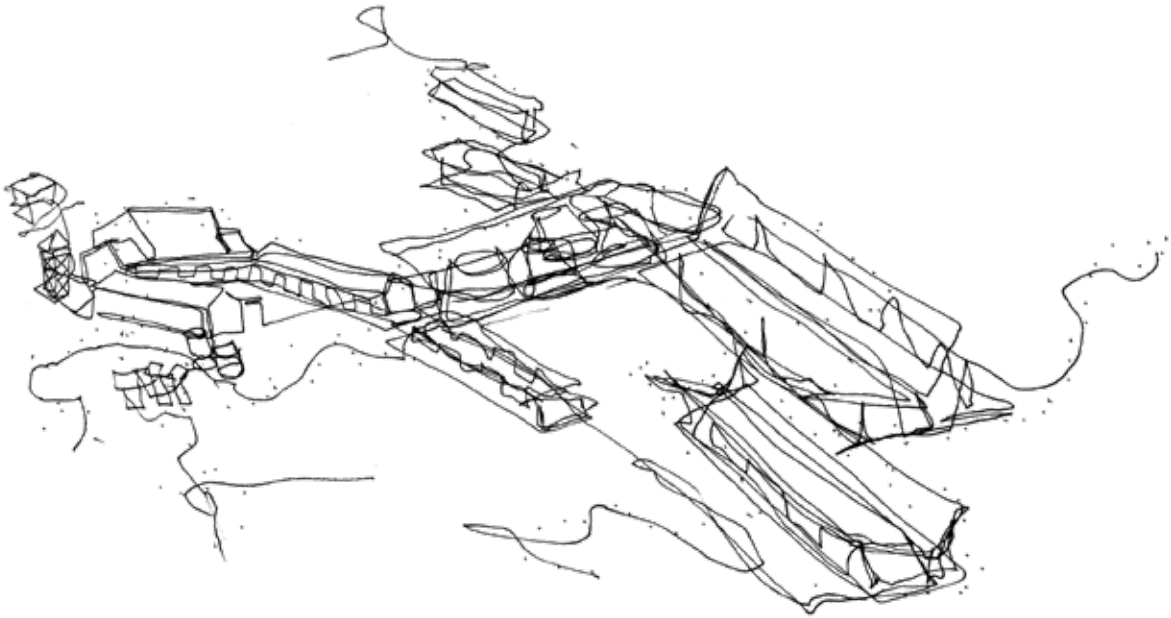
INTRODUCING SERICULTURE TO THE RURAL COMMUNITY OF BAINSVLEI, BLOEMFONTEIN



EXPLORING HOW ARCHITECTURE CAN ACT AS A HYBRID MODEL THAT CAN INITIATE CHANGE AND TRANSFORMATION WITHIN A RURAL SOCIETY.

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Exploring how architecture can act as a hybrid model that can initiate change and transformation within a rural society.

Client: Africa Silks Farm and Weavery

Bloemfontein, Free State.

Dissertation submitted in partial fulfilment of the requirements for the degree M. Arch. (Prof).

All the work contained in this document is my own except where otherwise acknowledged.

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ABSTRACT

The focus of this dissertation stems from an interest in the physical and abstract parameters of the rural Bainsvlei community in Bloemfontein and their socio-economic problems that affects rural schools and children. This dissertation investigates how architectural hybridity can act as a model for change and transformation, particularly at Tjhabelang Primary School (figure 01) located in the rural community of Bainsvlei. Similar studies often confront the challenges of limited resources and education with traditional images of thought and fails to address the true root of the poverty cycle, that lies with the parental figures of children. Children are completely reliant on their parental sources for a better future and parents have the authority to install change. By disrupting the traditional image of thought and essentially habits, it can create place for change and new possibilities. This is done by introducing a platform where architecture act as a hybrid model of recognisable traditional methods within a larger scheme that speaks of change. This idea of change and disruption is already encompassed in the sericulture process, which is the rearing of silkworms for the production of silk. The Africa Silks Farm and Weavery as client introduce new opportunities in the community, such as employment, agriculture, trade and public events. Without change there is no room for development; this research explores a different view on how we can disrupt existing patterns in rural communities by creating new opportunities and essentially a pathway out of poverty.

Figure 01: Children holding hands at Tjhabelang Primary School (Stokes, 2014: photo).

"History will judge us by the difference we make in the everyday lives of children"
- Nelson Mandela.

[YourSelfQuotes, 2019: online]

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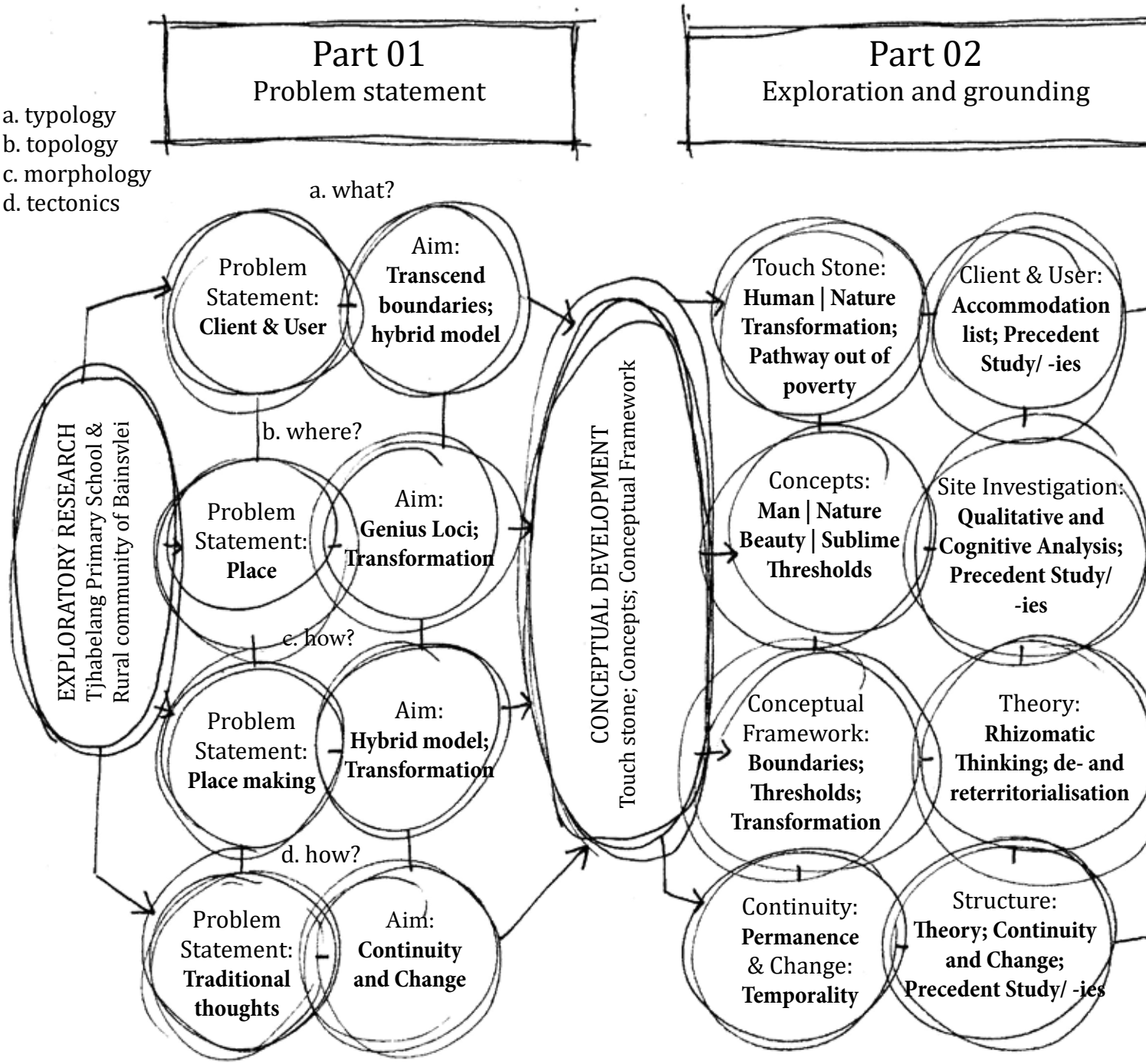
INTRODUCTION

This investigation was initiated by an awareness of the socio-economic problems connected to the children of Tjhabelang Primary School, which are compounded by extreme poverty, unemployment and poor infrastructure. What intrigued me was seeing the founder of Tjhabelang Primary School, Engela Fourie devoting her life to finding new opportunities, learning platforms, food donations and activities to engrave education and hope into these children and prepare them for life's challenges. The thoughts of the unknown and what happens after primary school was the inspiration to get involved.

There are many examples, including this school, where architecture can be a discriminating force – creating buildings in isolation. But in saying this, it also has the ability to help us reimagine and regenerate spaces to the service of complex human problems. This does not imply that architecture can solve all human problems, but that through it we are able to create meaningful places; platforms of hope that can initiate change and transformation within a complex society.

The document consists of four parts (see figure 02). Part 01 includes exploratory research that was done to identify the client, user and site. This includes the further identification of problems and aims specifically related to the typological, topological, morphological and tectological aspects that need to be addressed through an architectural intervention. Part 02 is the phenomenological exploration and grounding of the project where information is gathered and analysed as a means of addressing the problems mentioned in Part 01. Part 02 embraces the process of research, theoretical and design exploration and deduction. Part 03 reveals different phases of the design development and technical resolution that occurred, as well as the design and construction synthesis that derived from all the knowledge and processes explored in the above chapters. Part 04 as evaluation, includes a list of sources and a personal reflection on the process and final development.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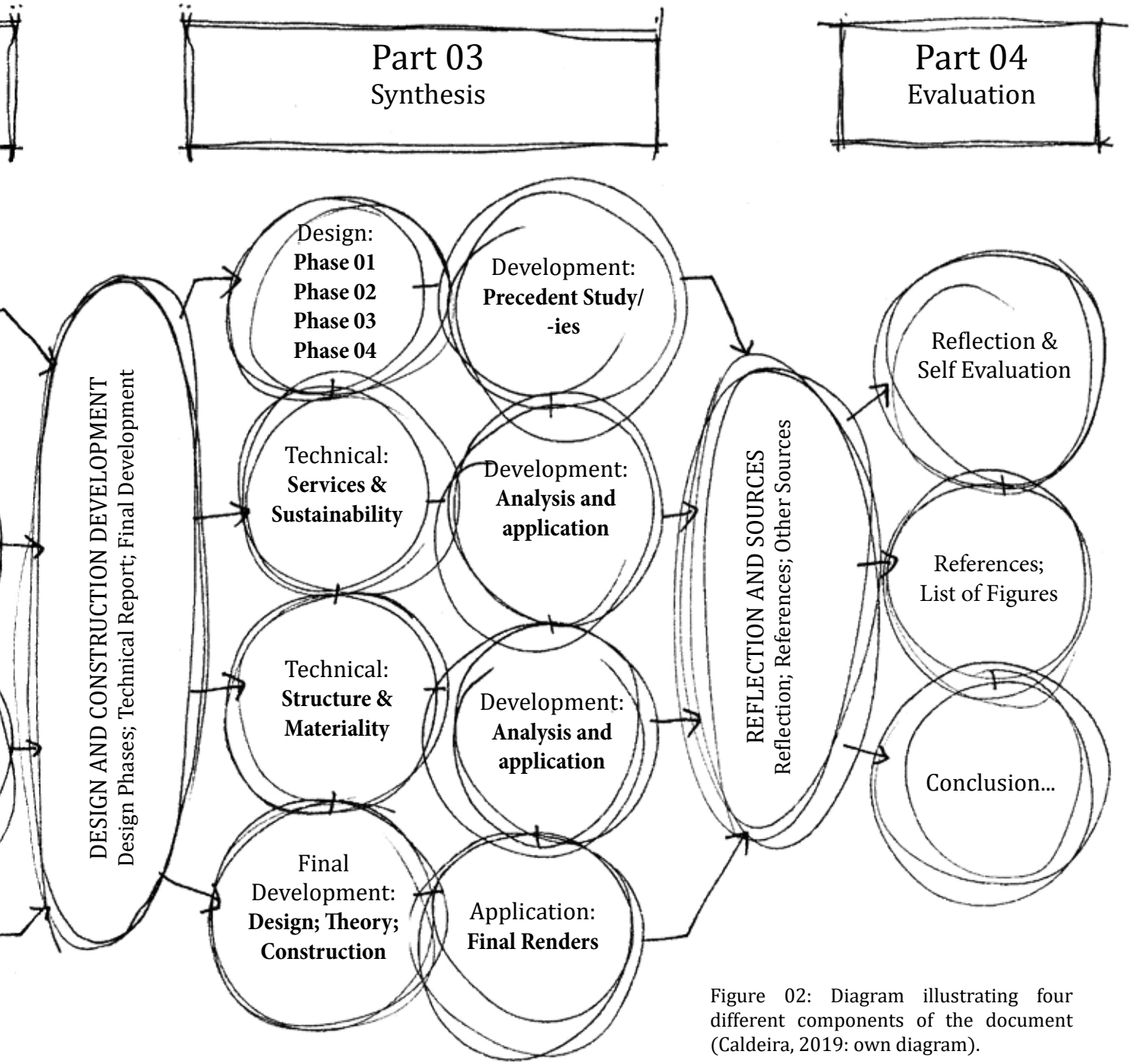

Figure 02: Diagram illustrating four different components of the document (Caldeira, 2019: own diagram).

RESEARCH DESIGN

This research emerged around the exploration of four problem statements relating to the fundamentals of design: What to design for whom? Where to design it? How the gestalt, *character*, of the design is influenced? And how the design is constructed? In this document these questions will be explored and related to the sources of knowledge that influence the logic of typology, topology, morphology and tectonics. The research originated from an interest in the rural Free State landscape and the socio-economic problems that are intrinsic to areas such as the rural community of Bainsvlei. The theme encompasses the gap between education and the work environment among the youth of these communities that allow the poverty cycle to fortify. Tjhabelang Primary School is the catalyst for this project as it calls for users from the rural community of Bainsvlei, the larger community of Bloemfontein and external forces, such as visitors and job creation organisations to get involved. The aim of the project (figure 03) is finding a hybrid solution that address the gap between the school (education) and the work environment that essentially address the existing socio-economic and future sustainability problems of the community. Different sources of knowledge are explored in order to develop a specific design methodology for this project.

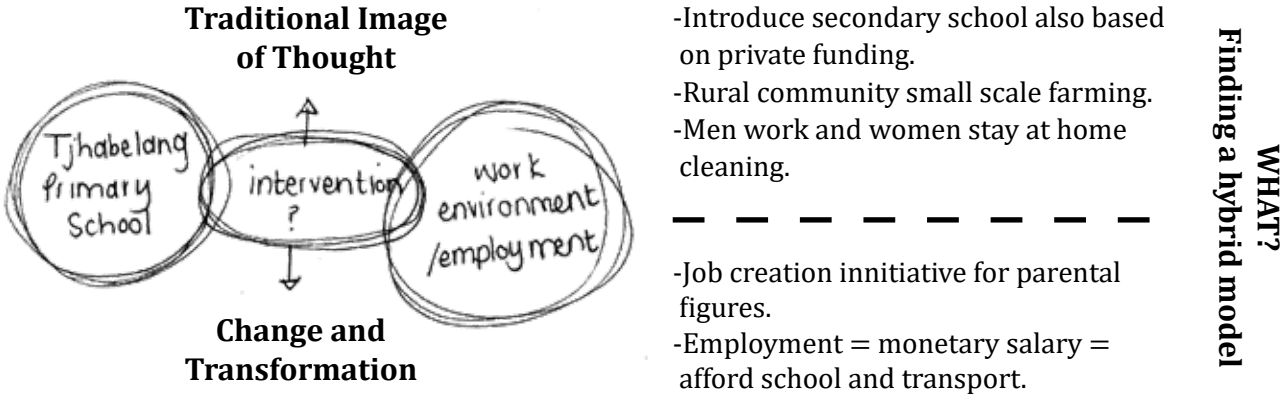

Figure 03: Diagram illustrating the aim for the project (Caldeira, 2019: own drawing).

DEFINITIONS

the TOUCH STONE forms the essence of the design. An initial thought on the focus of the design represented by an abstract interpretation and then into form. This is used to generate a set of concepts that are not necessarily form driven, but architecturally related and serves as a test as to whether the design kept its initial focus (Boshoff, 2017: 10).

PRECEDENT STUDIES are projects ranging from art, photography, videography and architecture that are studied and analysed in terms of one's project in order to gain an understanding of how these principles are to be applied (Firstinarchitecture, 2019: online).

COGNITIVE ANALYSIS is a phenomenological explanation of how one experienced something, for example the site, this relates to one's personal feelings and experience of the specific day, time, weather and smell- this experience differs from person to person.

INTERPRETIVE ANALYSIS is the subjective understanding of the author in regard to the topic at hand.

a CONCEPT is the main idea through which design decisions are made. Three concepts are explored during the site investigation and later strengthened by the typology of the project: sericulture (Boshoff, 2017: 10).

the CONCEPTUAL FRAMEWORK consists of initial ideas that developed from the touch stone and concepts as well as the further investigation of precedent studies (Boshoff, 2017: 10).

the SITE INVESTIGATION includes past, present and future discoveries relating to culture, place and the socio-economic realities of the rural community of Bainsvlei.

QUANTATIVE INFORMATION includes the measurements of all physical elements on site that could inform the project.

INTERVIEWS conducted with Engela Fourie and Marne Stokes, the founder, principal and vice-principal at Tjhabelang Primary School. Interviews were conducted in order to gain information on the present issues, needs and background of the school and children.

the THEORETICAL GROUNDING is an exploration of theories relating to thresholds and transformation, specifically rhizomatic thinking. This reflects the ideas of Deleuze and Guittari as it relates and influenced the morphological process of the design (Boshoff, 2017: 11).

"He who plants a tree, plants a hope" - Lucy Larcom.

[Goodreads, 2019: online]

Figure 04: One of the first trees planted at Tjhabelang Primary School, Bloemfontein (Stokes, 2019: photo).

Figure 05: Children of Tjhabelang Primary School continuing to plant trees every year (Stokes, 2019: photo).

PART 01

PROBLEM STATEMENT

Working within a rural area introduces certain typological, topological, morphological and tectonic contradictions that needs to be explored in search for possible solutions. This chapter considers project limitations and challenges with regards to architecture, the landscape and the programme that will allow for change and development in terms of the site and its inhabitants. This is done by means of exploratory research that allow the social, cultural and economic sustainability of the smaller Tjhabelang Primary school and larger rural community of Bainsvlei to inform the decisions of the client (Africa Silks), the program and the user.

Figures 04 to 06 reveals the importance of nature and agriculture at Tjhabelang Primary School and how the school as a collective is restricted, with a fence, in relation to the surrounding landscape.

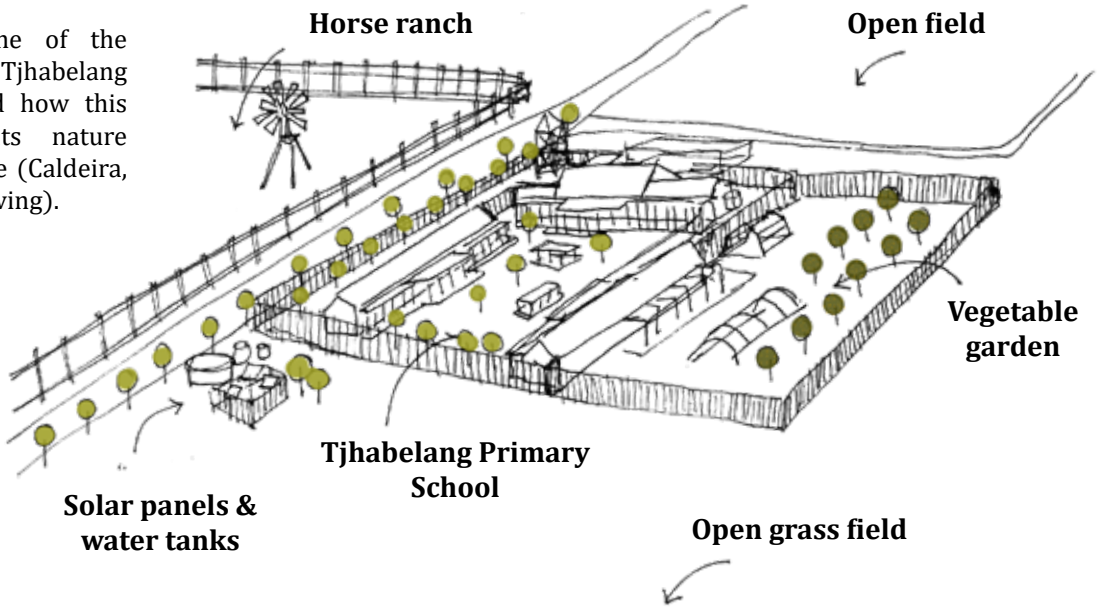

Figure 06: One of the challenges at Tjhabelang is security and how this currently limits nature and agriculture (Caldeira, 2019: own drawing).

Numerous community development work within rural areas either disguise the main problems at hand by providing services or resources that these communities can not maintain, or they fail to address the three major components to creating a sustainable intervention (Flora & Flora, 1993: online). That components being economic, social and environmental development.

This project aims to create a pathway out of poverty for the community of Bainsvlei, starting with the children from Tjhabelang Primary School. In order to establish a sustainable intervention that will have long-term effects on the larger community, exploratory research is done to identify the root of this poverty cycle and an indication to what the client, the programme and the users will be.

1.1 EXPLORATORY RESEARCH

"Studies have shown that the higher a person's qualification, the more likely they are to be employed and absorbed in the formal labour force, and therefore, are less susceptible to falling into poverty" (Stats SA, 2017: 61). Statistics South Africa shows that education has the potential to obliterate poverty and the repercussions thereof. Figure 07 illustrates the results of the poverty headcounts between adults based on their level of education. As seen

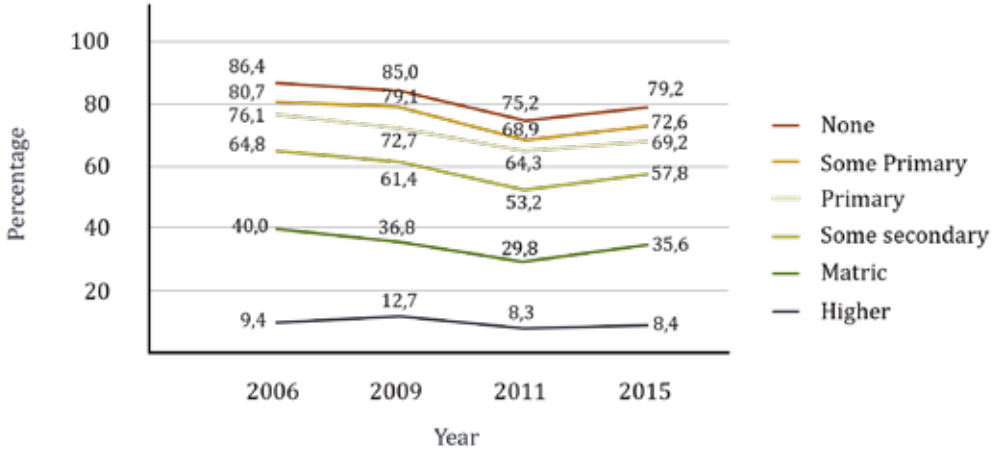

Figure 07: South Africa Statistics revealing poverty levels specifically amongst adults with primary education (Stats SA, 2017. Stats SA statistics: own graph).

here, the poverty rate amongst primary education groups increased from 68,9% to 72,6% in 2011 and 64,3% to 69.2% in 2015 (Stats SA, 2017: 62). Figure 08 illustrates the difference in poverty levels between rural and urban areas. During the financial crisis in 2008-2009 rural areas suffered more reaching a poverty level increase of 88,0% as opposed to urban areas that decreased to 46,8%. This financial crisis had an affect on people from rural communities that lost their jobs in urban areas and resulted in them having to return back home to their rural communities (Stats SA, 2017: 67).

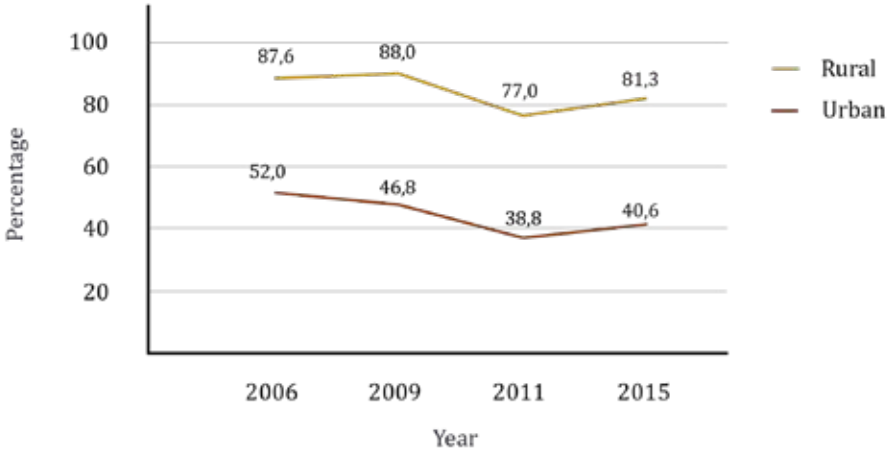

Figure 08: South Africa Statistics comparing poverty levels in rural and urban areas during 2008- 2009 financial crisis (Stats SA, 2017. Stats SA statistics: own graph).

The above data legitimize the degree of poverty in rural parts of South Africa and its relationship to education and unemployment in rural areas as opposed to urban areas.

1.1.1 Tjhabelang Primary School

Tjhabelang Primary School (Tjhabelang), located in the rural area Bainsvlei, Bloemfontein, was established by the Clinvet Community Development and Education Trust (CCDET), in 2007. The founder, Engela Fourie created this organisation with the idea to improve the lives of impoverished rural communities in Bainsvlei. She believes in education especially in the

first six years in a child's life in order for them to form their own individual opinion on education (Tjhabelang, 2019: online). The lack of social and academic experience during a person's childhood can place one in a disadvantaged situation when competing with others that are more privileged (Tjhabelang, 2019: online). Struggling through these barriers of finding employment, whilst already in a disadvantaged position, easily creates negative attitudes amongst young people that encourages them to give up, and evidently the poverty cycle is repeated.

Tjhabelang Primary School's mission is to break this cycle and intervene whilst these children are young. A positive attitude towards education and health is created through activities driven by art, culture, religion, worship, sport, communication and technology (figure 09 to 17). Along with this, Tjhabelang is recognized as a green school, saving on water and electricity, and recycling. A big part of their education stems from vegetable gardening where they engage with nature and small-scale farming and children enjoy taking vegetables home to their families (Tjabelang, 2019: online).

The school is completely reliant on private funding from the larger community of Bainsvlei as most of the parents are unemployed and can't afford the expenses involved in education. The school provides the children with numerous benefits including transport to and from school, three meals per day, afternoon care and regular dental clinic visits. But what happens to these children after primary school?

Figure 09: New library at Tjhabelang (Stokes, 2014: photo).

Figure 10, 11: Athletic Day at Tjhabelang (Stokes, 2014: photo).

Figure 12, 13: Music and Dance activities at Tjhabelang (Stokes, 2014: photo).

Figure 14: Children are provided with three meals per day (Stokes, 2019: photo).

Figure 15: Annual school concerts held at Tjhabelang (Stokes, 2013: photo).

Figure 16, 17: Casual day fun and activities at Tjhabelang (Stokes, 2019: photo).


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1.1.2 The affects of unemployment among parents

"Poverty is defined by the World Bank as "… the inability to obtain a minimal standard of living"; and this minimal standard of living can only be maintained if sufficient income is earned" (Levin, 1995: 173). Levin refers to a poverty culture in rural areas that ensures the continuity of poverty. The characteristics of this culture are the tendency for the poor to have many children, a lack of a better-quality life preference and insufficient plans for the future (Levin, 1995: 173).

These characteristics are engraved in some communities due to a lack of education, opportunities and exposure to a productive labour market. Increasing the productivity of labour will have an immense effect on a community's income and its poverty cycle (Levin, 1995: 174). Levin suggests the implementation of conventional measures that involves forms of employment where goods with labour value are exported. This allows for economic growth and an increase of employment that will correspond with the increase of production.

One of the main issues for children from these communities, even with a high level of education, is finding a job after school. Jobs with higher income are located within urban areas which is a far way to travel for people with limited resources. "The unemployed, especially youth, tend to lack resources and mobility for a job search or the ability to relocate for a distant job" (World Bank, 2018: 88).

According to international research, parental involvement in children's education has significant benefits for schools, families and the long-term economic growth for developing communities (Meier & Lemmer, 2015: 1). Tjhabelang Primary School aids children with early education, but these years of learning will be redundant unless the gap between education and employment is addressed.

This process and the development of children can only be ensured through change in performance on the parents' behalf. Introducing employment that creates a productive labour market, as mentioned by Levin (1995: 173), specifically for the unemployed people in the rural community of Bainsvlei can make a difference. Household income plays a big role in the future of these children who is essentially the future of the community. By creating a working place for these children's parents, it does not only ensure a better livelihood for the children but also creates a mind shift within adults, where they feel significant within a working society.

1.2 TYPOLOGY (What?)

There is a variety of different job opportunities that can work within the rural Free State landscape, but there are certain elements that should be taken into consideration when creating this workplace specifically for the parents of Tjhabelang. Community upliftment and cultural traditions are at the heart of Tjhabelang Primary school and in this intervention. There are two constituents that will inform the type of this project and ensure change in the future of these children and sustainability of the rural community. Firstly the parents' traditional Sotho-Tswana skills such as weaving, painting, traditional clothing, jewelry beading, and cultivation (Smith, 2018: online). And secondly, the three components to sustainable community development, mentioned on page 2.

1.2.1 Towards a problem statement

The client selected for this intervention, is a branch for the Africa Silks Farm and Weavery originally established by Ronel Swart in 1995, in Graskop, Mpumalanga. After many travels to Taiwan to learn more about the sericulture process, Swart returned to South Africa to build the business as a job creation initiative for the rural community of Graskop (Africa Silks, 2019: online). What first started as a small showroom (figure 18) and weavery in town later extended into her own silk farm outside Graskop (figure 19), where over 40 people from the rural community were employed. The silk farm expanded as the business grew and the demand for traditional African silk products increased (Africa Silks, 2019: online).

Today Swart has Africa Silks shops in (Graskop, Pilgrims Rest, Dullstroom and Stellenbosch) South Africa (figure 20) and exports silk nationally and internationally. As the production of silk is completely reliant on the amount of mulberry plants available to feed the silkworms it only makes sense to further expand the silk farm.

The users of Africa Silks include the employment of men and women, specifically the parents of Tjhabelang, but also of the larger rural community of Bainsvlei. The program reflects traditional activities, such as labour intensive farming and large-scale weaving that already exist in these communities. Further, Africa Silks provide each worker the freedom to challenge their creativity to design and make whatever they see as beautiful. This allows them to play with their traditional roots along with modern styles when creating clothing and products for customers all over the world.

Figure 18: Africa Silks showroom established in Graskop, Mpumalanga, as a job creation initiative (Caldeira, 2019: own photo).

Figure 19: Africa Silks Farm established in the rural area of Graskop, Mpumalanga, where over 40 people from the community are employed (Caldeira, 2019: own photo).

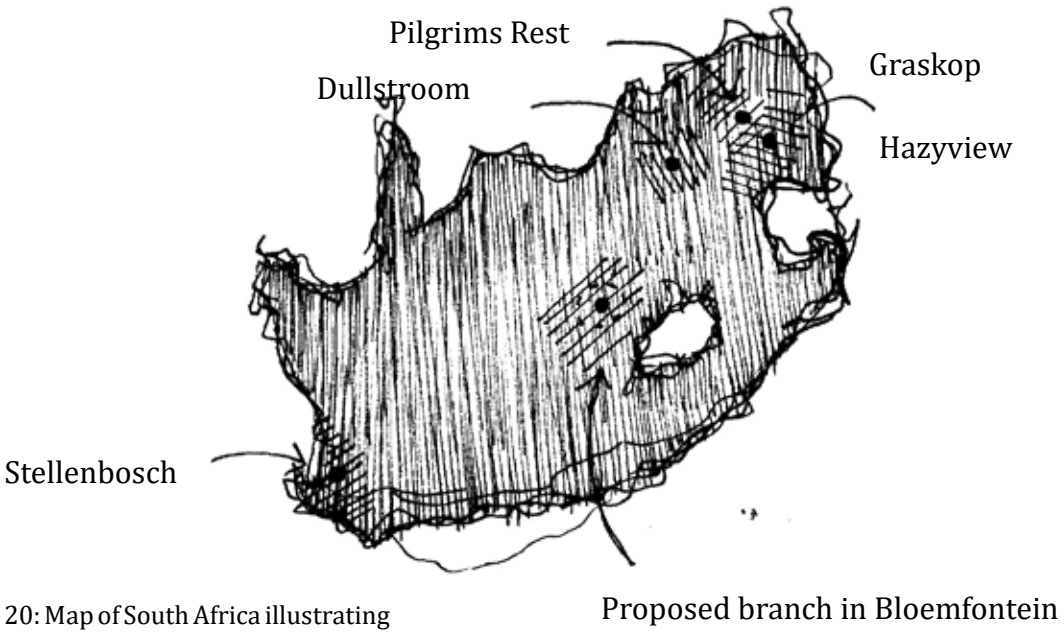


Figure 20: Map of South Africa illustrating all the Africa Silks shop branches (Caldeira, 2019: own drawing).

1.2.2 Aim

The typological exploration aims to facilitate a process where the architecture transcends the boundaries of Tjhabelang Primary School, creating a physical connection between child and parent and also addressing the gap that exist between education and future development. This project also aims to address the economic, social and environmental sustainability of the rural Bainsvlei community by introducing Africa Silks that celebrates their traditional roots (existing) along with modern ideas (new). In essence this intervention becomes a visitors' centre where the rural community share their love for agriculture with the larger community of Bloemfontein. Within this design permanent and temporary states are contrasted to emphasize the idea of change and transformation and its importance in this intervention. Traditional building methods are combined with modern technology to address the need for change through architecture whilst at the same time establishing the human characteristic of association, continuity, connectedness and a deeper rootedness.

1.3 TOPOLOGY (Where?)

Norberg Schulz refers to the character of a place and how this relates to time; it changes over the course of a day; it changes with seasons and weather and all of the above has an effect on the condition of the light. This is determined by the formal composition of place. “The boundaries of a landscape […] consist of ground, horizon and sky” (Norberg-Schulz, 1976: 419). To truly understand place, we should ask ourselves how is the boundaries that define this place? How is the sky above our heads? How is the ground we walk on? (Norberg-Schulz, 1976: 420). And how does this change over time?

The character of a place gives us clues as to how things are and the genius loci (spirit of place) symbolizes the essence of a place. “The genius […] denotes what a thing is or what it wants to be” (Norberg-Schulz, 1976: 422). Tjhabelang Primary School’s vision is to aid children for their futures and to expose them to a new and better life. This vision is opposed by the school’s physical connection within the landscape.

1.3. 1 TOWARDS A PROBLEM STATEMENT

The site is located in the rural landscape of Bainsvlei and consist of a vast open sky and flat plains where, as seen in figure 21, fences disappear between long grass fields. Completely different from the city, the rural landscape has a calmness to it that allows one to escape the noise and congested city streets, to a place of freedom and nature. In contrast to the landscape, Tjhabelang Primary School is fortified with multiple layers of rigid fencing. These fences reflects ideas of permanency, imprisonment and isolation that does not represent the school’s vision or the *genius loci* of the place.

Figure 21: Vast flat plains of the rural Bainsvlei landscape, view towards site and Tjhabelang Primary School (Caldeira, 2019: own photo).

1.3.2 Aim

The aim of this dissertation is to capture the totality of the landscape along with the traditional values of its users. A place that reflects freedom, transformation and continuity; one that melts into the Free State landscape; a reflection of the school's vision, a reflection of the sericulture process and the future of the rural community of Bainsvlei.

1.4 MORPHOLOGY (How?)

The aim of this morphological exploration is to investigate thresholds as a means of disturbing existing boundaries and creating new connections. This is present in the work of Deleuze and Guittari, considered as 'rhizomatic thinking'. Rhizomatic thinking moves away from the traditional image of thought where a subject is produced by the process of subjectification (Dick, Kruger & Le Roux. 2018: 4). This process of subjectification is present in the idea of the morphology of a typical farmstead in the rural Bainsvlei.

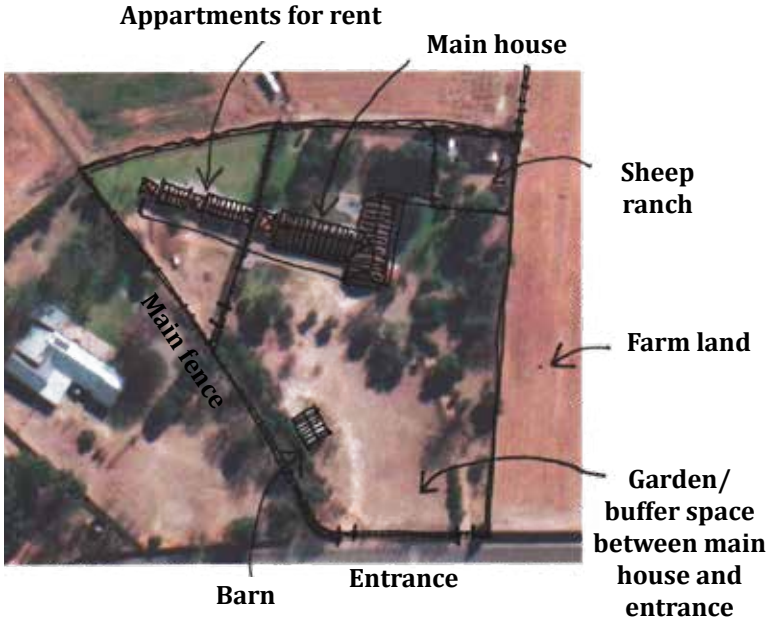


Figure 22: Typical Farmstead morphology in Bainsvlei Bloemfontein, different components gathered according to datum - in this instance, the fence (Google Earth, 2019: edited by author).

1.4. 1 TOWARDS A PROBLEM STATEMENT

The existing morphology of Tjhabelang Primary School (figure 05) inherent typical farmstead qualities. This include multiple buildings with pitched roofs connected through a continuous datum of either covered walkways, courtyards and/ or fences.

These qualities can also be identified on a farm setting nearby (figure 22). Figure 22 is a typical Free State farmstead where different components to the farm are gathered according

to the fence. Figure 22 and 23 shows the main house and barn with a typical farmhouse morphology that consists of a pitched roof and multiple components gathered and connected through paved walkways and fences.

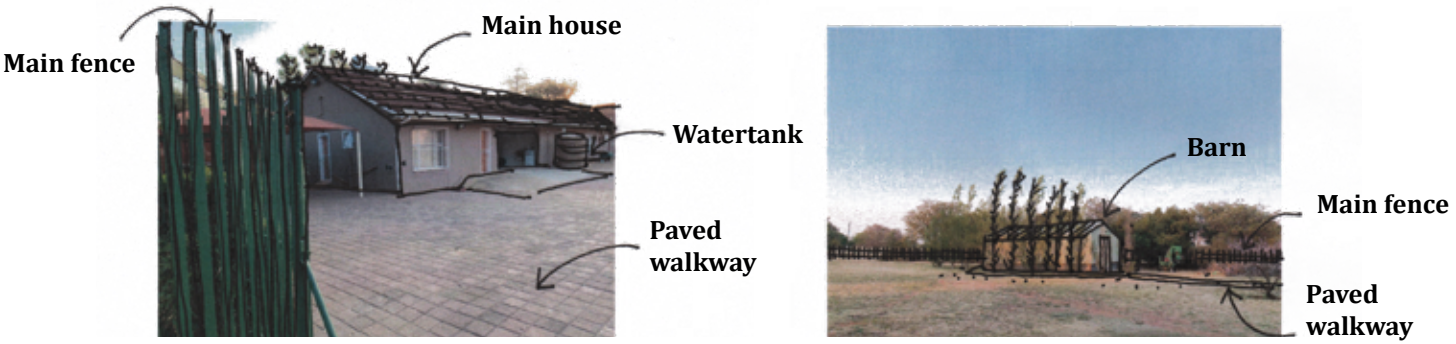


Figure 23 and 24: Typical farmstead in Bainsvlei, Bloemfontein, revealing the connection between different components on the farm (Caldeira, 2019: own photos).

1.4.2 Aim

In order for new connections to exist a subject is deterritorialised (disturbed) and reterritorialized (re-established) and always in the process of becoming (Dick et al., 2018). In this project the subject is not only the morphology of the school but also that of a factory (warehouse). In practice, Africa Silks is associated with a factory as its main function is the production of silk products. The aim of this exploration is to question this farm and warehouse morphology (traditional images of thought) and transcend the boundaries of the school through architecture that speaks of change and transformation with a direct relationship to the sericulture process (see figure 25).

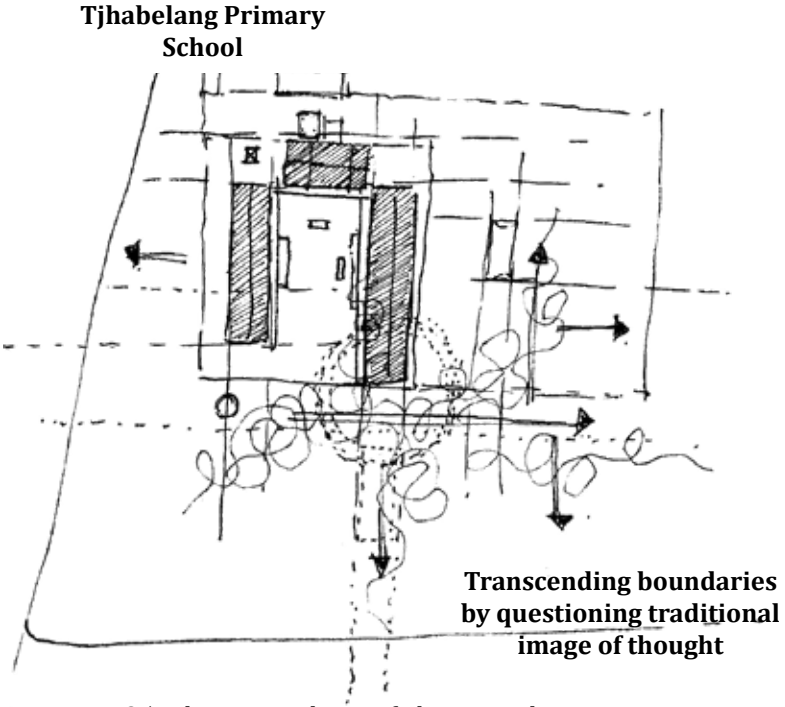


Figure 25: The giving shape of change and new connections at Tjhabelang Primary School (Caldeira, 2019: own drawing).

1.5 TECTONICS (How?)

The Free State building culture is known for its loadbearing brick walls, SA pine timber roof structures and corrugated iron roof sheeting. This along with steel construction and infill brickwork is an iconic image of the Free State built environment and is seen in figure 26 and 27 in House Enkalweni Rayton, designed by Smit Architects in 2005 (Raman, 2009: 226- 229).

Figure 26 and 27: House Enkalweni in Bloemfontein, showing typical appearance of light steel structure with brick infill (Smit, 2019: photos).

1.5.1 Towards a problem statement

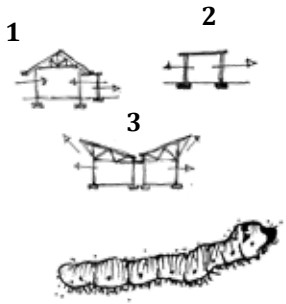
Figure 28: Structure and building materials covered in green, white and grey paint at Tjhabelang (Maritz, 2013: photo).

The tectonics at Tjhabelang Primary School comprise of loadbearing brick walls, SA pine roof structures, corrugated iron roof sheeting and steel frameworks for the corrugated iron covered walkways. As seen in figure 28 all building components at Tjhabelang are covered in paint in contrast to the raw nature of all the building materials seen above in House Enkalweni. The structure and materiality chosen for House Enkalweni is derived from the landscape as well as the needs of the client and the same will be done with Africa Silks.

1.5.2 Aim

Africa Silks is introduced to Tjhabelang as a job creation initiative to change the future of children in the rural community of Bainsvlei and essentially to create a pathway out of poverty. This idea of transformation and change is visible in the life cycle of the silkworm and the work of Deleuze and Guittari, through rhizomatic thinking. The aim for this investigation is to allow the life cycle of the silkworm and the natural landscape to inform the structure and materiality of the building. Figure 29 illustrates this idea of connecting sericulture and transformation to the tectonics of the building and will be discussed in more detail in part 02.

Change:

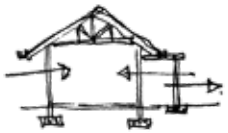


The silkworm is a symbol of change, constantly growing and shedding its skin three times during the cycle.

These three times are related to the tectonics of the design where the structure will also undergo three main changes.

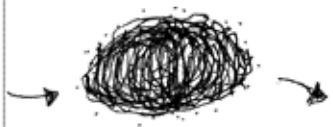
Life:

the pupa represents an entity that encompasses life that is yet to come.



An entity on the brink of transformation. This part of the cycle is related to (the tectonics) Tjhabelang Primary School: an existing entity on the verge of change.

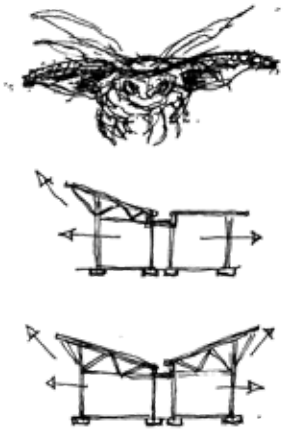
In-between:



The cocoon, a form of shelter and protection for the pupa (Tjhabelang). In this project, Africa Silks is the security for the future of Tjhabelang, and this relies on the silk. The structure of the cocoon therefore, house the different phases of the rearing of silkworms. (See part 02 for more details)

Rebirth:

The moth is the rebirth of the worm;



As the silk products are the rebirth of the cocoon. This part of the cycle is thus related to the showroom and shop of Africa Silks. The rebirth comprises parts of the old and new structure.

29: Drawing illustrating how the sericulture process relates to the tectonics of the building (Caldeira, 2019: own drawing).


Nº 1
I.

PART 02

EXPLORATION AND GROUNDING

This chapter further investigates the what, where, and how of the project (figure 30) through research that will be analysed and applied. The touch stone and concepts reveal an initial focus for the project that were directly focused towards the site and the programme. Later conceptual developments are directed more towards change and transformation. The client and sericulture process are discussed in accordance with an accommodation list. This is followed by a qualitative and cognitive site analysis that provides one with an understanding of the site in relation to its location, history, current state and *genius loci*. Lastly an investigation of the theoretical grounding is discussed that encourage the morphology and structure of the building.

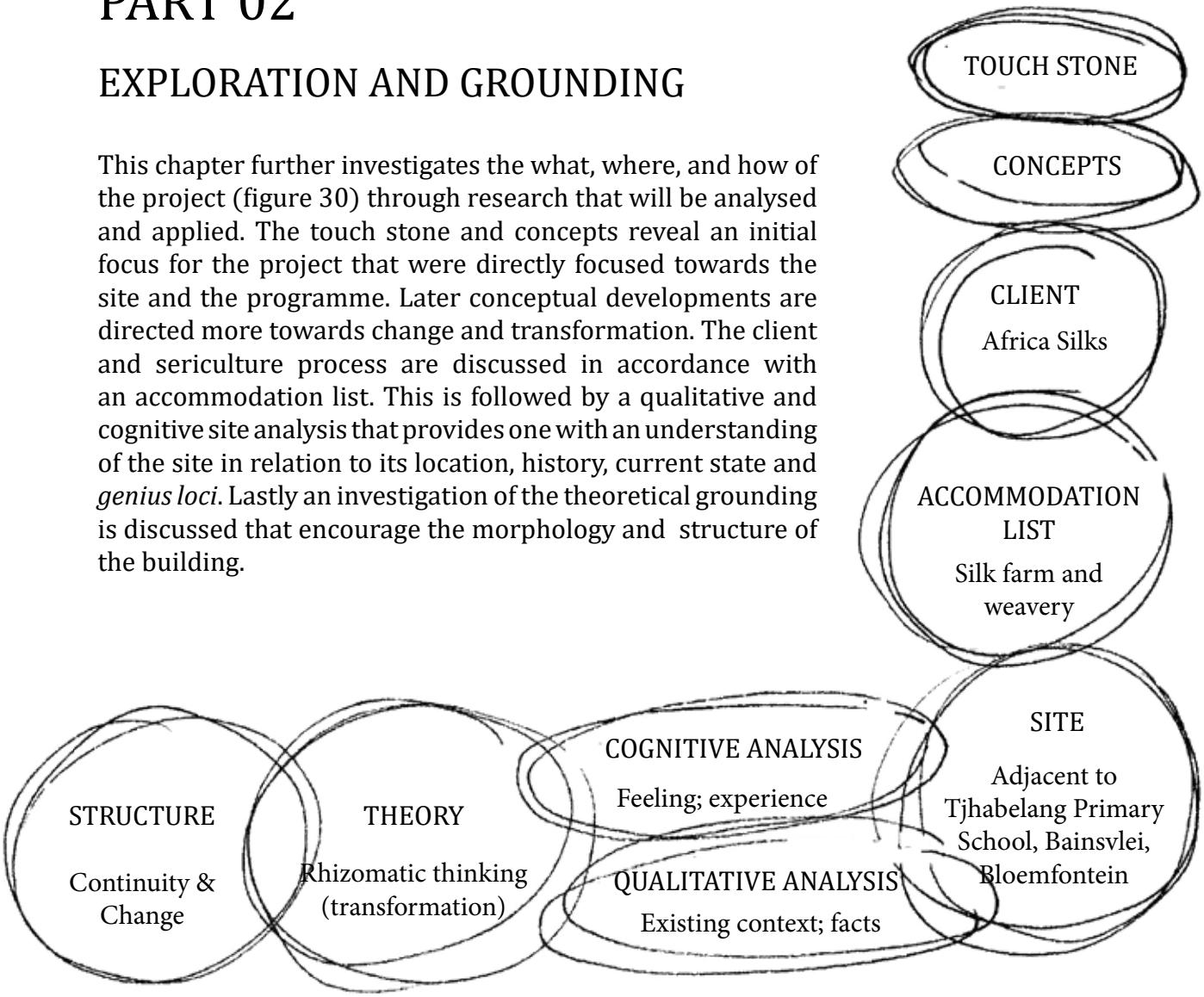


Figure 30: Diagram illustrating part 02 investigation (Caldeira, 2019: own drawing).

