</i>	Dill
<i>Foeniculum vulgare</i>	Fennel(common)
<i>Allium sativum</i>	Garlic
<i>Lavandula species</i>	Lavender
<i>Melissa officinalis</i>	Lemon balm
<i>Aloysia triphylla</i>	Lemon verbena
<i>Origanum marjorana</i>	Marjoram (sweet)
<i>Mentha suaveolens</i>	Mint(apple)
<i>Origanum vulgare</i>	Oregano
<i>Petroselinum crispum</i>	Parsley (curly)
<i>Mentha x piperita</i>	Peppermint
<i>Rosmarinus officinalis</i>	Rosemary
<i>Salcia officinalis</i>	Sage
<i>Satureja hortensis</i>	Savory (summer)
<i>Mentha spicata</i>	Spearmint
<i>Mentha rotundifolia</i>	Spearmint (crickle-leaved)
<i>Artemisia dracuncululus</i>	Tarragon
<i>Thymus vulgaris</i>	Thyme

FOOD FOREST COMMUNITIES



MEDICINAL GARDEN

Rhizomes/Roots

<i>Agapanthus inapertus</i>	Blue Lily
<i>Aster bakerianus</i>	Undlutshana
<i>Ehretia rigida</i>	Puzzle Bush
<i>Gnidia kraussiana</i>	Yellow Heads
<i>Hypoxis hemerocallidea</i>	Star Flower
<i>Pelargonium luridum</i>	Ishaqa
<i>Rhoicissus tridentata</i>	Bushmen's Grape
<i>Pentanisia prunelloides</i>	Wild Verbena

Foliage/Leaves

<i>Artemisia afra</i>	African Wormwood
<i>Asclepias fruticosa</i>	Milkweed
<i>Cotyledon orbiculata</i>	Pig's Ear
<i>Helichrysum</i> species	Everlastings
<i>Pallaea calomelanos</i>	Hard Fern
<i>Vernonia oligocephala</i>	Sefatse
<i>Catharanthus roseus</i>	Madagascar periwinkle
<i>Scabiosa columbaria</i>	Wild Scabious
<i>Senecio serratuloides</i>	Two Day Plant

Bulbs

<i>Boophane disticha</i>	Bushman Poison Bulb
<i>Crinum macowanii</i>	River Lily
<i>Bowiea volubilis</i>	Climbing Potato

Bark

<i>Withania somnifera</i>	Winter Cherry
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