2.1 TOUCH STONE

CONCEPTUAL DEVELOPMENT

"Cocoon production involves two distinct activities — production of mulberry leaf, which is a field-related activity and the rearing of silkworm that is conducted in separate rearing houses or in a portion of the dwelling houses of farmers" (Kumaresan, Srinivasa & Prakash, 2015: 96). Both of these processes require a specific amount of staff to perform the tasks involved in mulberry leaf cultivation and the rearing of silkworms. The main element that allows the sericulture process to be successful, as oppose to the natural life cycle of a silkworm, is the involvement of humans.

The touch stone is a physical representation of this relationship between humans (productivity) and nature. The components of the touch stone, as seen in figure 31, include a cocoon cast in resin that unravels towards the outside. A gear system that is connected to batteries allows this unraveled silk to be spun onto a spool that creates one continuous thread of silk.

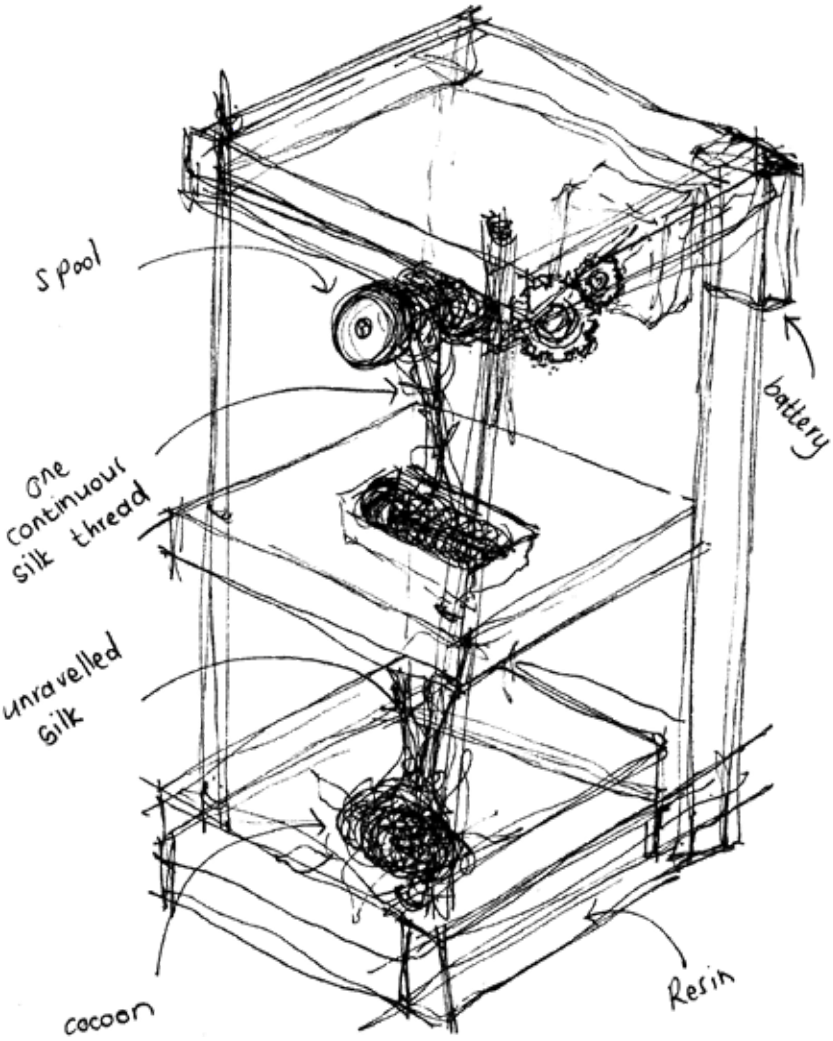


Figure 31: Drawing illustrating the different components to the touch stone (Caldeira, 2019: own drawing).

The cocoon fixed in resin represents the natural life cycle of the silkworm that is a continuous process of reproduction, life and death. The unravelling silk represents the idea of something's potential to become more than what it is. The gear connecting to a battery represents humans and our ability to adapt in order to create.

The process of life and death mentioned above, refers to the moth and the cocoon. When the silkworm metamorphose into a moth and escapes the cocoon, the continuous thread of silk (life) is ruptured (death). Thereafter, the male moth has the ability to mate two times whilst the female moths are only able to mate one time before dying. After two hours of mating the female moth lays her eggs (new life) and both moths die (death) (Nkozi, 2019: interview). The focus of this project is to introduce change (new life- better future for these children), by disrupting the life of an existing entity (the life of these parental figures and on site: Tjhabelang Primary School) to create a (new life) pathway out of poverty.

This touch stone captures the essence of this dissertation. Figure 31 illustrates how these elements relate to transformation. The cocoon fixed in resin symbolizes the rural community of Bainsvlei, stuck within the poverty cycle, habits, traditional thoughts and children from Tjhabelang with an incredible primary education, failing to find employment or higher levels of education due to socio-economic challenges. The gear fixed to a battery symbolizes external forces that are at play as a reaction on breaking away from the traditional image of thought.

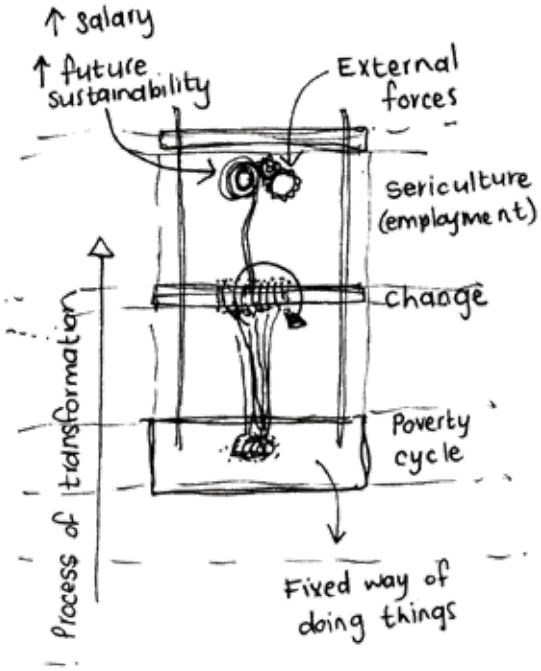


Figure 32: Illustration of symbolic meaning behind different components in the touch stone (Caldeira, 2019: own drawing).

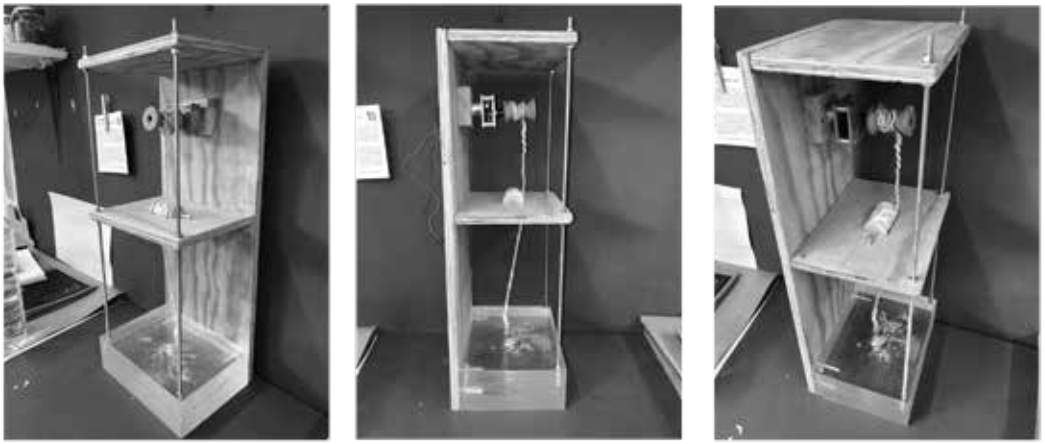


Figure 33, 34 and 35: Photographs of touch stone model (Caldeira, 2019: own photos).

2.2 CONCEPTS

The following concepts derived from early site visits and are grounded in the experience of the *genius loci* (spirit) of the place.

2.2.1 BEAUTY | SUBLIME

The existing road to the site is about a meter lower than the surrounding grass fields. This road resembles driving through a mini canyon with rocks protruding outwards from the red-brown cliffs, seen in figure 36. As the light falls against these rocks the shiny reflection of different stones and rocks reflect on the beauty and the sublime. The beauty being the whole scenery when the light reflects against the rocks, and the sublime being the realization that this beauty is due to the gradual destruction of the road being eroded over time.

In sericulture, quite evidently, the product of silk is the element of beauty. But yes (sublime) in order to produce this one continuous silk thread, the cocoons are boiled until they start to unravel and are pulled apart by humans. In this process of boiling the cocoon, the pupa inside it dies. At Africa Silks 80% of the cocoons are boiled and used for silk, and the remaining 20% are used for reproduction where broken cocoons are worked into soils with fertilizers and used as compost for the mulberry leaf cultivation (Nkozi, 2019: interview).

Figure 36: Road towards site inspiring the concept of the beauty and the sublime (Caldeira, 2019: own photo).

The model in figure 37 represents the beauty and the sublime, mimicking the existing rift (road to site) with a dark split in the ground, and complementing it with a glass panel that represents the sky, an element of beauty. This concept introduces the importance of light in this project, an element that symbolizes hope in this development with the fundamental focus being change.

Three explorations, figure 38 to 40, followed that explores this idea of light (beauty) and shadows (sublime) in a way that it encompasses an architectural quality that has the potential to inform the design development.

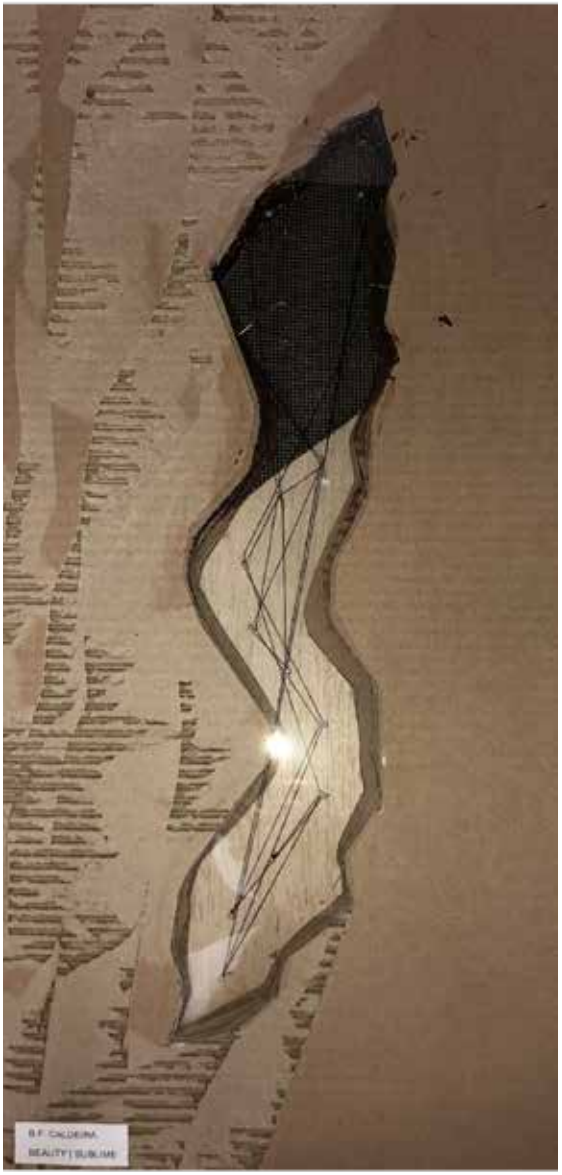


Figure 37: Concept 01: Beauty | Sublime; relationship between earth and sky; light and dark (Caldeira, 2019: own model).

Figure 38: Light and shadows; at an angle (Caldeira, 2019: own model).

Figure 39: Light and shadows; between planes (Caldeira, 2019: own model).

Figure 40: Light and shadows; through openings (Caldeira, 2019: own model).

2.2.2 NATURE | MACHINE

Looking at the macro context of the site (figure 41) one will see the Soetdoring Nature Reserve on your left that transforms slowly over time- due to natural causes and the city of Bloemfontein to the right- a manmade landscape– that grows rapidly due to urban sprawl.

Similarly, in nature the life cycle of the silkworm will take a duration of a whole year to be completed (slow process). And in sericulture this process is controlled by adapting the different stages of the silkworm cycle to specific temperatures and humidity that speed up the process and enables them to have continuous cycles throughout the whole year (Nkozi, 2019: interview).

Therefore, the first model, figure 42, represents an organic element that is fragmented and a rigid structural element that moves in between these fragmented spaces. This idea of fragmentation relates to the natural process of the silkworm being adapted and changed by human beings. Referring to place, this concept implies a connection to nature- the vast landscape of the rural Free State (horizontality) as well as suggest a new order (verticality) that disturbs these existing conditions, in a way that allows for transformation.

From this main idea three explorations, figure 43 to 45, were done that shows this connection between man and nature in a way that it encompasses an architectural quality that has the potential to inform the design development.

Figure 41: Macro context: illustrating the relationship between site, nature and man (Caldeira, 2019: own drawing).

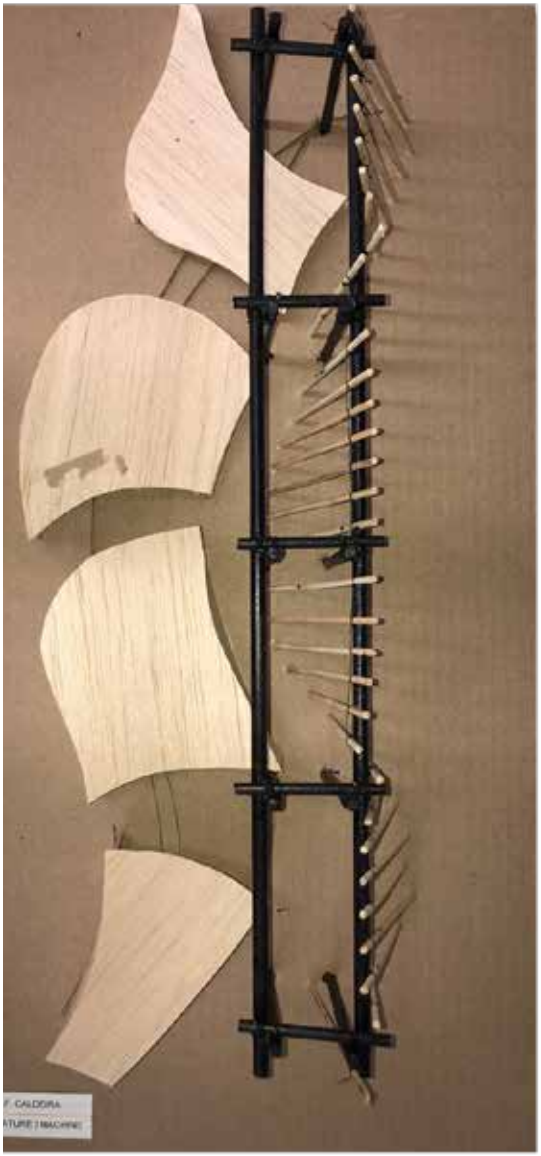


Figure 42: Concept 02: Model of Nature | Machine (Caldeira, 2019: own photo).

Figure 43: Relationship between man and nature; overlapping (Caldeira, 2019: own photo).

Figure 44: Relationship between man and nature; coexisting (Caldeira, 2019: own photo).

Figure 45: Relationship between man and nature; interconnected (Caldeira, 2019: own photo).

2.2.3 THRESHOLDS

The rural Bainsvlei landscape is decked with long grass fields and small yellow flowers that stretches as far as the eye can see. Different farm plots are divided with thin wired fences that melts away into these vast flat plains. Approaching site cars are hidden within the rift that slopes upwards in order to access the site. This layering of ground, sand, rocks, grass, flowers and sky seen in figure 46 speaks of the composition of the land (place) and is therefore a very important aspect in understanding this environment. All of the above relates to thresholds and the transitioning between spaces.

This model allows two different perspectives of thresholds. The first one being multiple layers that relate to movement and transformation; elements that represents discontinuity, elements that creates visual connections but no room for movement, elements of change that obstruct movement and elements of continuity (figure 47).

The second one is focused on the transitioning between spaces specifically in the rural Bainsvlei landscape. This relates to the composition of elements on site, traditionally being that of a main farm house, a shed or barn, a fence surrounding the property and walkways that connects these elements (figure 48). As the essence of this project calls upon change and transformation, one has to question these traditional images of thoughts.

This typical layout of a rural farm landscape is questioned and established the process of discovering what it is that will inform the morphology of this project. Three explorations, seen in figure 49 to 51, followed this concept on possible organisational layouts that relate to architecture.

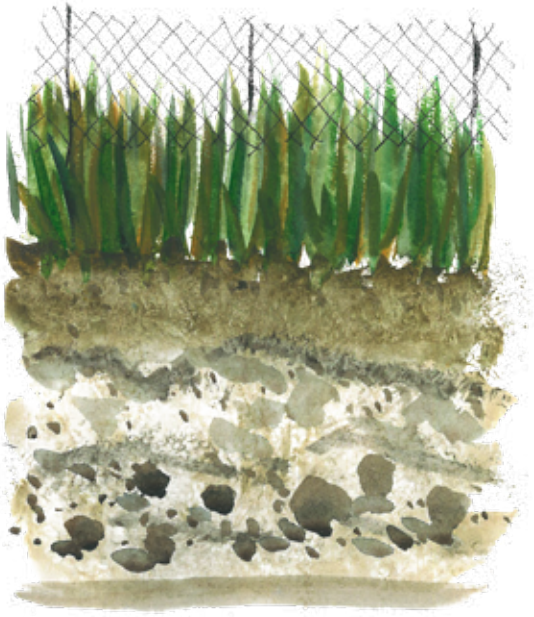


Figure 46: Layering of nature that defines place in the rural Bainsvlei landscape; earth, ground, sand, rocks, grass, flowers, sky (Caldeira, 2019: own drawing).

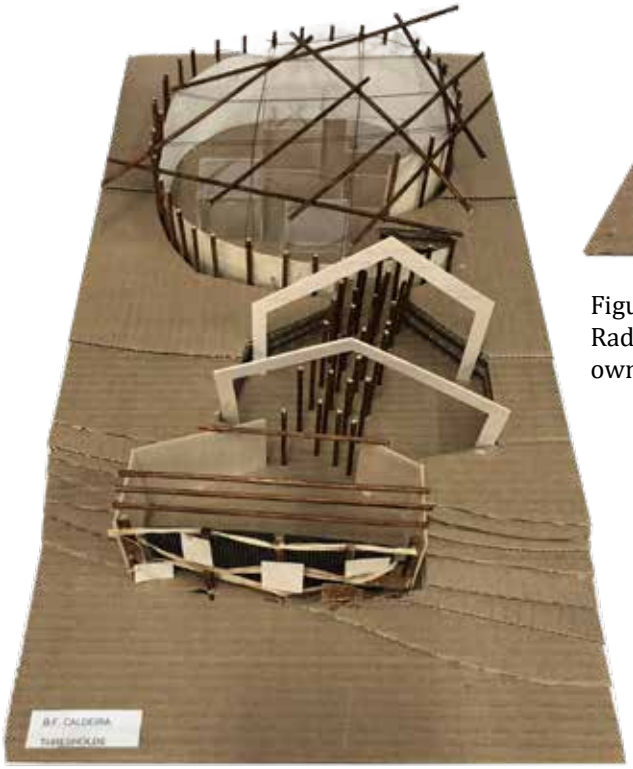


Figure 47: Perspective 01: Thresholds of movement (Caldeira, 2019: own model).

Figure 48: Perspective 02: Thresholds of composition. Typical farm typology (Caldeira, 2019: own model).

Figure 49: Searching for form: Radial plan (Caldeira, 2019: own model).

Figure 50: Searching for form: Africa Silks farm, Graskop, layout. (Caldeira, 2019: own model).

Figure 51: Searching for form: Linear plan (Caldeira, 2019: own model).

2.3 CONCEPTUAL FRAMEWORK

2.3.1 CONCEPTUAL DEVELOPMENT

Throughout these three concepts certain things were made evident on site and within the sericulture process. The importance of the relationship between nature and man, the contrast of moments of beauty (hope for the future- light) and the sublime (circumstances and failures- shadows) and the subtleness of thresholds and boundaries that distinguish different physical and mental spaces.

In order to create a hybrid architectural model that would essentially create a pathway out of poverty, starting with the children of Tjhabelang, existing thresholds are questioned.

Turner (1982; 1974) and Van Gennep (1960) speaks about thresholds and liminal spaces where people undergo a rite of passage. One moves from the real (the present) through a symbolic (or real) threshold into a different state and time. This process of transformation speaks of the death or end of the old you (previous life chapter) and the birth of the new you (new chapter in one's life). Initiands enter this new chapter "by freely and ludically combining elements of the old order into a new one" (Viljoen, 2007: 195).

This dissertation is vested in filling the gap between education (chapter a) and the work environment (chapter c) to address the cycle of poverty in the rural Bainsvlei community. By introducing Africa Silks to essentially fill this gap it is evident that there are two rites of passages happening. One being the change in the lives of these children (employment for parents= salary= afford secondary and high school) and the other being the change in the landscape. The following framework highlights some issues at Tjhabelang and reveals the conceptual focus of this project relating to change (rites of passage).

2.3.2 BOUNDARY

One of the main limitations on site is the physical boundaries created by Tjhabelang to install a form of security. As seen in figure 52, multiple layers of fences divide spaces according to their use. There are four boundaries illustrated in this figure but in this project the division between space A and C is the one in question.

A. Main fence
B. Fence between school and vegetable garden
C. Erf fence
D. Fence between school and parking area

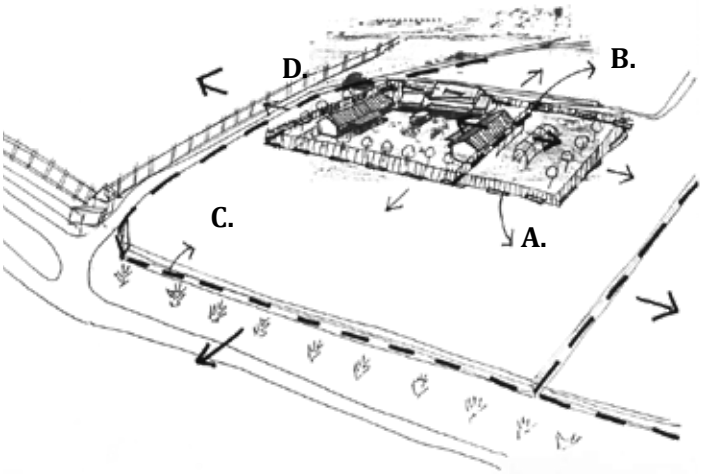


Figure 52: Boundary in question at Tjhabelang Primary School (Caldeira, 2019: own drawing).

2.3.3 THRESHOLDS

A threshold is seen as a space or pause when transitioning from one space to another (Wiredspace, 2008. Online: 12, 14). At Tjhabelang the walkways between the classrooms and playground is a clear threshold between inside and outside. The threshold between the playground and larger context is however in question as this becomes clearly defined by the fence. As the school marks the beginning of a better future it is important that this is resembled in the way one treats this threshold (figure 53). Currently the fence surrounding the school is a boundary that speaks of imprisonment rather than a threshold into the future of the school learners.

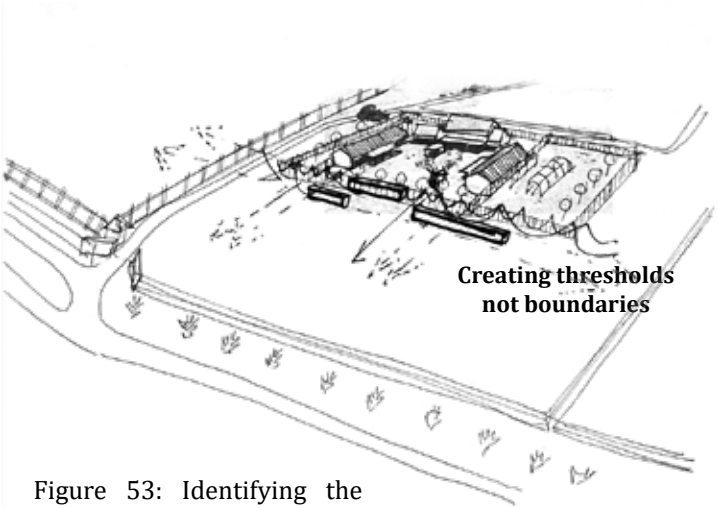


Figure 53: Identifying the main thresholds for change at Tjhabelang (Caldeira, 2019: own drawing).

As Turner (1982; 1974) and Van Gennep (1960) said, this threshold combines elements of the old chapter into the new one. This new addition of Africa Silks is seen as the threshold of breaking this poverty cycle, a rite of passage that combines elements of the old (traditional systems) and of the new (modern systems). Therefore, as seen in figure 54, in totality this design speaks of transformation and in detailing of continuity (existing) and change (new). The process of identifying elements of continuity and change becomes more evident during the last phases of the design development in part 03. The remainder of this chapter first focuses on understanding the site and the sericulture process (Africa Silks) to establishing what is needed from the design. Thereafter, ideas of continuity and change are brought forward by Deleuze and Guittari (1987) that influenced the design and structure of the building.

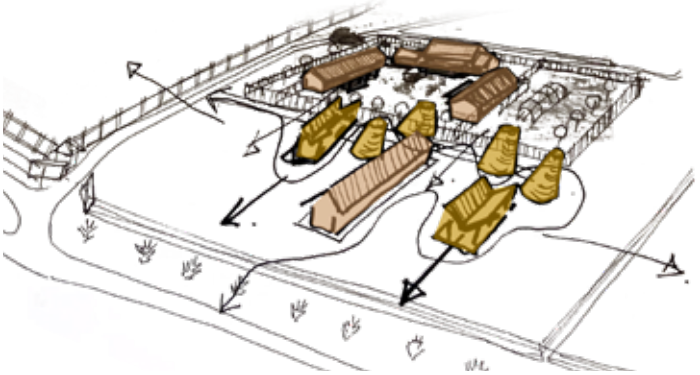


Figure 54: Africa Silks acts as a threshold between what was and what will be; a rite of passage to breaking the poverty cycle (Caldeira, 2019: own drawing).

2.4 Typology

2.4.1 CLIENT

As mentioned in Part 01, Africa Silks was originally established as a small showroom in Graskop, where silk was imported from Taiwan and used to create a variety of African Silk products. Due to the expenses involved in importing the silk, Swart (establisher of Africa Silks) decided to learn more about the sericulture process and opened her own silk farm in the natural landscape of Graskop (Africa Silks, 2019: online). The layout of the farm was built according to function and practicality. As seen in figure 55, the different phases of the silkworms are placed in close proximity to one another situated in between the mulberry plants.

The only difference between the structure for these phases are that phase 02 and 04, where the fully-grown silkworms feed and the silkworms start to spin cocoons, are bigger than phase 01 and 03 where the smaller silkworms feed and where moths lay their eggs. Figure 56 to 62 shows the different phases of the silkworm cycle.

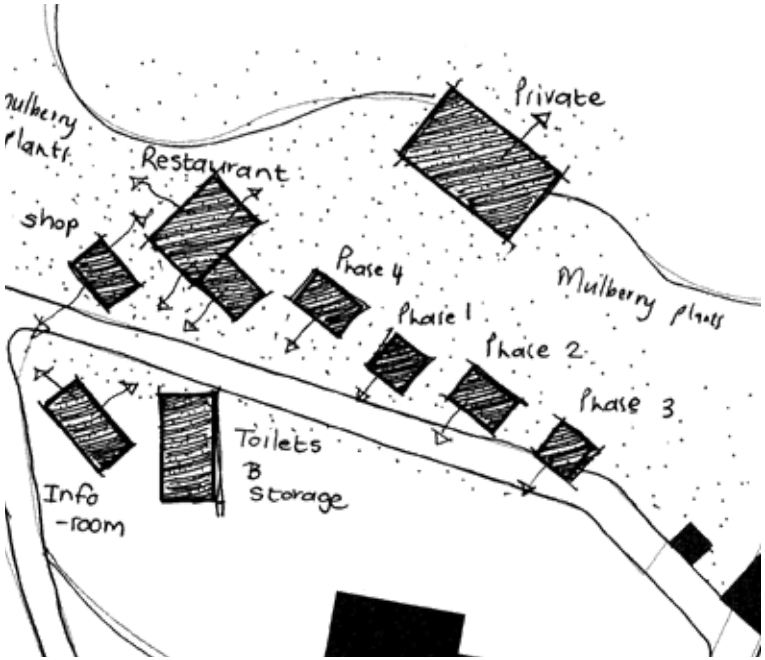


Figure 55: Layout of Africa Silks farm in Graskop, Mpumalanga (Caldeira, 2019: own drawing).

Mulberry Plants

Africa Silks make use of three different mulberry plants. Firstly, the South African white mulberry tree, secondly the Noi mulberry tree, seeds imported from Thailand, and thirdly the Thaishang mulberry tree, seeds imported from Taiwan. The difference between these three trees relates to climate, where the Noi mulberry tree continues to grow leaves during winter, the other two lose their leaves (Nkozi, 2019: interview). Figures 63 and 64 shows the difference in their leaf shape.

Figure 56: Phase 02 at Africa Silks, baby silkworms. Figure 57: Phase 03, full-grown silkworm. Figure 58: Phase 03, Spinning of cocoons. Figure 59: Phase 04, moths mating. Figure 60: Phase 01 Moths laying eggs. Figure 61 and 62: Cocoon and pupae's inside cocoons (Caldeira, 2019: own photos).

Africa Silks Farm and Showroom Tours

The silk farm spaces will include an information room from where tours will commence, and a presentation on the history of Africa Silks and the process of rearing silkworms will be done. Thereafter one is taken through to the different phases of the silkworm cycle. Followed by this there is a presentation on the boiling and stretching of the cocoons either by hand or with handcrafted de-threading machinery (figure 65 and 66). A small shop concludes the farm tour and a restaurant completes the silk farm outing. At the showroom in town, one experience numerous women and men weaving on small and large weaving looms whilst singing traditional songs inside and outside the Africa Silks shop (figure 67 to 70). The shop (figure 71) includes anything silk from skincare to linens, duvets, clothing, toys, and tablecloths, etc. (Africa Silks, 2019: online).


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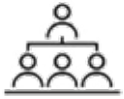
Figure 62: South African white mulberry tree, Graskop. Figure 63: Thaishang mulberry tree, seeds imported from Taiwan. Figure 64 to 65: De-threading methods for cocoons. Figure 66 to 68: Weaving looms at Africa Silks showroom. Figure 69: Duvet inner pulling table at Africa Silks showroom. Figure 70: Interior of Africa Silks shop in Graskop. (Caldeira, 2019: own photos).

2.4.2 USERS

The users of Africa Silks include management and staff, at least 40 people (parents from Tjhabelang Primary School), for each different component of the sericulture process. Components of the project will also accommodate for events held by Tjhabelang, therefore the school is also a user. And lastly other users include tourists, guest schools and the larger community of Bloemfontein. Africa Silks provide guided tours throughout the whole sericulture process that allows children and adults to gain knowledge whilst at the same time breaking away from their rushed city lives.

Rearing of Silkworms:
-Management and Staff

Cultivation of Mulberry plants:
-Management and Staff

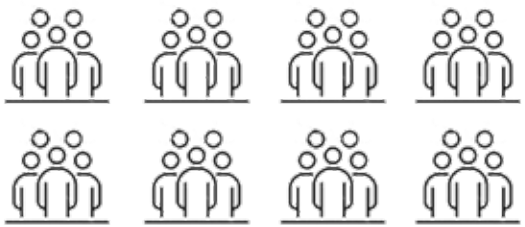


Restaurant:
-Management
-Chef and kitchen staff
-Waiters

Information Room:
-Management

Africa Silks Shop:
-Management and Staff

Production of Silk:
-Management & Staff
-Tourists
-Tour guide
-Local visitors
-School groups
-Tjhabelang Primary School



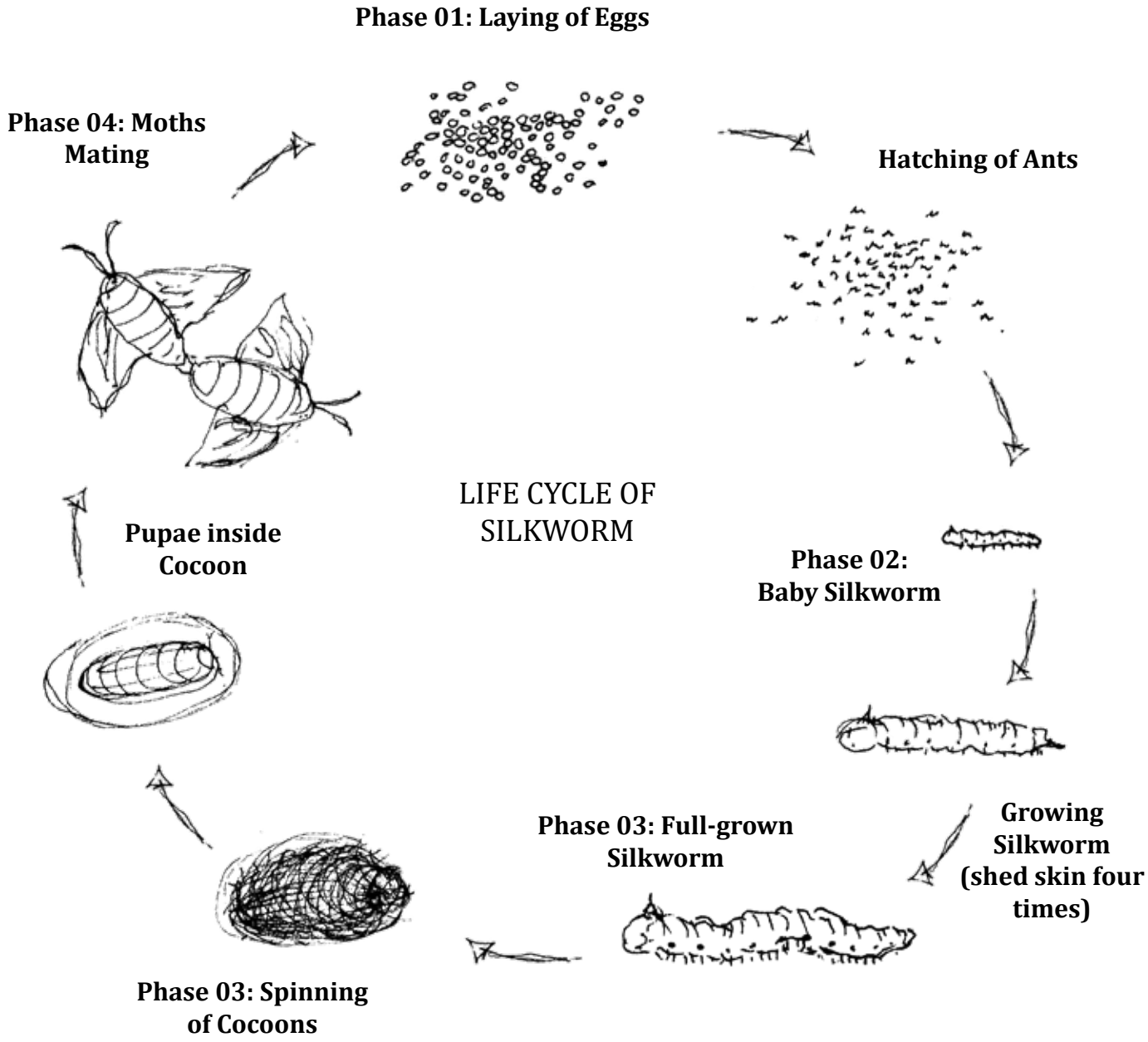


Figure 72: Drawing illustrating the life cycle and different phases of the silkworm (Nkozi, 2019: interview. Own drawing).

Figure 72 illustrates the life cycle of the silkworm and the different phases of the rearing of silkworms at Africa Silks that has to be accommodated in different pods according to specific temperatures and humidity.

2.4.3 ACCOMMODATION LIST

Table 1: Accommodation list for Africa Silks in Bainsvlei Bloemfontein
(Caldeira, 2019: own table).

Function:	m^2	Function:	m^2
Reception	12	**Staff Quarters:**	
Information Room	100	Staff Lounge	70
Storage	35	Staff Kitchen	30
Staff Toilet	8	Staff Bathroom	75
Visitors Toilet (2)	24	Staff Locker Room	75
Sericulture Process:		**Mulberry Cultivation:**	
Phase 01	15	Garden Storage	80
Phase 02	15	Land	25000
Phase 03	30		
Phase 04	30	Parking	400
Boiling Area	20		
Showroom (Weavery)	200		
Shop	300		
Storage	50		
Restaurant:			
Kitchen	80		
Restaurant Seating	450		
Storage	50		

2.4 Typology

2.4.4 Precedent Studies

2.4.4.1 The Bowali Visitors Centre in Kakadu National Park

Northern Territory Australia. By Glenn Murcutt & Associates and Troppo Architects. 1994.

The Kakadu National Park is a big nature and wildlife reserve with vast lands that consist of caves, cliffs and a variety of animals (Rael, 2009: 24). This building was chosen for its typology, being a Visitors Centre, and the way it was designed to fit into and relate to the landscape. The reflective roof seen in figure 73 represents a creek nearby that collects an enormous amount of rainwater through a long central gutter (figure 74) (Rael, 2009: 24).

Along the spine of the building, curved rammed earth walls becomes exhibition spaces that creates an exciting interior without over complicating the roofscape (figure 75). The circulation and columns in the building, seen in figure 76, becomes an extension of the trees, resembling this idea of meandering through a forest, to find numerous creatures (in the exhibition spaces).

Figure 73: Bowali Visitors Centre, photo revealing the roofscape (Gollings, 2012: photo).

Figure 74: Detailing of roof gutter defining different functions (Gollings, 2012: photo).

Figure 76: Columns and circulation becoming an extension of meandering through the trees (Gollings, 2012: photo).

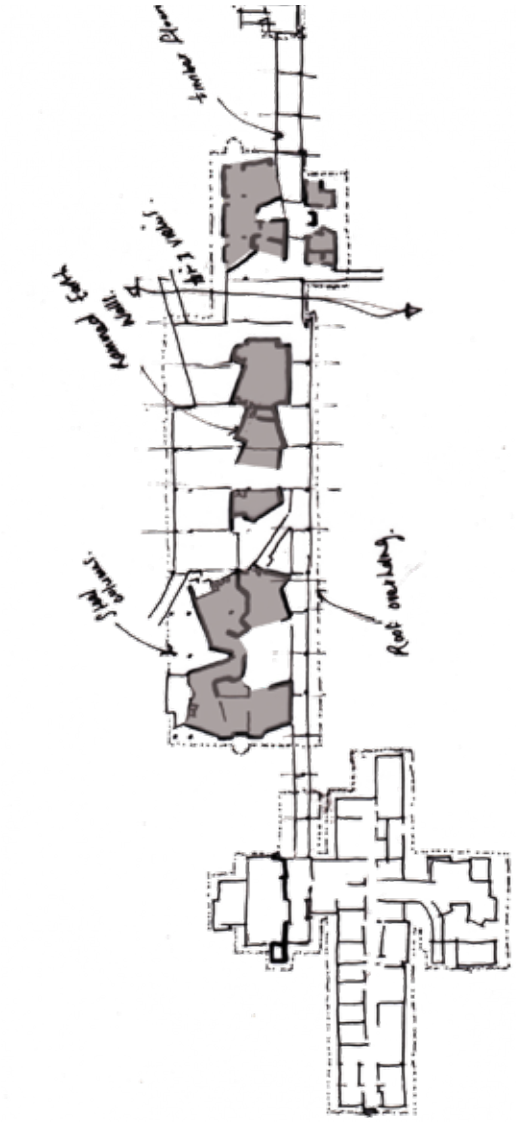


Figure 75: Exhibition spaces creating the spine of the building (Caldeira, 2019: own drawing).

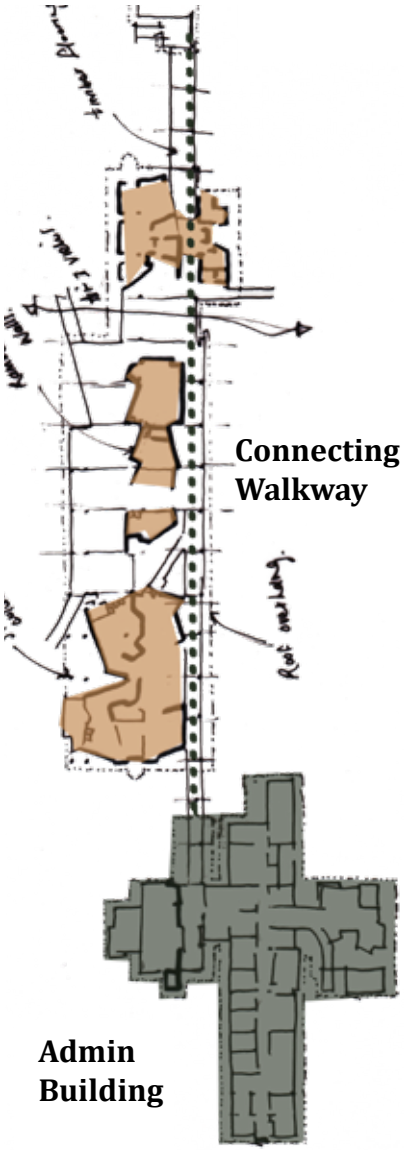


Figure 76: Roofscape and ordering of spaces at Bowali Visitor Centre (Caldeira, 2019: own drawing).

An important aspect of a Visitor Centre is the staff routes and quarters. Staff has to access these exhibition spaces to feed and clean the insects without disturbing guest visitors.

As seen in figure 76, Bowali creates a second wing for all admin and staff activities. Private and public spaces are connected with walkways and becomes an extension to the main valley (creek) with smaller arched roof overhangs.

The influence of this study is evident in design development phase 03, in Part 03 of this book.

2.3.4.2 Monastery and Learning Center

Maharashtra, India. By Sameep Padora & Associates. 2016.

Located in the rural Maharashtra, the Buddhist Learning Center (figure 77) acts as a spiritual anchor and skill development center for the local Dalit Baudh Ambedkar Buddhist community (Summer, 2016: online).

Although Africa Silks is not involved in any formal religious vow activities, it will act as a beacon of hope at Tjhabelang and everyday's weaving is celebrated with traditional songs in their Sesotho language. The reason for this precedent study is the type of building designed for their learning and religist activities.

Designed around existing trees, the programme was divided into six buildings that were linked by two courtyards (figure 78). The overall morphology of these buildings was kept light by inverting the roof profile, as seen in figure 79, 80 and 81, and seperating the roof from the existing walls.

Figure 77: Monastery by Sameep & Associates (Summer, 2016: photo).

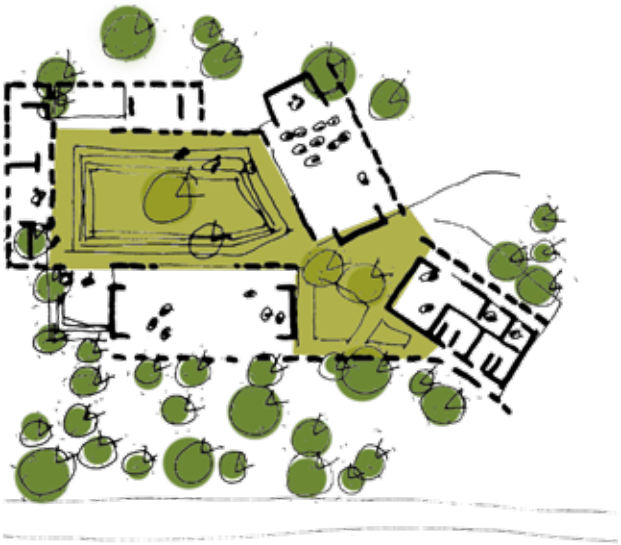


Figure 78: Monastery buildings designed around trees and connected to two courtyards (Caldeira, 2019: own drawing).

This not only creates a physical connection to the outside but also allows for extreme light infiltration and cross-ventilation. The reason for keeping these spaces light and open, was to avoid it from being a distraction in regards to the monastery activities.

Tjhabelang's building character is very strong (farmstead), enclosed and confined. This will be in contrast to Africa Silks' character , being a very light, open set of buildings that are connected with communal outdoor spaces, similar to the monastery.

The construction process included traditional building materials and methods done by some of the local members of the Bainsvlei community. This included the traditional mud and cow dung flooring and rammed loadbearing walls of basalt stone dust. At Africa Silks the idea is also to involve some of the local Bainsvlei members with the construction process to introduce traditional materials and methods in contrast to modern technology.

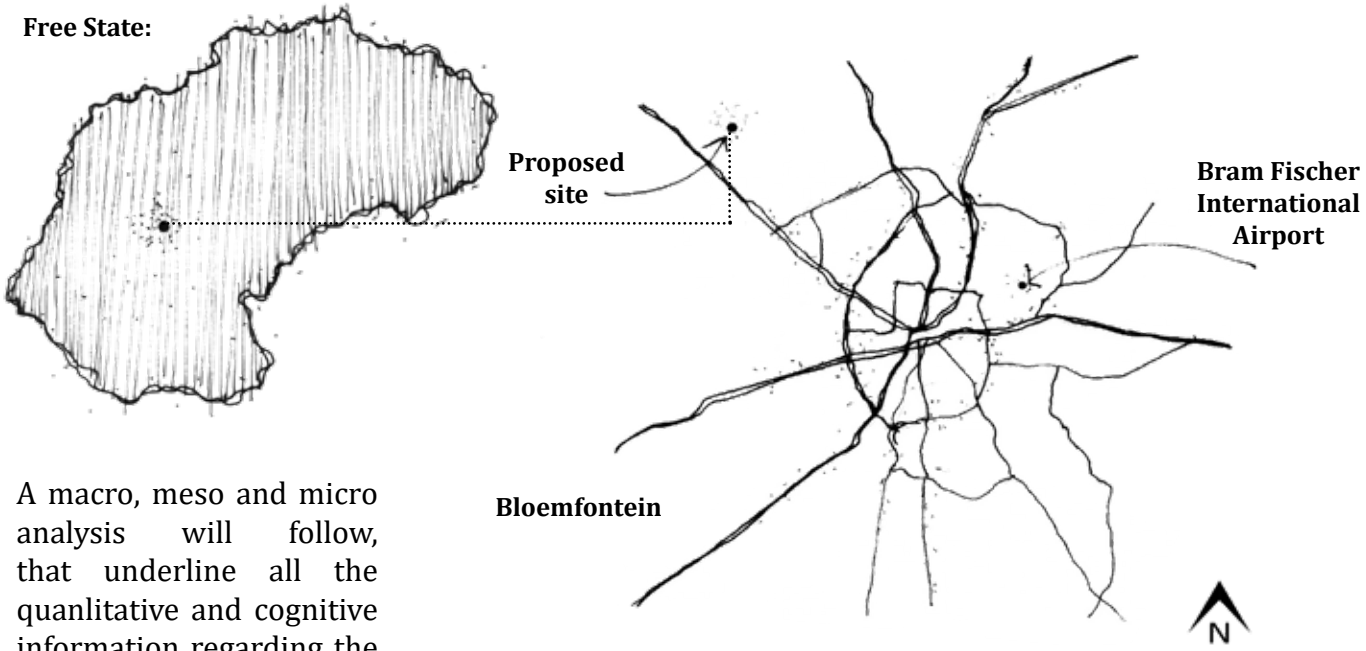
Figure 79: Drawing illustrating the invertion of roofs and connection to courtyard (Caldeira, 2019: own drawing).

Figure 80 and 81: Butterfly roofs, light and openness of Monastery buildings (Summer, 2016: photo).

2.5 Topology

2.5.1 Site Investigation

The site within the rural Bainsvlei area in Bloemfontein was specifically chosen because of the need for a socio-economic intervention that has the ability to change the poverty cycle. It is located west of Bloemfontein, seen in figure 82, next to Tjhabelang Primary School, that inspired this project. The vision of the school is creating a better future for these children and this idea of aiding them to dream and have the freedom to be or do many things, is opposed by how the school connects to the landscape and its closest surroundings (opportunities). This topological investigation is done to understand the genius loci (spirit of place) of the site and the Free State landscape that is essential for new connections to occur.



A macro, meso and micro analysis will follow, that underline all the quanlitative and cognitive information regarding the site, the context and the existing boundaries.

Figure 82: Drawing illustrating location of site in Bloemfontein, Free State. (Caldeira, 2019: own drawing).

Figure 83 is a photo taken of the site, view from Tjhabelang Primary School.

Figure 83: Site and surrounding context, located next to Tjhabelang Primary School (Caldeira, 2019: own photo).

Free State map, indicating site in relation to Bloemfontein.
Not to scale.

Figure 84: Map illustrating road from Bloemfontein towards site. (Google Earth, 2019: map).

2.5.2 Macro Site Analysis (Qualitative)

The site forms an irregular L-shape and sits West of Uitzicht Road, towards ClinVet International. The managers of ClinVet, Bloemfontein, Engela Fourie and her husband, established Tjhabelang Primary School in 2007, on the remainder of their farmland, next to ClinVet, seen in figure 85 (Tjhabelang, 2019: online).

Map of site in Bainsvlei, Bloemfontein.
Not to scale

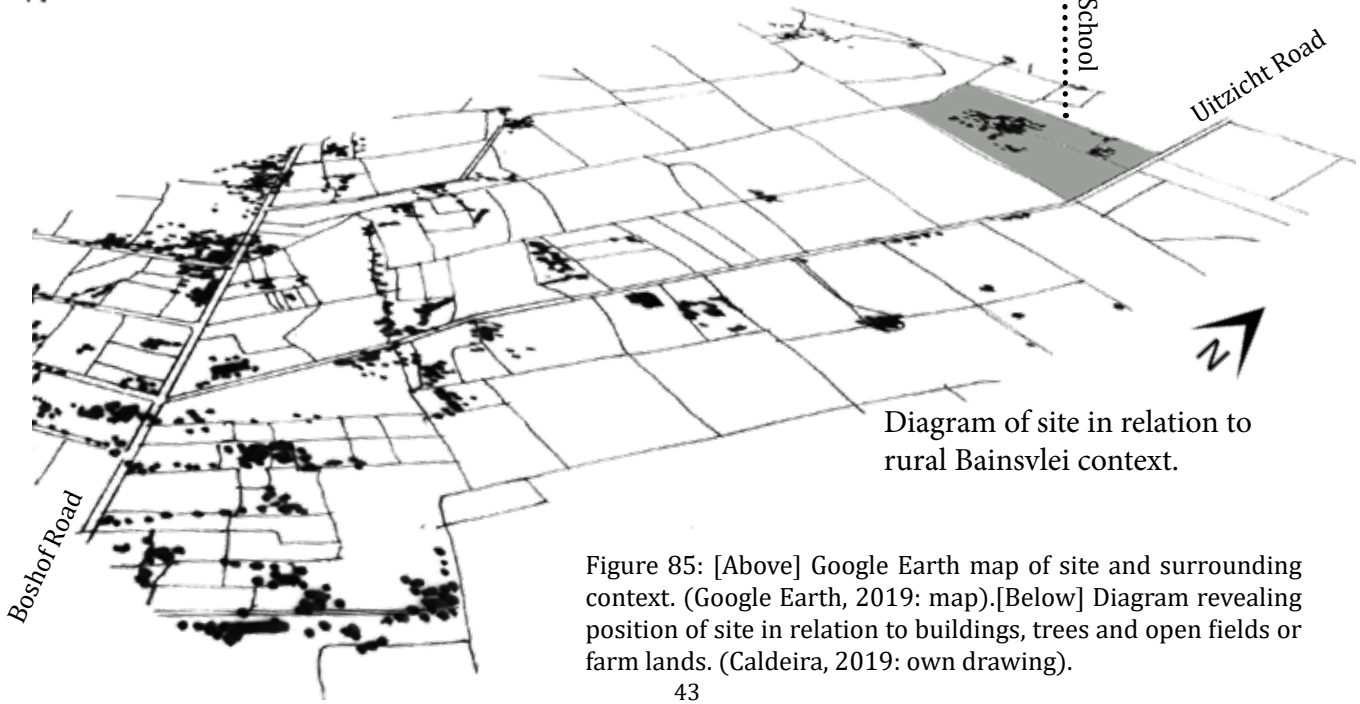


Diagram of site in relation to rural Bainsvlei context.

Figure 85: [Above] Google Earth map of site and surrounding context. (Google Earth, 2019: map).[Below] Diagram revealing position of site in relation to buildings, trees and open fields or farm lands. (Caldeira, 2019: own drawing).

The existing road to site, Uitzicht Road, as well as the informal road towards Tjhabelang and ClinVet are both dirt roads, and as seen in figure 86 and 87, has been deteriorated over the years. There are no formal parking areas accommodated for Tjhabelang, except for school staff members, as most children are transported to and from school with the school bus. As Tjhabelang is currently raising funds to pave the road to school, the focus on bettering the existing infrastructure would be creating an adequate amount of parking for the school, when public events occur, as well as for the new addition of Africa Silks.

Figure 88 reveals the position of these two roads in relation to Tjhabelang Primary School.

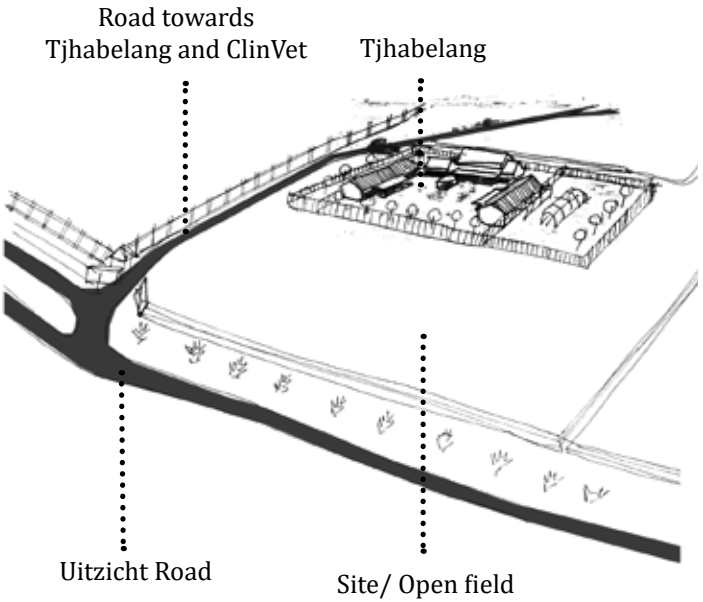


Figure 86: Uitzicht Road, dirt road towards site (Caldeira, 2019: own photo).

Figure 87: Dirt road towards Tjhabelang and ClinVet International (Caldeira, 2019: own photo).

Figure 88: Drawing illustrating dirt roads to site (Caldeira, 2019: own drawing).

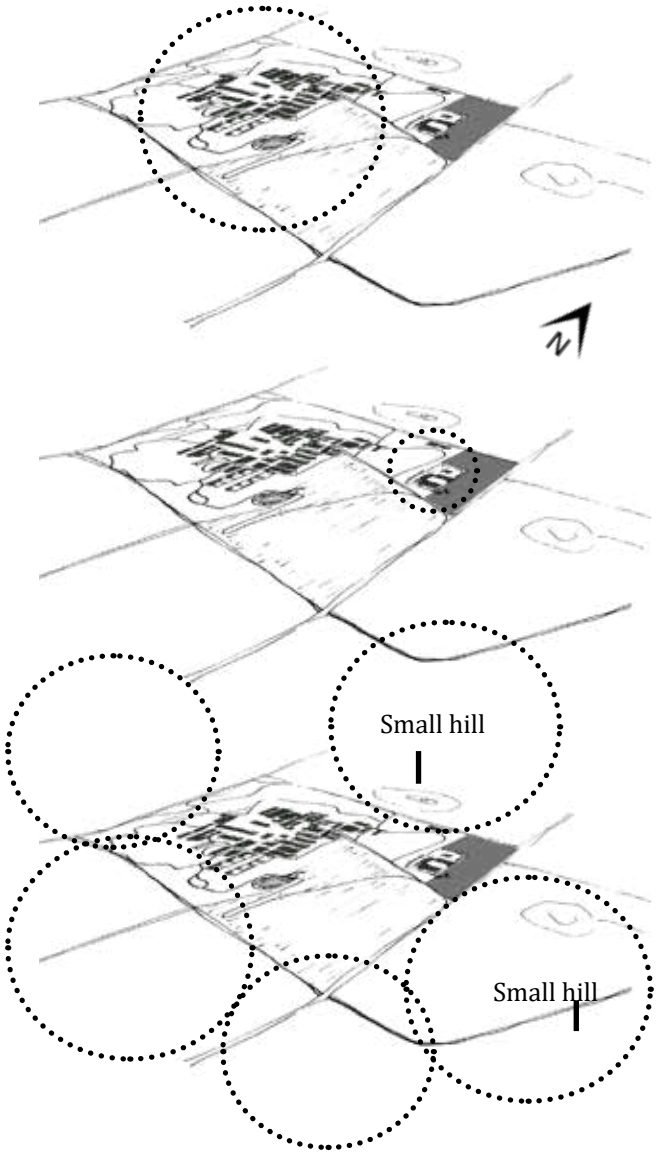


Figure 89: Macro context, Bainsvlei, Bloemfontein (Caldeira, 2019: own drawing).

ClinVet International:

The contract research organisation (CRO), ClinVet (figure 90), was established in 1999 as a laboratory and field-based organisation that does clinical trials to evaluate veterinary health products (ClinVet, 2019: online). Being successful for many years, ClinVet has registered as an NPO, ClinVet Community Development and Education Trust, and established Tjhabelang Primary School, adjacent to their facilities, for the rural children in Bainsvlei, in 2007 (Tjhabelang, 2019: online).

Tjhabelang Primary School:

Located next to ClinVet, Tjhabelang's mission is the following: "At Tjhabelang we strongly believe that social healing can be achieved through early intervention and the provision of a meaningful education. We manage a developmentally appropriate early childhood programme aimed at laying a solid foundation for a love of life-long learning." (Tjhabelang, 2019: online).

Rural Bainsvlei Landscape:

The surrounding stands are mostly farmlands that are either unplanted or vegetated with long grass fields and small yellow flowers that grow all year-round, except in winter. The landscape, mostly flat – except for two small hills, stretches far into the horizon where earth meets sky. This Bainsvlei landscape, as seen in figures 94- 97, is a combination between a cosmic (desert) and classical (forest) landscape where flat plains and a dome- like sky is seldom interrupted with a cluster of trees or long grass fields.

Figure 90: ClinVet International, Bainsvlei, Bloemfontein; located next to Tjhabelang (Marais, 2010: photo).

Figure 91, 92 and 93: Tjhabelang Primary School just after construction completion (Marais, 2010: photos).

Figure 94, 95, 96 and 97: Rural landscape of Bainsvlei, surrounding the site (Caldeira, 2019: own photos).

2.5.3 Meso Site Analysis (Qualitative)

The site is an open field of grass adjacent to Tjhabelang, within the vast open plains of the rural Bainsvlei landscape. The design seeks to alter the existing character of Tjhabelang by breaking certain physical boundaries, such as the fence. As seen in figure 98, there is a clear division between the school playground and the surrounding landscape. This fence is to be altered and conserved to an extent that allows for connectivity whilst remaining a form of security. The following precedent studies questions boundaries and creates disruptions through play. This allows one to transcend the physical boundaries of the school whilst staying within the safe parameters thereof.

Figure 98: Photo taken from inside Tjhabelang Primary School looking towards site, to the East (Caldeira, 2019: own photo).

2.5.4 Precedent Studies

2.5.4.1 Festival des Jardins. Chaumont-sur-Loire, Centre, France. 2007.

Questioning boundaries through interactive play. This allows children to move through the physical boundary and play with adjustable panels according to their activity.

Figure 99, 100 and 101: Transcending boundaries through interactive play. (Sylvie, 2007. Online: photo).

2.5.4.2 Frederiksvej Kindergarten by COBE Architects. 2016.

The inspiration for this design was to create a 'small village' playground indoor inspired by the dense urban building blocks in the surrounding context (figure 102). Wired fencing, seen in figure 103, is used to create thresholds between different areas where doorways in the shape of a building (figure 104) is used to create the idea of entering a new building block (Wang, 2016: online).

This design of inserting the outline of a building as a doorway, threshold, to another space will be used in the design to disrupt and extend the periphery of Tjhabelang, creating the potential for new connections in a playful manner. Further it is proposed to design an afterschool care centre for the children of Tjhabeang whose parents work at Africa Silks.

This will act as an extension of Tjhabelang, designed in correlation with the functions of Africa Silks Farm and Weavery, to create a clear connection between the existing and new infrastructure.

Figure 102: Kindergarden inspired by surrounding dense urban building blocks (Mork, 2016. Online: photo).

Figure 103: Wired fencing as room or 'building block'dividers (Mork, 2016. Online: photo).

Figure 104: Building outline acts as doorway between different spaces (Mork, 2016. Online: photo).

As the site has six boundaries it is important to identify existing access routes and movement in and around site. This is shown in the following figures:

Figure 105: Map illustrating existing vehicle access to site (Google Earth, 2019: map).

Figure 106: Map illustrating existing pedestrian movement on site (Google Earth, 2019: map).

Figure 107: Map illustrating boundaries (fences) on site (Google Earth, 2019: map).

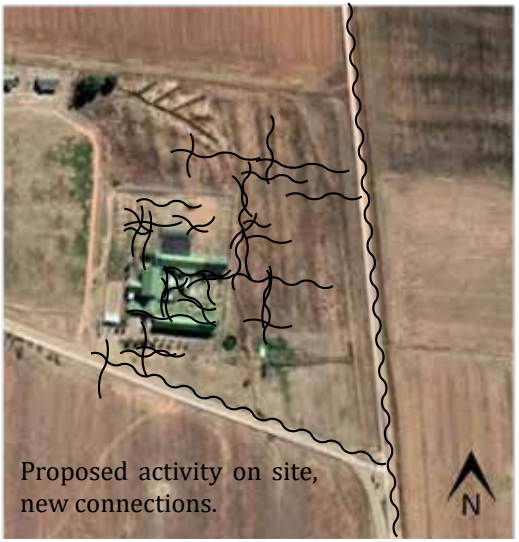


Figure 108: Map illustrating proposed hypothesis of pedestrian activity on site (Google Earth, 2019: map).

2.5.5 Micro Site Analysis (Qualitative)

Figure 109: Perspective of site highlighting the micro context (Caldeira, 2019: own drawing).

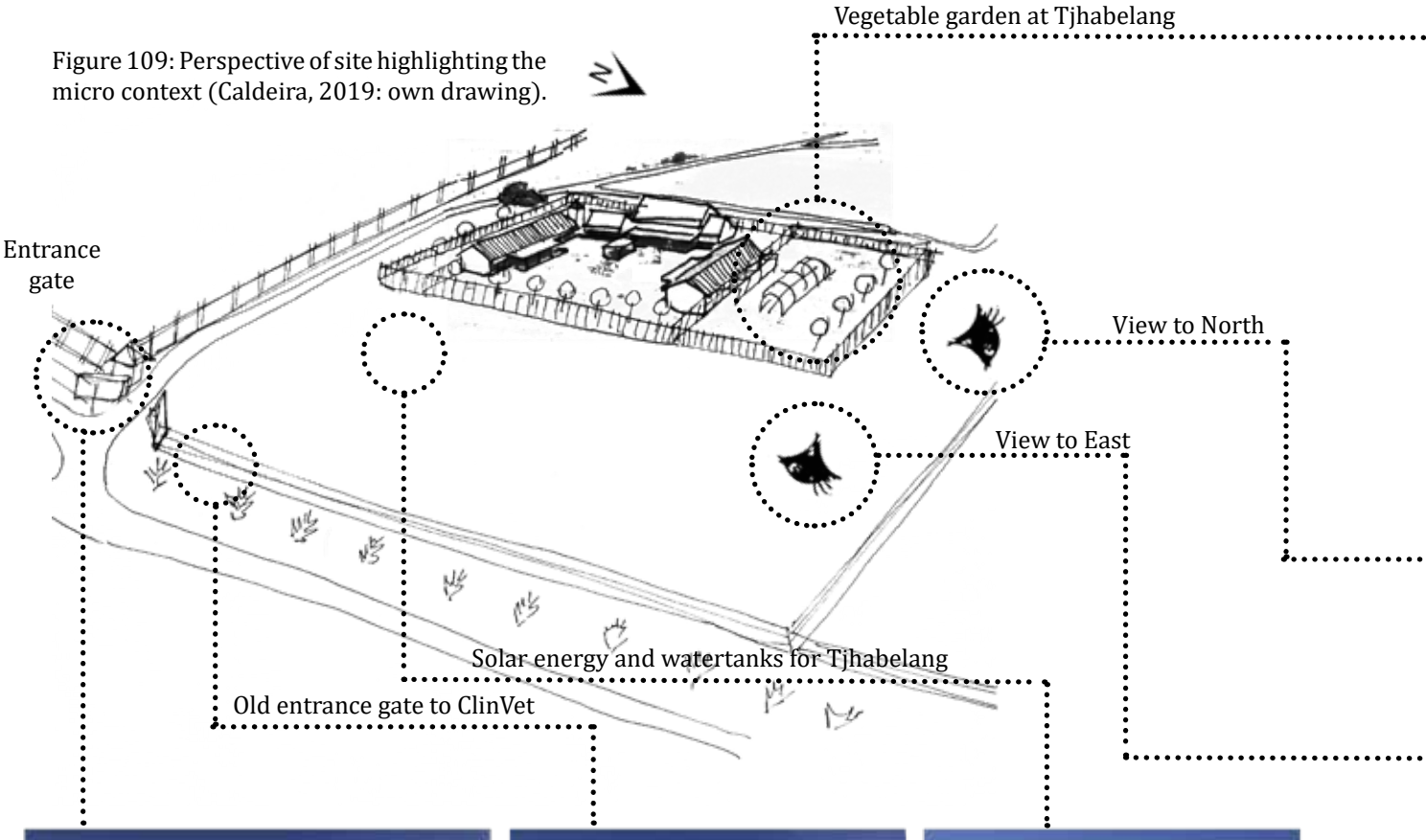


Figure 110: Entrance to site, ClinVet and Tjhabelang (Caldeira, 2019: own photo).

Figure 113, 114 and 115: Vegetable garden at Tjhabelang Primary School (Caldeira, 2019: own photos).

Figure 116: View towards North of vegetable garden and site (Caldeira, 2019: own photo).

Figure 117: View towards East of site, along Tjhabelang Primary School's fence (Caldeira, 2019: own photo).

Figure 111 and 118: Old entrance gate to ClinVet, still part of main fence around site (Caldeira, 2019: own photo).

Figure 111: Tjhabelang's watertanks and solar panels (Caldeira, 2019: own photo).

Figures 111 to 118 shows the micro context on site. These photos reveal the natural landscape surrounding Tjhabelang, as well as the importance of agriculture. The fence (figure 111 and 118) and entrance (figure 110) are both important to this development as it acts as a threshold between possible new connections (created through Africa Silks) and the larger Bainsvlei- Bloemfontein community.

The following figures reveals the views and periphery of the site. Figure 112 and 113 shows the corner of Tjhabelang Primary school that dictates the L-shape of the site.

Figure 118 (left): Tjhabelang, towards West of site. Figure 119 (middle): Vegetable garden, West of site, North of Tjhabelang. Figure 120 (right): Fence seperating vegetable garden from site; view towards East of Site (Caldeira, 2019: own photos).

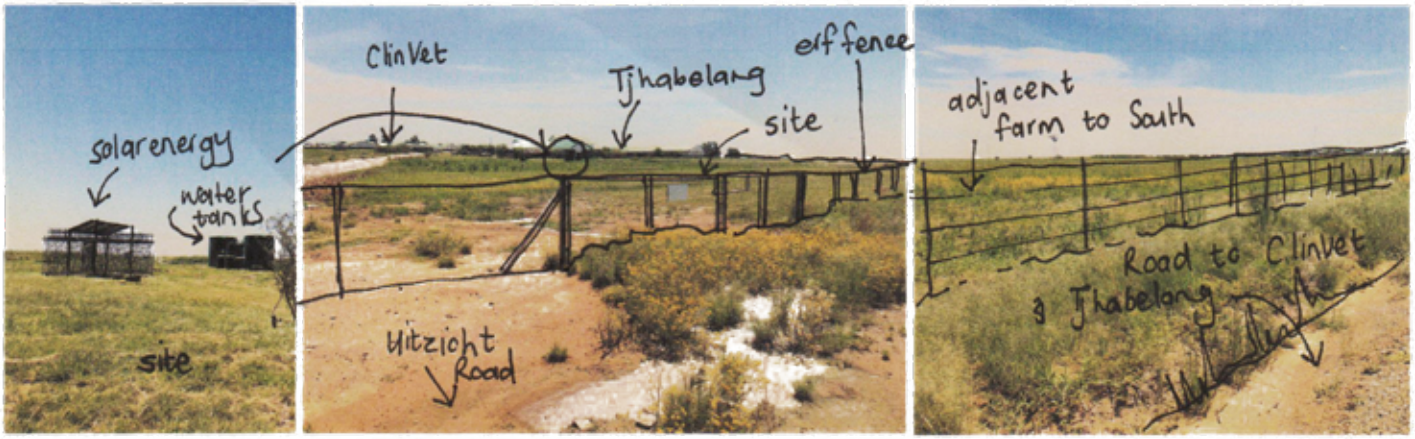


Figure 121 (left): Watertanks and solar panels on site. Figure 122 (middle): View of site from entrance gate, revealing surrounding fence. Figure 123 (right): View towards South of site, revealing adjacent farm land (Caldeira, 2019: own photo).

The site in general is an open field surrounded with a continuous fence. Adjacent to the site, towards the North, East (across from Uitzicht Road) and South is open farm lands and to the West is Tjhabelang. The only built structures on site is the fence surrounding the land and Tjhabelang, and as seen in figure 121, the solar panels.

2.5.6 Feeling of site (Cognitive)

The idea with a parti sketch is to capture one's personal experience of the site as an abstract representation in a drawing. The red-brown paint represents the eroded dirt road towards the site. This is accompanied by an even thicker green paint layer that represents the vast landscape with long grass fields. The larger background is in light blue, representing the large dome- like blue sky of the Free State. The small yellow flowers in the surrounding context is introduced with subtle splashes of yellow paint. A rigid black rectangular frame represents the fence around Tjhabelang and thin lines through it represents the spirit of the place – the remaining landscape (fences melting away), and what this site wants to be.

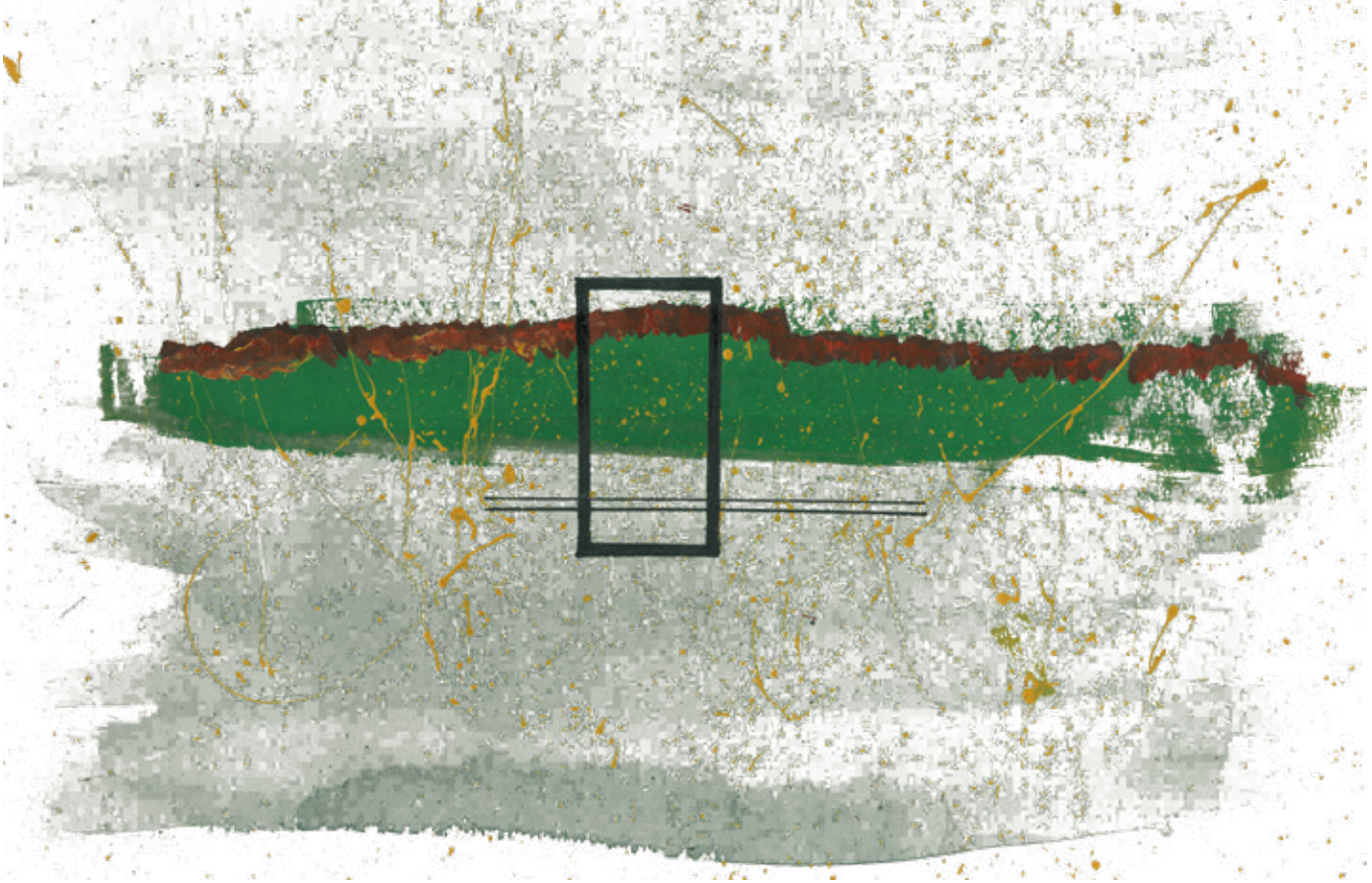


Figure 124: Abstract parti sketch representing experience on site (Caldeira, 2019: own drawing).

The following sketches, seen in figure 125, are memory sketches done a month after the second visit to site. Each view is drawn in half an hour and represents a personal reflection of what the mind wants to remember.

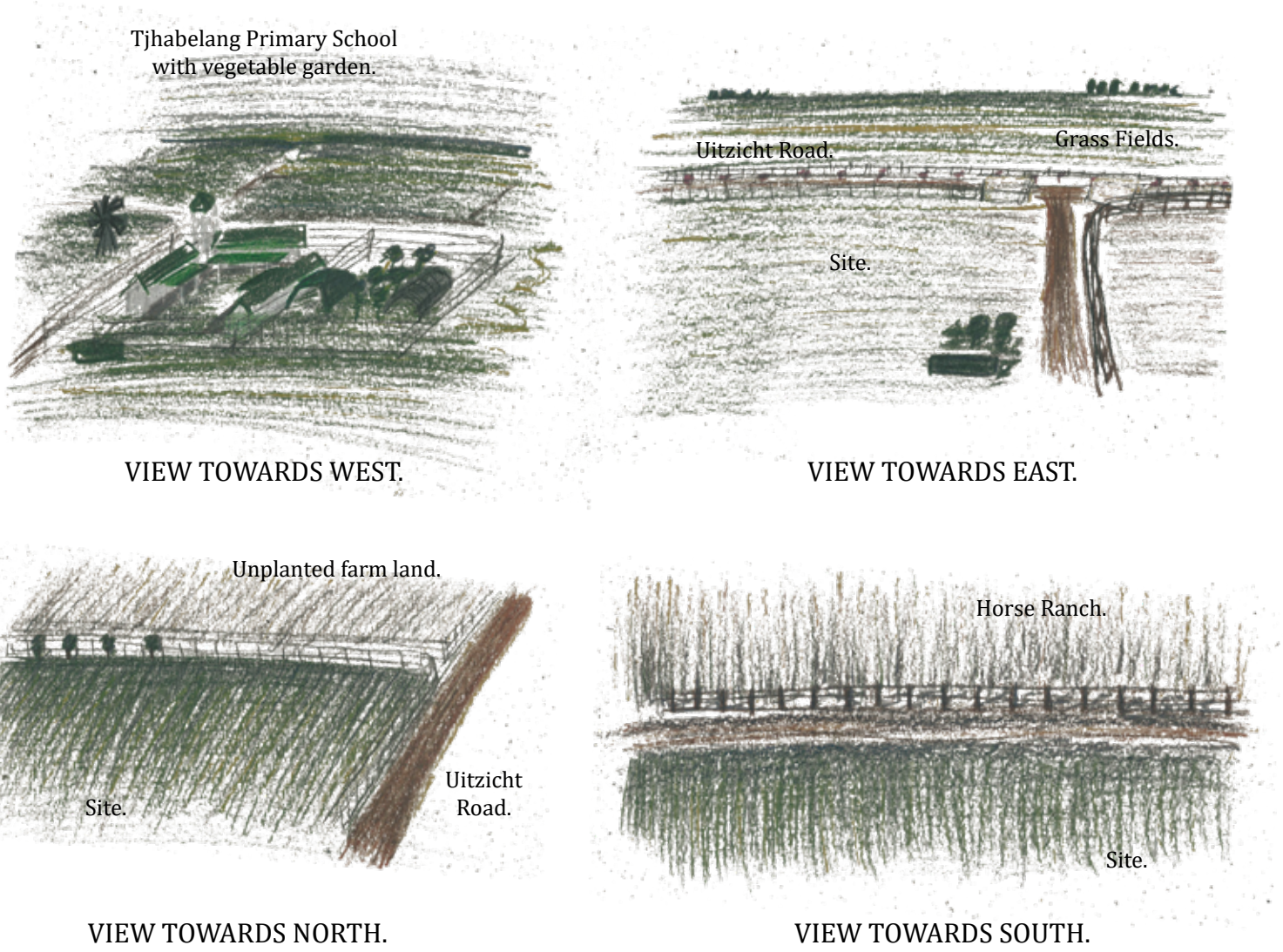


Figure 125: Memory sketches of views from site (Caldeira, 2019: own drawing).

2.6 Morphology (Breaking away from the traditional image of thought)

2.6.1 Theoretical Grounding

The exploration of thresholds serves as a guideline for the architecture to reveal transformation by embracing a subjectivity of multiplicity. Theories of thresholds that support the design are proposed by Turner (1982; 1974) and Van Gennep's (1960) idea of thresholds as a state of liminality, and Deleuze and Guittari's idea of the "rhizome". This theory of the rhizome is described by Dick, Kruger and Le Roux (2018) and guided the thesis to embrace thinking differently (rhizomatically) and to disrupt existing patterns that allow new ones to grow.

Figure 126: Typical Farmstead morphology in rural Bloemfontein, Free State (Caldeira, 2019: own drawing).

Rhizomatic thinking moves away from the traditional, rational way of thinking "where the subject is produced by the process of subjectification" (Dick, Kruger & Le Roux. 2018: 4). This process of subjectification is present in the morphology of Tjhabelang- a typical farmstead setting in the rural Bainsvlei landscape (figure 126 resembles a typical farmstead in the rural Free State landscape where multiple pitched roof buildings are connected with a fence and accompanied by a cluster of trees). Rhizomatic thinking allows multiplicities to connect to one another within an affective assemblage whereby the subject is deterritorialised[1] and reterritorialised[2] , and always in the process of becoming (Dick et al., 2018: 5). This idea of rhizomatic thinking is proposed for the extension of Tjhabelang Primary School (Africa Silks).

The existing structure of the context has the latent potential to upsurge opportunities such as the engagement in productive activities, small-scale farming and harmonizing modern technology with traditional knowledge in the rural community of Bainsvlei. All of which contributes to the sustainable development of the community, and essentially creating the potential for a pathway out of poverty. Tjhabelang Primary School's vision and mission is to guide "children on a journey towards confidence, independence and meaningful lives" (Tjhabelang. 2019: online). Although they may achieve this, the school is still an isolated entity unlike a rhizome that grows from the middle and makes multiple connections in any direction.

[1]A process of transformation where the terrain's fixed elements are disrupted (deterritorialised) (Dick et al., 2018: 7).

2.6.1.1 Rhizomatic Thinking

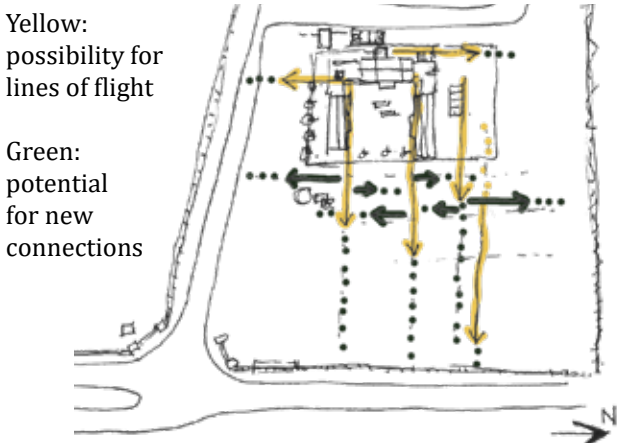


Figure 127: Extending the existing infrastructure into the landscape, revealing possiblities for lines of flight between Tjhabelang and Africa Silks (Caldeira, 2019: own drawing).

In order for the school to initiate real change within the rural community it is proposed that it would act as a map (rhizome) that is always prolonging itself, always connectable, modifiable (adaptable to transformation) and has multiple possibilities for lines of flight, see figure 127. "Lines of flight is a series of mutations, stimulated by the actualization of connections between bodies, where this connection was previously implicit or virtual" (Dick et al., 2018: 6). The school believes in social healing and early intervention therefore they aid the children of the community with educational enrichment. But what will happen to the children after this if there are no further engagement?

Liezl Dick, a residence head at the Madelief assemblage[3] in Bloemfontein, experienced and observed how racial subjectivity among students (including herself), prevented them to be deterritorialised and connect to other multiplicities. She realised she was socially responsible to create lines of flight that result in the deterritorialisation of the racialised subjectivities (Dick, 2016: 6). Crisis situations made these connections between students possible, but habits kept these subjectivities from continuing sinuously. An important factor to this were habits of parents (Dick, 2016: 7). Older generations are more likely to be stuck in the traditional ways of thinking and they have a substantial influence on children and their habits.

Tjhabelang Primary School initiates change within children, but they need connections from older generations in the community to make the creation of new subjectivities (pathway out of poverty) possible and lasting.

[2] The disruption of a terrain allows for change, new connections and organisations (reterritorialisation) (Dick et al., 2018: 7).
[3] A community that forms when the material and immaterial connect, constantly changing and connecting to other assemblages (Dick et al., 2018: 5).

> "We have to realise that we need each other. We are components in an assemblage. If becoming happens when we connect, and new connections make the creation of new subjectivities possible, we have to ask ourselves: what kind of subjectivities are we creating in this assemblage? Who are we becoming?" (Dick, 2016: 7).

According to Engela Fourie, founder of Tjhabelang Primary School, most of these children's parents don't have the money to contribute to their children's education and aren't involved within this assemblage (Fourie, 2019: interview). The thesis proposes to create new connections to the existing assemblage, where the older generation in the rural community of Bainsvlei are a part of Tjhabelang's process of becoming. The following diagram (figure 128) illustrates the ripple effect of connecting two assemblages, Tjhabelang and the parental figures within the rural Bainsvlei community. Lines of flight are created that result in the deteritorialisation of isolated entities that transform habits related to the subjectivities of rural children's futures and enhance connections to other multiplicities.

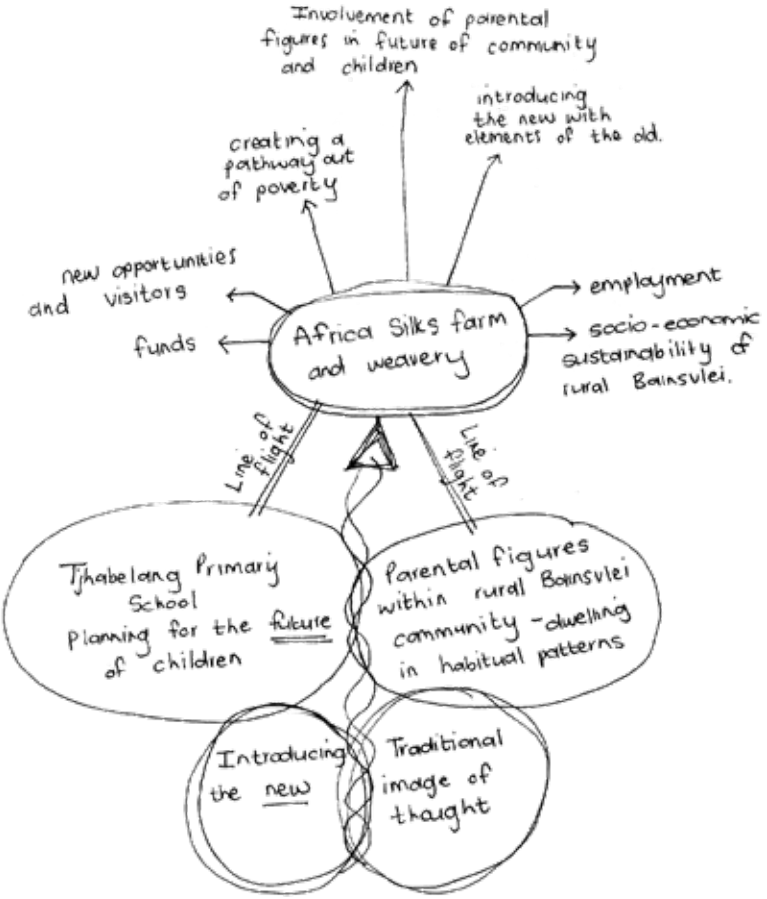


Figure 128: Diagram illustrating the effects of connecting two assemblages for new connections to take place (Caldeira, 2019: own drawing).

2.6.1.1.1 Deterritorialisation

The design aims to alter fixed ordering systems such as the courtyard and fence surrounding Tjhabelang, to enable the potential for new connections and transform existing socio-economic patterns in the rural Bainsvlei, through rhizomatic demeanor.

The role of this rhizomatic movement is to disturb in order to make becoming possible (Dick et al., 2018: 6). The process of deterritorialisation, reterretorialisation and territorialisation are inherently part of any social context in the form of crisis, breach and readdress (figure 129 illustrates this idea). When a terrain or body is deterritorialised new connections are made possible by disrupting the fixed connections of the terrain. The social cycle is disturbed by introducing parental figures, through Africa Silks, at Tjhabelang to the existing Tjhabelang assemblage. This addition creates a physical disruption within an existing transformative vector terrain (this refers to the social dynamic of the Tjhabelang assemblage but also the physical landscape) (Dick et al., 2018: 7). Figure 130 and 131 is an example of this disturbance to take place at Tjhabelang.

2.5.1.1.2 Reterritorialisation

Deleuze and Guittari (1987) sees subjectivity as a creative process where a subject is in the process of becoming when connected in an assemblage that consist of other bodies and subjects. The connection between these entities are important as they determine the "flow of affect, intensities and desire between subjects"

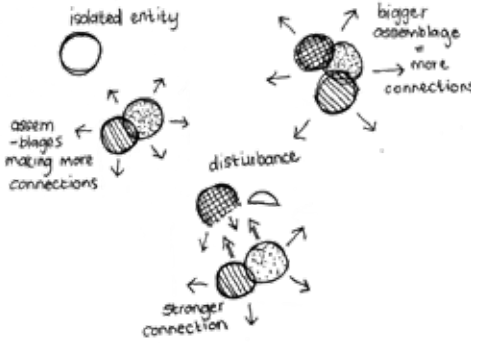


Figure 129: Illustration of rhizomatic behaviour between different assemblages connecting (Caldeira, 2019: own drawing).

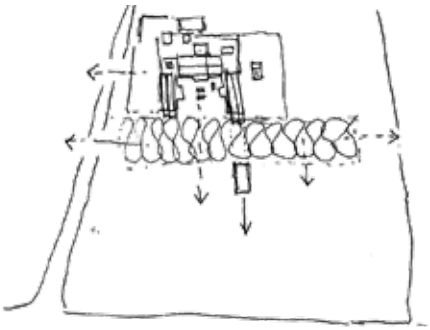


Figure 130: Deterritorialision at Tjhabelang: social change (Caldeira, 2019: own drawing).

Two entities forming one assemblage.

Figure 131: Deterritorialision at Tjhabelang: infrastructure (Caldeira, 2019: own drawing).

(Dick et al., 2018: 7). The focus is on the collective, the assemblage as a whole rather than individual elements thereof. Although the rhizome exists from connections between numerous multiplicities that are diverse in nature, it is an acentered, non-hierarchial system (Deleuze & Guittari. 1987: 21).

The connection between the Tjhabelang and Africa Silks assemblage is that of family and even more important, of social change. To strengthen this connection and gain involvement from the rural community, people from the community are employed and trained during the construction of this new assemblage. Local building techniques are to be combined within the design along with new techniques that questions the traditional way of thinking.

2.6.2 Morphological Grounding

This investigation is aimed at change, new connections and breaking away from the traditional image of thought. Questioning existing systems (traditional) and introducing new ones. One of the main elements that enables this change is the introduction of the Africa Silks assemblage as a job creation initiative, that will enable the connection of other assemblages and multiplicities to Tjhabelang. Therefore, the sericulture process, in particular the cycle of the silkworm will curate this change in the architecture and disturbance within the landscape. This approach is vested in the ideas of Deleuze and Guittari as rhizomatic thinking, where one moves away from traditional thoughts and the process of subjectification (Dick, Kruger & Le Roux. 2018: 4).

Traditional farm and warehouse morphology (traditional images of thought), as discussed on page 11 and 12, are questioned and alternative morphologies inspired from the life cycle of the silkworm, and Turner (1982; 1974) and Van Gennep's (1960) ideas of liminality are explored. As mentioned by Liezl Dick, rhizomatic ideas are not formed by a pre-existing normative model but favours creativity and difference-in-itself (Dick, et al., 2018: 4).

2.6.2.1 Thresholds and liminality

Victor Turner (1982; 1974) and Arnold van Gennep (1960) describes a threshold as a state of liminality. In their view, during a rite of passage, one undergoes a state change, where one is neither here nor there, a state of in-between-ness. This is called a liminal stage and can be

seen as a transitioning phase between the old and the new. In some cultures, a rite of passage is done as a symbolic gesture of a child's death and celebration of his/ her new life as an adult. For the initiands to enter into a new communitas, they ludically combine elements of the old order into the new one (Viljoen, 2007: 194, 195).

This state of in-between-ness is present in the life cycle of the silkworm. When an adult worm has reached the stage of spinning silk it will lift its head up and stop feeding on mulberry plants. Thereafter, it will start spinning silk against a given surface until a cocoon is formed and the silk runs out. As the silk runs out the silkworm enters the cocoon, continues to close the cocoon with the remainder of the silk and turns into a pupae. The pupae inside the cocoon will metamorphose into a silk moth and break through the silk to escape this state of liminality.

This stage of liminality (figure 132) during the silkworm cycle (precedent 01) and sericulture process will guide the morphology of this design. As the rearing of the silkworms play a big role in Africa Silks and the larger scheme of introducing change to the Tjhabelang assemblage, this will become the link (liminal stage) between the two assemblages (figure 133).

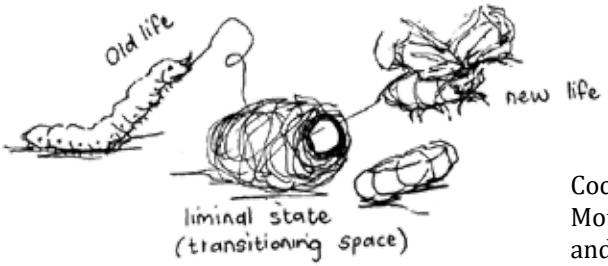


Figure 132: Liminality phase in cycle of silkworm (Caldeira, 2019: own drawing).

Cocoon: Liminal state.
Moths: Symbolize new life and better future.
Eggs: Extension of Tjhabelang in the form of education.
Silkworm: Staff (parental figures), element with transformation abilities.

Figure 133: Life cycle of silkworm acting as curator in the connection between Tjhabelang Primary School's assemblage and Africa Silks' assemblage (Caldeira, 2019: own drawing).

The first precedent study for the morphology of Africa Silks, as mentioned above, is the life cycle of the silkworm. The second precedent study is an art piece by Bill Viola that looks at thresholds in terms of rituals: life, birth and rebirth. These expressions can be related to the idea of change (Tjhabelang as an isolated entity, in the process of *becoming* when connecting to Africa Silks as a means of changing the future of children in the rural Bainsvlei area) with different spatial experiences throughout the whole building scheme, seen in figure 135.

2.6.3 Precedent Studies

2.6.3.1 Life cycle of Silkworm. Africa Silks. Graskop, Mpumalanga.

The life cycle of the silkworm is illustrated below in correlation with the needs of Africa Silks and connection to the larger aim of this dissertation, creating a pathway out of poverty for families in the rural Bainsvlei community.

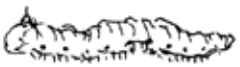
Eggs 	The start of a new life. Also seen as the start of change. And is related to Tjhabelang (education), from which this thesis grew.	Information Room (History of Africa Silks)
Silkworm 	The silkworm reflects hard work, creativity and transformation and can be related to the parental figures at Tjhabelang that will be employed at Africa Silks.	Staff Members
Cocoon 	Liminal state between old and new life. Related to an inbetween space that resembles a transition between Tjhabelang (as an isolated entity) and new connections made possible through Africa Silks.	Rearing of silkworms and after school care for children
Moths 	Metamorphosis of pupae into moths. Represents change and possibility for new life (mating and laying eggs). Moth breaking through cocoon also represents freedom and a new beginning.	Restaurant and Africa Silks shop (international trade)

Figure 134: Life cycle of silkworm related to needs of Africa Silks and Tjhabelang (creating a pathway out of poverty) (Caldeira, 2019: own drawing).

2.6.3.2 Thresholds: Life, Death, Rebirth. Bill Viola.

Working with sound, spatial experiences and camera techniques, Bill Viola intrigues all of one's sense with his art works and videos that relate to the very nature of our existence. The following exhibitions and films (figure 135) incorporate air, water, fire and earth to convey life and the transitioning that happens after death (rebirth). This transitioning either happens with a person drowning in water (with the sound of water thrashing through the speakers) and ascending into the air (sound of water dripping slowly). Or someone burning in fire (with loud flames crackling) looking at a mirrored image of oneself ascending out of a still water pool (silence) and falling on the ground (wind blowing, full of dust).

Figure 135: Films and art exhibitions by Bill Viola, revealing transitions between life, death and rebirth (Itsliquid, 2014: photo by Bill Viola).

These transitions between earth, air, water and fire along with the sounds can be related to a symbolic ritual of life and is the inspiration for the experiential spaces to be experienced at the Africa Silks assemblage. As mentioned previously, the link (the liminal space: transition between old and new) between the Tjhabelang and Africa Silks assemblage is where the rearing of the silkworms will take place. The requirements for these spaces are four different pods, each with their own humidity and temperature plant that needs to be adjusted according to the phase of the silkworm life cycle.

These pods need to be separated from noise, direct light and insects, and therefore is designed as a separate walkthrough experience that sits in between Tjhabelang and the remainder of Africa Silks. As this acts as a liminal space of in-between-ness it will also be lowered into the ground to resemble that idea of liminality, an escape from the 'real', and rite of passage between the old Tjhabelang and its process of connecting and becoming (becoming one with the landscape and the start of better lives for the rural children of Bainsvlei).

2.6.3.3 Daegu Gosan Library Competition entry, by Patkau Architects. 2012.

The following precedent study has been identified in relation to the liminal stage present in the cycle of the silkworm (figure 132). Within the landscape, as mentioned on page 60, the rearing of the silkworms will become the link between the existing Tjhabelang assemblage and the Africa Silks assemblage. This process of rearing the silkworms happens in four different pods. The morphology of this building seen in figure 136 and 137 resembles two pods that folds open towards the top. This design was selected as the inspiration for this liminal stage, where the rearing of the silkworms take place, as it reflects physical qualities described during the liminal stage where a pupae develops into a moth, inside the cocoon.

The transitioning to Tjhabelang when adding Africa Silks is creating that potential for a pathway out of poverty and better future for children. Therefore, this idea of a cocoon 'breaking' open , as the liminal space between Tjhabelang and Africa Silks, is used as it symbolises freedom and a stage of metamorphosis (change from pupae to a moth and from poverty to a sustainable economic future for children in the rural Bainsvlei community).

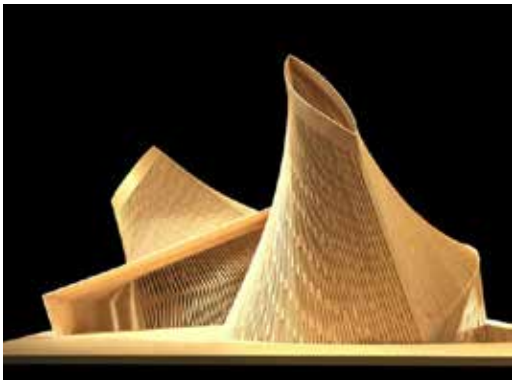


Figure 136: Computer model of Daegu Gosan Library by Patkau Architects (Patkau Architects, 2012: online).

Figure 137: Model of Daegu Gosan Library by Patkau Architects (Patkau Architects, 2012: online).

2.7 Tectonics (Connecting old and new)

In contrast to Tjhabelang Primary School the structure and materials used at Africa Silks will be of their raw natural quality, inspired by the Free State building culture (see page 13) and natural surroundings. This includes timbers, clay bricks (unpainted), rammed earth walls, corten steel and corrugated iron roof sheeting.

The addition of the Africa Silks assemblage will incorporate elements of the old (Tjhabelang) along with new ones. This idea along with the morphology of the design is influenced by the cycle of the silkworm. Figure 134 on page 61 reveals the connections made between the lifecycle of the silkworm and the functions required for Africa Silks. The following figure (figure 138) illustrates how elements of the old and of the new are linked to these different spaces, according to the silkworm lifecycle.

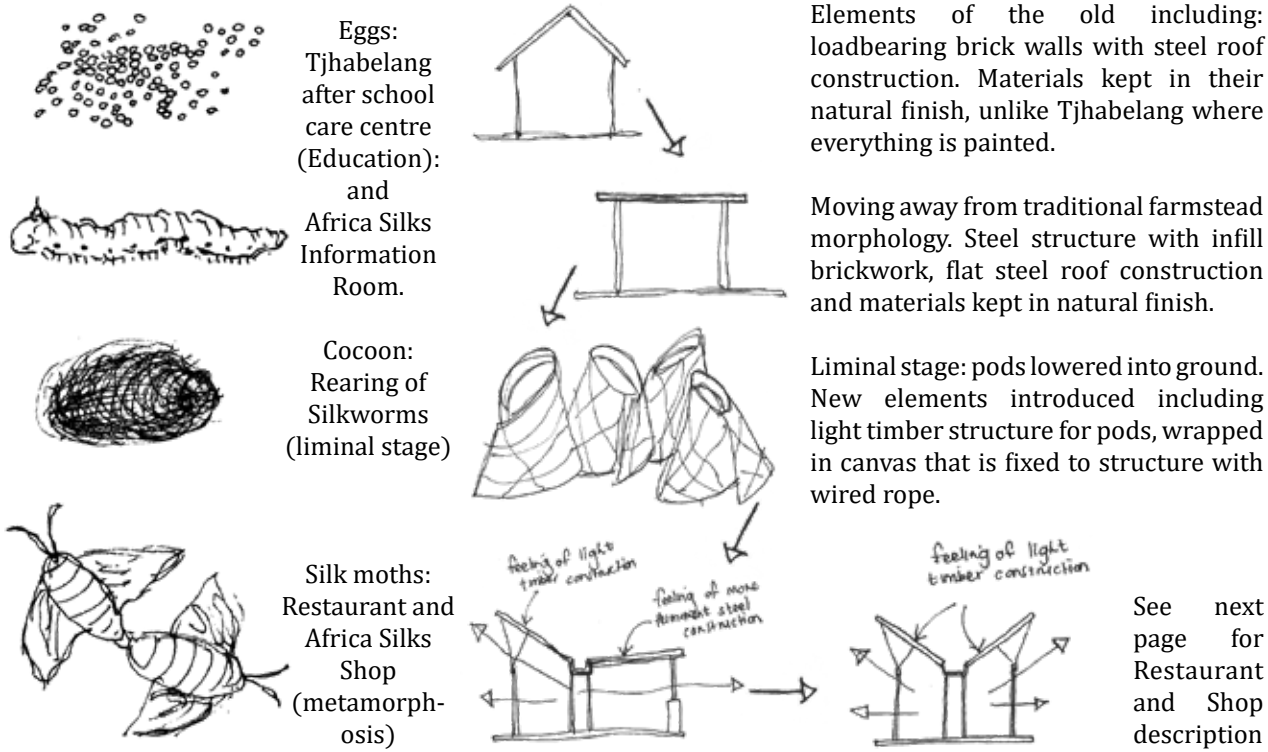


Figure 138: Relationship between tectonic character of design and lifecycle of the silkworm (Caldeira, 2019: own drawing).

Metamorphosis into moth: character of transformation. Complete inversion of traditional pitched roof. One building (restaurant) including elements of the old (steel structure) and of the new (timber structure).

Final building (shop), completely opening up to natural surroundings, with the feeling of a light timber structure (temporariness) and butterfly roof. This symbolizes the idea of ascending into the landscape, and the 'future'.

Elements of the old are related to Tjhabelang Primary School, being an isolated entity within the landscape, and this is also related to the existing poverty cycle within the rural community of Bainsvlei that prevents children from receiving education. These motions represent a fixed state, something that will not change, a vision (of Tjhabelang) that will not be successful, unless external forces are brought forward. This fixed state will be represented in the design through steel, and loadbearing clay brick structures.

Elements of the new, introduced through Africa Silks, will include natural materials that represents temporariness, and change. This include timber, rammed earth and weaved grass elements. Wired rope, as seen in the precedent study below, is introduced as an interpretation of silk threads that moves with the wind (this movement is also connected to a feeling of temporariness). The movement of these 'threads' will create obstructive views towards the landscape, which is a reminder that this context, this stage in life, is temporary; and that there is a future for these children after Tjhabelang Primary School.

2.7.1 Precedent Studies

2.7.1.1 Touche Pass House. By Lake and Flato Architects. 2009.

This modern farmstead, seen in figure 139, is located in Carmel Valley, California. A typical farmhouse morphology where natural materials such as timber (figure 140) and stone (figure 141) is used and metal is treated, seen in figure 142, to fit into the natural landscape. This feeling of light steel structures and adjustable rusted metal panels allows one to extend the periphery of the building where outdoor spaces dissolves into indoor spaces. The tectonics and nature of materials used in this design will be incorporated into Africa Silks as a means of truly connecting to the natural Free State landscape.

Figure 139: Modern farm compound design by Lake and Flato (Ooms, 2019: photo).

Figure 140 (left): Use of natural materials seen with timber roofing. Figure 141 (middle): Use of natural stones for flooring. Figure 142 (right): Metal treated for rustic aesthetic, connecting indoor spaces with the outdoor feeling of the natural landscape (Ooms, 2019: photos).

Elements of the old has been discussed on page 13. The following buildings introduce elements of the new, relating to natural materials and the idea of wired rope representing silk threads and movement.

2.7.1.2 Salvaged Ring Cafe located in Vietnam. By a21 Studio Architects. 2014.

The use of timber in its natural finish for structure and shading devices, seen in figure 144. This use of timber and weaved grass (ceiling) are techniques that the people from the rural Bainsvlei are familiar with and will be designed in contrast to the old elements.

Figure 143 (left): Salvaged Ring Cafe, in Vitenam. Figure 144 (right): Interior view, revealing natural use of timber construction and a weaved grass ceiling and shading devices (A21 Studio, 2019: photos).

2.7.1.3 Windshape, Lacoste, France. By nArchitects. 2006.

Two eight-meter-high pavilions that dynamically changes with the wind, seen in figure 145, 146 and 147. A structural network of white plastic pipes, some joined together, and some stretched apart by aluminium collars, have been connected with polypropylene string that creates swaying gestures with the wind. These movements change the spatial experience of the pavilion and constantly changes the way one perceives the surroundings. This inspired the idea of introducing wired rope to the design of Africa Silks.

Figure 145 (left): Windshape Pavilion designed by nArchitects. Figure 146 (right): Pavilion twisting with wind, view looking up into pavilion (nArchitects, 2019: photos).

Figure 147: Dynamic public gathering spaces created within pavilion (nArchitects, 2019: photos).

PART 03

DESIGN AND CONSTRUCTION SYNTHESIS

This chapter reveals the design development of Africa Silks as well as the final design development and technical resolution. Different phases of the design development are illustrated along with what inspired it. Phase 01 develops from the conceptual developments in Part 02. Phase 02 develops from climatic conditions, silk and influences from the cognitive analysis of the site. Phase 03 develops according to two gears that symbolizes the functioning of Africa Silks. And phase 04 develops from the morphological grounding in Part 02 about thresholds and liminality, where Bill Viola's work inspires the connection between the old assemblage (Tjhabelang) and the new assemblage (Africa Silks).

The final phase (05) links with the final design development, where the design develops according to rhizomatic thinking, questioning the process of subjectification (and therefore the morphology of a typical farmstead) and traditional thoughts. This final phase and development are inspired by Deleuze and Guittari's (1987) idea of the rhizome as well as the life cycle of the silkworm. These two ideas are related to the larger scheme, the layout and structure of the buildings to create a hybrid model that speaks of change and transformation.

Figure 148: Macro Context, revealing manmade city and Soetdoring Nature Reserve (Caldeira, 2019: own drawing).

3.1 Design Development

3.1.1 Phase 01: Africa Silks Farm and Weavery

This phase developed from the Nature - Machine concept, on page 21.

Concept: Slow process of nature (relating to macro context – Soetdoring Nature Reserve (figure 148), and the client -natural life cycle of the silkworm) represented with curved lines. And straight lines are used to represent the machine (influence of man in the landscape – manmade city, and influence of man controlling the natural lifecycle of the silkworm, to speed up the process).

At Africa Silks the silk is dependent on the production of silk, where the natural life cycle (that only occurs once a year) of the silkworms needs to be adapted in order for continuous silk production throughout the year. This control of people in the sericulture process relates to the machine and inspired the idea to compose a design that consist of 'different parts'

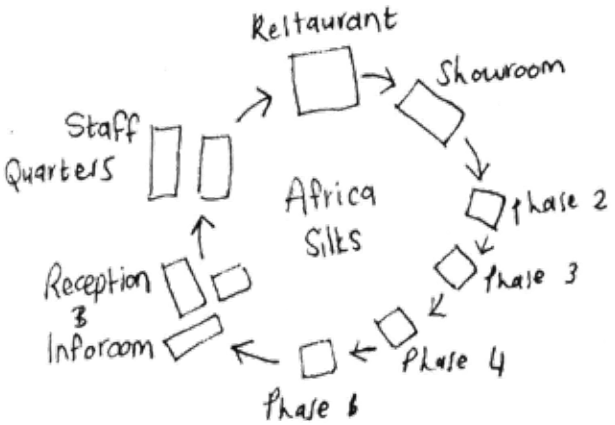


Figure 149: Idea of machine, visual resemblance to silkworm lifecycle (Caldeira, 2019: own drawing).

interlocking, working together as a system. Figure 149 shows how this machine of interlocking parts take the shape of the silkworm life cycle.

On site, South of Tjhabelang, there are informal parking grounds that was proposed to also facilitate the guests of Africa Silks. From this a walkway is created that allows one to move past the school's playgrounds, allowing a visual connection to what inspired this development. As Tjhabelang is organised along straight lines, to create the connection between machine (straight lines) and nature (curved lines), Africa Silks are organised according to a circular path, creating a loop back to the parking area. This creates a journey similar to the life cycle of the silkworm, where it is one continuous movement (see figure 150 and 151).

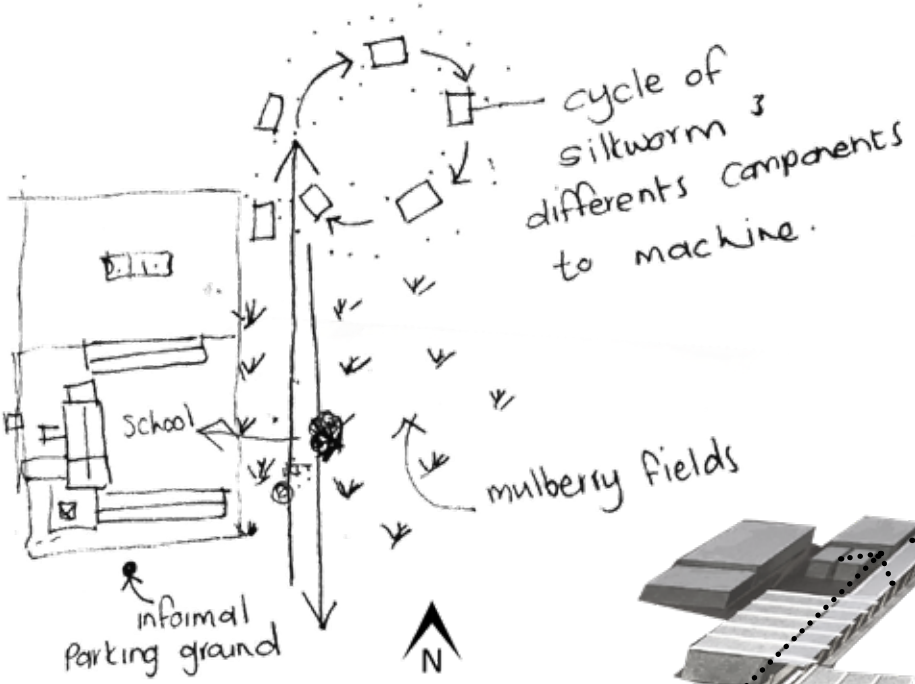


Figure 150: Phase 01: Machine | Nature (Caldeira, 2019: drawing).

This design, like Tjhabelang, also creates a courtyard space, where mulberry plants are to be planted.

With all the spaces having a connection to the courtyard and being connected with walkways, it creates the feeling of a small village.

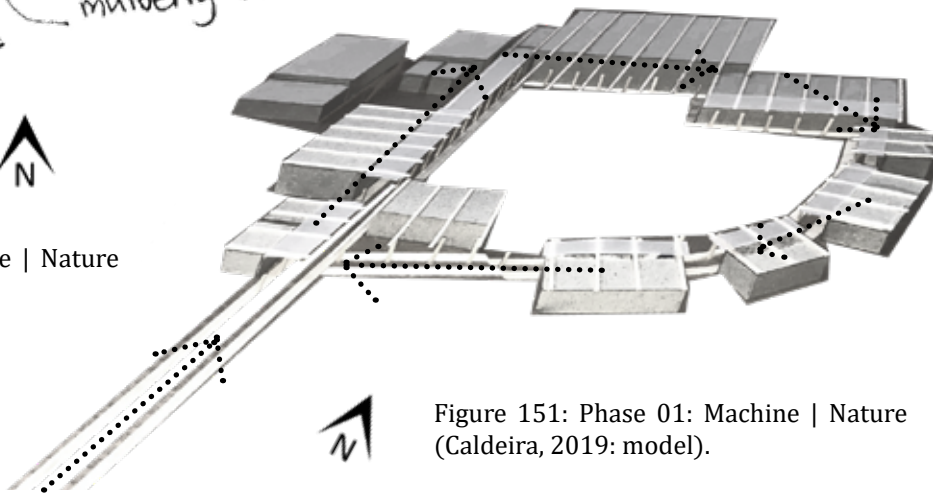


Figure 151: Phase 01: Machine | Nature (Caldeira, 2019: model).

Figure 152 reveals the cycle (layout, circulation and system) of the design.

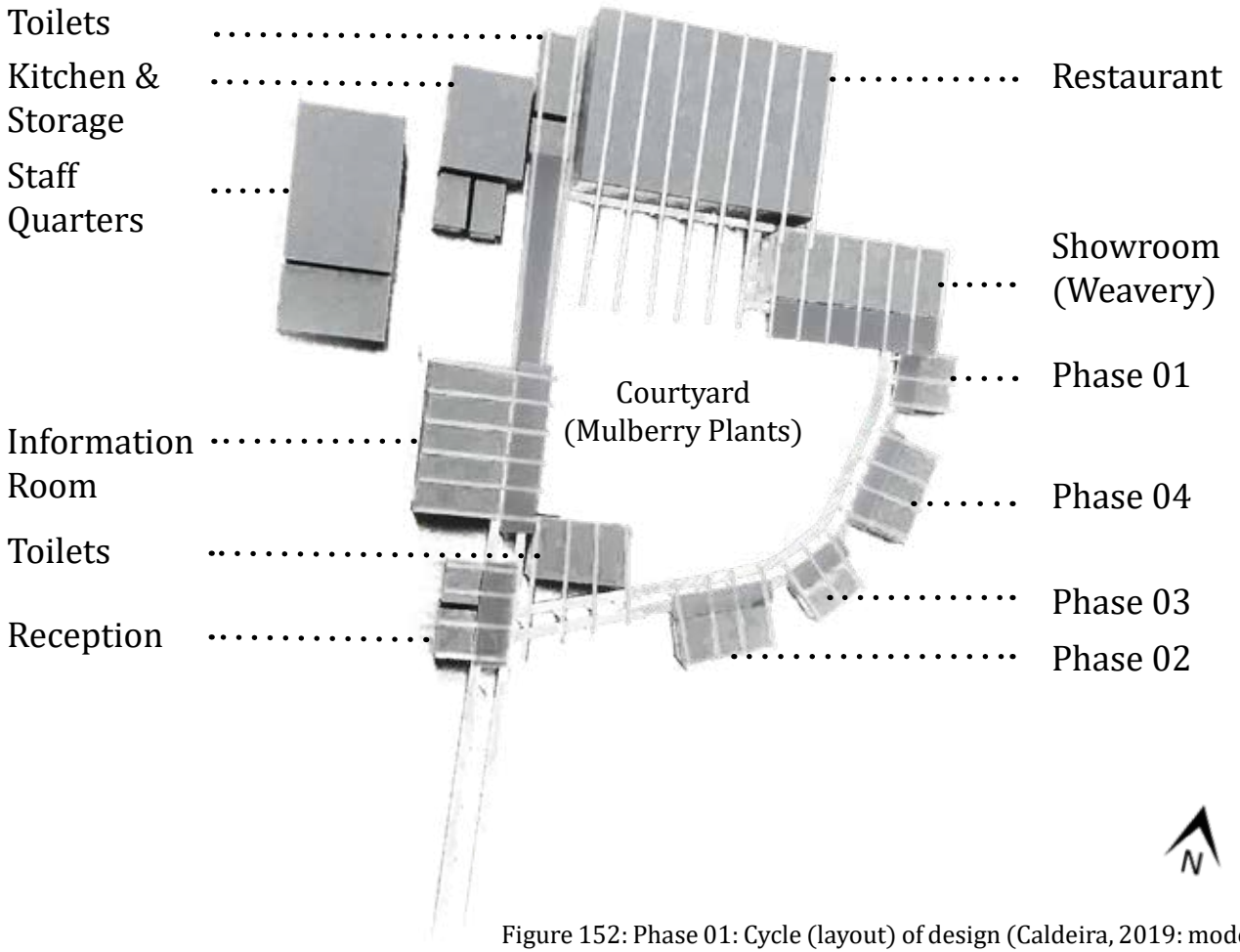


Figure 152: Phase 01: Cycle (layout) of design (Caldeira, 2019: model).

NOTE: Mulberry plants are planted on the remainder of the site, thus everywhere except where buildings are to be built (mulberry plants will be shown on final drawings of the design). And the description of what happens during each phase of the silkworm life cycle is on page 29, along with photos.

3.1.2 Phase 02: One Continuous Silk Thread

During summer, Bloemfontein reach up to 33°C temperatures that will be harmful to the mulberry plants (AccuWeather, 2019: online). This part of the design development introduced farm shading nets in a way that it forms part of the design. Figure 153 and 154 shows the inspiration and development for this idea.

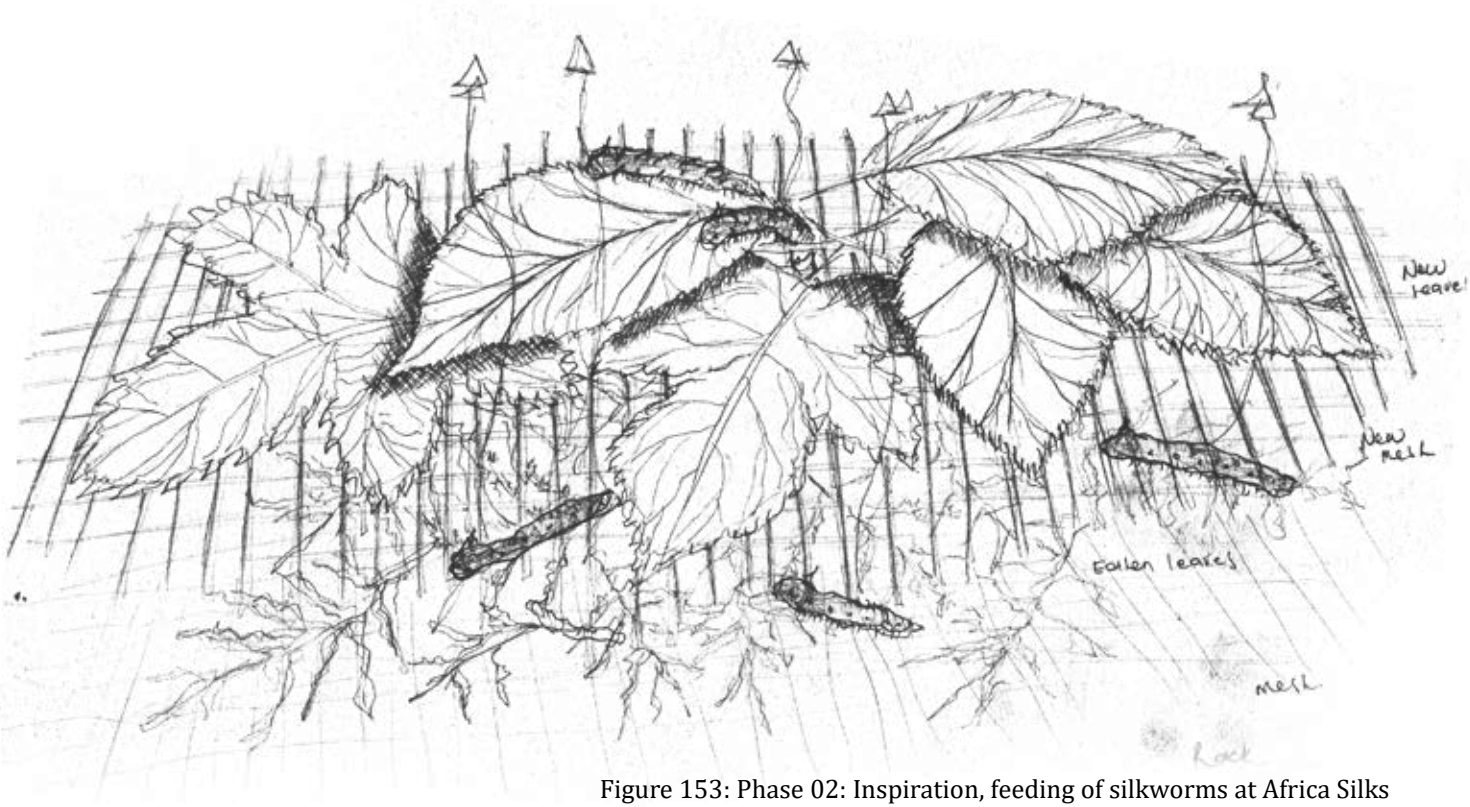


Figure 153: Phase 02: Inspiration, feeding of silkworms at Africa Silks farm in Graskop (Caldeira, 2019: drawing).

The drawing above, as inspiration for this phase, reveals the feeding process at the Africa Silks farm in Graskop, Mpumalanga. For the silkworms to grow and start spinning, they have to continuously feed on fresh mulberry plants. This is done inside the different phase pods, on timber framed shelves where staff provide fresh leaves daily. Layers of mesh are placed above

Figure 154: Phase 02: Development of shading nets (Caldeira, 2019: drawing).

the silkworms, with new leaves, and the silkworms make their way through the mesh within an hour's time (Nkozi, 2019: interview). This process of layering leaves on top of one another, seen in figure 153, inspired the design for farm nets on site, overlapping with parts of the design.

The organisation of the design stays the same whilst the natural (curved lines) elements increase and are contrasted to thick rammed earth ordering walls (straight lines), further playing with the idea of machine and nature, described on page 70.

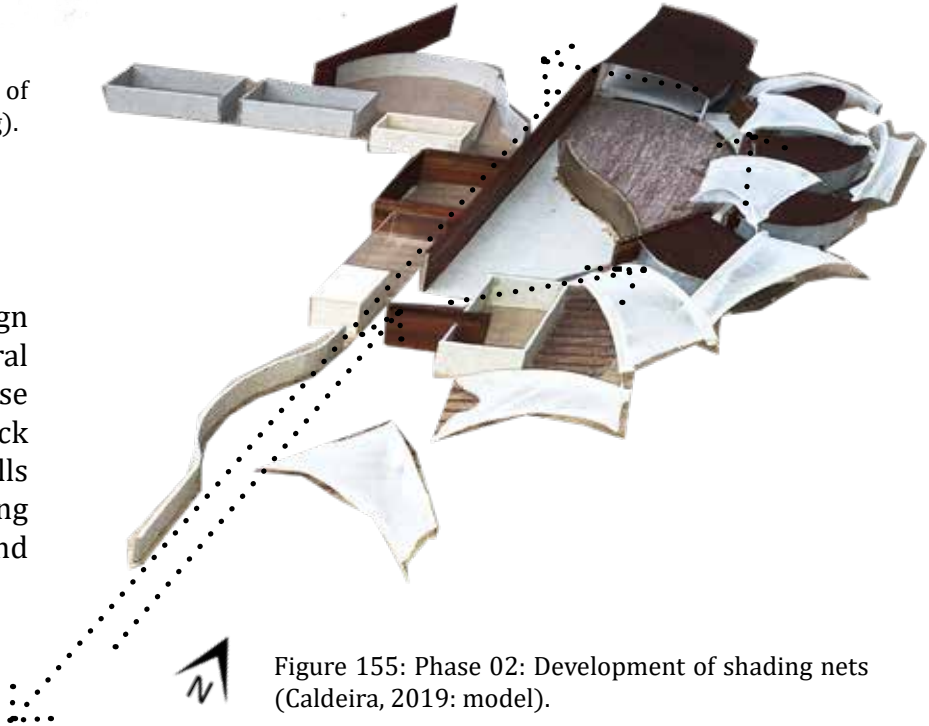


Figure 155: Phase 02: Development of shading nets (Caldeira, 2019: model).

The thick rammed earth walls and introduction of more natural (curved lines) elements were inspired by three main focuses during the early stages of this design development. The climate (page 73), the silkworm and the landscape (figure 157). The following architecture (figures 158 to 161) relates to the cognitive analysis (personal experience) of the site, where vast flat landscapes melts into the horizon. Thick rammed earth walls and flat roofs sits heavily within these landscapes, but not in contrast to it, rather as if it mimics the surrounding red-brown rocks, seen on page 20 and figure 156.

Figure 156: Surrounding rocks found next to site, on Uitzicht Road (Caldeira, 2019: photo).

Figure 157: Surrounding natural Bainsvlei, Bloemfontein, Free State landscape (Caldeira, 2019: photo).

Architecture relating to cognitive analysis; understanding the feeling of the rural Free State landscape; Thick rammed earth walls rising from the red-brown Free State ground, acting as ordering mechanisms within the landscape.

Figure 158 (left): Cognitive Analysis: by Vidal and Rahola Architects (Pons, 2018: online). Figure 159 (right): Cognitive Analysis: House in Napa Valley by Jorgensen Designs (Edelson, 2015: online).

Figure 160 and 161: Nk'Mip Desert Cultural Centre by Brady Dunlop in 2006 (Archdaily, 2019: online).

The other main element is the silkworm. Specifically, the process of spinning silk (figure 162). The thick rammed earth walls within this design is therefore contrasted with light tectonic steel cables that are inspired by silk threads. The following design by Olafur Eliasson and Kjetil Thorsen is similar to what I propose in this design phase with steel cables.

Figure 162: Silkworm spinning silk on timber frame (Caldeira, 2019: photo).

3.1.3 Precedent Study

3.1.3.1 Serpentine Gallery, Pavilion. By Olafur Eliasson and Kjetil Thorsen. 2006.

Figure 163, 164 and 165: Design by Olafur Eliasson and Kjetil Thorsen revealing twisted thread-like cables becoming part of facade (Hayes, 2016: online).

Figure 166 reveals the plan, in relation to Tjhabelang Primary School, for this design development phase. Figure 167 and 168 shows a detailed plan of one of the silkworm pods with one of the designed shelves. This is followed with another photo of the built model, revealing the different spaces of Africa Silks.

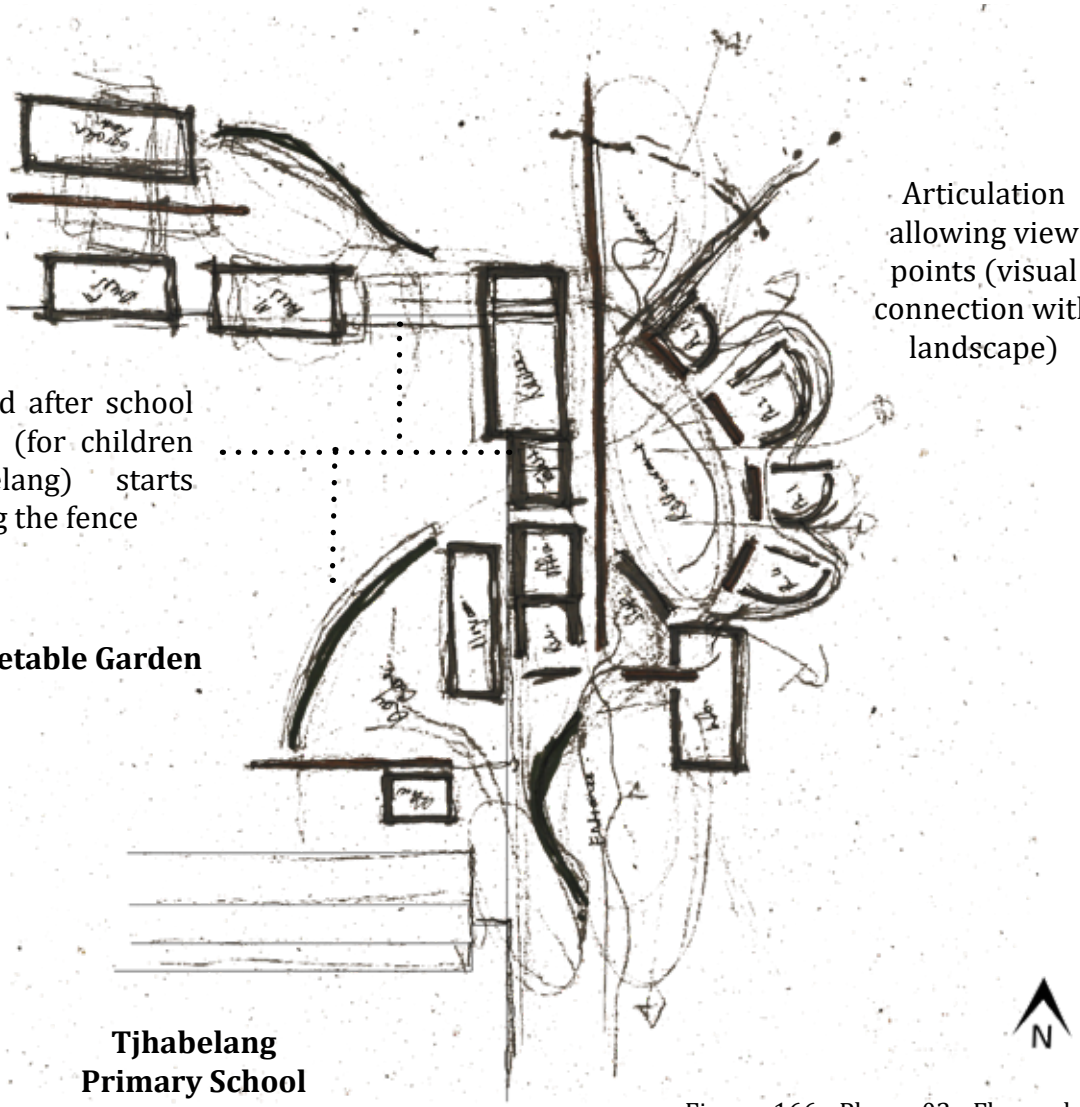


Figure 166: Phase 02: Floor plan (Caldeira, 2019: drawing).

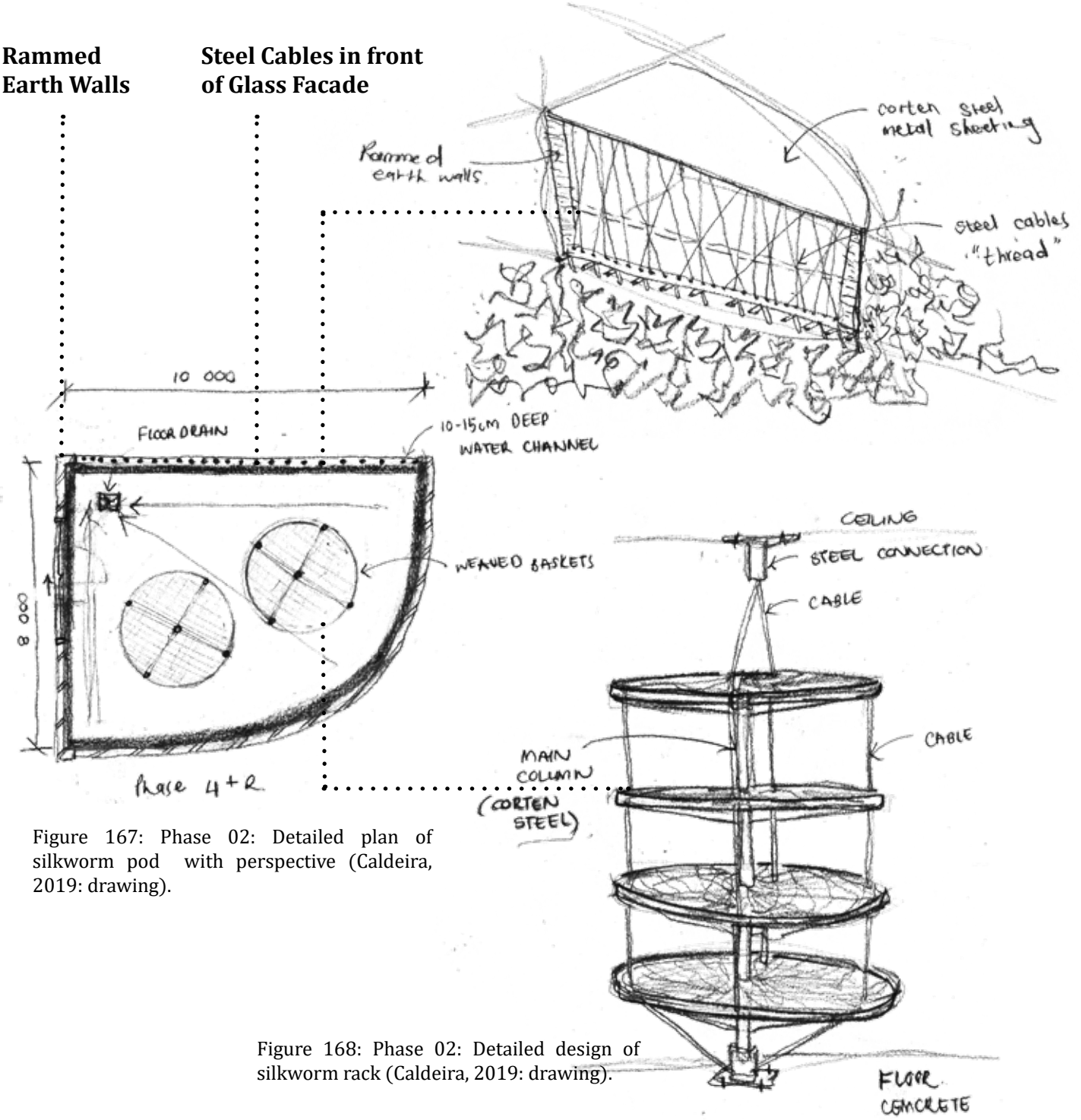


Figure 167: Phase 02: Detailed plan of silkworm pod with perspective (Caldeira, 2019: drawing).

Figure 168: Phase 02: Detailed design of silkworm rack (Caldeira, 2019: drawing).

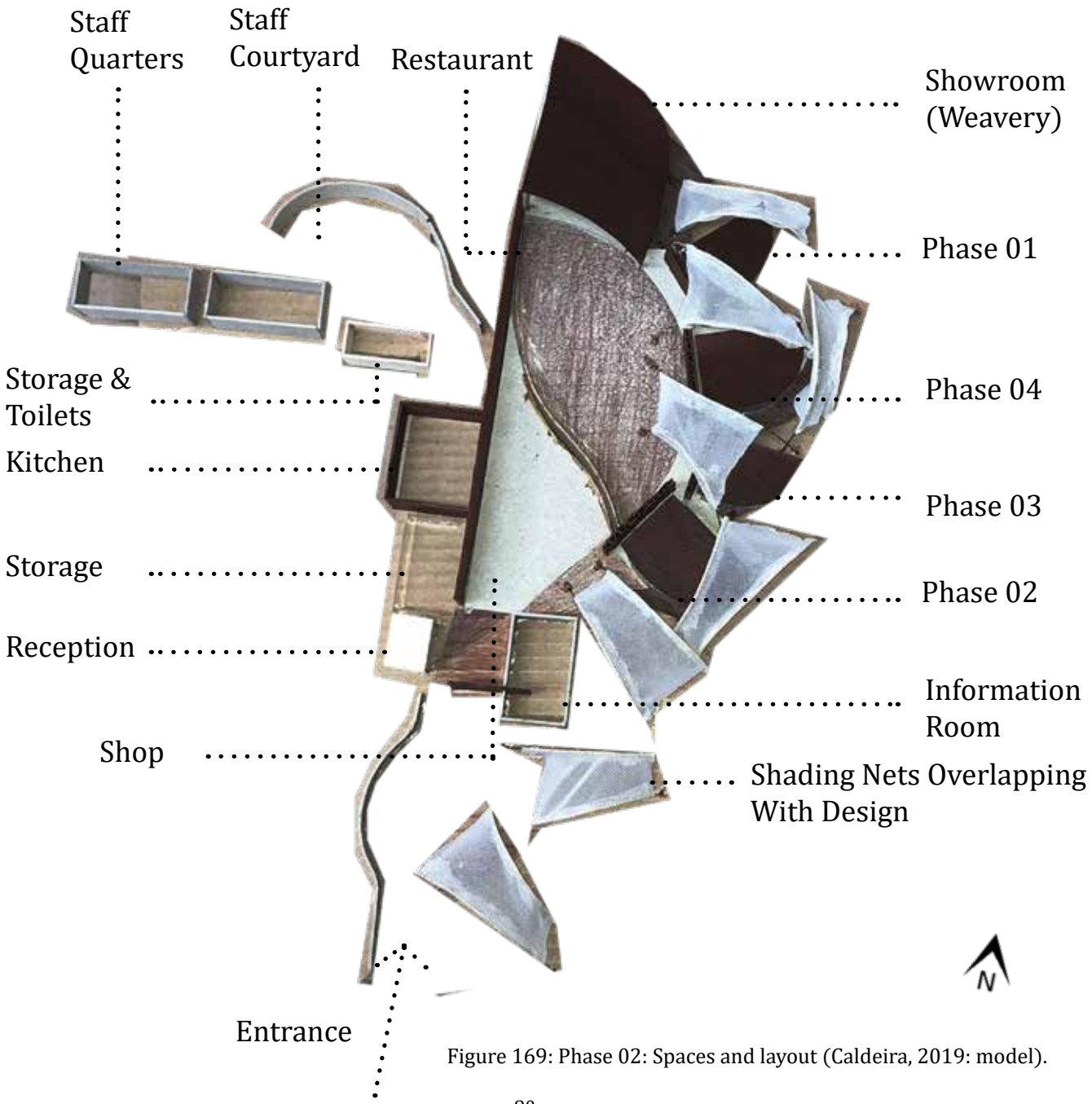


Figure 169: Phase 02: Spaces and layout (Caldeira, 2019: model).

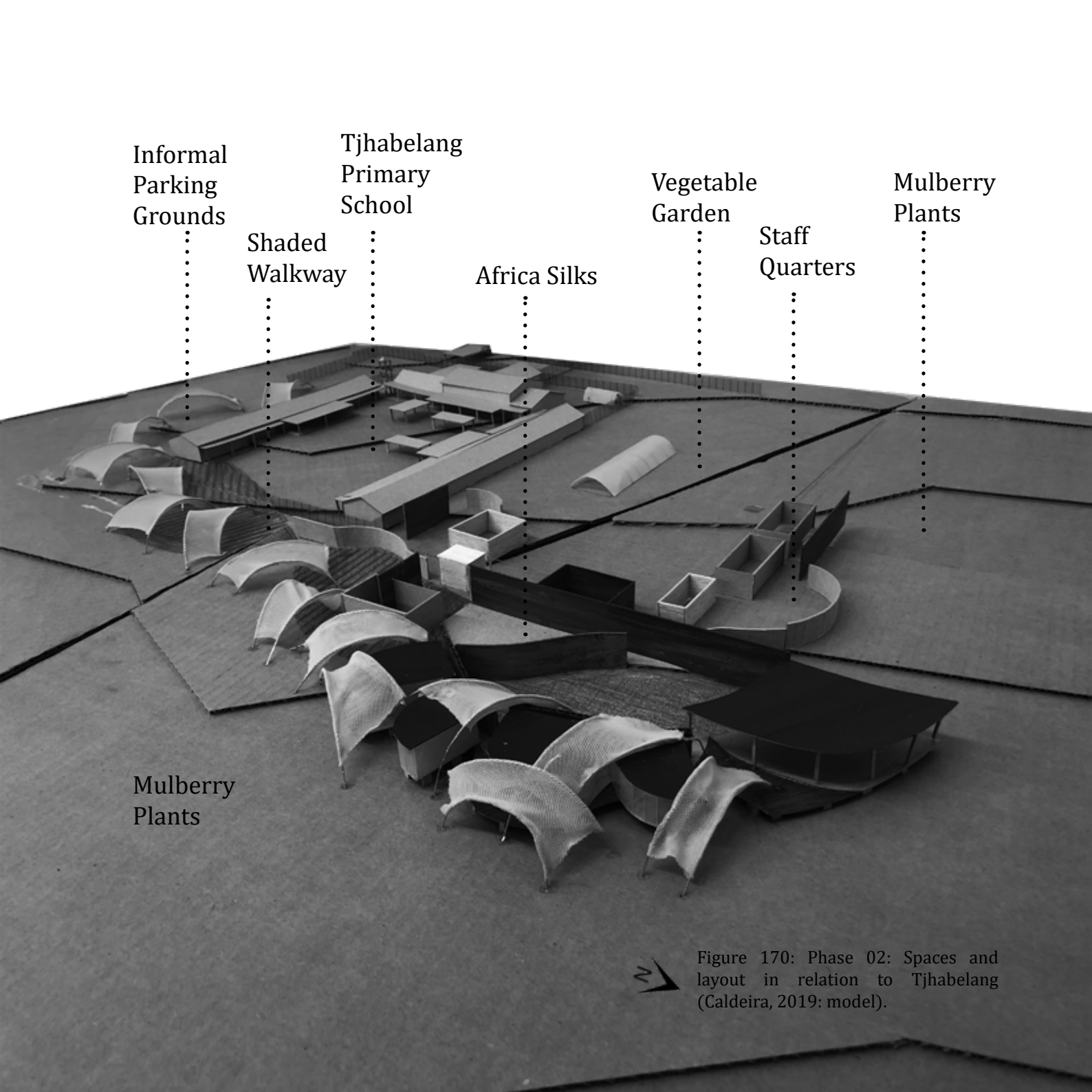


Figure 170: Phase 02: Spaces and layout in relation to Tjhabelang (Caldeira, 2019: model).

3.1.4 Phase 03: Two Gears, One System

From this, the idea of creating a loop (one continuous circulation loop like the silkworm life cycle) remained the same, whilst the ordering of the different components changed.

A specific system became evident, that of Africa Silks as the production of silk (first gear), and that of the staff members (second gear) whom are needed for this organisation to function (figure 171 and 172). The staff quarters and kitchen (private services) moved towards the West where an existing road can act as a delivery road. And all buildings were aligned according to existing ordering systems on site, to create the idea that these two designs (Tjhabelang and Africa Silks) are one.

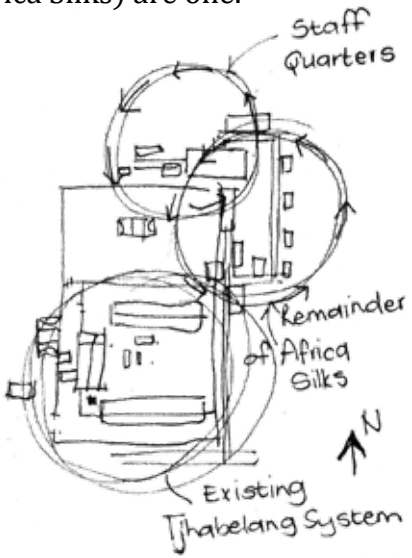


Figure 171: Phase 03: Plan illustrating two gears connecting to Tjhabelang (Caldeira, 2019: drawing).

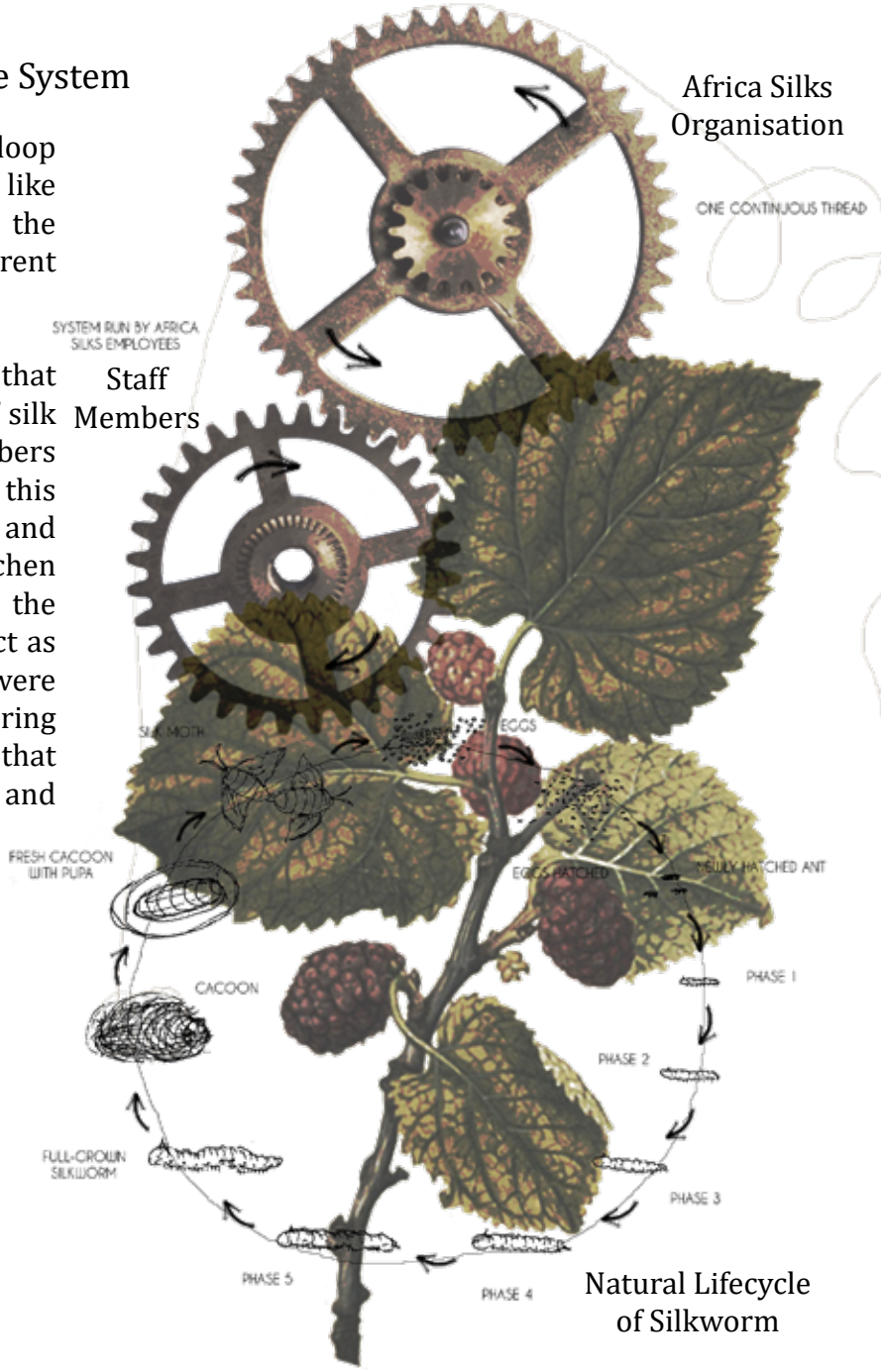
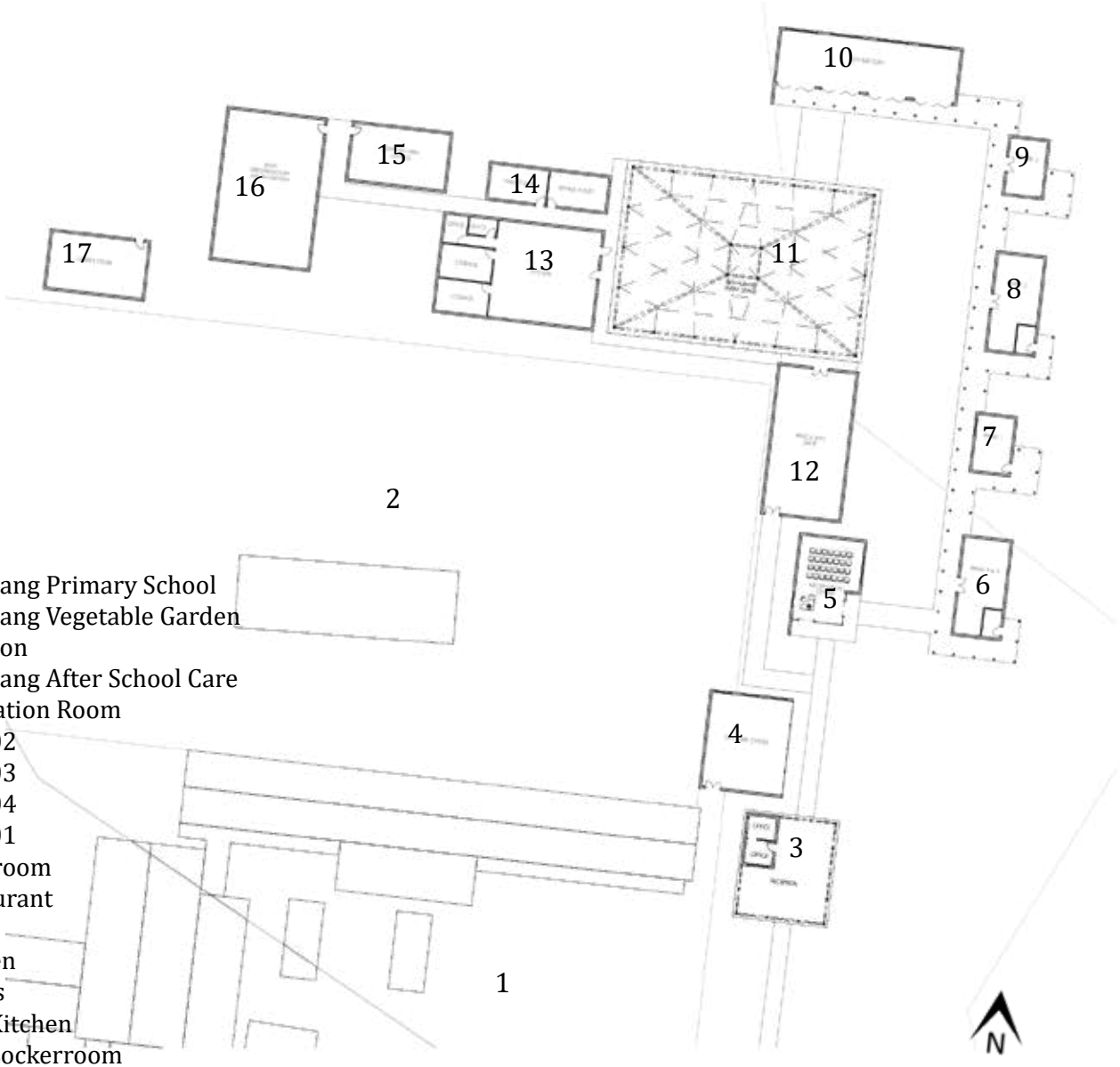


Figure 172: Phase 03: Diagram illustrating two gears behind the functioning of Africa Silks (Caldeira, 2019: collage).

Figure 173 is a floorplan, illustrating the further development of phase 03: Africa Silks.



1. Tjhabelang Primary School
2. Tjhabelang Vegetable Garden
3. Reception
4. Tjhabelang After School Care
5. Information Room
6. Phase 02
7. Phase 03
8. Phase 04
9. Phase 01
10. Showroom
11. Restaurant
12. Shop
13. Kitchen
14. Toilets
15. Staff Kitchen
16. Staff Lockerroom
17. Garden Store

Figure 173: Phase 03: Development; floorplan (Caldeira, 2019: plan).

During this stage of design development, precedent studies included Touche Pass (page 65- 67) and The Prow (figures 174- 180) by Lake and Flato Architects. Designs that are similar to what one will find in the rural Free State landscape, typical farmhouse morphology and the use of steel, brick and timber construction.

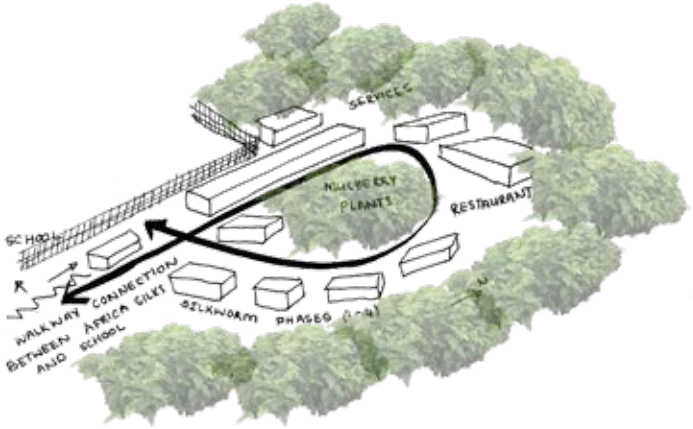
3.1.5 Precedent Study

3.1.5.1 The Prow. Fort Davis, TX. By Lake and Flato Architects.

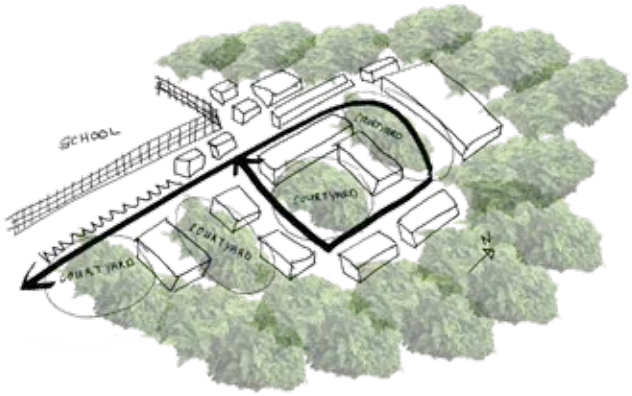
Figure 174 and 175: The Prow house, similar building culture and landscape to rural Free State (Lake and Flato, 2019: photos).

Figure 176, 177, 178, 179 and 180: Photos illustrating building materials used in the Prow house, that blends in with the natural landscape (Lake and Flato, 2019: photos).

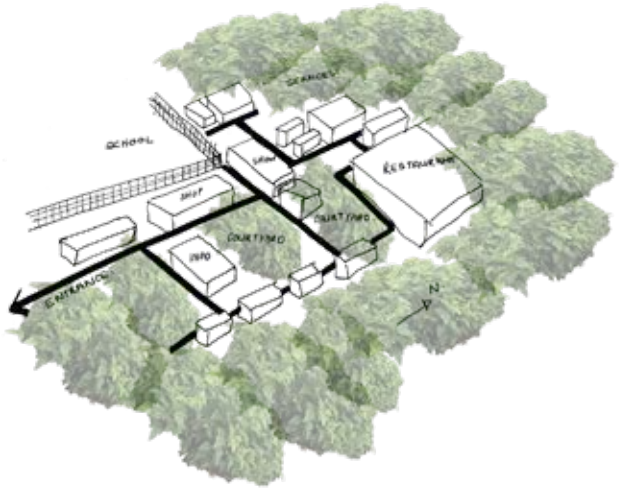
This typical farmhouse morphology relates to the idea of creating a small village where different building components connect with walkways and share multiple green spaces. From this the following developments (figure 181) have been made, to break up the central courtyard, into multiple smaller ones, creating more intimate gathering and green spaces.



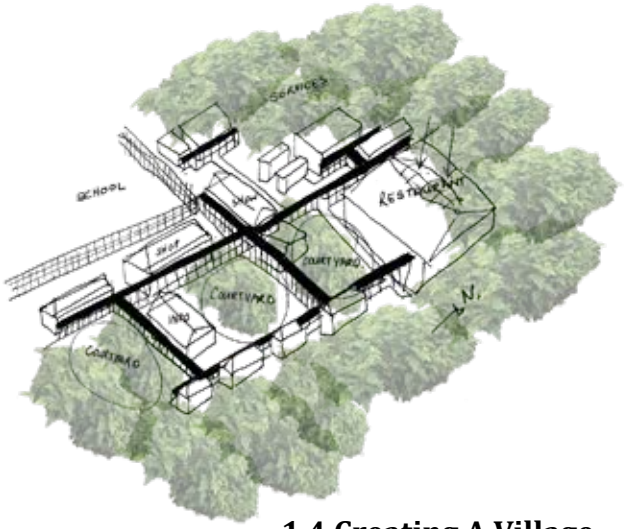
1.1 Nature | Machine



1.2 Two Gears



1.3 Green Spaces



1.4 Creating A Village

Figure 181: Development sketches, phase 03 (Caldeira, 2019: drawings).

Phase 03: Creating a Village (further development).

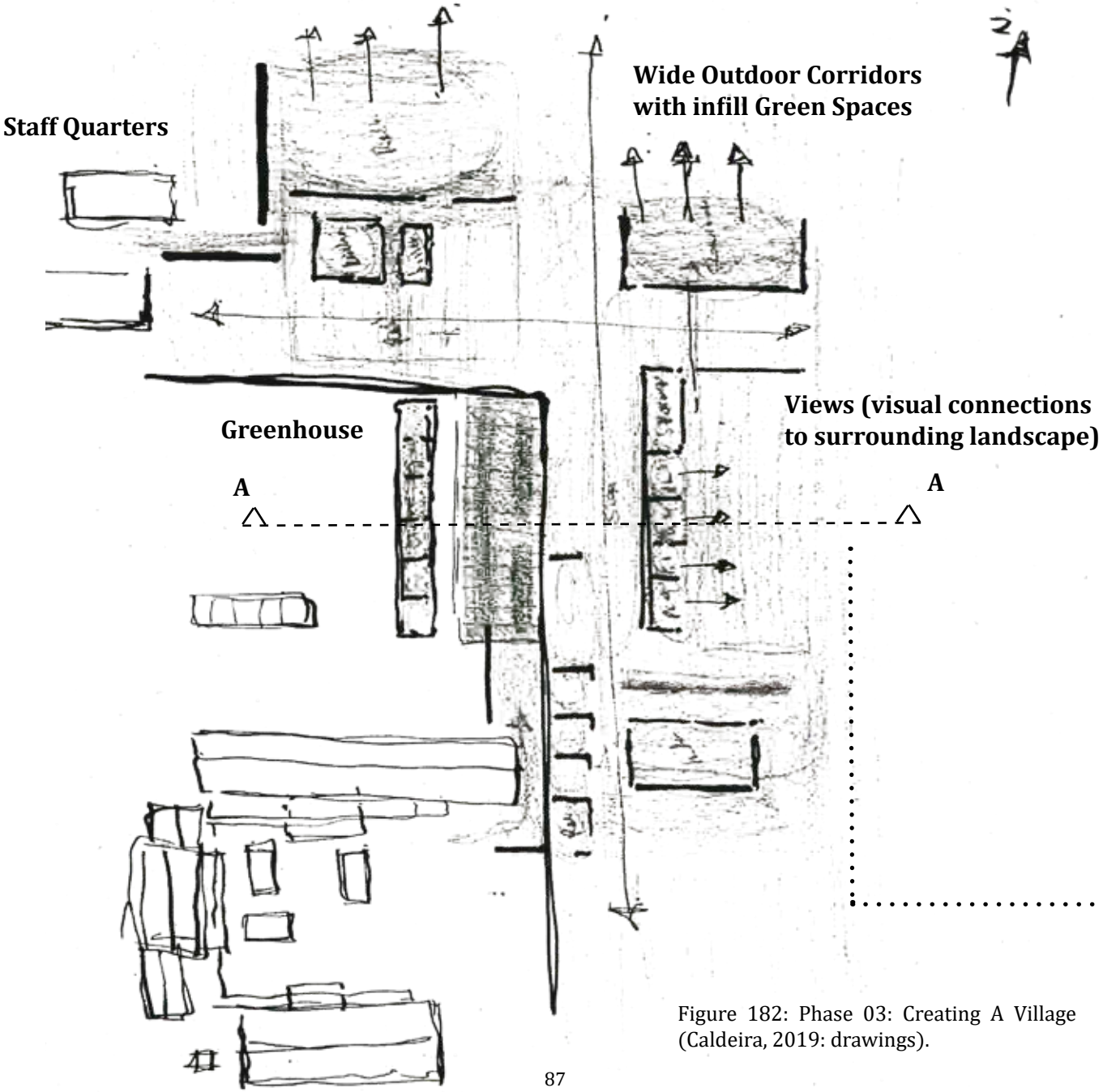


Figure 182: Phase 03: Creating A Village (Caldeira, 2019: drawings).

Thick rammed earth ordering walls opposed by light dynamic steel cable design (page 76 and 77), inspired by Windshape Pavilion, page 67 and 67.

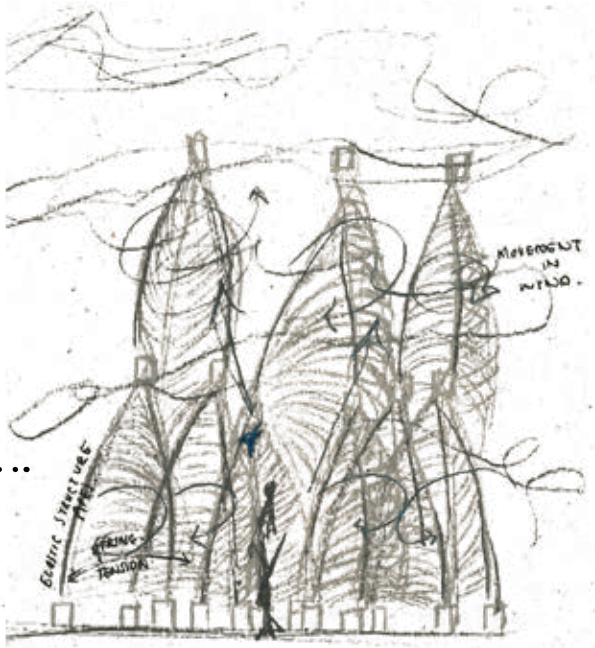


Figure 183: Phase 03: Inspiration (Windshape) (Caldeira, 2019: drawings).

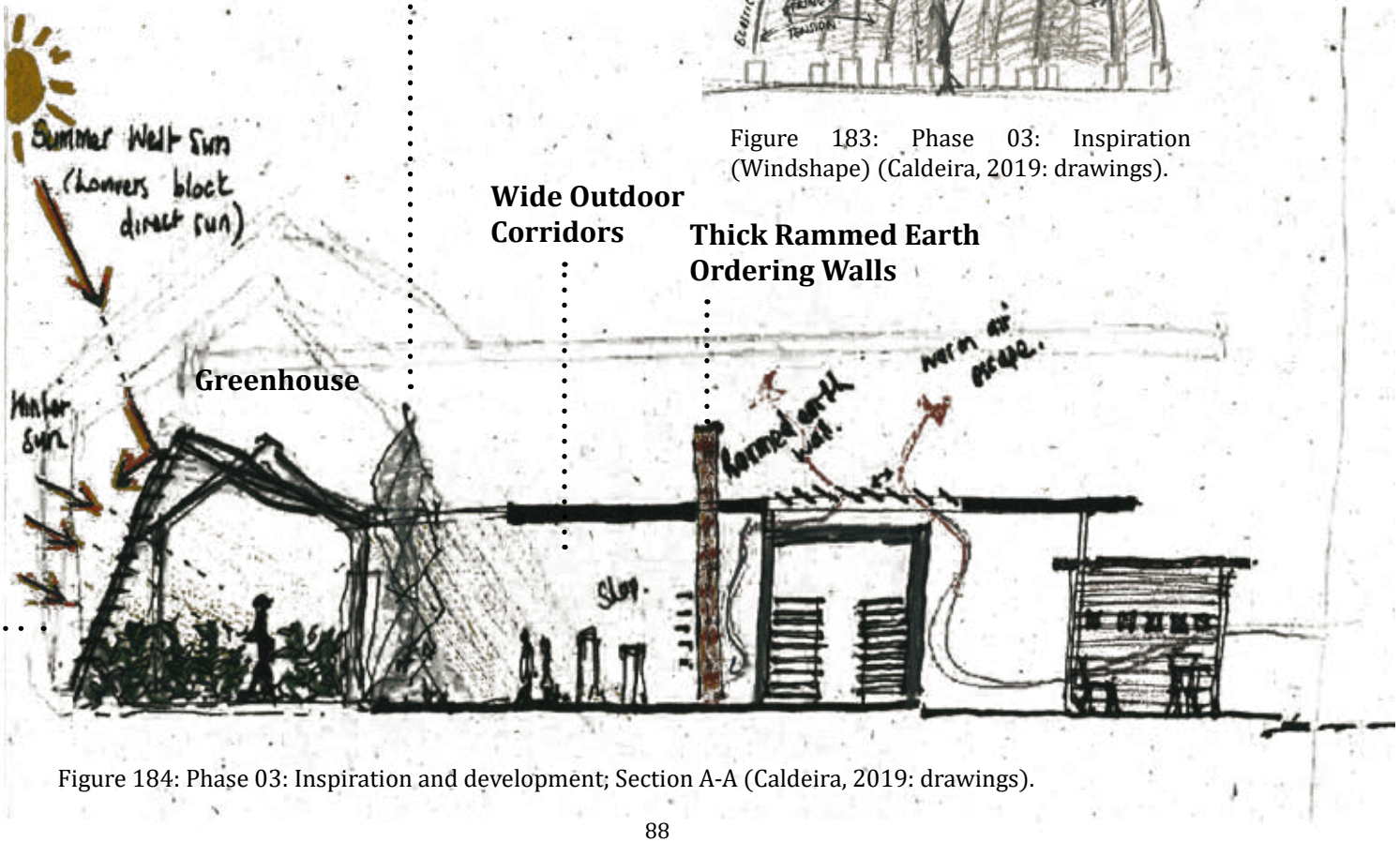


Figure 184: Phase 03: Inspiration and development; Section A-A (Caldeira, 2019: drawings).

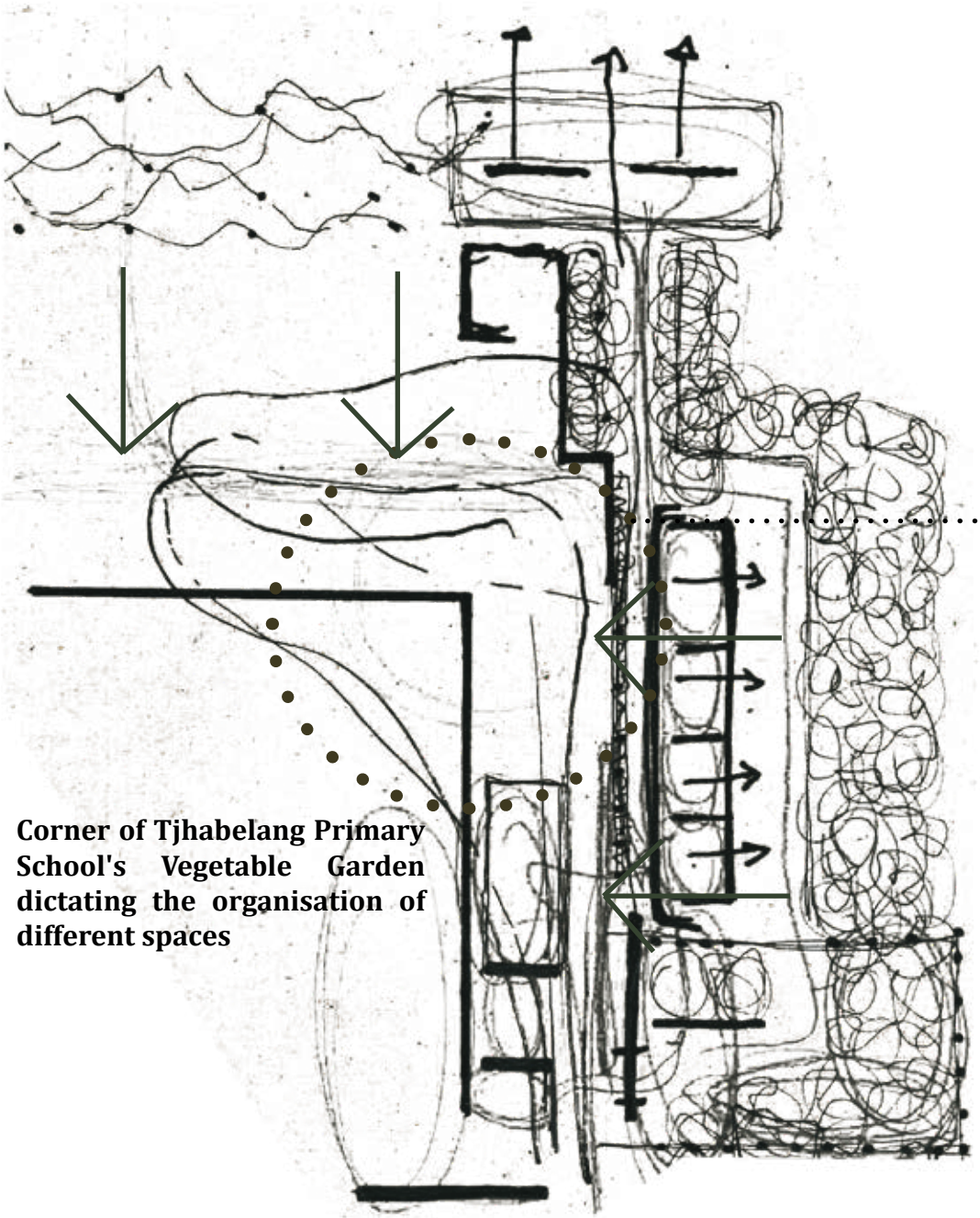


Figure 185: Phase 03: Reflection (Caldeira, 2019: drawings).

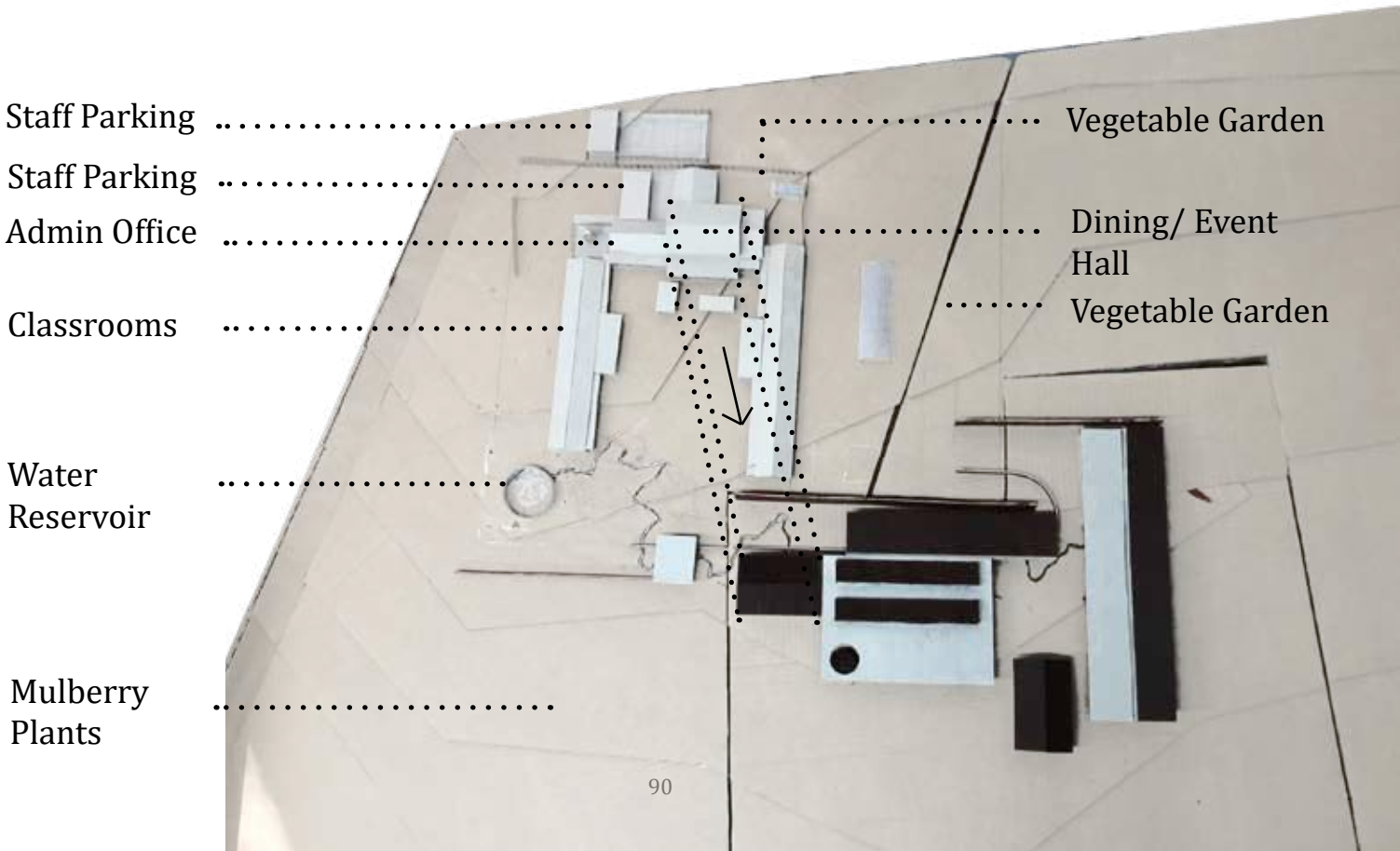
3.1.6 Phase 04: Thresholds; Connection to Tjhabelang Primary School

Problems that arrived with the previous design developments, was that of connection. Till thus far, there are no clear connection to Tjhabelang Primary School and therefore, thresholds (between Tjhabelang and Africa Silks) were identified as one of the main elements to be explored in the remainder of this dissertation. This phase is inspired by Bill Viola's idea of thresholds, page 60, and connecting to Tjhabelang Primary School.

Connecting to Tjhabelang Primary School

The heart of the school (the dinning and event hall) has been mimicked towards the East of the site (figure 186), where the Africa Silks journey begins (information room). This is a presentation room where tour groups start with watching videos on the history of Africa Silks and the sericulture process (like Tjhabelang also a place of education).

Figure 186: Phase 04 Design model (Caldeira, 2019: model).



Bill Viola: Thresholds

Bill Viola works with earth, air, fire and water in his artworks and films as an expression of thresholds representing the phase changes between life, death and rebirth. And as mentioned on page 59:

> "Victor Turner (1982; 1974) and Arnold van Gennep (1960) describes a threshold as a state of liminality. In their view, during a rite of passage, one undergoes a state change, where one is neither here nor there, a state of in-between-ness. This is called a liminal stage and can be seen as a transitioning phase between the old and the new. In some cultures, a rite of passage is done as a symbolic gesture of a child's death and celebration of his/ her new life as an adult. For the initiands to enter into a new communitas, they ludically combine elements of the old order into the new one (Viljoen, 2007: 194, 195)."

Tjhabelang Primary School represents the old (isolated entity within rural Free State landscape and the existing habits of parents allowing the poverty cycle to fortify). And Africa Silks, the new (creating new connections in the landscape (figure 188) and employment for parents at Tjhabelang that will create the potential for higher education for children and future sustainability within the rural community). This rite of passage between the old assemblage (Tjhabelang) and the new assemblage (Africa Silks) is inspired by Bill Viola's work with earth, air, fire and water (figure 187).

Figure 187: Collage representing inspiration for this design phase 04 (Caldeira, 2019: collage).

Figure 188 illustrates connections made within the surrounding Bainsvlei landscape. Three small hills, the Soetdoring Nature Reserve and the orientation of the site has been identified in this drawing that will influence the development of the buildings and visual connections within the landscape.

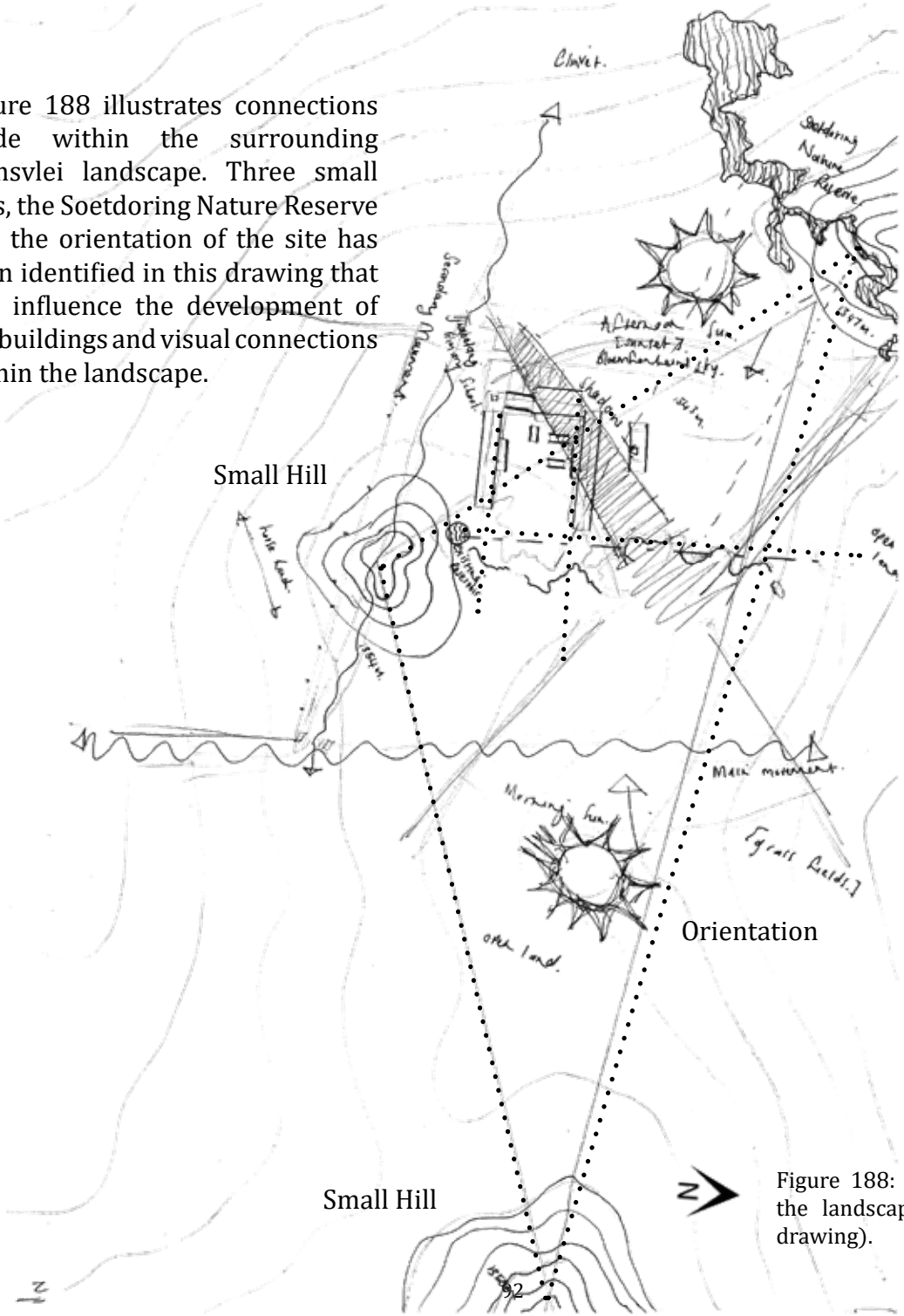


Figure 188: Connections within the landscape (Caldeira, 2019: drawing).

Figure 189 is a parti sketch (see page 53 for definition) for this design. Straight lines (as kept from phase 02 and 03) and a water channel (symbol of existing life on site: Tjhabelang) acts as an extension of the existing; a curved element represents change within this existing assemblage (Tjhabelang), as well as a liminal space of in-between-ness; and the change in direction of the, relatively lighter (lighter structure, idea of breaking free from existing poverty cycle and Tjhabelang as an isolated entity), straight lines, represents the new (addition of Africa Silks).

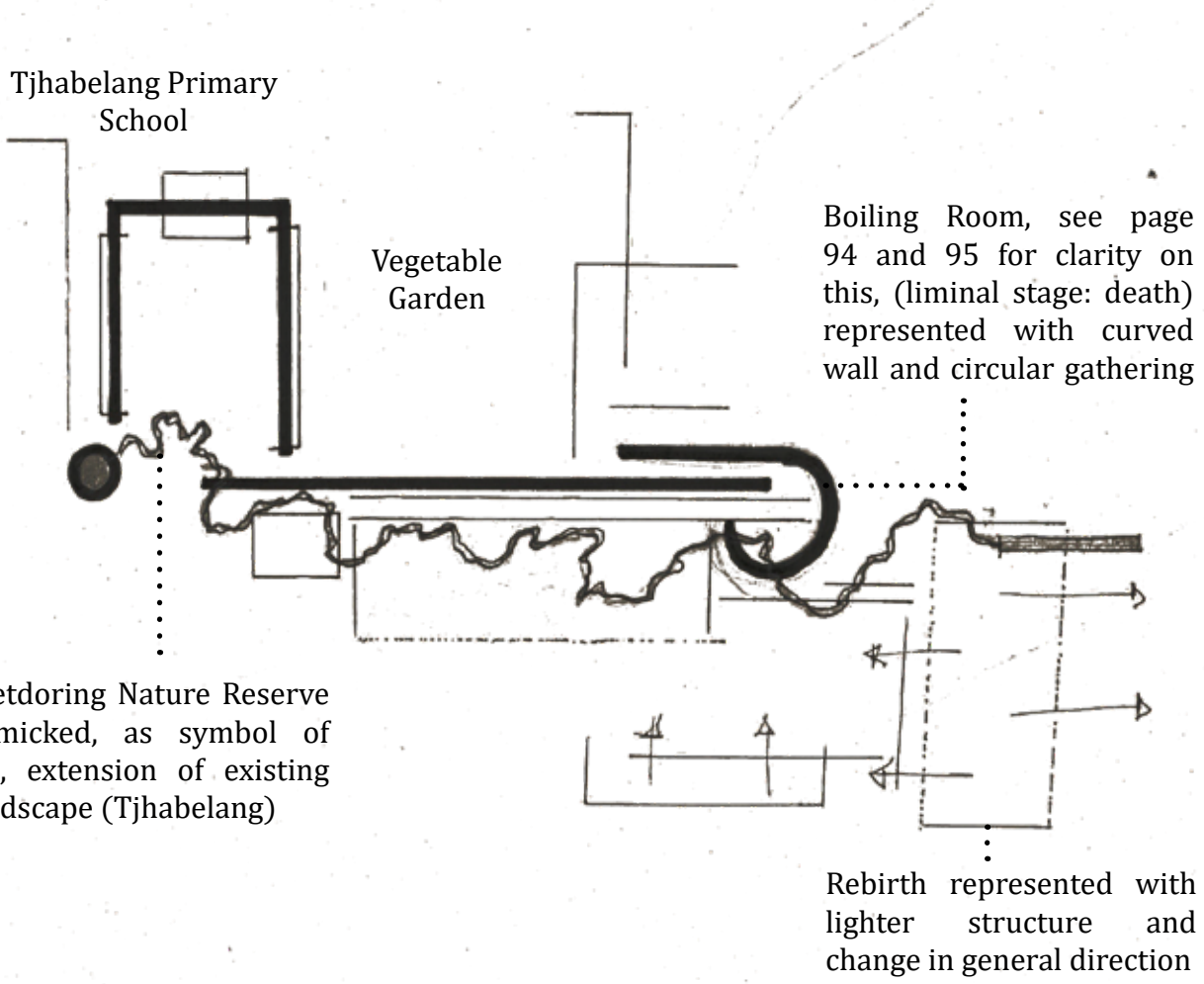


Figure 189: Phase 04: Parti Sketch (Caldeira, 2019: drawing).

Figure 190 reveals the layout of Africa Silks. From the parti sketch, the pods (where the rearing of silkworms happen) form part of the 'old' as they are hidden under a big rectangular roof. This idea, inspired by the Bowali Visitor's Centre (page 34), allows one to create experiential spaces with curved walls, without disturbing existing organisations (straight lines created by Tjhabelang) within the landscape. This is followed by the boiling room (where cocoons are boiled), a curved wall, that acts as the liminal stage between old and new.

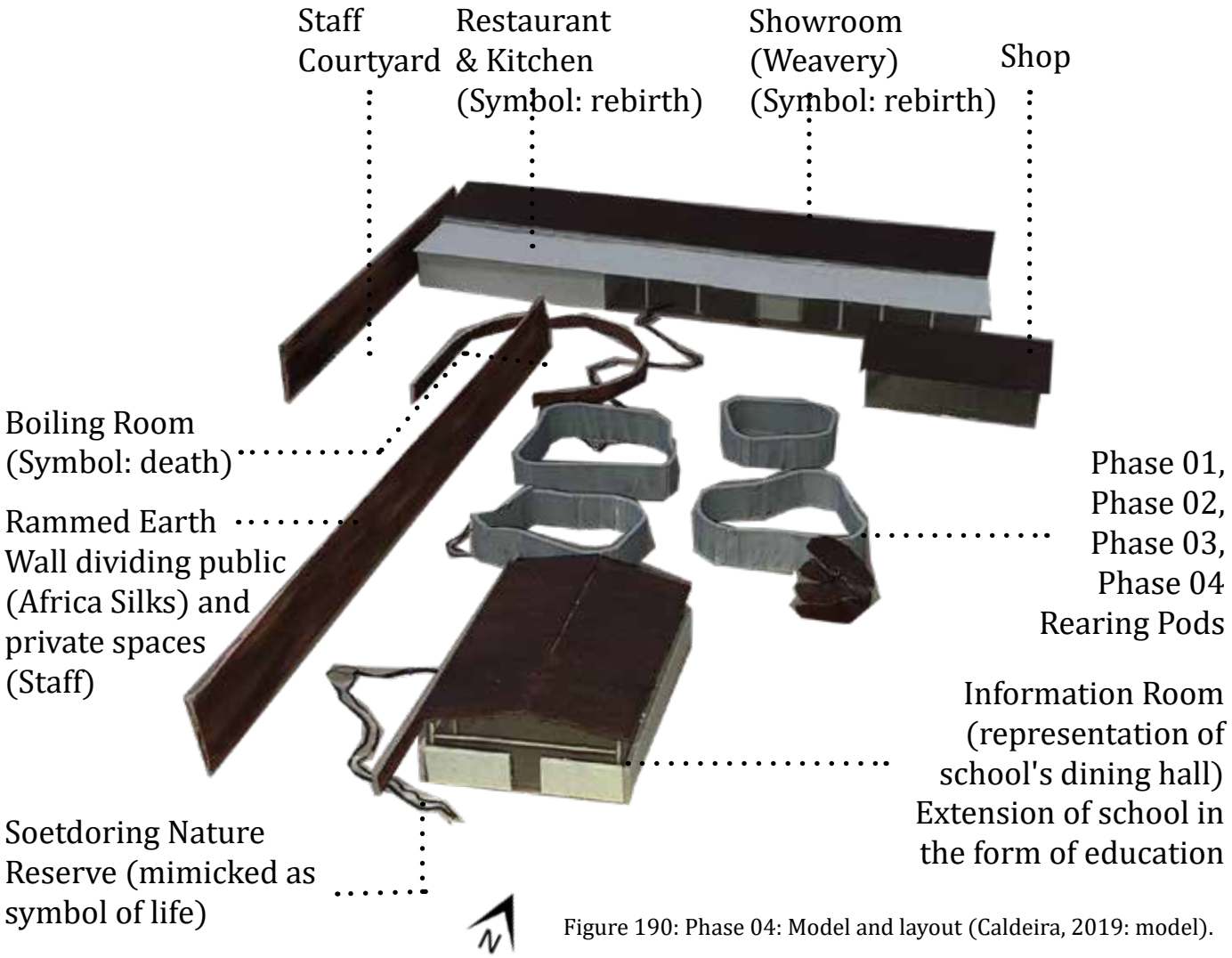


Figure 190: Phase 04: Model and layout (Caldeira, 2019: model).

The boiling room was chosen as the liminal stage, as Bill Viola's liminal stage starts with death and follows with rebirth. In the boiling room the pupae's inside the cocoons die, while the cocoon boils in water for the de-threading into one continuous silk thread. Thereafter (death), the cocoon is rebirthed in the form of clothing and other products at the Africa Silks Shop. Figure 191 reveals the influence of Bill Viola, in this artistic location plan exploration.

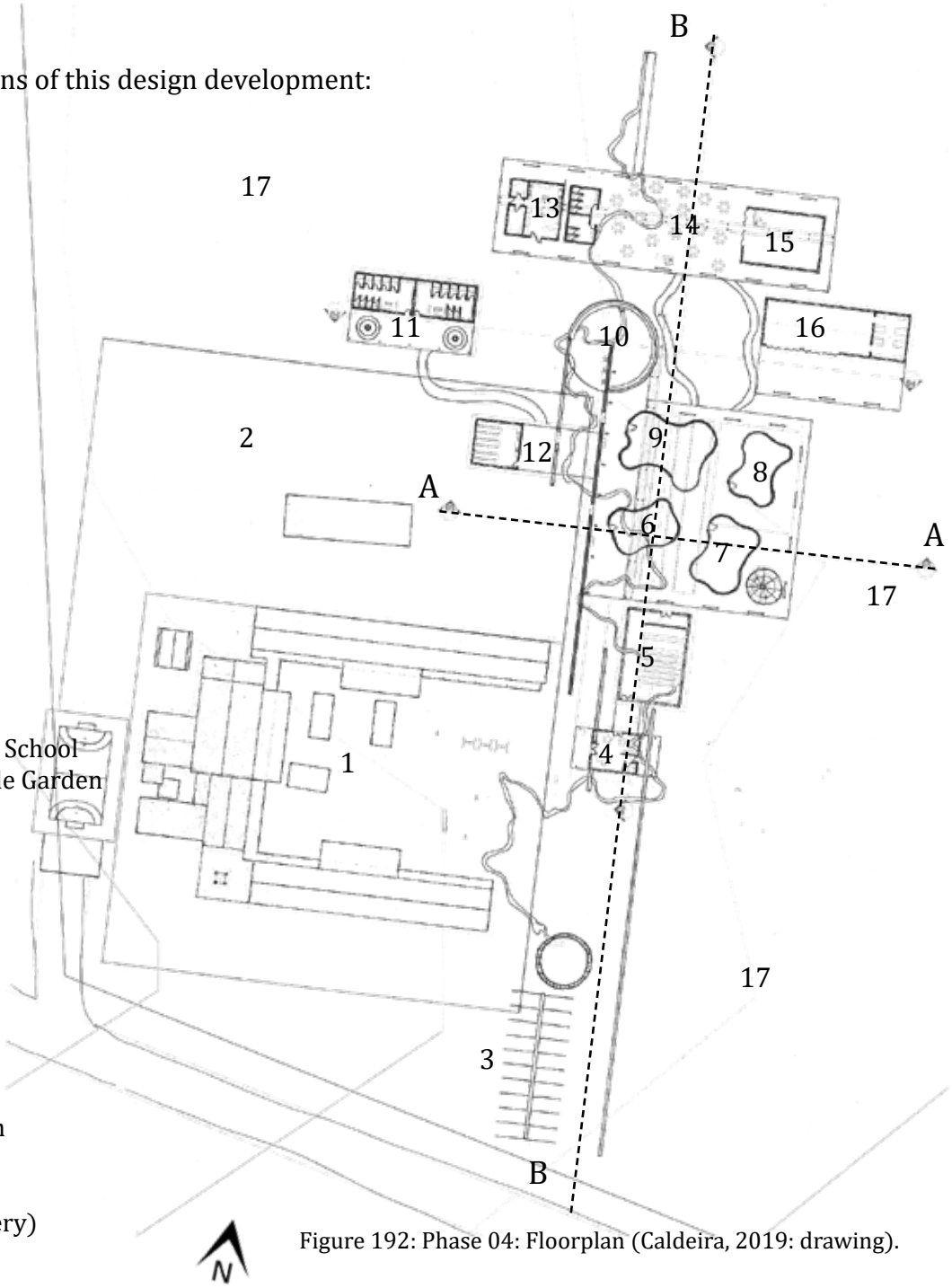
Death: The point of change: death of the pupae to create one continuous silk thread; and the death of the poverty cycle by introducing sericulture to the rural community of Bainsvlei.

Rebirth: The rebirth of the cocoon into silk but also the rebirth of the future of Tjhabelang. This addition of Africa Silks has the ability to change the life of children and parents in the rural Bainsvlei community.

Life: The existing Tjhabelang assemblage on site, before the addition of Africa Silks.

Figure 191: Phase 04: Location Plan indicating the influence of Bill Viola (Caldeira, 2019: drawing).

Floorplan and sections of this design development:



1. Tjhabelang Primary School
2. Tjhabelang Vegetable Garden
3. Parking
4. Reception
5. Information Room
6. Phase 02
7. Phase 03
8. Phase 04
9. Phase 01
10. Boiling Room
11. Staff Locker Room
12. Staff Kitchen
13. Restaurant Kitchen
14. Restaurant
15. Shop
16. Showroom (Weavery)
17.Mulberry Plants

Figure 192: Phase 04: Floorplan (Caldeira, 2019: drawing).

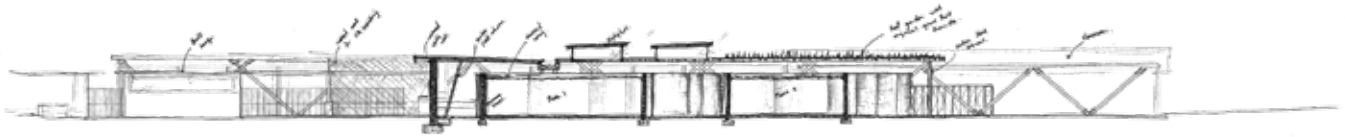


Figure 193: Phase 04: Section A-A (Caldeira, 2019: drawing).

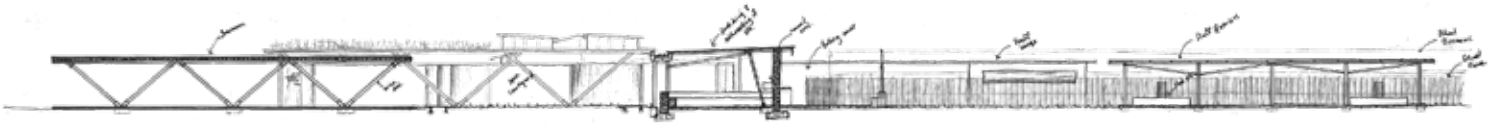
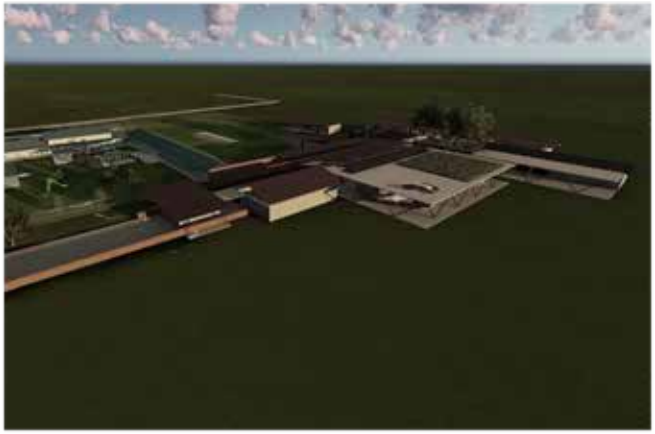


Figure 194: Phase 04: Section B-B (Caldeira, 2019: drawing).

This phase starts implementing contrasting elements that represents the old (Tjhabelang) and the new (Africa Silks). Old elements include pitched roofs (derived from Tjhabelang and larger rural Free State farmhouse morphologies), the use of steel construction (but as an element of transformation: corten steel – rustic feeling fits into the rural Free State landscape), traditional weaving for ceilings and furniture and metal roof sheeting. Elements of the new include thick rammed earth walls, large flat concrete roofs that melts into the Free State horizon, light steel cables (inspired by silk threads) and the change of corten steel within the landscape as an element of transformation (the idea of steel that rust more over time). The following figures include photos of 3D explorations for this design development.

Figure 195: Aerial view of design development in relation to Tjhabelang Primary School (Caldeira, 2019: 3d render).



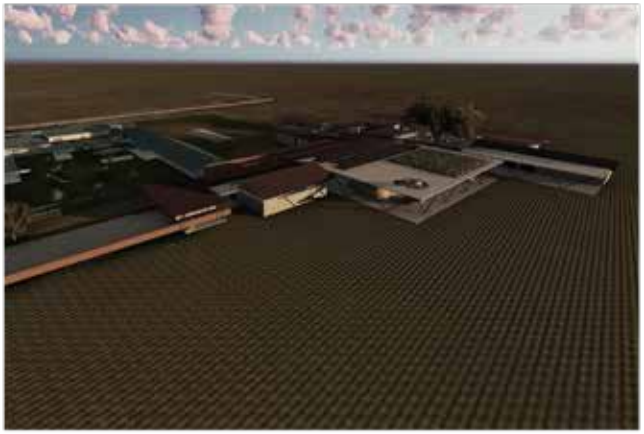


Figure 196 (left): 3D view of design development in relation to landscape in summer and spring. Figure 197 (right): 3D view of design development blending in to landscape during winter and autumn (Caldeira, 2019: 3d render).

Figure 198: Parking (Caldeira, 2019: 3d render).

Figure 199: Entrance (Caldeira, 2019: 3d render).

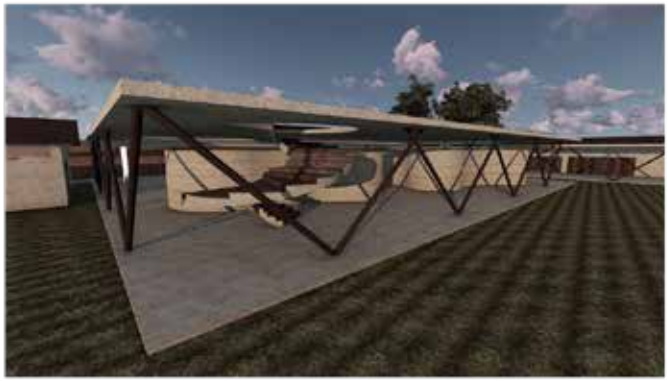


Figure 200: Silkworm Phases (Caldeira, 2019: 3d render).

Figure 201: Phase 02 Pod (Caldeira, 2019: 3d render).

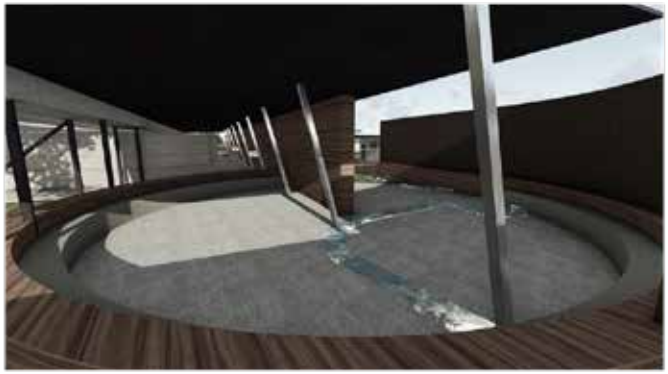


Figure 202: Boiling Area (Caldeira, 2019: 3d render).

Figure 203: Outdoor Showroom (Weavery) Area (Caldeira, 2019: 3d render).

3.1.7 Phase 05: Rhizomatic Thinking

Phase 04 of the design development is inspired by Bill Viola's work on thresholds. Although the concept behind the design is strong, it still has not address the issue of connectivity between the school and Africa Silks. Phase 05 of the design development focus on the transition between Tjhabelang Primary School and Africa Silks.

An exploration of thresholds (including the work of Deleuze and Guittari (1987) and Van Gennep (1960) and Turner (1982; 1974)) acted as a guideline for the architecture to reveal transformation by embracing rhizomatic thinking (a subjectivity of multiplicity). This is done when Tjhabelang Primary School and Africa Silks, no longer exist as separate, isolated entities (figure 204); and where an existing assemblage is disturbed in order for new connections to be possible.

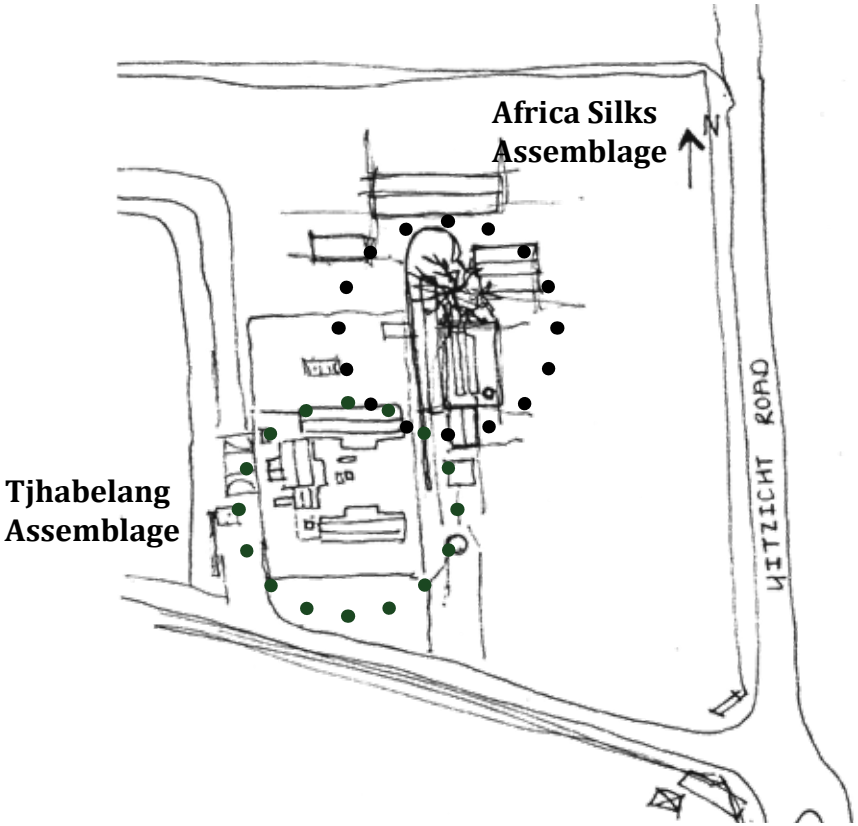


Figure 204: Phase 04: two seperate entities (Caldeira, 2019: drawing).

The theoretical and morphological grounding for this development is described on pages 55 to 61. Main ideas include:

- The dissertation proposes to create new connections to the existing assemblage, where the older generation in the rural community of Bainsvlei are a part of Tjhabelang's process of becoming (introducing Africa Silks to the rural community of Bainsvlei).
- This is done through rhizomatic demeanor (like a map, always connecting to other things and always prolonging itself), seen in figure 205:
- Deterritorialisation: The design aims to alter fixed ordering systems such as the courtyard and fence surrounding Tjhabelang, to enable the potential for new connections.
- Reterritorialisation: Deleuze and Guittari (1987) sees subjectivity as a creative process where a subject is in the process of becoming when connected in an assemblage that consist of other (diverse) bodies and subjects.

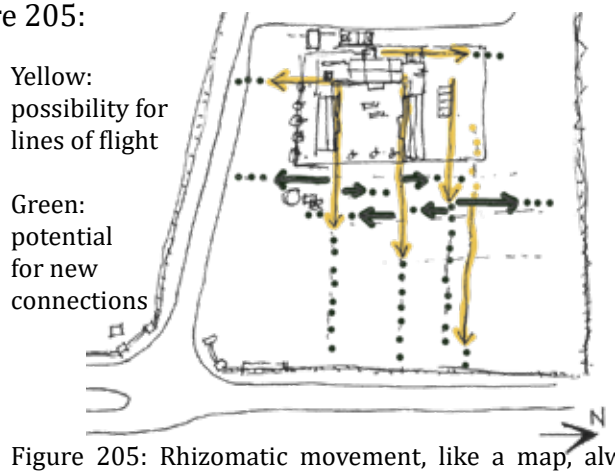


Figure 205: Rhizomatic movement, like a map, always prolonging itself (Caldeira, 2019: own drawing).

One of the main elements that enables this change is the introduction of the Africa Silks assemblage as a job creation initiative, that will enable the connection of other assemblages and multiplicities to Tjhabelang. Therefore, the sericulture process, in particular the cycle of the silkworm will curate this change in the architecture and disturbance within the landscape.

- Traditional farm and warehouse morphologies (traditional images of thought), as discussed on page 11 and 12, are questioned and alternative morphologies inspired from the life cycle of the silkworm, and Turner (1982; 1974) and Van Gennep's (1960) ideas of liminality are explored.
- Victor Turner (1982; 1974) and Arnold van Gennep (1960) describes a threshold as a state of liminality. In their view, this relates to a rite of passage, where one undergoes a state change, where one is neither here nor there, a state of in-between-ness. This is called a liminal stage and can be seen as a transitioning phase between the old and the new.

- This state of in-between-ness is present in the life cycle of the silkworm (where the silkworm spins a cocoon, and develops into a pupae, it metamorphoses into a moth and breaks through the silk cocoon). As the rearing of the silkworms play a big role in Africa Silks and the larger scheme of introducing change to the Tjhabelang assemblage, this has been identified as the link (liminal stage) between the two assemblages, seen in figure 207 and 208.

Transitioning between Tjhabelang and Africa Silks assemblages: liminal phase inspired by cocoon (liminal phase in life cycle of the silkworm).

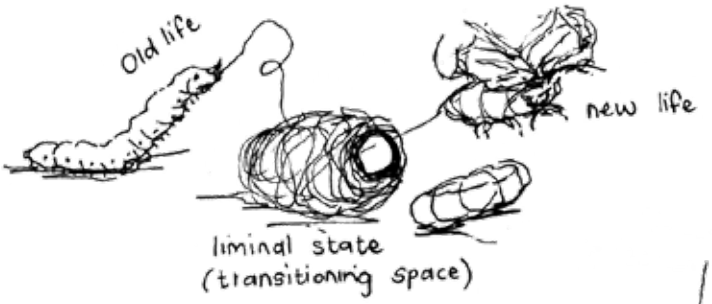


Figure 207: Cocoon as stage of liminality present in the life cycle of the silkworm (Caldeira, 2019: own drawing).

Cocoon: Liminal state.
Moths: Symbolize new life and better future for children.
Eggs: Extension of Tjhabelang, relating to education.
Silkworm: Staff (parental figures), element with transformation abilities.

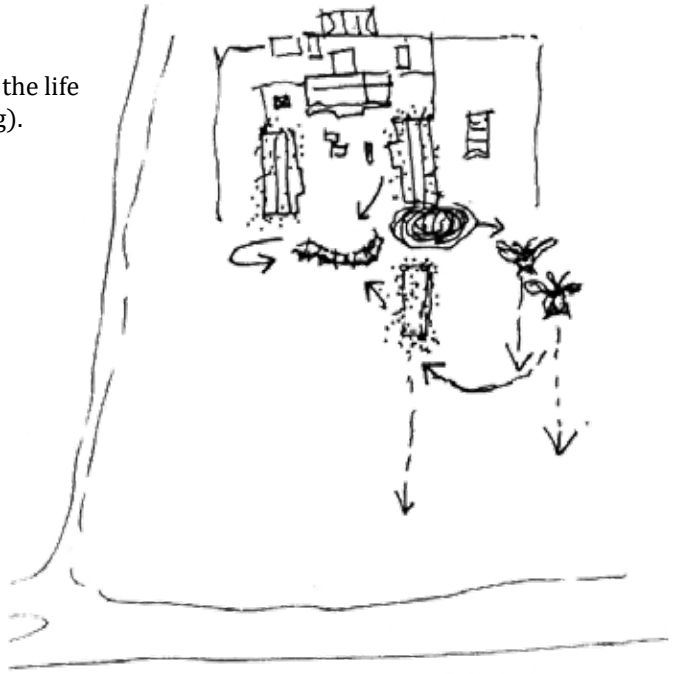


Figure 208: Life cycle of silkworm acting as curator in the new connection of Africa Silks' assemblage (Caldeira, 2019: own drawing).

Africa Silks assemblage inspired by different stages of the silkworm life cycle. This informs the architecture to also speak of transformation and change.

Cycle in correlation with the functions at Africa Silks:

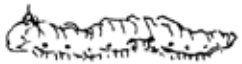
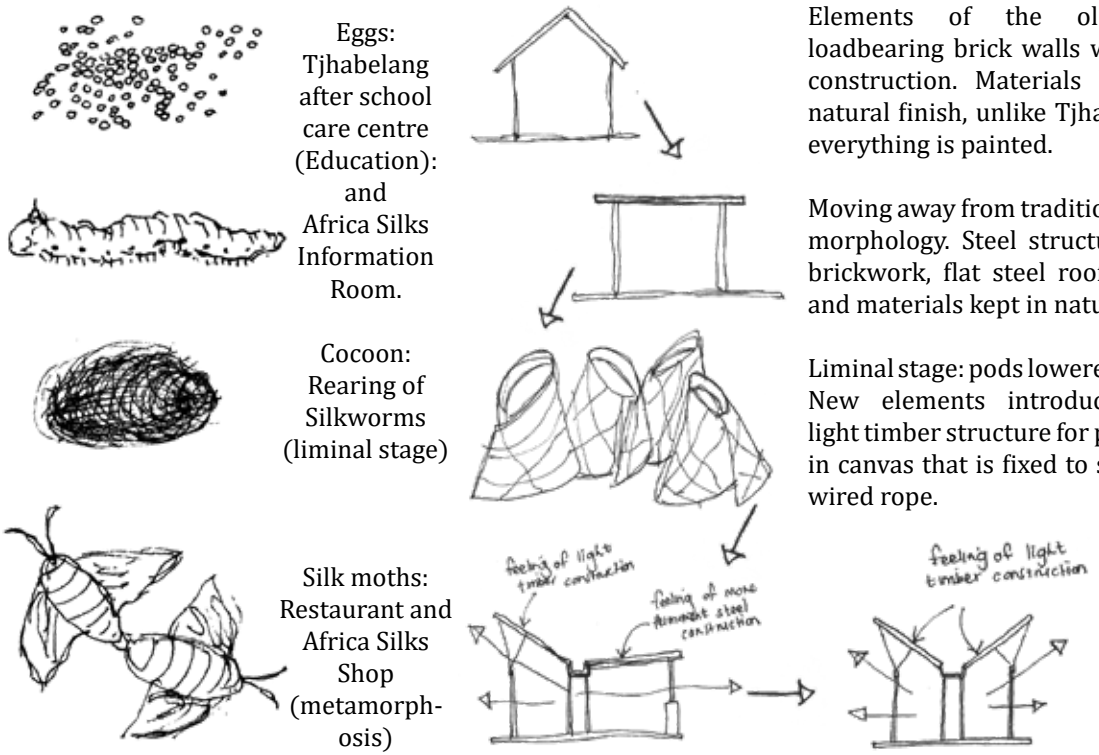
Eggs 	The **start** of a new life. Also seen as the start of change. And is related to Tjhabelang (**education**), from which this thesis grew.	Information Room (History of Africa Silks)
Silkworm 	The silkworm reflects hard work, creativity and **transformation** and can be related to the parental figures at Tjhabelang that will be employed at Africa Silks.	Staff Members
Cocoon 	Liminal state between old and new life. Related to an **inbetween** space that resembles a **transition** between Tjhabelang (as an isolated entity) and new connections made possible through Africa Silks.	Rearing of Silkworms and After School Care for Children
Moths 	**Metamorphosis** of pupae into moths. Represents **change** and possibility for **new** life (mating and laying eggs). Moth breaking through cocoon also represents freedom and a new beginning.	Restaurant, Africa Silks Shop and Showroom (Weavery)

Figure 209: Life cycle of silkworm in relation to needs of Africa Silks and as extension of Tjhabelang (creating a pathway out of poverty) (Caldeira, 2019: own drawing).

This further relates directly to the structure of the buildings. Figure 210 shows the cycle of the silkworm in relation to how the tectonics of the Africa Silks assemblage will transform according to the cycle of the design: start (extension of Tjhabelang: Information Room), liminal phase (where change occurs: introduction of Africa Silks (creating a pathway out of poverty): main element being the rearing of silkworms in four different pods) and metamorphoses (employment allowing higher education for children; this relates to the restaurant, showroom (weavery) and Africa Silks shop).



Metamorphosis into moth: character of transformation. Complete inversion of traditional pitched roof. One building (restaurant) including elements of the old (steel structure) and of the new (timber structure).

Final building (shop), completely opening up to natural surroundings, with the feeling of a light timber structure (temporariness) and butterfly roof. This symbolizes the idea of ascending into the landscape, and the 'future'.

Figure 210: Transformation of tectonics according to the cycle of the design (Caldeira, 2019: own drawing).

Figure 211 reveals the cycle of the silkworm in relation to the model built during this exploration. This is followed with figure 212, a photo taken of the design development on site, in relation to the existing assemblage (Tjhabelang).

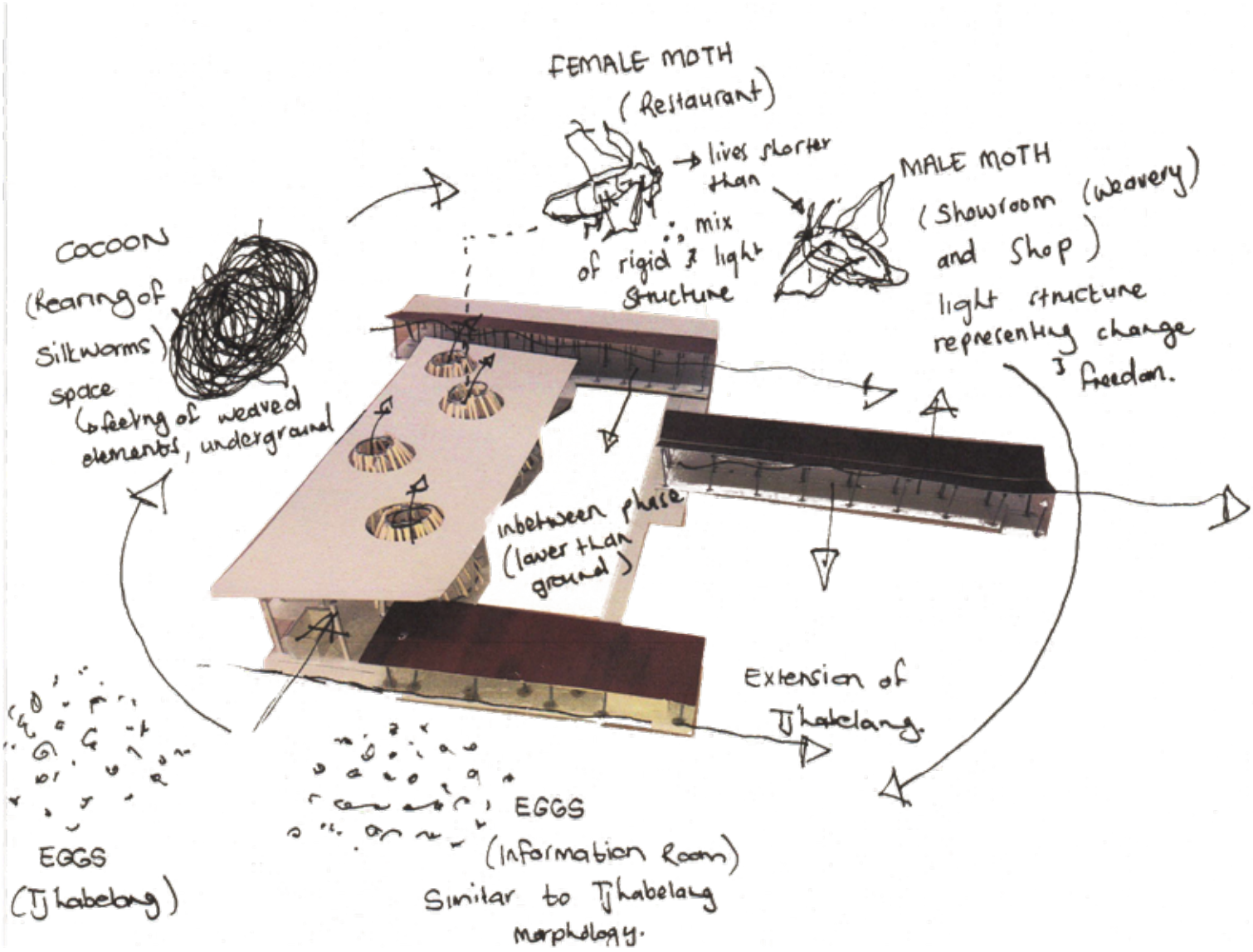


Figure 211: Cycle of silkworm in relation to phase 05, design development (Caldeira, 2019: analysis and model).

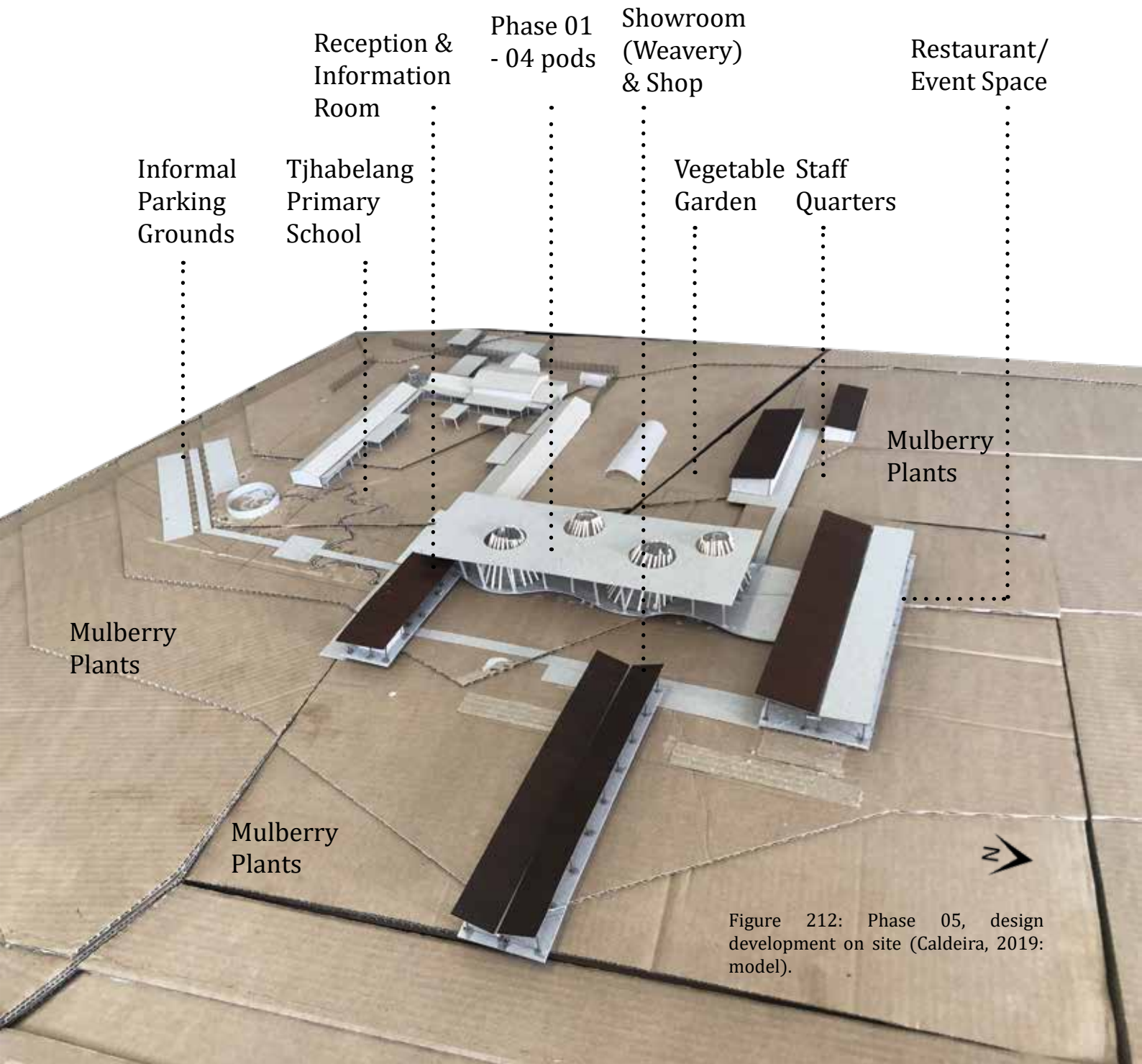
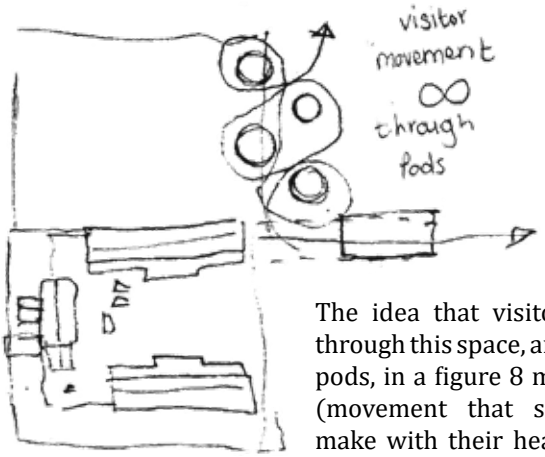


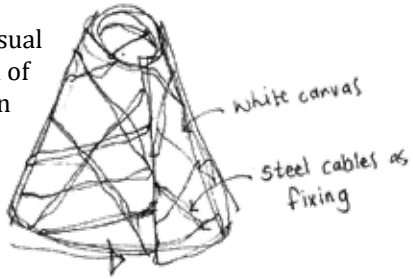
Figure 212: Phase 05, design development on site (Caldeira, 2019: model).

Further investigation as to how the tectonics of the buildings will transform during this cycle, will be discussed in the technical resolution. The following drawings relates to the liminal stage in this design development where the rearing of silkworms will take place in four different pods. These are influenced by the Serpentine Gallery (page 77) and the Windshape Pavilion's (page 67) use of steel cables and polypropylene string to create structures that are light and dynamic in nature.

Morphology: Inspired from the idea of the cocoon where the moth metamorphose and breaks through the silk, leaving a hole in the cocoon.



Steel cables used as fixing of white canvas for the membrane of the four different pods (resembling a cocoon and visual interpretation of silk being spun around these pods).



The idea that visitors move through this space, around the pods, in a figure 8 movement (movement that silkworms make with their heads when they start to spin). In contrast to existing movement along straight walkways.

It is proposed that this part of the design, is lowered into the ground as it represents the liminal phase (cocoon) in the development (a place of in-between-ness). One will move down into this liminal phase, through these cocoon-like structures (away from the rest of the landscape) and ascend to ground level (symbol of metamorphosis) towards the restaurant, weavery and shop.

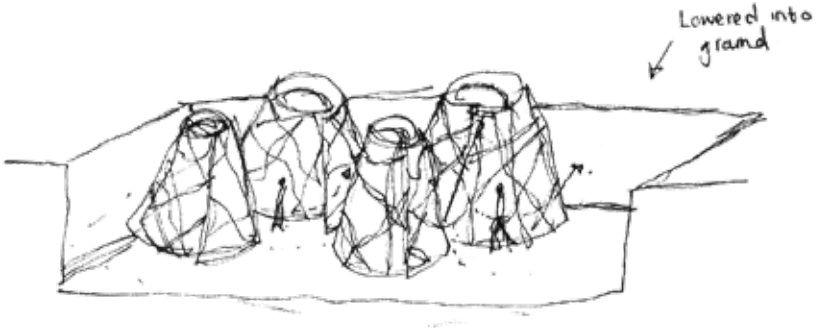


Figure 213: Phase 05, pods sketches (Caldeira, 2019: drawings).

Requirements for these pods, relating to design:

Viewing windows. For hygienic and noise related reasons, visitors are not allowed inside the pods. Viewing of different silkworm phases, happens through a window, and a tour guide will bring one of the silkworms, cocoons or moths out for viewing.

Soundproof. These pods have to be designed in a way that it is away from any loud noises as the silkworms are susceptible to loud noises. This includes the restaurant and showroom (weavery) where women weaving sings traditional songs while working.

Ventilation. Some form of ventilation is required for hot air to escape when temperature and humidity rises. In saying this, these pods have to be protected from direct sunlight as the silkworms are more susceptible to darker spaces (MIT Media Lab, 2018: online).

Water channel. Surrounding the interior rearing hall walls, there should be a 150mm wide by 100- 150mm deep water channel to prevent entry from ants and other insects (Csrtimys, 2019: online).

The following sketches explores these requirements within the 'cocoon' pods.

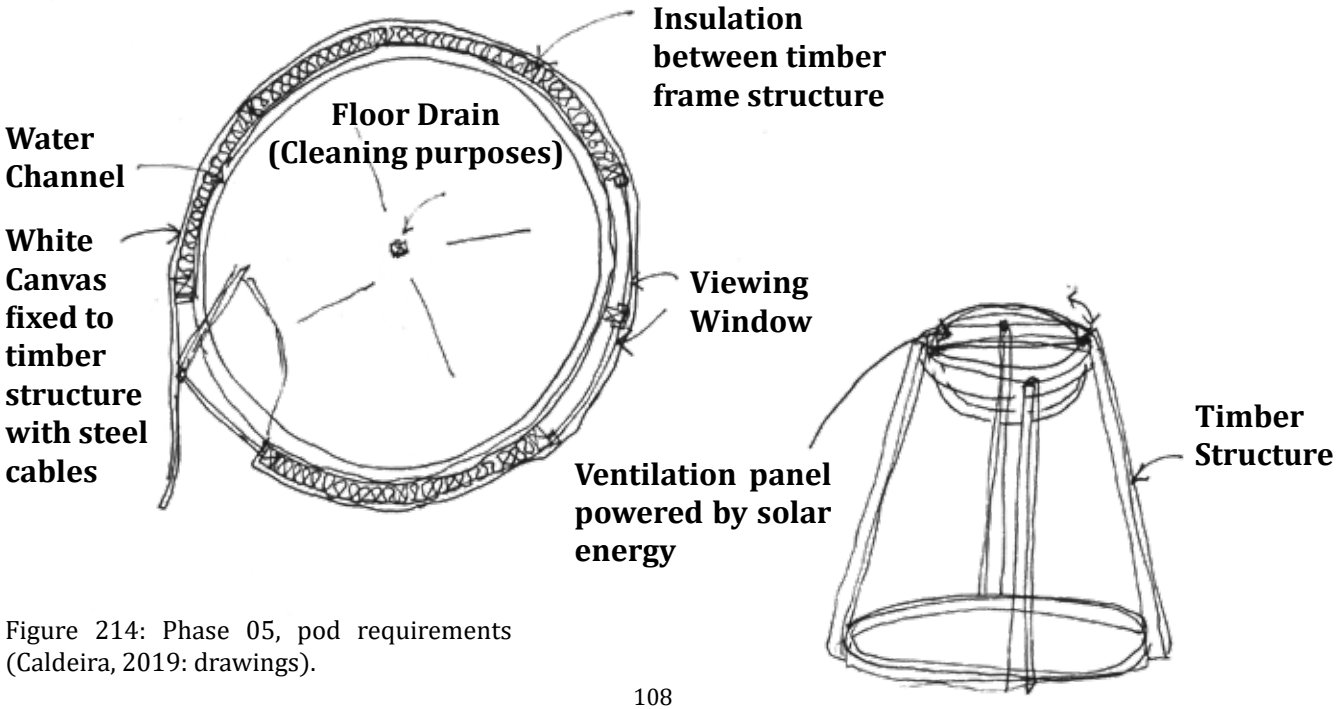


Figure 214: Phase 05, pod requirements (Caldeira, 2019: drawings).

The final design development forms part of phase 05 and all precedent studies previously mentioned in this book has influenced the development of the final design. The following drawings are part of design development 05, thereafter the final design development will follow.

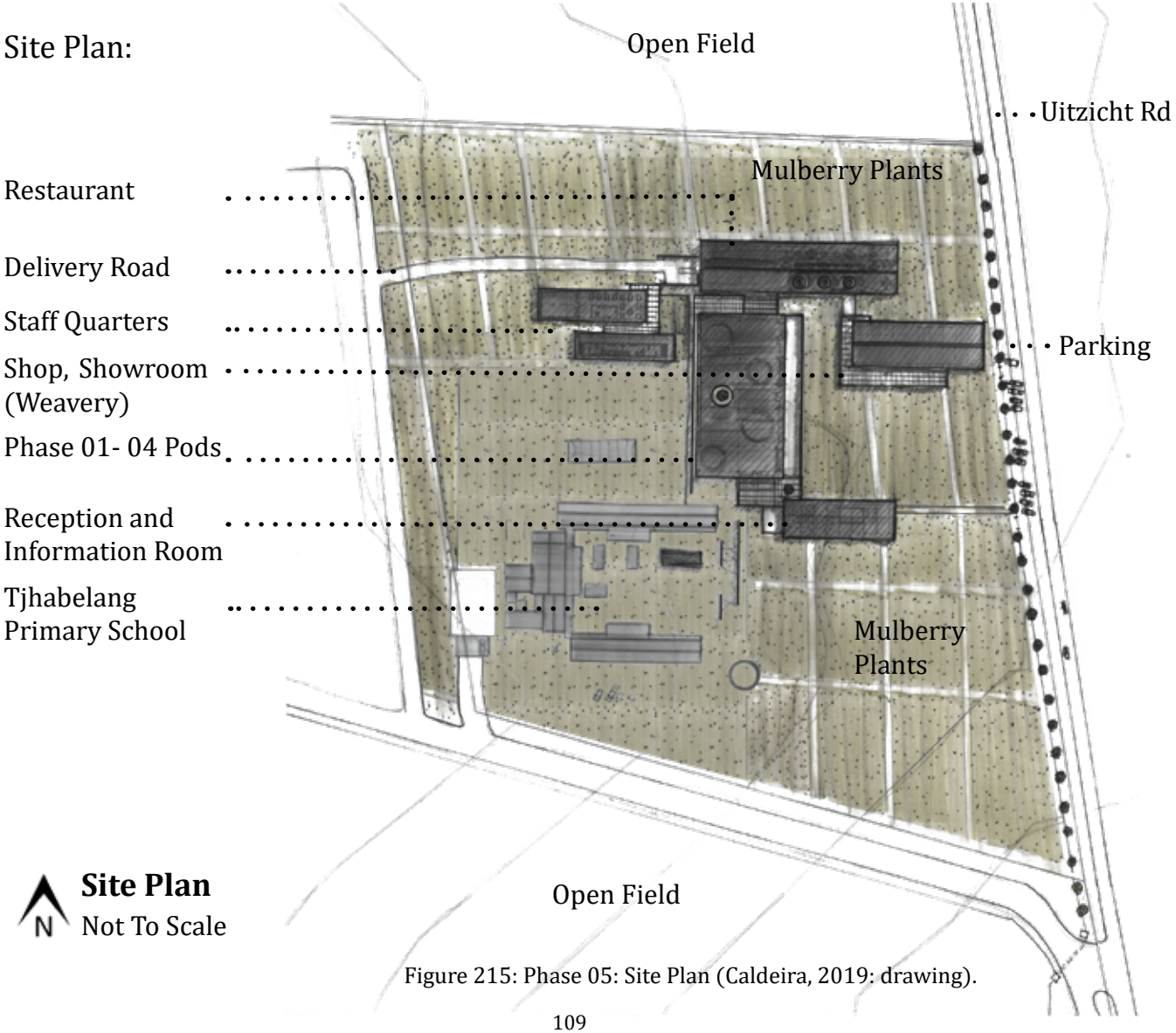
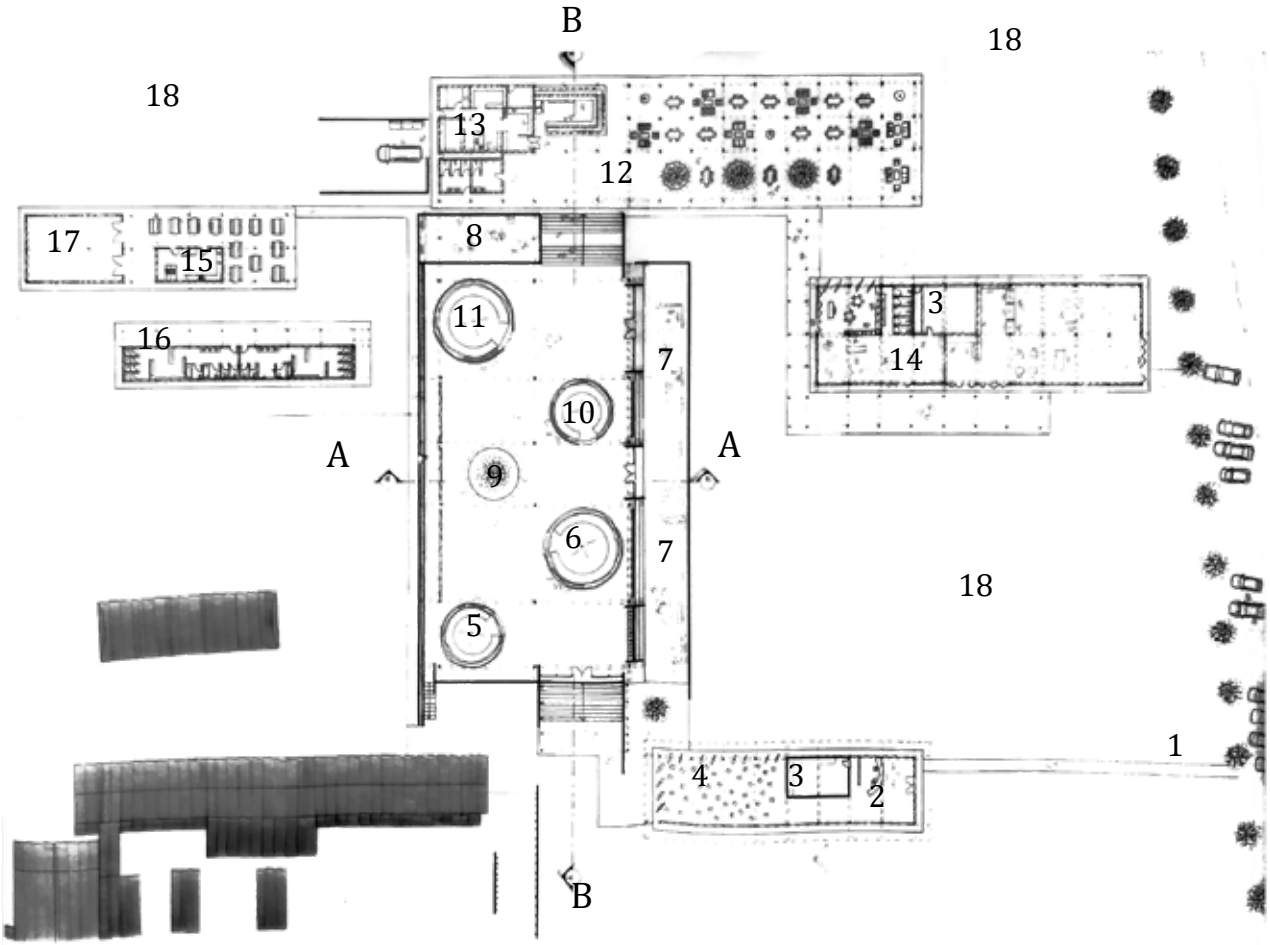


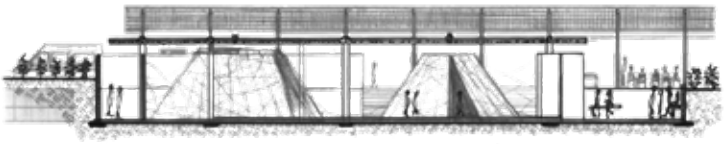
Figure 215: Phase 05: Site Plan (Caldeira, 2019: drawing).

1. Entrance
2. Reception
3. Toilets
4. Information Room
5. Phase 02
6. Phase 03
7. Showroom (Weavery)
8. Boiling Room
9. Full-grown Mulberry Tree
10. Phase 04
11. Phase 05
12. Restaurant Seating
13. Kitchen
14. Shop
15. Staff Kitchen
16. Staff Lockerroom
17. Garden Store
18. Mulberry Plants

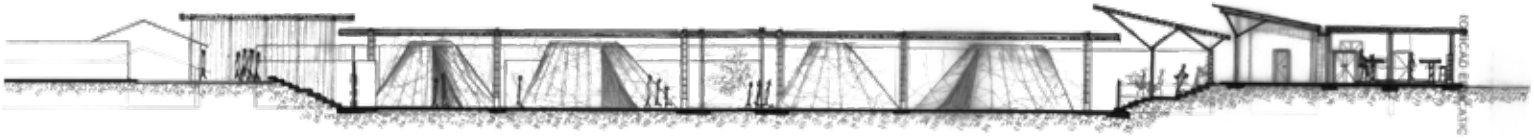


Floorplan
Not To Scale

Figure 216: Phase 05: Floorplan (Caldeira, 2019: drawing).



Section A-A



Section B-B

Sections (Not To Scale)

Figure 216 and 217: Phase 05: Sections(Caldeira, 2019: drawing).

3.2 Phase 05: Final Design Development

3.2.1 Location Plan

Site located on erf portion 31 and 46 of 1182, Uitzicht. Bainsvlei, Bloemfontein, FS.

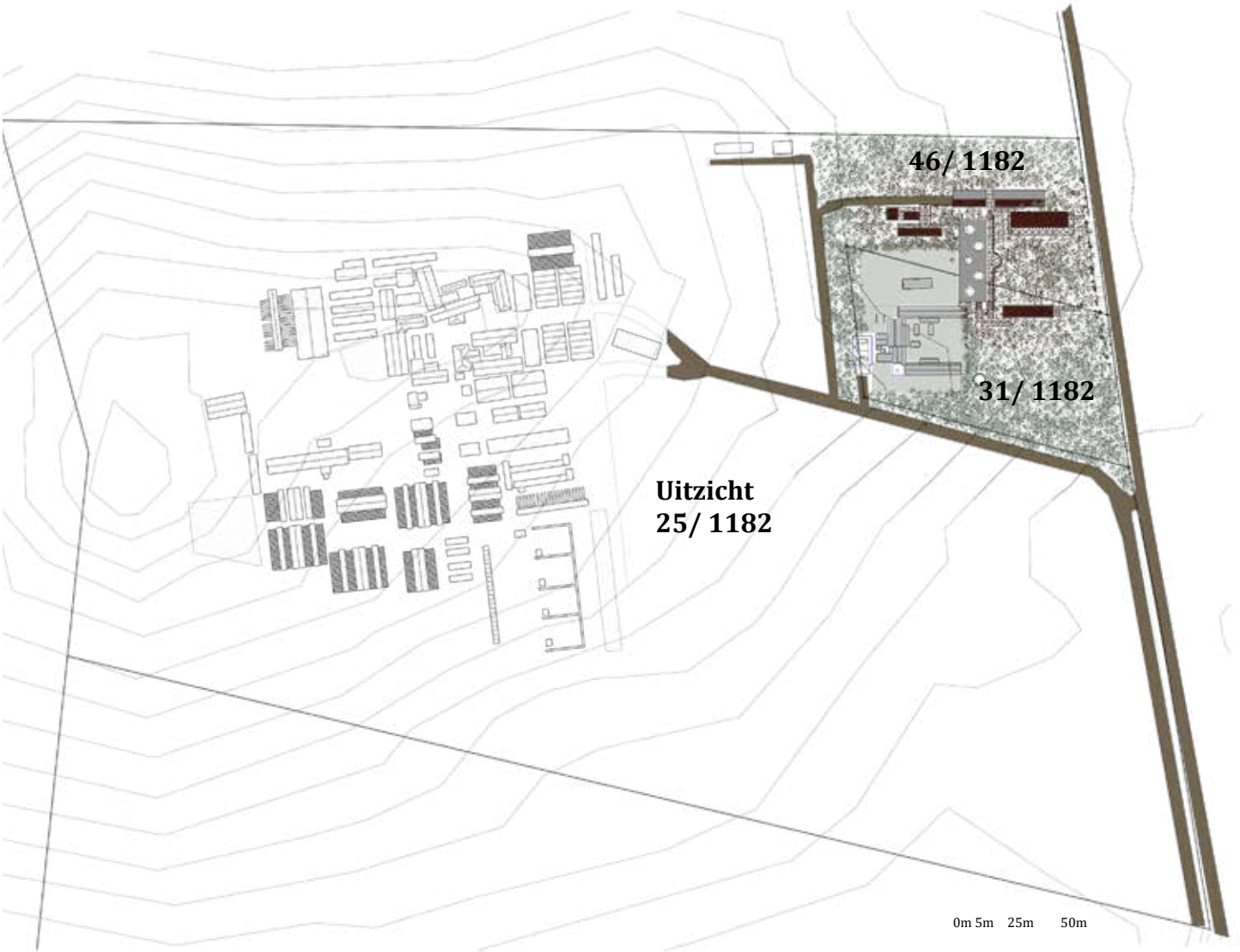


Figure 218: Final design development: Location Plan (Caldeira, 2019: drawing).

3.2.2 Site Plan

1. Tjhabelang Primary School
2. Tjhabelang Vegetable Garden
3. Reception and Information Room
4. Phase 01- 04 Pods
5. Kitchen and Bar
6. Restaurant
7. Africa Silks Shop
8. Staff Quarters and Garden Store
9. Parking
10. Uitzicht Road
11. Delivery Road
12. Mulberry Plants

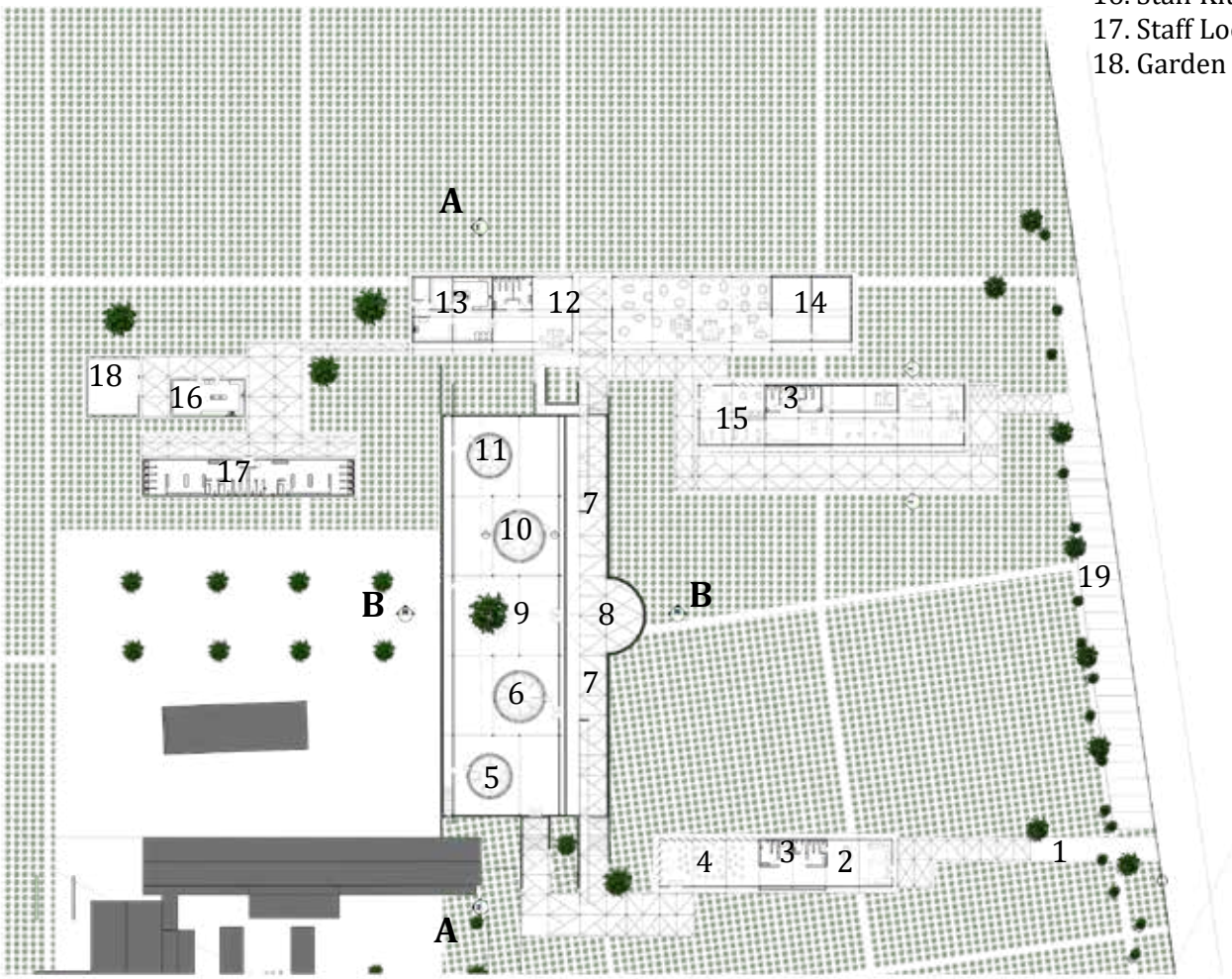
N

Site Plan
Not To Scale

Figure 219: Final design development: Site Plan (Caldeira, 2019: drawing).

3.2.3 Floorplan

1. Entrance
2. Reception
3. Toilets
4. Information Room
5. Phase 02
6. Phase 03
7. Showroom (Weavery)
8. Boiling Room
9. Full-grown Mulberry Tree
10. Phase 04
11. Phase 05
12. Restaurant Seating
13. Kitchen
14. Private Staff Meeting Room
15. Shop
16. Staff Kitchen
17. Staff Lockerroom
18. Garden Store



Floorplan
Not To Scale

Figure 220: Final design development: Floorplan (Caldeira, 2019: drawing).

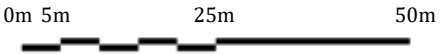
3.2.4 Elevations

South Elevation

East Elevation

North Elevation

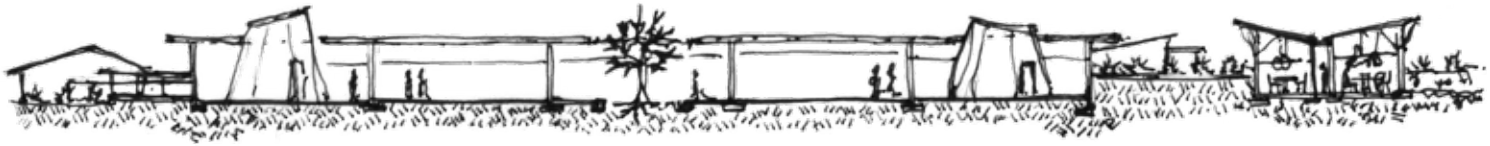
West Elevation



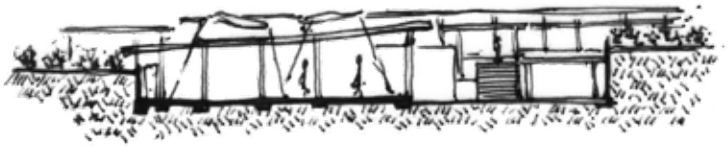
Elevations
Not To Scale

Figure 221: Final design development: Elevations (Caldeira, 2019: drawing).

3.2.5 Sections



Section A-A



Section B-B

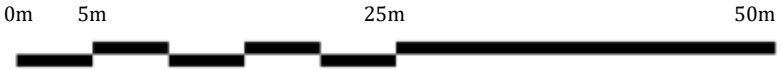


Figure 222: Final design development: Sections (Caldeira, 2019: drawing).

3.2.6 Details

Detail of Restaurant gutter between two different structures:

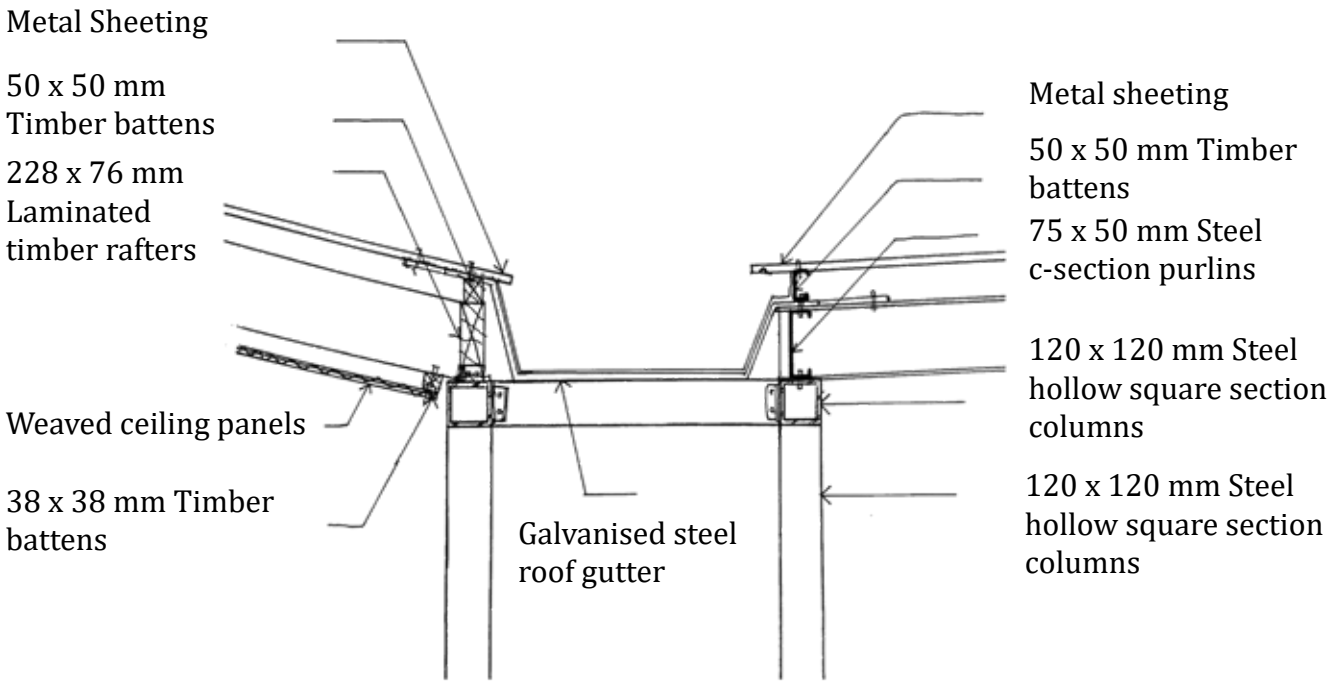


Figure 223: Final design development: Detail A (Caldeira, 2019: drawing).

Detail of Silkworm Pods:

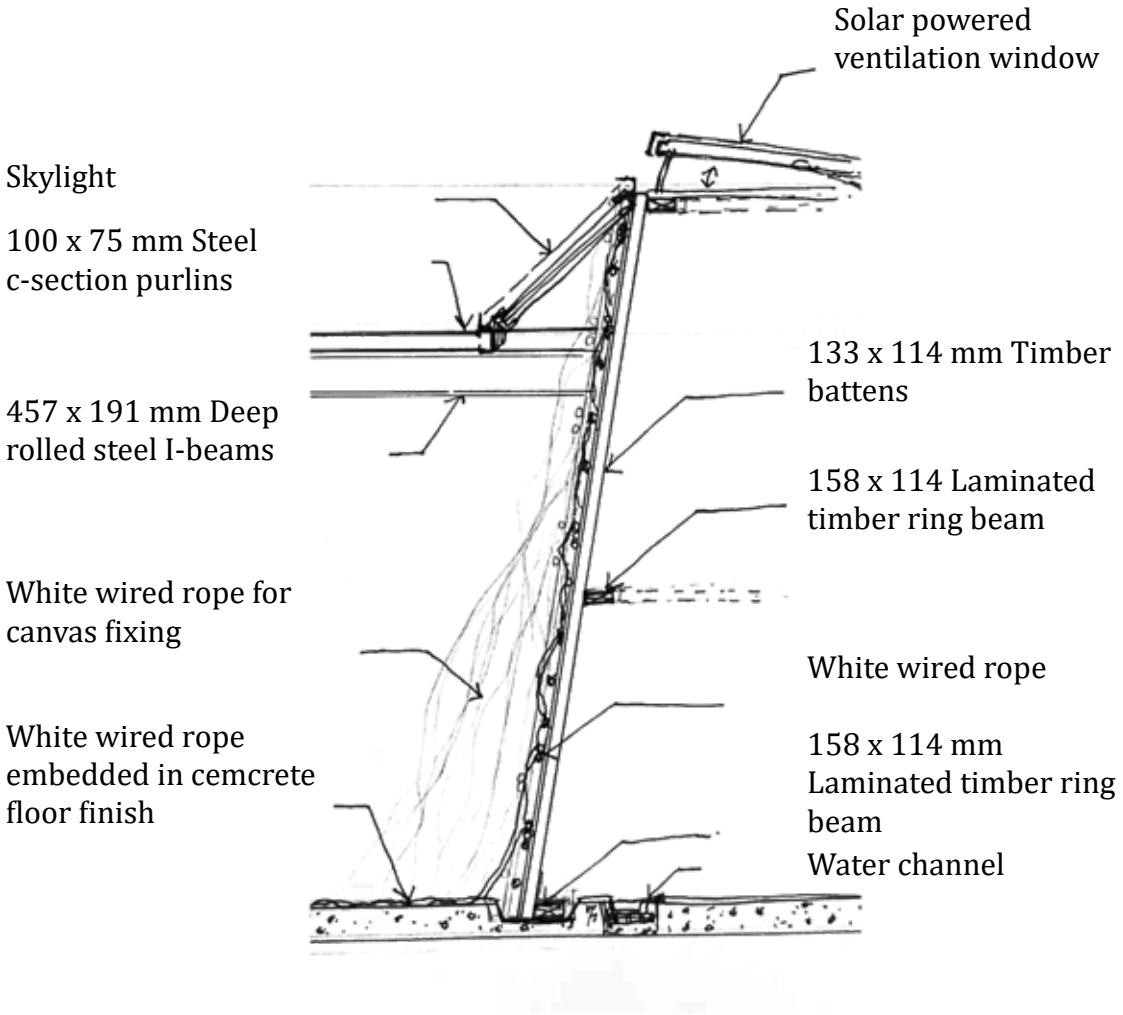


Figure 224: Final design development: Detail B (Caldeira, 2019: drawing).

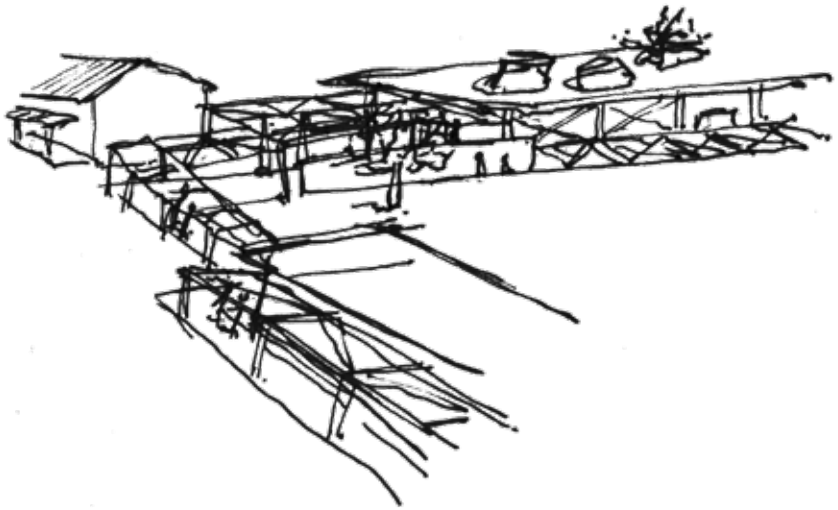


Figure 225: Final design development: connection between Tjhabelang and Africa Silks (Caldeira, 2019: drawing).

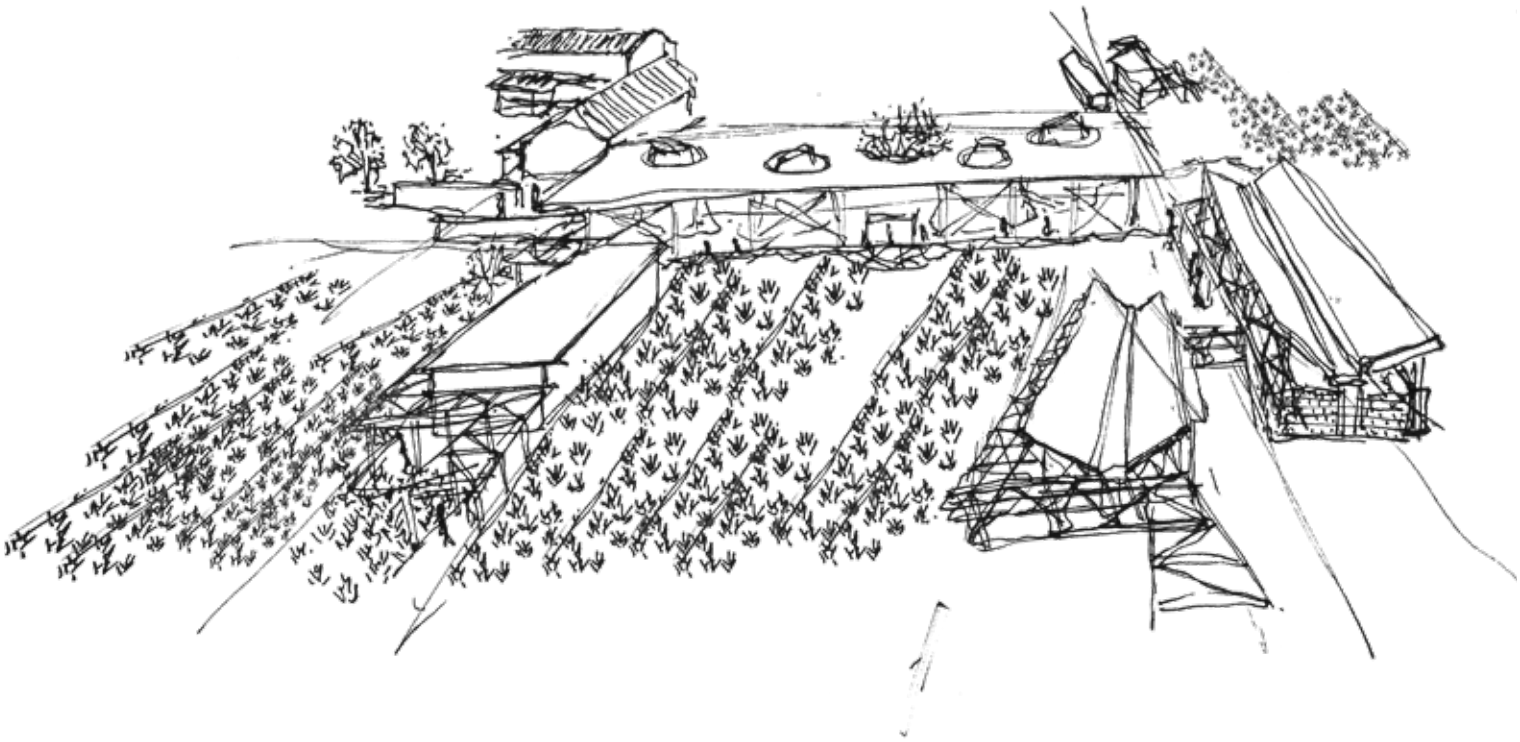


Figure 226: Final design development: Africa Silks assemblage (Caldeira, 2019: drawing).

3.3 Technical Resolution

This technical investigation focus on the site, the sustainability of the design, special services required, the materiality and structural development.

3.3.1 Site

The site is located west of Bloemfontein, approximately 12 kilometers (km) west on Boshof Road (R64) and an additional 3.2km onto Uitzicht Road (figure 227). It is positioned next to the Tjhabelang Primary School, established in 2007 for the children in the rural community of Bainsvlei (Tjhabelang, 2019: online).

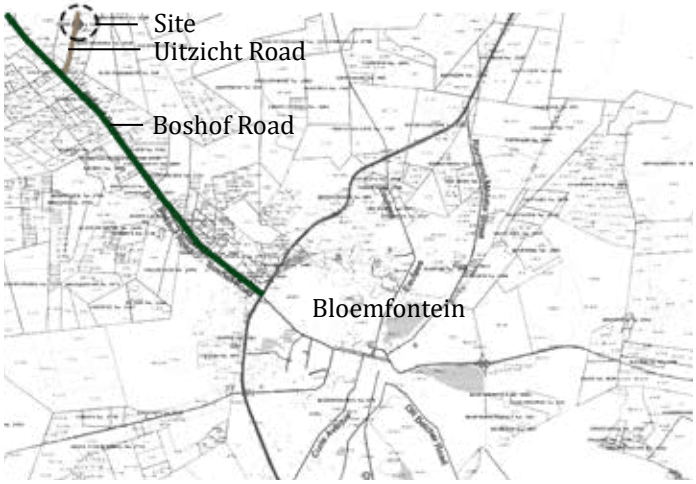


Figure 227: Location Map (Caldeira adapted from 1Map, 2019: map).

3.3.1.1 Cadastral Information

Tjhabelang Primary School is located on farm portion 31/ 1182. The idea is to introduce Africa Silks adjacent to Tjhabelang, on the remainder of erf portion 31/ 1182. As this is not enough land for the growth of the mulberry plants, it is proposed to subdivide erf portion 46 from 25/ 1182, seen in figure 228 and 229.

SG diagrams are attached under Appendix A- 1.

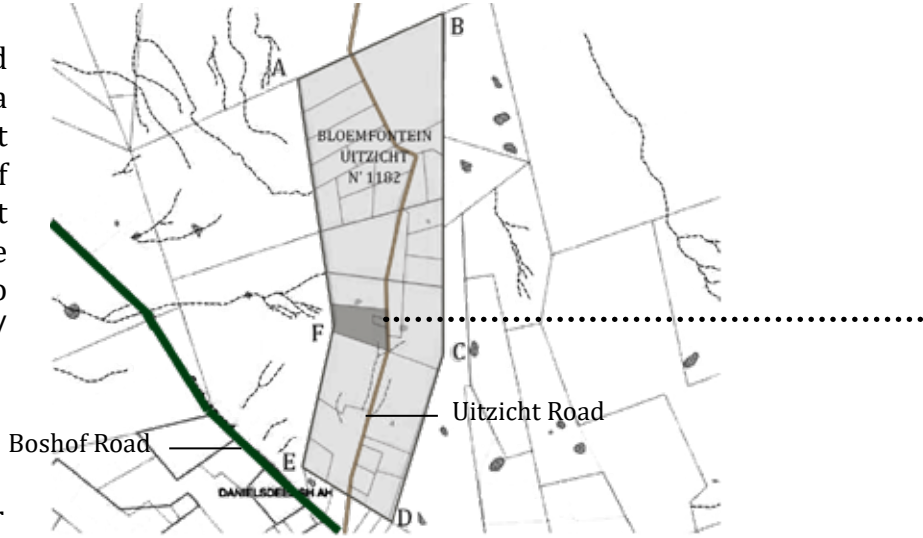
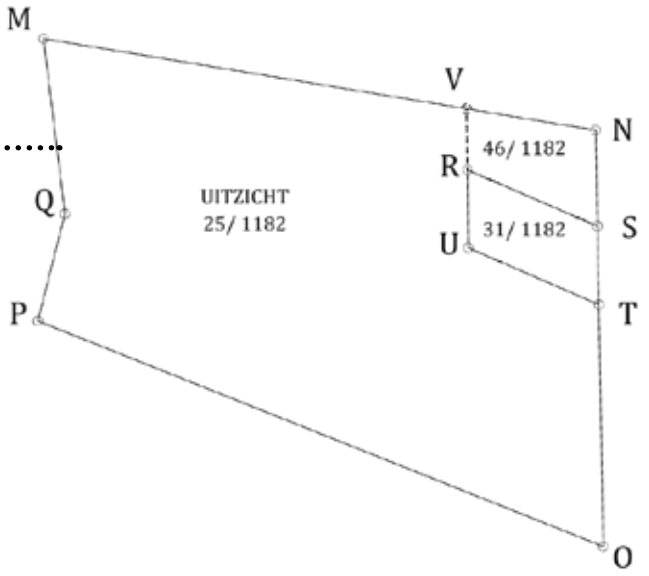


Figure 228: Diagram illustrating Portion 25/ 1182 (Caldeira adapted from 1Map, 2019: map).



See Table 2 on next page for information regarding subdivision of erf 25 of 1182, Uitzicht, Bloemfontein.

Figure 229: Proposed subdivision of erf portion 46 from 25/ 1182 (Caldeira, 2019: map).

3.3.1.2 Mangaung Metropolitan Municipality's Municipal land use planning by-laws:

"32. SUBDIVISION OR CONSOLIDATION OF LAND PARCELS:

Subdivision or consolidation of land should be approved by the Municipality and each subdivision should have adequate services and acceptable access to a public road (see Appendix A- 2 for site access to public road).

The following documentation is needed for the subdivision of a land:

(1) A copy of the approval must accompany the diagram that is submitted to the Surveyor-General's office.

(2) If a Municipality approves a subdivision or consolidation, the applicant must submit a diagram to the Surveyor-General for approval, with the following information:

(a) the decision to approve the subdivision or consolidation;
(b) the conditions of the approval;
(c) and the approved subdivision or consolidation plan.
(5) On approval, the Municipality will amend the land use scheme and the register accordingly."
(Mangaung Metropolitan Municipality, 2019: online).

Attatched under Appendix A- 3, see application forms for subdivsion of land.

Table 2: Information regarding subdivision of erf portion 25 of 1182
(Caldeira, 2019: own table).

Site Information: Subdivision of erf portion 46 from 25 of 1182, for the utilization of mulberry plants.	Data:
Proposed Site	Erf Portion 31 of 1182
Size of Proposed Site	20 114. 74 m²
Size of Proposed Site Excluding Existing Buildings (Tjhabelang Primary School)	9 833. 5 m²
Adjacent Land to be Subdivided	Erf Portion 25 of 1182
Size of Erf Portion 25 of 1182	364 948. 61 m²
Size of Portion 46 to be subdivided from 25 of 1182	20 738. 83 m²

3.3.1.3 Civil Engineering Services

Services to the site are connected to a main service line on Boshof Road, seen in figure 230.

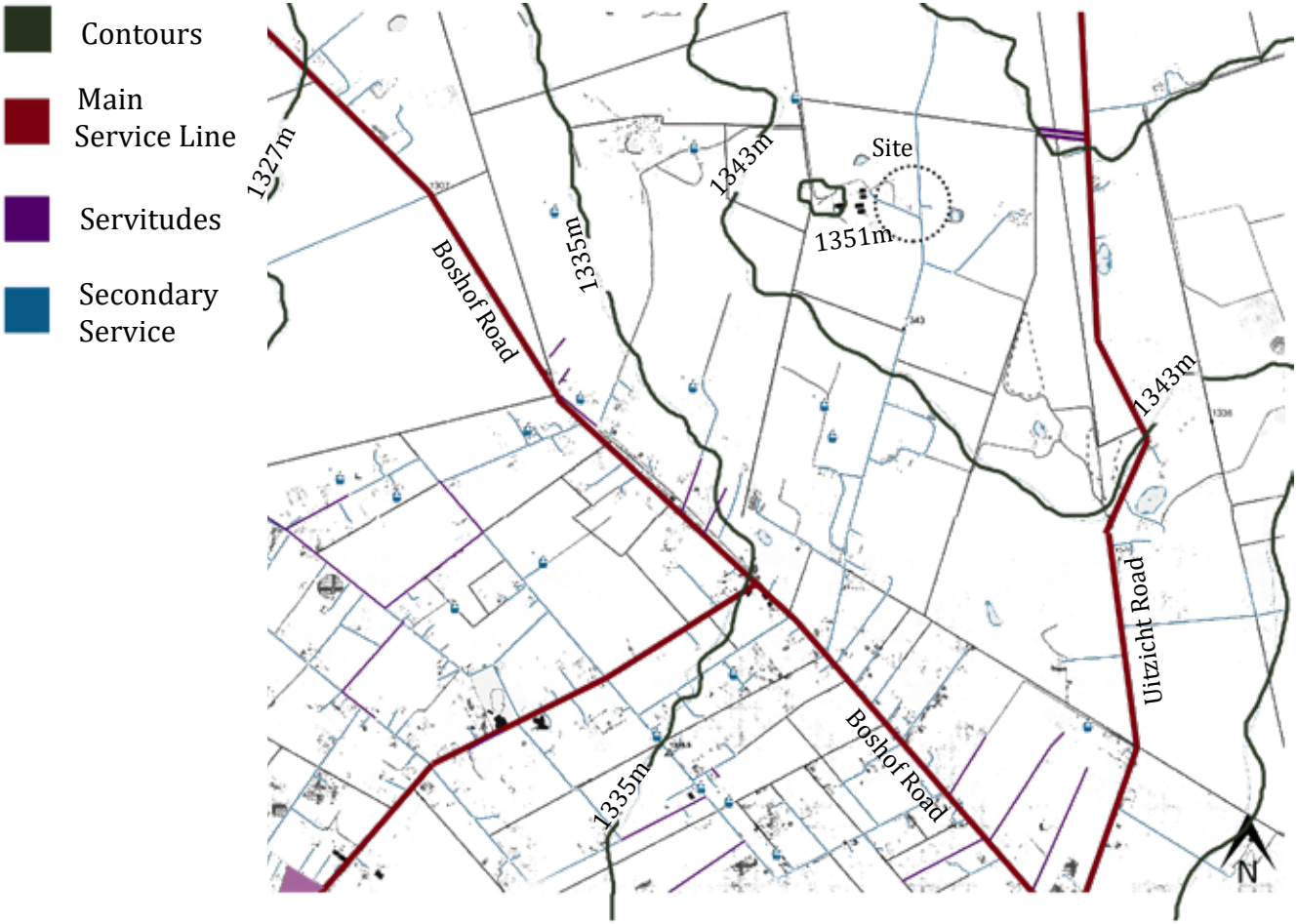


Figure 230: Services to Site (Caldeira adapted from 1Map, 2019: map).

3.3.1.4 Topographic Analysis

Figure 231: Topographic Analysis (Caldeira adapted from Google Earth, 2019: map).

3.3.1.5 Sections

The following sections (figure 232) show existing site conditions (on an exaggerated scale) such as built structures, the slope, vegetation and roads. Vertical scale is 1:100 and horizontal scale is 1:2000.

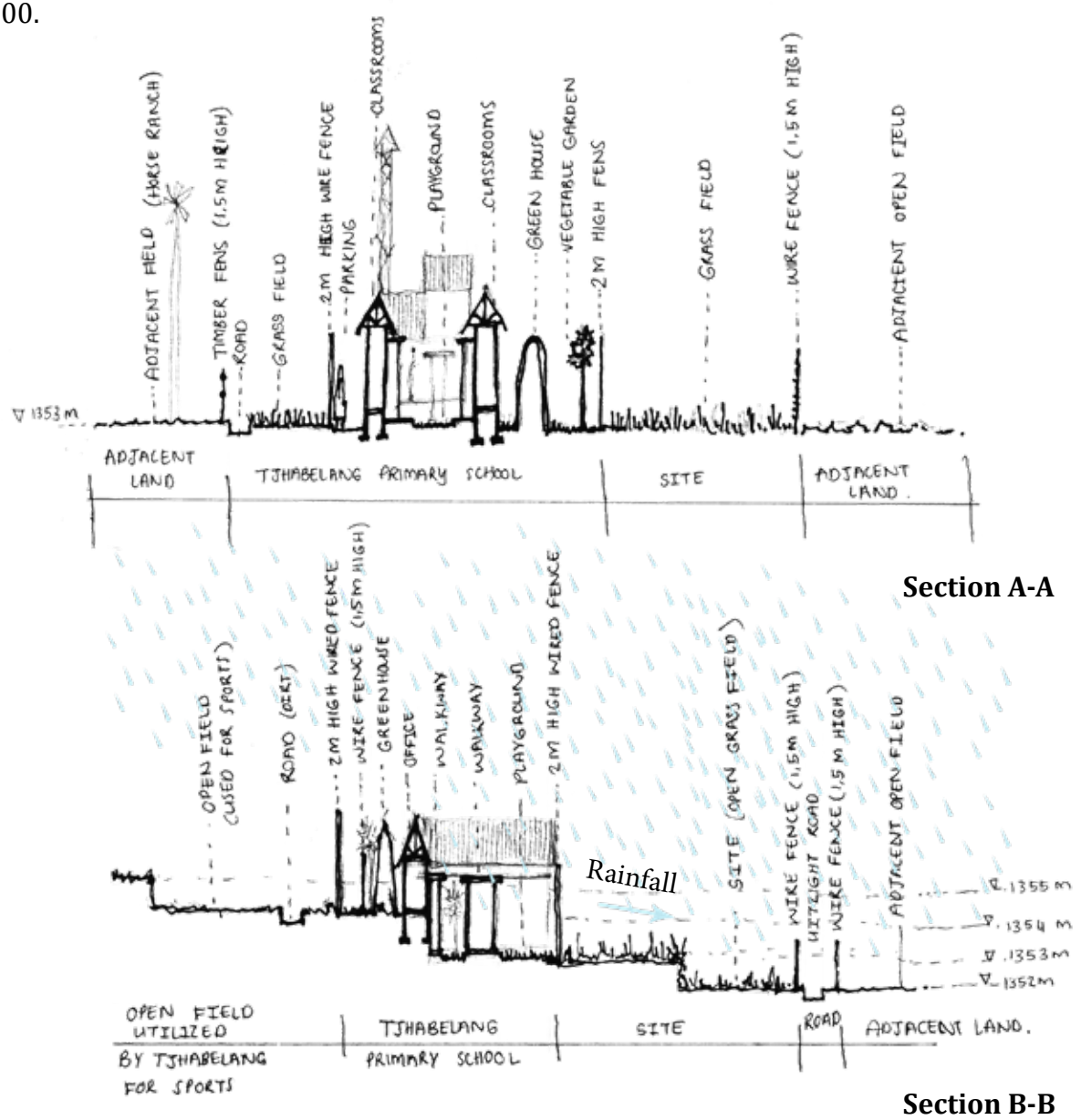


Figure 232: Site Conditions: section A-A (top) and section B-B (bottom) (Caldeira, 2019: drawings).

Section B-B reveals a three-meter fall on site towards the East (Uitzicht Road). The design will therefore allocate stormwater disposal systems according to new hard landscaping (paving and floor slabs) to prevent excessive rainwater run-off onto Uitzicht Road. (Stormwater disposal systems can be seen on the attached site plan in Appendix A- 4).

3.3.2 Developmental Rights

As the site is located in the rural Free State area, only municipal development restrictions apply that are from the Mangaung Metropolitan Municipality's land use by-laws (Mangaung Metropolitan Municipality, 2019: online). This include:

Spatial Planning

All developments in the Free State province should be represented according to specific spatial planning categories. This development of Africa Silks falls under the category (c) Agricultural Areas, and should comply with the following:

Development Management

- The owner of land, owner of Tjhabelang Primary School and the site (Engela Fourie), may apply for the determination of a zoning for land, in terms of section 16(3) to the Municipality.
- The development of land may not continue without the approval of the Municipality in terms of subsection (2) (Mangaung Metropolitan Municipality, 2015: 5).

Rezoning of Land

An application can be submitted to the Municipality in terms of section 16 (2), for the rezoning of land. The land use of the site is currently that of agriculture and will continue as an agricultural development but with the addition of public services and commercial activities (Mangaung Metropolitan Municipality, 2015: 9).

Subdivision of Land

One may not subdivide or consolidate land without the approval of the Municipality. Each subdivision of land should have adequate access to services and public streets (see Appendix A-2), and this should be shown as part of the documentation for the subdivision application. If a Municipality approves a subdivision, the Municipality must amend the land use scheme,

and where applicable, the register (Mangaung Metropolitan Municipality, 2015: 15).

Application for Land Development

The following information should be included in the application to the municipality:

Locality map showing orientation; a zoning and land use map; a detailed layout map; a site development plan; an aerial photograph; an extract of the approved spatial development frameworks; services reports; a traffic impact study; and an environmental impact assessment. The remainder of this document explores the above-mentioned requirements (Mangaung Metropolitan Municipality, 2015: 17).

3.3.3 Environmental Assessment

Geotechnical Analysis

Understanding the soil conditions on site is important for the design and construction process as well as the growth of mulberry plants. The following figures (figures 233 to 236) reveal the location and results of soil jar tests done on site. The four main particle layers that formed after conducting the soil jar tests: are organic matter, clay, silt and sand.

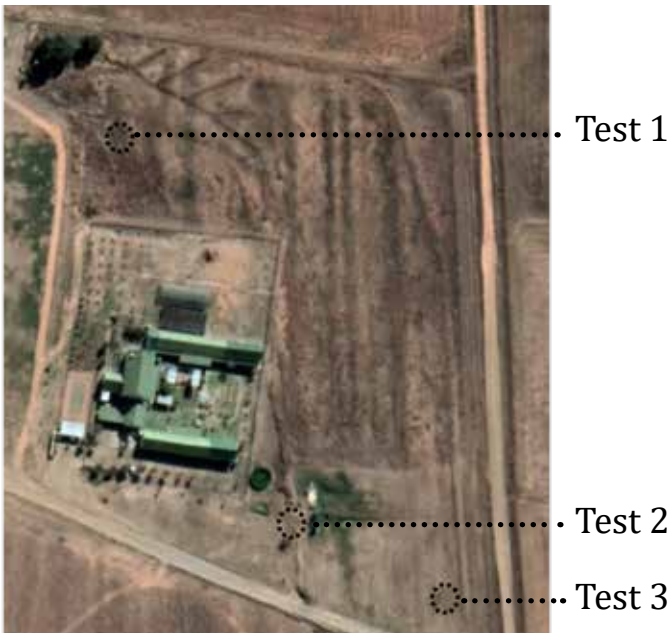


Figure 233: Locations where soil samples were taken (Caldeira, 2019: map).

Test 1:

Figure 234: Soil jar test 1: organic matter, clay, silt and sand (Caldeira, 2019: photo).

Test 2:

Figure 235: Soil jar test 2: organic matter, clay, silt and sand (Caldeira, 2019: photo).

Test 3:

Figure 236: Soil jar test 3: organic matter, clay, silt and sand (Caldeira, 2019: photo).

"Mulberry flourishes well in soils that are flat, deep, fertile, well drained, loamy to clayey, and porous with good moisture holding capacity." (FAO, 2019: online). Due to the moisture holding capacity of test 1 and 3, it is proposed to plant the mulberry plants along the areas shown in figure 237 and treat the remainder of the soils located in the wetlands area. Of the four main elements found in the soil, results show that the average of the organic matter, clay and sand are of equal quantities in the soil mixture (see below).

Combined results of test 1- 3:

Organic Matter: 31. 56 %

Clay: 34. 67 %

Silt: 2.67 %

Figure 237: Preferred soil conditions for mulberry plants (Caldeira, 2019: drawing).

Foundations

Because of the high percentage organic matter, and difference in soil consistency throughout the site, it is proposed to over excavate, compact the earth and fill back up with suitable clay and sand mixture (The constructor, 2019: online). According to the SANS 10400-H: 2012, "Fine-grained soils with moderate to very high plasticity (clays, silty clays, clayey silts and sandy clays)" (soil found on site) falls under class H, H1, H2 and H3 soils, known as expansive soils (SANS 10400, 2012: 11).

As strip foundations (figure 238) are appropriate for class H soils, it will be used as the standard foundation in this dissertation (SANS 10400, 2012: 17- 20). Pad footings (figure 239) will be used where suitable (areas where the distance between columns are not too little).

1. 200 x 600mm Shallow Concrete Strip Foundation
2. Natural Ground Level (ngl)
3. Compacted Ground Fill (150mm)
4. Damp Proof Membrane (dpm)
5. 85mm Concrete Surface Bed
6. 25mm Cement Screed with Floor Finish
7. 900 x 900 x 600mm Concrete Pad Footing
8. Steel Base Plate with Anchor Bolts
9. Steel Hollow Square Section Column
10. Approved Fill

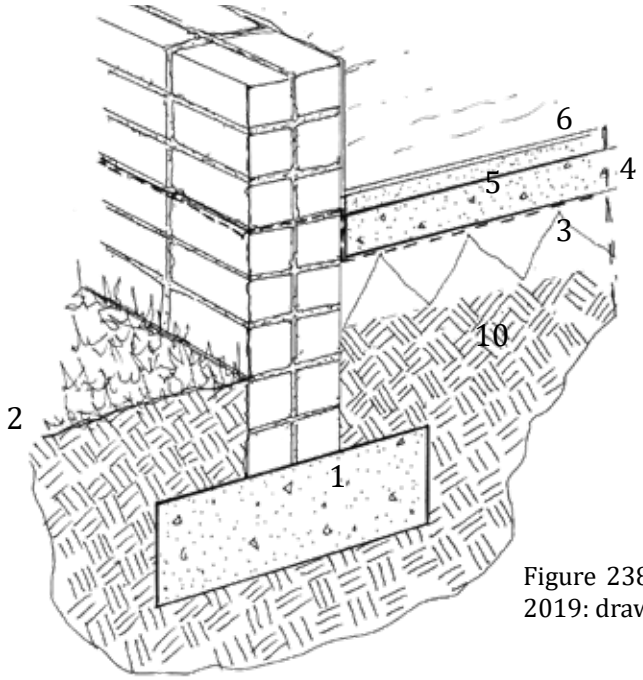


Figure 238: Standard foundation to be used: strip foundation (Caldeira, 2019: drawing).

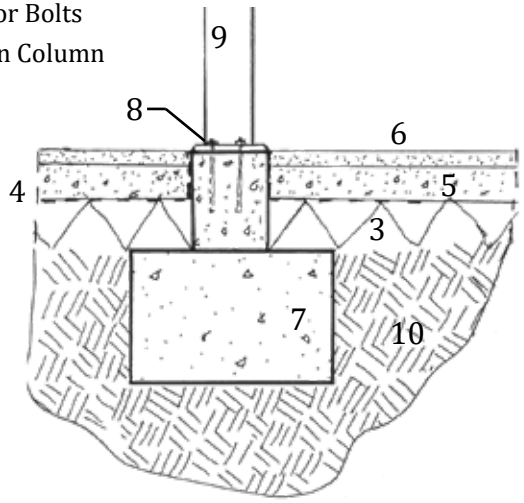


Figure 239: Pad footings (Caldeira, 2019: drawing).

The soil jar test results along with the Organic Mulberry Farming Guide (Sakthivel, Ravikumar, Chikkanna, Kirsur, Bindroo and Sivaprasad, 2014: 13- 16) was used as guidance for the layout of the mulberry plants (seen on the site plan, Appendix A- 4).

The following guidelines were followed:

- Plant mulberry plants according to water jetting system.
- Insert (PVC pipes) pipeline from primary water source (bore-well) that is connected to a water pump.
- Place 50mm diameter PVC pipes as main pipelines across the mulberry lands at 60m spacings and connect all pipes using PVC solvent cement.
- The main pipeline should be placed in the opposite direction of the parallel mulberry plant rows.
- Connect one end of the main pipeline (using a 'T' joint) to the outlet of an irrigation system and the other end with a threaded end cap (figure 241).
- Create water outlets from the main pipeline at 12m spacings, with gate valves. Garden hoses are connected to these outlets for the water jetting of mulberry plants (figure 242).

(Sakthivel et al., 2014: 13- 16).

Figure 240 reveals the typical layout of mulberry plants according to these water jetting guidelines:

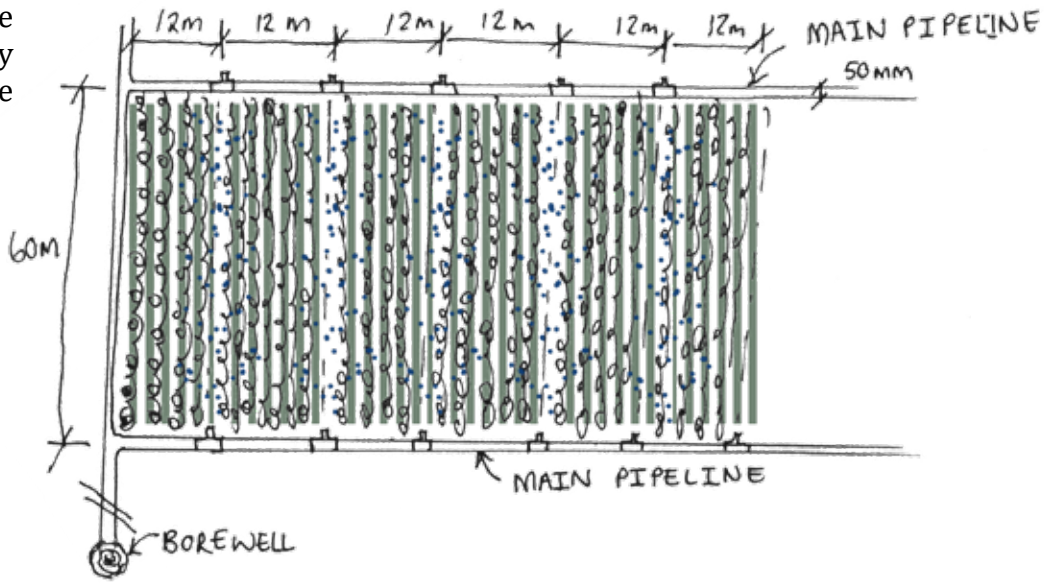


Figure 240: Typical Layout of Mulberry Lands (Caldeira, 2019: drawing).

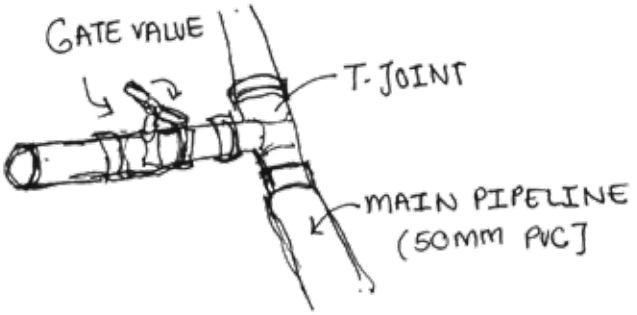


Figure 240: Water Jetting System: Main pipeline with outlet (T-joint with gate valve) (Caldeira, 2019: drawing).

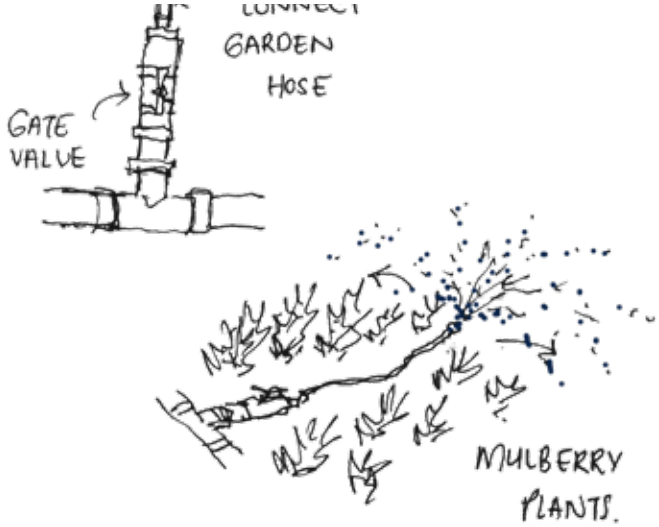


Figure 241: Water Jetting System: Outlet connected to garden hose (Caldeira, 2019: drawing).

Climate

Mulberry Plant Requirements (FAO, 2019: online):

Table 3: Typical climate conditions for Mulberry Plants (Caldeira, 2019: table).

Climate Conditions	Temperate to tropical
Temperature	24°C to 28°C
Annual Rainfall	600- 2 500mm
Humidity	65- 80 %

The Free State consist of a semi-arid climate with weather typical of an interior plateau: hot summers with rainfall and cold winters with sunshine. The capital city of the Free State, Bloemfontein receives between 500 and 600mm rain per year, and has an average temperature of 25.7°C and an average humidity of 57% (Cu Conradie, 2012: 03). Due to the three different mulberry plant species that Africa Silks grow, the Bloemfontein temperature will not affect the harvest and also adjustable shading nets can be erected during hot summer weather.

The three different mulberry plants grown at Africa Silks (Nkosi, 2019: interview):

Table 4: Three types of Mulberry Plants (Caldeira, 2019: table).

Name:	Origin:	Weather:
SA White Mulberry Plant	South Africa	Lose leaves in winter
Thaishang Mulberry Plant	Taiwan	Lose leaves in winter
Noi Mulberry Plant	Thailand	Grows leaves in winter

Irrigation of mulberry plants should occur every 8- 10 days (Reddy, 2015: online), therefore, to make up for the shortage of rainfall throughout the year in Bloemfontein, it is proposed to dig a secondary bore-well that can be used as supplement to the existing bore-well that Tjhabelang Primary School utilize.

Orientation

Bloemfontein receives sunlight in a way that a north- south orientation is ideal for a linear building typology. As seen in the figure 242, all buildings are oriented north, except for the silkworm rearing pods that requires dark lighting.

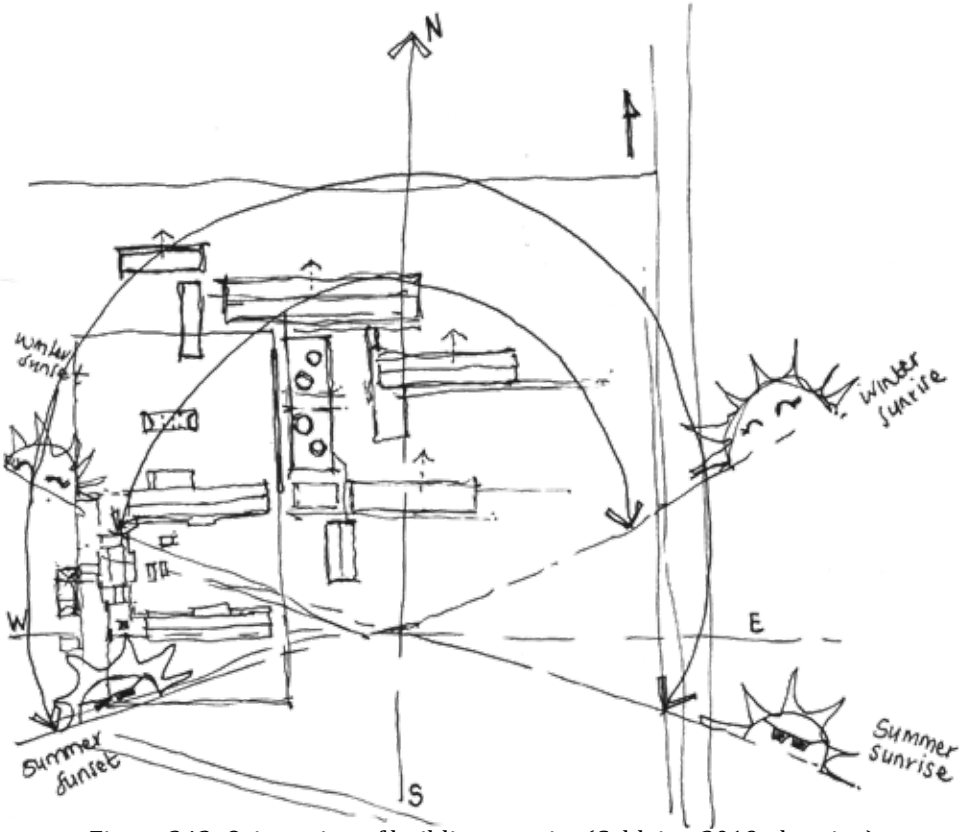


Figure 242: Orientation of buildings on site (Caldeira, 2019: drawing).

Due to heavy rainfall during summers, waterproofing (see detail roof drawing in Appendix A- 4) should be implemented in all buildings as well as appropriate drainage, see Site Development Plan (occasional floods have occurred in Bloemfontein). Passive design methods, such as cross ventilation, operable shading, buffer spaces and space (and landscape) planning will be implemented through adjustable building envelopes that will regulate the change between extreme cold and hot temperatures (Muller, 2013: 108- 124).

Program and Requirements

Africa Silks' main components consist of an information (presentation) room, 'exhibition' (silkworm rearing) pods, a restaurant and a shop. The following occupancies apply (SANS 10400-XA. 2013: 3- 4):

- A1- Entertainment and public assembly
- A3- Places of Instruction
- C1- Exhibition Hall
- F2- Large Shop
- G1- Offices

According to the SANS10400 Part XA the following occupancies or building classifications (excluding garage and storage areas) are to be designed and constructed in a way that they are energy efficient while fulfilling user needs. And in a way that the building envelope and services facilitate the effective use of energy that is appropriate to their purpose and use, internal and geographical location (SANS10400-XA. 2013).

To satisfy the National Building Regulations in terms of sustainability, these occupancies are to comply with the following eight aspects:

a) Building Orientation

Longer side of the building to be orientated east-west with the facade with the most glass to be orientated north between 345º and 15º. Minimum fenestration on east, south and western facades (SANS10400-XA. 2013). This has been achieved in the design, see floor plan (Appendix A- 4).

b) Shading of the northern wall

"SANS10400-XA requires shading to the northern wall to be as per the requirements of SANS204. This shading must exclude summer solar radiation." (SANS10400-XA. 2013: 08).

The following terms are used for the calculation of the roof overhang or shading device required for the northern wall (SANS10400-XA. 2013: 08- 09):

P: horizontal distance from the edge of the roof overhang or shading device to the edge of the window
H: vertical distance from the base of the window to the underside of the roof overhang or shading device
G: vertical distance from the top of the window to the underside of the shading device
Ø: angle of the sun during summer (Given in SANS 10400 Part XA)

The following data is specifically for the shading of this design's (Africa Silks) northern walls. This includes the building for the restaurant and the information room.

H: 3500mm
G: 200mm
Ø: 29. 10° (SANS10400-XA. 2013: 13)

P= TanØ x H
P= Tan (29.10) x 3500
P= 1960mm

This means that the shading or roof overhang of the northern wall, may not be less than 1960mm. The following outdoor seating areas with shading devices has been designed to create the required shading for the northern facade during summer with a removable cover that allows direct sun during winter.

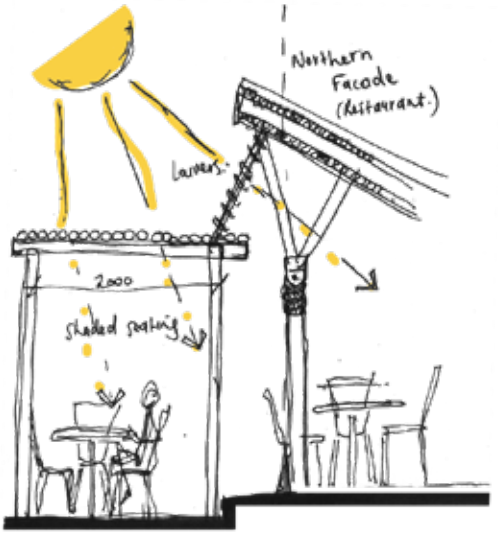


Figure 243: Outdoor shaded buffer space for northern facade (Caldeira, 2019: drawing).

Landscape planning is also used to minimize heat gain in north facing buildings. The following drawings (figure 244) shows how full grown South African White Mulberry Trees can act as shading during summer and allow for direct sun during winter.

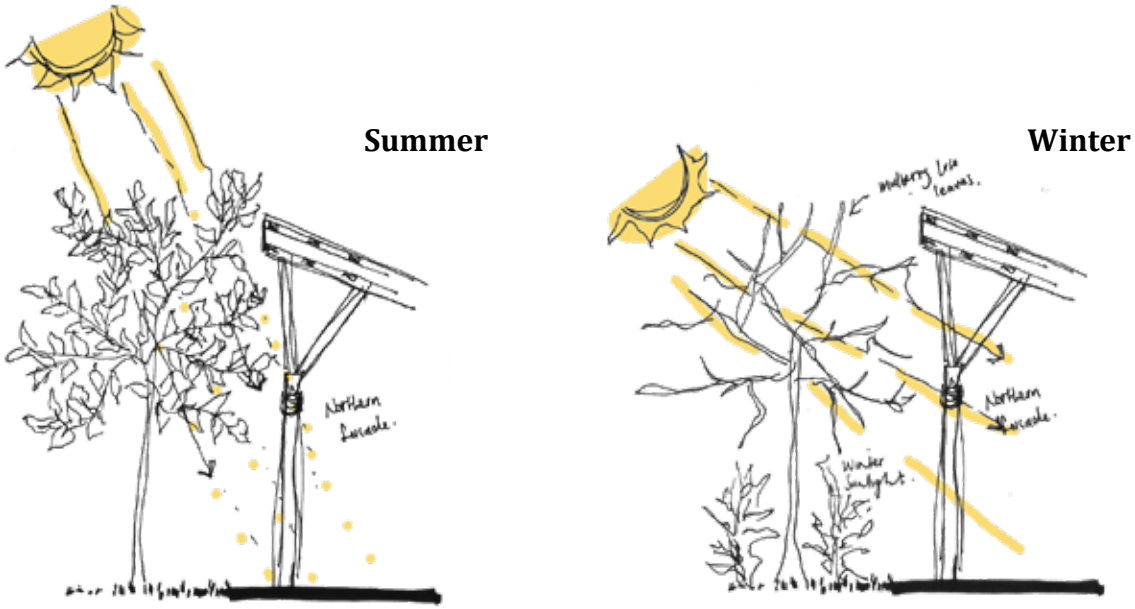


Figure 244: Landscape planning to prevent unwanted heat gain during summer (Caldeira, 2019: drawing).

c) Floors

Insulation material with an R-value of at least 1 should be installed under any slab or carpet that has a heating system (SANS10400-XA. 2013: 24). Due to the cold winter seasons in Bloemfontein, floor heating systems powered by solar energy will be inserted below the floor slab of the restaurant, shop and information room (detailing of floor slab shown in figure 245). See figure illustrating solar power diagram on page 40.

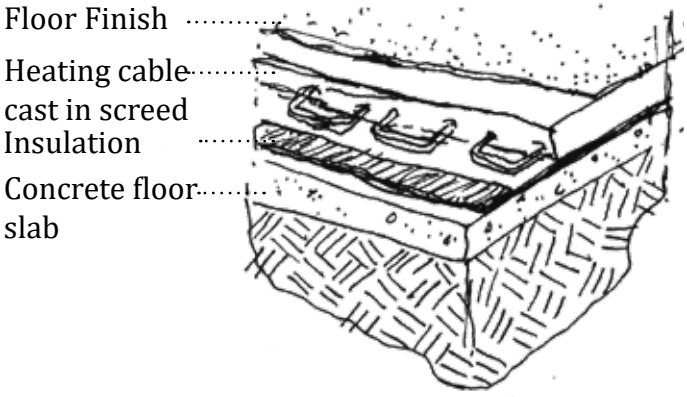


Figure 245: Floor heating system according to SANS 10400 Part XA requirements (Caldeira, 2019: drawing).

d) Walls

The minimum total R-value for Bloemfontein walls, climatic zone 1, is 2.2. The design of Africa Silks includes masonry walls that are constructed of clay blocks and mortar (natural finish). The different components' R-values are added together for the total R-value. (SANS10400-XA. 2013: 25). The total R-value for clay brick cavity walls with insulation (figure 246) equals: (this comply with the SANS 10400 Part XA requirements).

Outer Wall: 0.110/ 1.0= 0.11
Inner Wall: 0.110/ 1.0= 0.11
50mm Air Space: 0.05/ 0.024= 2.0
Insulation: 0.025/ 0.048= 0.52
Cement Mortar: 0.016/ 1.73= 0.0092
Plaster Sand: 0.010/ 0.71= 0.0141

Total R-Value= 2.76 (this comply with the SANS 10400 Part XA requirements).

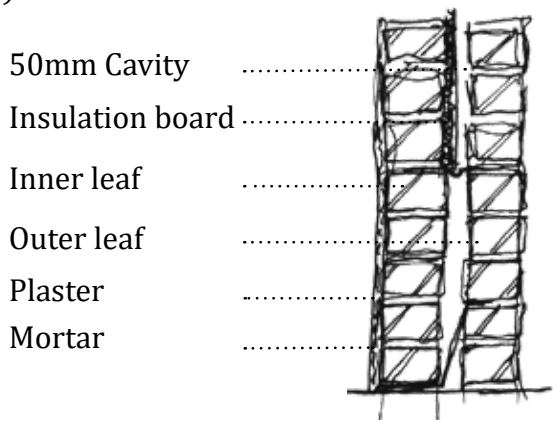


Figure 246: Suitable external wall insulation for Bloemfontein climate (Muller, 2013: 115. Own drawing).

e) Roof assembly

Climatic zone 1 (Bloemfontein) requires that additional insulation be provided for metal cladded roofs (R-value of at least 3.35) (SANS10400-XA. 2013: 26), see figure 247.

Total R-value: 3.78

Outdoor air film: 0.03
Roofing material: 0.02
Roof air space: 0.18
Aerolite insulation: 3.38
Rhinoboard ceiling: 0.06
Indoor air film: 0.11

(Muller, 2013: 116)

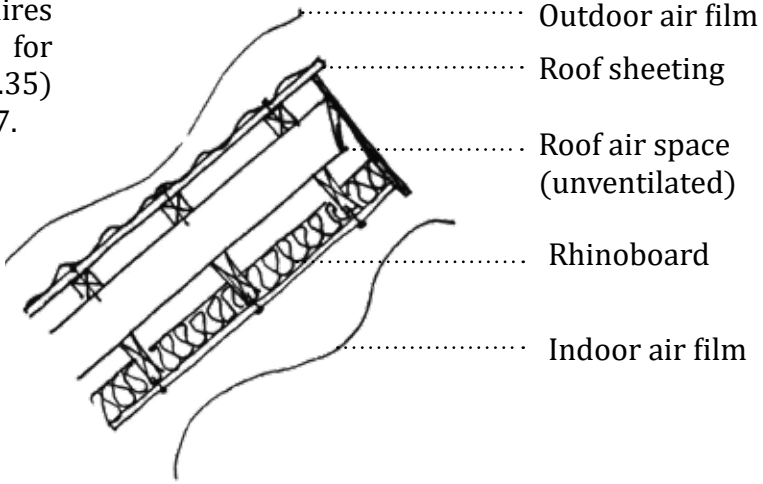


Figure 247: Roof Insulation (Caldeira, 2019: drawing).

f) Services that utilize or control energy

The demand and consumption of energy used by each light fitting may not exceed the maximum values indicated by Part XA of SANS 10400 (SANS204 Table 12) (SANS10400-XA. 2013: 29).

g) Hot water supply requirement

"At least 50% (volume fraction) of the annual average hot water heating requirement shall be provided by means other than electrical resistance heating including but not limited to solar heating, heat pumps, heat recovery from other systems or processes and renewable combustible fuel." (SANS10400-XA. 2013: 31). See diagram below (figure 248) for solar powered systems in the design:

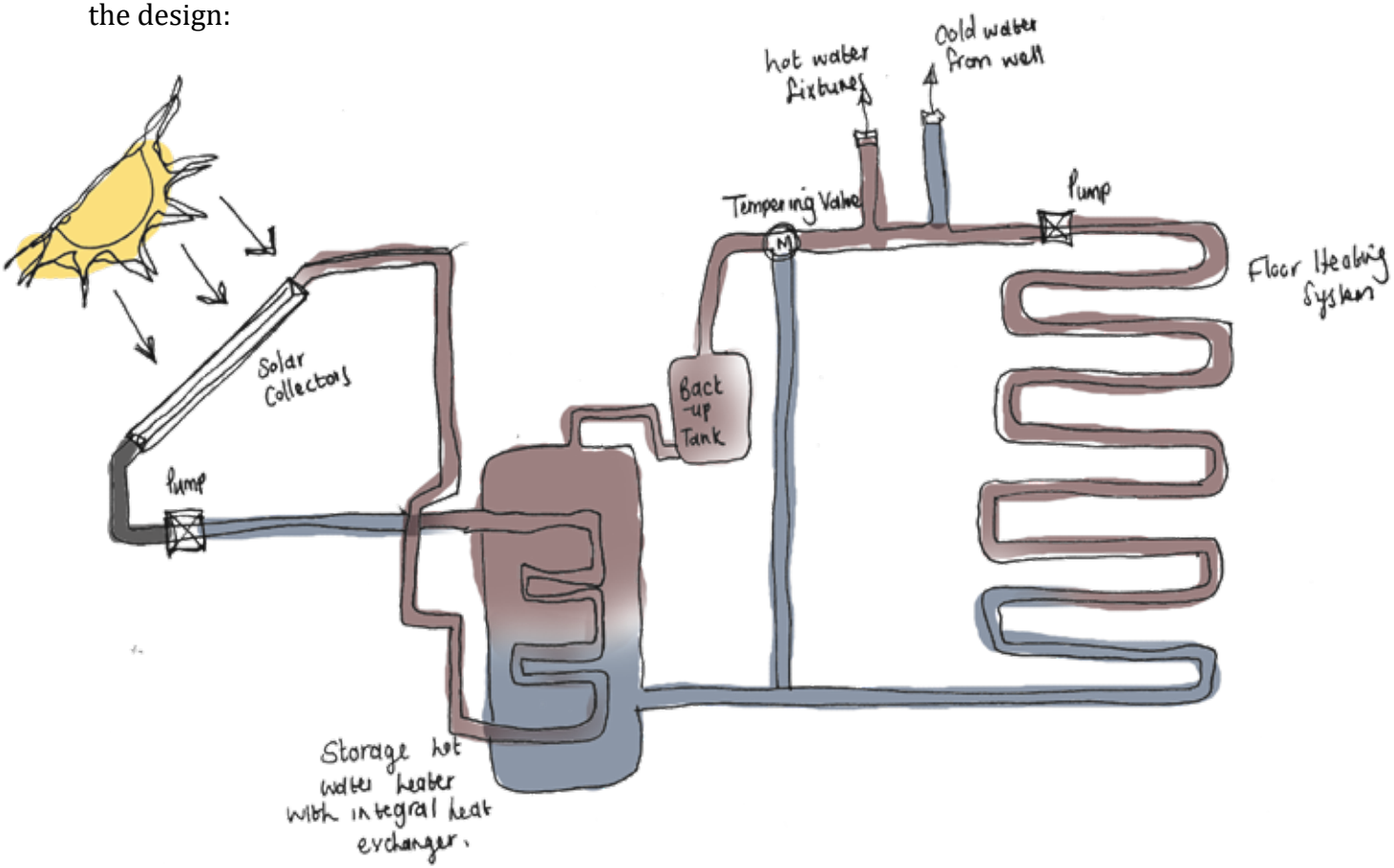


Figure 248: Diagram illustrating solar power energy network for Africa Silks (Caldeira, 2019: drawing).

Morphology and Program

The morphological grounding of the design and building structures are inspired by the reason behind this dissertation: to extend the program of Tjhabelang Primary School (rural school in Bainsvlei Bloemfontein) and their vision that is to create a better future for children. By introducing the Africa Silks Farm and Weavery (client, for more info see page 28- 33) to Tjhabelang it creates the possibility for change, through job creation, for parental figures of the children at Tjhabelang. This dissertation is vested in the need for change within the rural community of Bainsvlei (creating a pathway out of poverty, for the future of the community and the children). And this idea of change and transformation, along with the life cycle of the silkworm, inspired the morphology of the design and building structures.

Main Idea: Change and Transformation (for more information, see page 55- 65).

The design consists of four main buildings (relating to four main metamorphosis stages within the life cycle of a silkworm):

1. The information room: Along with reception, the information room is the first building (first metamorphosis phase in cycle) within the design. From Tjhabelang the information room becomes an extension (figure 249) of the existing entity on site (Tjhabelang: education), where visitors are informed of the history and process of Arica Silks. Like Tjhabelang this building also serves as an education platform where people learn more about sericulture.

The building represents the eggs (as a symbol) within the life cycle of the silkworm. Reason: Africa Silks starts as an extension of Tjhabelang Primary School (whom inspired this dissertation) and the eggs within the silkworm life cycle is where new life begins (new life of Tjhabelang and children starts with Africa Silks, and evidently the information room).

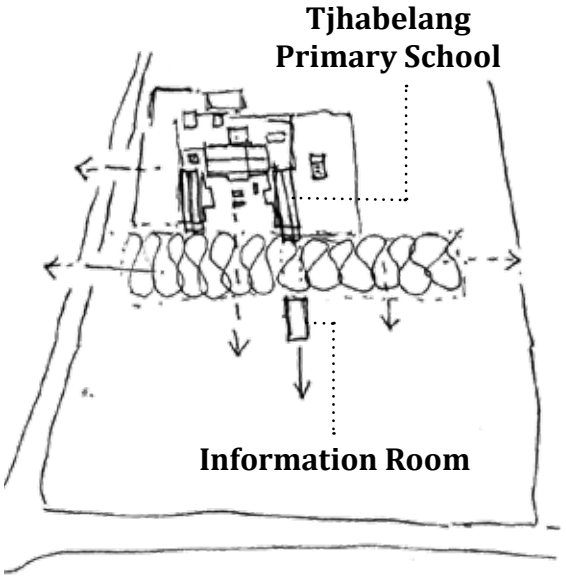


Figure 249: Information room as an extension of Tjhabelang Primary School (Caldeira, 2019: drawing).

2. The rearing of silkworms: This include four pods where the different stages of the rearing of silkworms for the production of silk, takes place (more information of different stages is on page 29). This is related to an in-between space between Tjhabelang (before) and Africa Silks (after change), as the rearing of the silkworms at Africa Silks are the most important factor relating to the success of the business and essentially creating a pathway out of poverty.

These pods represent the cocoon within the life cycle of the silkworm. Reason: The cocoon is also an in-between space, between the metamorphosis of a silkworm (developed from eggs) into a moth.

3. Restaurant and 4. Shop and Weavery: These two buildings represents the female and male moth within the life cycle of the silkworm and also the idea of metamorphosis (transformation).

After the in-between stage of the cocoon, the moth will break through the cocoon, ready for the next phase. Thereafter a female and male moth will mate for about two hours and the female moth will lay her eggs and die. Male moths can mate two times before they then also die (Nkosi, 2019: interview). This idea of metamorphosis into a new life where one almost instantly dies and the other continues to live to create more lives, speaks of the children of Tjhabelang. How Africa Silks almost becomes their cocoons from which their futures will metamorphose from something that is limited to opportunities that continues to arise.

This idea of the female moth (creating new lives but not continuing to live and grow) will be represented in a building that consist of a combination of a heavy grounded (fixed state) and a light tectonic (temporary) structure; this resembles the first part of change after metamorphosis after the in-between stage (Nr. 2). The second building represents the male moth (continues to live and create more lives), a light tectonic structure; resembling the completed metamorphosis (change in poverty cycle and life of children) where the end of the Africa Silks cycle represents a temporary state, where the future of these children begins and the life of the rural Bainsvlei community continues as a sustainable never-ending cycle of growth.

Structural Investigation for four different buildings:

1. Information Room:

As an extension of the existing Tjhabelang Primary School structure (figure 250), this will be steel column and beam construction with infill brickwork. The roof structure in contrast to the school, will be flat (inspired from the vast flat Free State landscape), as this is merely an extension of Tjhabelang and most importantly the start of something new (hence the new roof structure).

Figure 250: Existing Tjabelang Primary School structure (Caldeira, 2019: photo).

Materiality: The use of clay bricks and steel are used as it relates to the existing Tjhabelang and larger rural Free State building culture; and this building represents an extension of the traditional image of thought (relating to a typical farmstead) before any change or transformation have occurred.

Services

a) Parking and Disabled Access

Appropriate drop-off zones and parking areas will be provided for persons with disabilities as per the Architective (Muller, 2013: 74). And in terms of vertical access, both ramps and stairs will be provided where a difference in floor level occur (ramps to be done according to specifications given in the Architective (Muller, 2013: 78)).

b) Disabled Toilets

For toilet provisions in public buildings, "regulation requires that a person with a disability should not need to travel further than persons without disabilities to reach a toilet facility" (Muller, 2013: 86). The following toilet layout will be provided with an accessible route, for persons with disabilities.

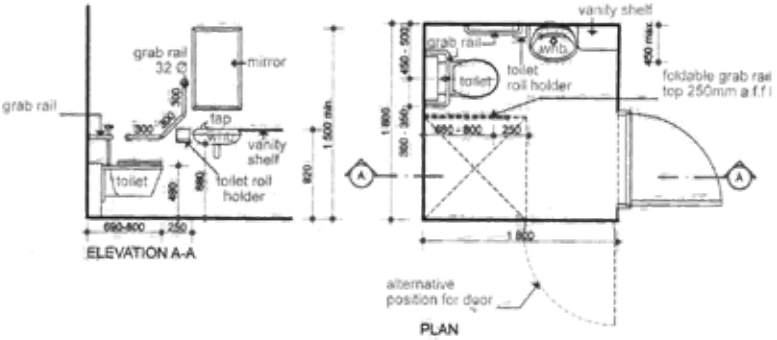


Figure 251: Floor plan and elevation, disabled toilet (Muller, 2013: drawings).

2. Rearing of Silkworms:

The in-between space (cocoon) consists of four different pods. The form giving of the pods are derived from the concept of a moth breaking through a cocoon (an in-between where there is no longer a silkworm nor a moth present). This in-between involves elements of the old, steel column and beam construction with clay brick infill, and elements of the new, that are timber and tectonic steel cables. An extension of the information room in terms of a flat steel roof construction that melts into the landscape, but different in the sense that this flat plane is interrupted with cone like pods (rhizomatic thinking, disturb in order for change to occur).

Materiality: An in-between space that combines elements of the old and the new. A combination of steel and clay bricks that represents the existing (fixed state) with light timber and rusted steel construction that represents temporariness.

Services (Nkosi, 2019: interview)**:**

- The different pods where the rearing of silkworms take place, should each be installed with a humidity and temperature controller.
- The pods should be elevated from the ground and designed with a 100- 150mm wide by 150mm deep water channel surrounding the inner walls to prevent any unwanted insects from entering the pods.
- Each pod should have suitable mesh shelves elevated from the finished floor level and with its own floor drain, for cleaning purposes.
- Each pod should have some form of cross ventilation or operable window that can be opened to allow for temperature and humidity regulation.
- All pods should be designed and constructed in such a way that it does not receive any direct sunlight and is isolated from any loud noises (as silkworms are susceptible to light and noise).
- For hygiene reasons, visitors are not allowed inside pods and each pod should therefore be equipped with a viewing window and staff door. In close proximity to the pods, a hand wash basin should be provided for staff members to wash their hands before entering the pods.

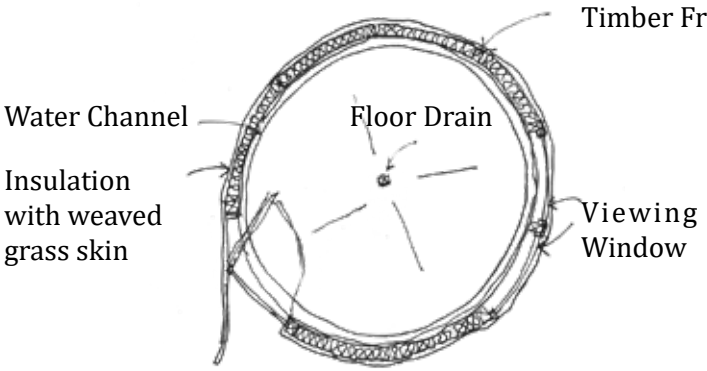


Figure 252: Floor plan of rearing pod (Caldeira, 2019: drawing).

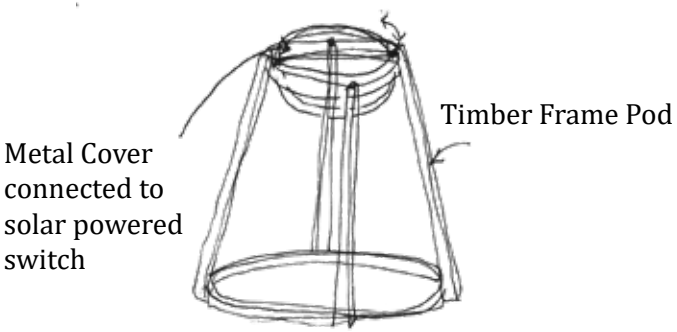


Figure 253: Section through pod illustrating ventilation (Caldeira, 2019: drawing).

3. Restaurant:

Female moth, first part of transformation. Combination of elements of the old (steel column and beam construction with infill clay brickwork) and elements of the new (timber column and beam construction with light steel cables). Inspired by the wings of a moth, the idea of transformation becomes evident as one part of the roof (timber column and beam construction) lifts up and the other stays flat (steel column and beam construction).

Materials: Start of transformation; combination of corten steel construction (idea of weathering relates to time and transformation) with clay brick infill (fixed state); and timber and light steel cables (temporary state).

Services:

a) Waste Management and Deliveries:

An existing road towards the west of the site allows for food delivery- and waste disposal truck access. The service yard (located west of the kitchen) is equipped to handle two weeks without the services of waste disposal trucks as the site is located on the outskirts of Bloemfontein.

3. Shop and 4. Weavery:

Male moth, transformation is completed. This building represents full metamorphosis where the roof is completely inverted, relating to the flying wings of a moth (in contrast to pitched roofs of Tjhabelang- full transformation of roofs).

Materiality: Full transformation (and the start of a new better life for children); Timber and light steel cables (resembles the movement of spinning silk and how the spinning of silk is merely a phase within a cycle: temporary) are used to represent the idea of temporality and change.

Services:

a) Disabled Access (see page 142).

Structural Exploration:

1) Clay Brick Walls

Red clay brick walls with steel construction are very important within the Free State building culture and will be implemented in the buildings as one of the 'old' elements in contrast to new (unfamiliar) ones. Within this dissertation the typical farmhouse morphology (structure and materiality) is questioned and disturbed in order for change to occur. Therefore, existing morphologies and building cultures are used in contrast to different ones that allows for transformation (through structure and materiality) as one walk through the development of Africa Silks.

With the first 2 buildings (before transformation) the use of steel construction and clay brick infill will be very evident and thereafter, towards the last two buildings the use of clay brick walls will be less and steel structures will be replaced with corten steel (that relates to the idea of time and transformation).

Clay brick cavity walls will be used as infill between steel columns for external walls (see detail on page 138). The following figure illustrates the detail of the foundation, steel column and infill brickwork for these buildings.

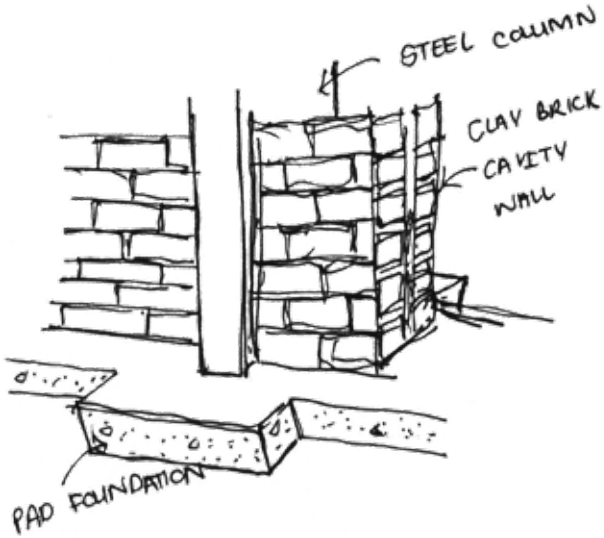


Figure 254: Steel column with clay brick infill detail (Caldeira, 2019: drawing).

2) Steel Roof Construction with Metal Sheeting

The information room's roof along with half of the restaurant's roof (figure 255) will consist of column and beam steel construction with corrugated iron cladding (as an extension of and relating to the existing metal roof sheeting at Tjhabelang Primary School).

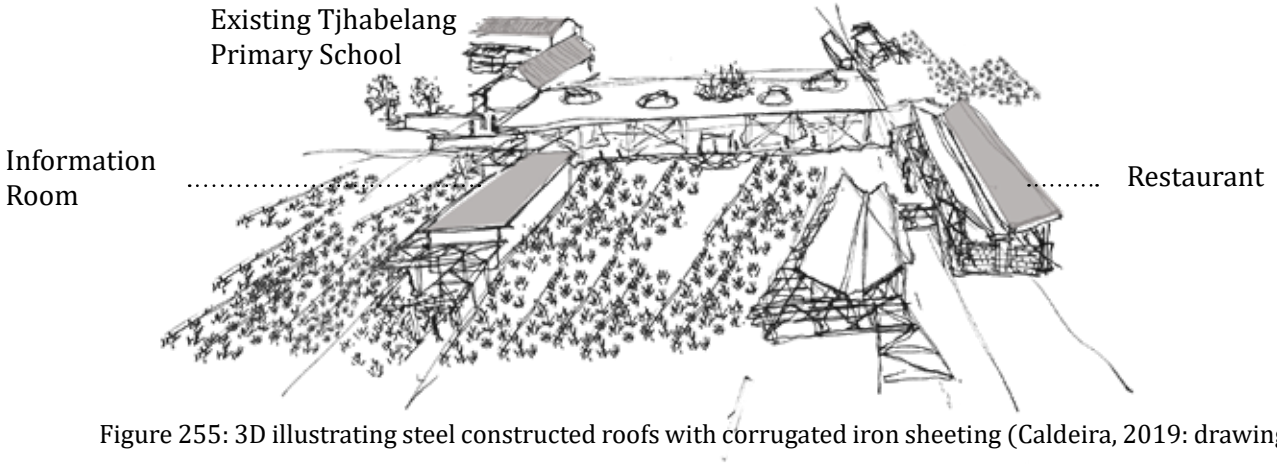


Figure 255: 3D illustrating steel constructed roofs with corrugated iron sheeting (Caldeira, 2019: drawing).

Figure 256 illustrates this roof construction detail:

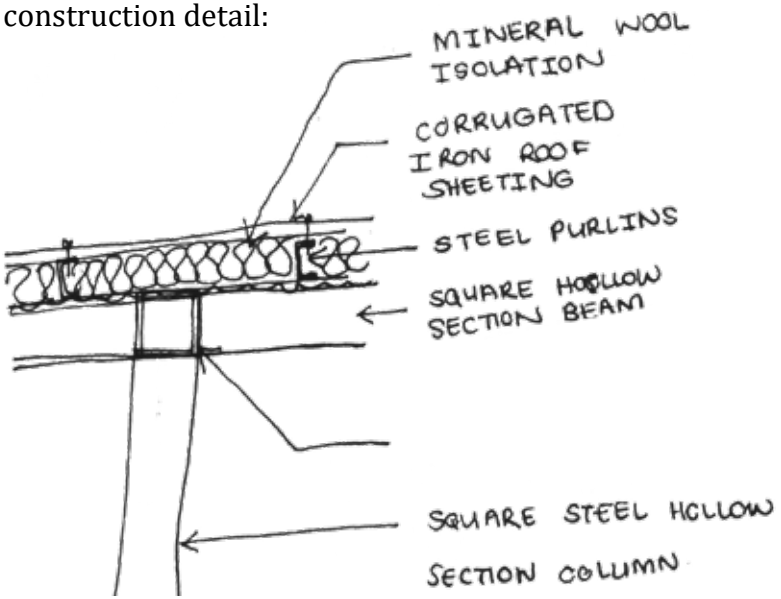


Figure 256: Steel roof construction with corrugated iron cladding (Caldeira, 2019: drawing).

3) Steel Roof Construction with Green Roof

The idea of elongated flat roofs is inspired by the cognitive analysis of the site and the vast flat Free State landscape that melts into the horizon. The rearing pods of the silkworm life cycle is an in-between space where the existing site (and Tjhabelang) is disturbed in order for transformation to transpire and new connections to form.

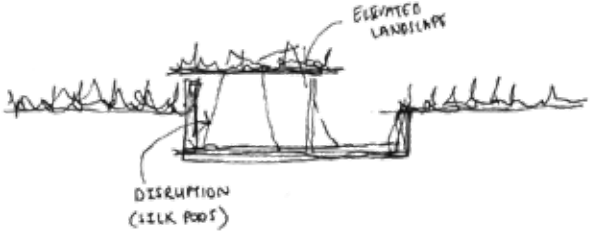


Figure 257: Idea of elevating the landscape (Caldeira, 2019: drawing).

As seen in figure 257, the idea is to elevate the landscape, in the form of a green roof, and disturb this landscape with cocoon-inspired pods that breaks through the ground (this also related to the metamorphosis of the silkworm into a moth and the life of children at Tjhabelang Primary School). This elevated landscape allows for a smooth transition between the school (and vegetable garden) and surrounding context without the use of a rigid fence (that interrupts the vast open Free State planes). The following figures illustrates details of the green roof structure along with retaining wall details, as this space is lowered into the ground.

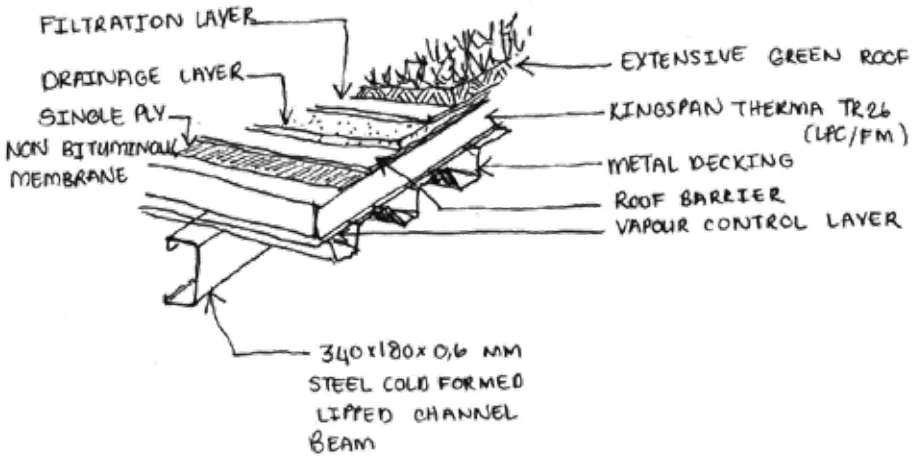


Figure 258: Green roof detail: silkworm rearing Pods (Caldeira, 2019: drawing).

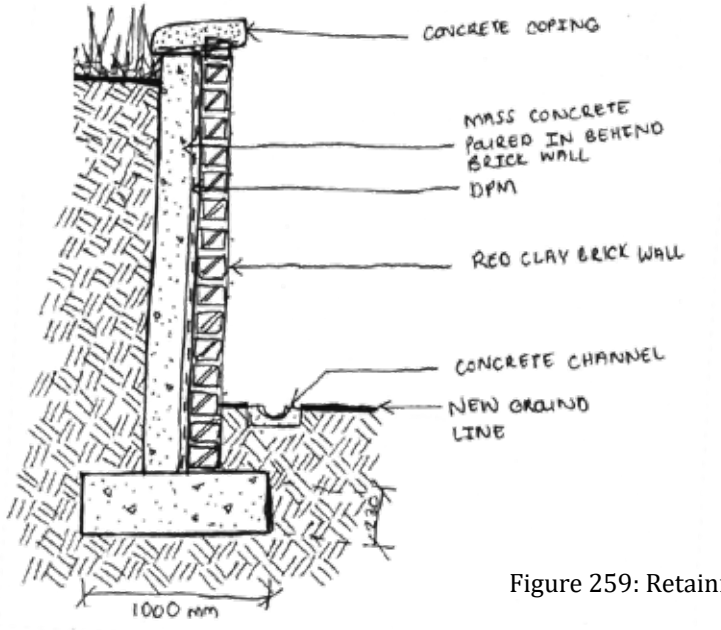


Figure 259: Retaining wall detail (Caldeira, 2019: drawing).

4) Timber Pod Construction with Solar Powered Roof Cover

As seen on page 63, the competition entry for the Daegu Gosan Library by Patkau Architects has a similar morphology to that of the silkworm pods, where a folding wall element creates a cone-like shape with an opening at the top.

This idea of a folding element along with the contrast between new and existing elements gave shape to the pod structures. As these pods represents the new (disturbing existing landscape- green roof) they are constructed as prefabricated timber structures (temporary feeling), see figure 260. Similar to the construction of a timber drywall, the skin of the pod will consist of an outer layer (weaved grass-weaved by rural women in community)fixed to the timber framework with wired rope, R13 Fiberglass insulation, soundproofing clips, drywall furring channel and an inner layer (flexible plasterboard), see figure 261.

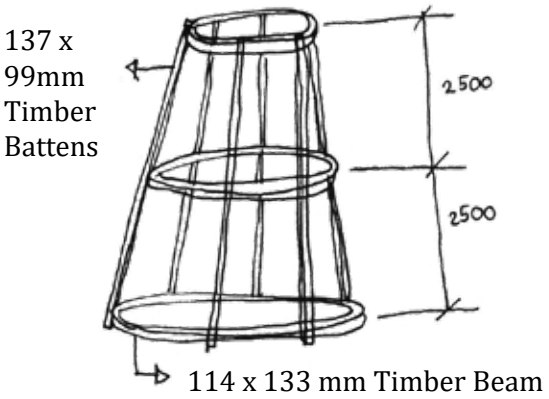


Figure 260: Prefabricated timber pod structure (Caldeira, 2019: drawing).

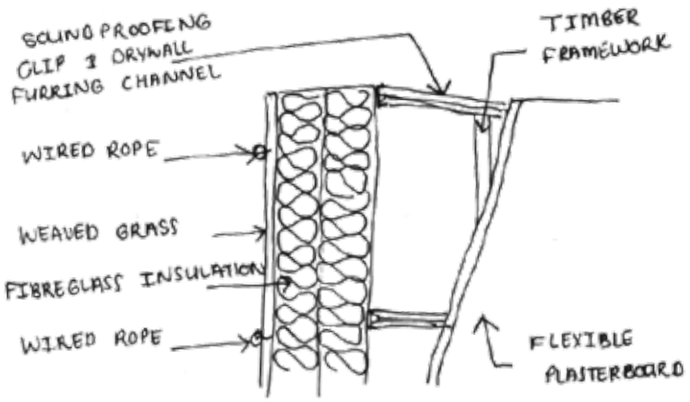


Figure 261: Detail through skin of pod (Caldeira, 2019: drawing).

A solar powered roof vent, connected to the timber frame, will regulate the temperature and humidity of the pods. Figure 262 is an photo of the vent:

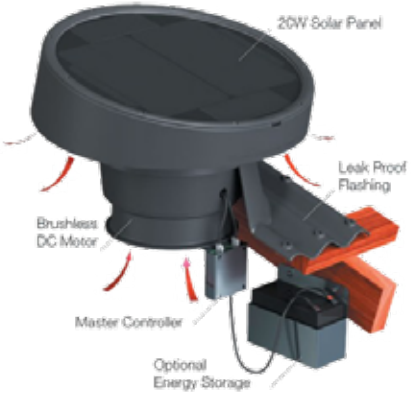


Figure 261: Solar Powered Roof Cover (JSR, 2019: online).

5) Timber Construction

The last two buildings, representing the metamorphosis in the design (inspired by moths), reflects the idea of transformation and temporariness, as the corten steel takes over the clean steel finishes in previous buildings (weathering- time- transformation) and the feeling of light timber structures replace those of steel construction and clay brick infill. Figure 262 illustrates the roofs of the last two buildings (to be cladded with corten steel sheeting) and figure 263 and 264 illustrates the foundation detail for the timber construction as well as the roof detail.

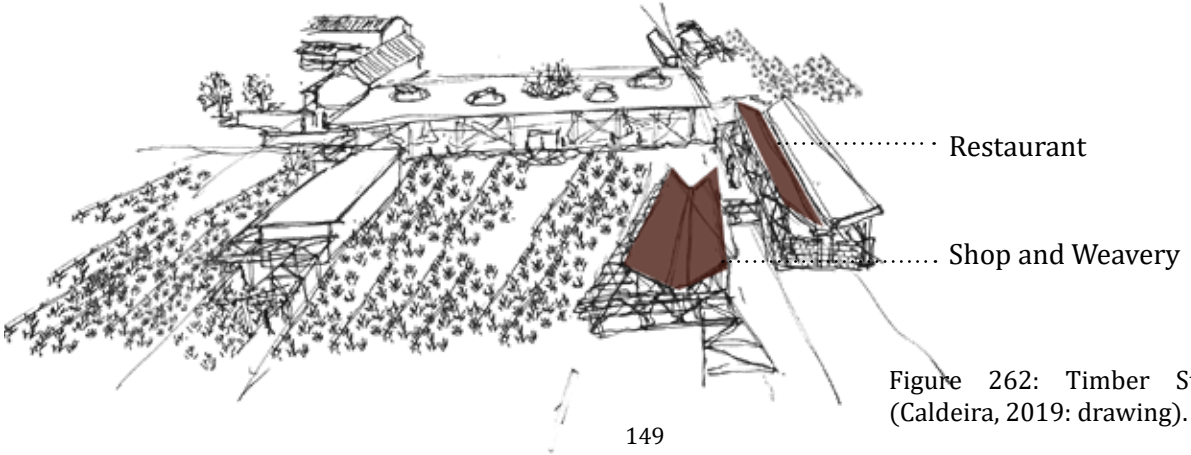


Figure 262: Timber Structures (Caldeira, 2019: drawing).

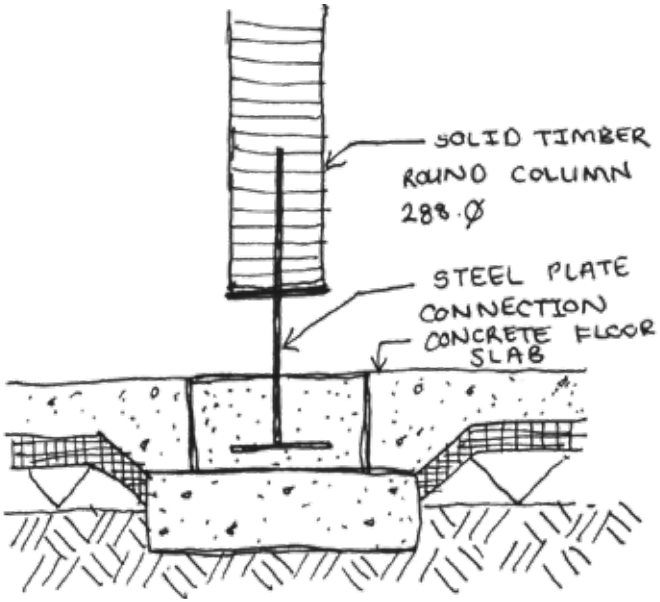


Figure 263: Timber Construction: Foundation (Caldeira, 2019: drawing).

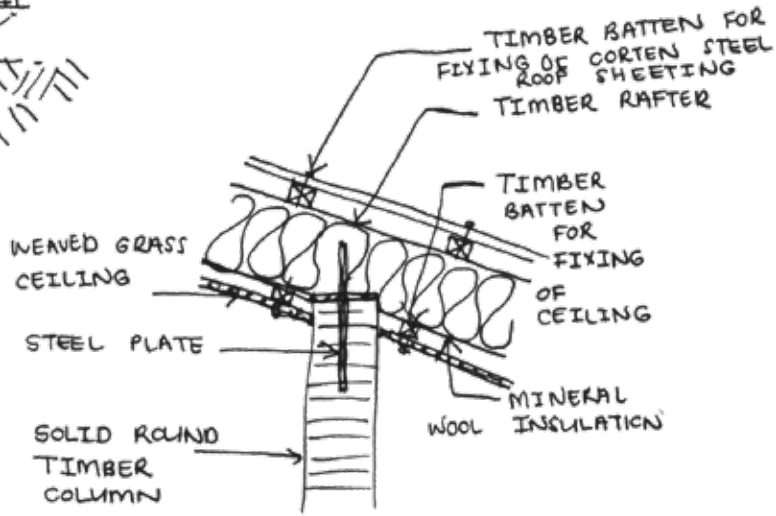


Figure 264: Timber Construction: Roof (Caldeira, 2019: drawing).

NOTES:

See connection between timber and steel roof construction on page 117.

Building 1 and 2 is designed with rainwater downpipes through the structure: steel hollow square columns; whilst building 3 and 4 (butterfly roofs) collect rainwater through galvanised steel gutters and water tanks.

Please find attatched under Appendix A- 4, all technical documentation for this dissertation.

Material Mood Board:

Clay Brick; Stainless Steel; Corten Steel; Timber; Concrete; Weaved Grass; Wired Steel Cables.

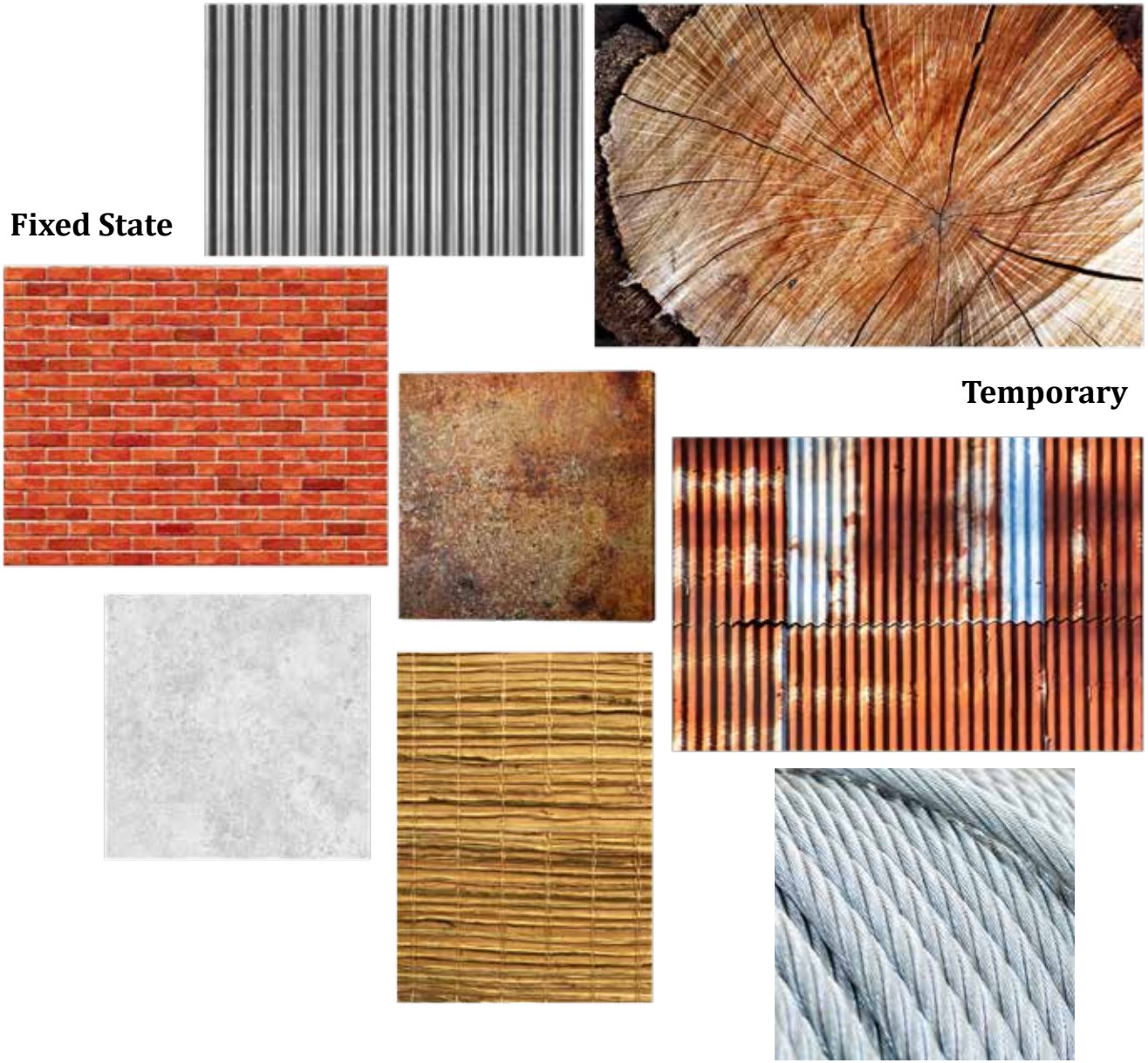


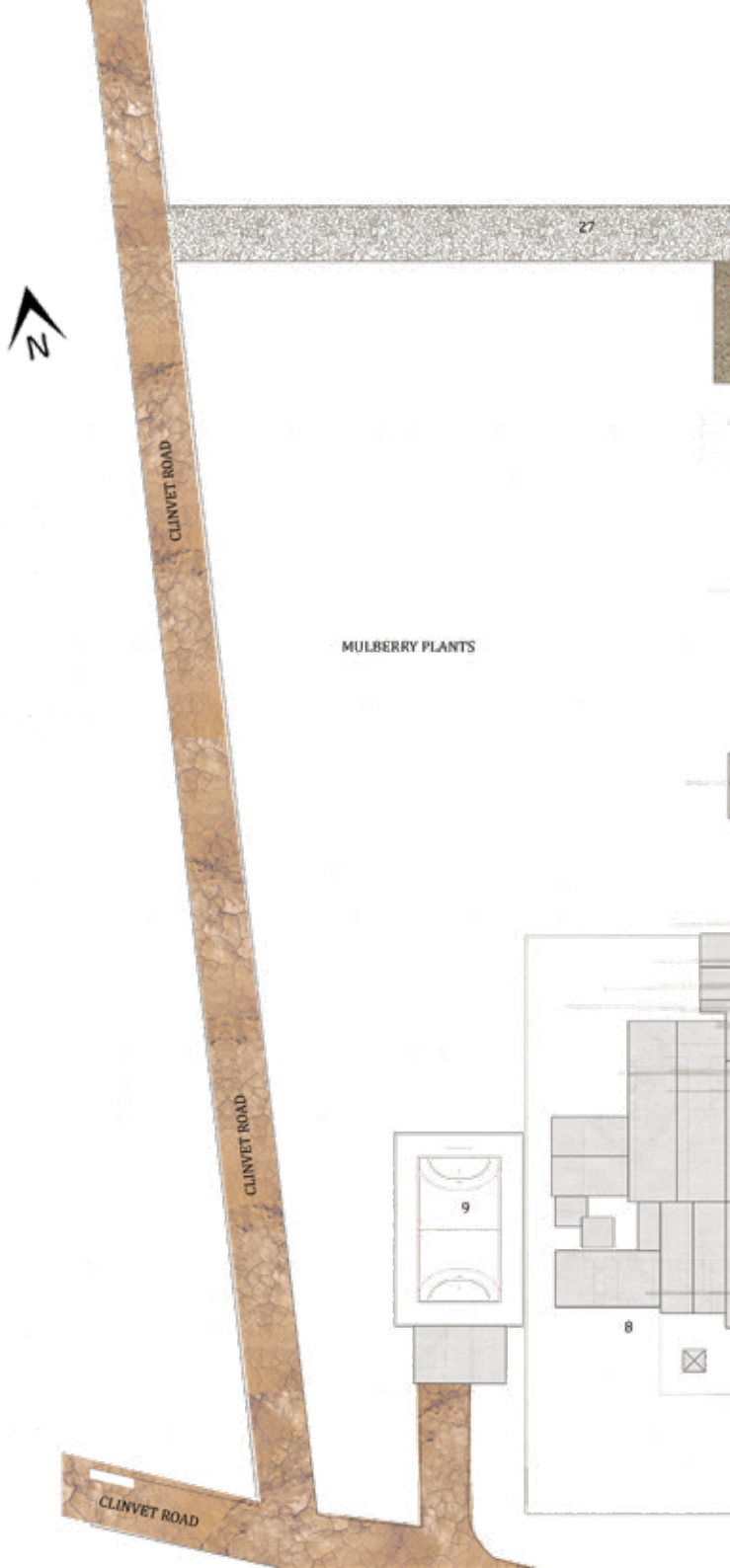
Figure 260: Material Mood Board (Caldeira, 2019: collage).

3.4 Final Design: Phase 05 Development for External Review

3.4.1 Floor Plan

Site located on erf portion 31 and 46 of 1182, Uitzicht. Bainsvlei, Bloemfontein, FS.

1. NEW CRUSHED STONE PARKING
2. AFRICA SILKS RECEPTION
3. INFORMATION ROOM (PRESENTATION ON HISTORY OF AFRICA SILKS AND REARING OF SILKWORMS)
4. PROPOSED AFTER SCHOOL CARE CENTRE FOR CHILDREN OF TJHABELANG
5. NEW LOWERED PLAYGROUND (GRASS TERRACE)
6. EXISTING TJHABELANG PRIMARY SCHOOL PLAYGROUND (GRASS TERRACE)
7. EXISTING VEGETABLE GARDEN AT TJHABELANG PRIMARY SCHOOL
8. TJHABELANG PRIMARY SCHOOL STAFF PARKING AND ENTRANCE
9. TJHABELANG TENNIS COURT
10. GALLERY SPACE FOR DE-THREADING OF COCOONS
11. REARING POD: PHASE 02 (BABY SILKWORMS)
12. REARING POD: PHASE 03 (ADULT SILKWORMS & SPINNING OF COCOONS)
13. FULL-GROWN MULBERRY TREE
14. REARING POD: PHASE 04 (MOTHS MATING)
15. REARIN
G POD: PHASE 01 (EGGS)
16. BOILING ROOM (BOILING OF COCOONS)
17. RESTAURANT
18. KITCHEN
19. TOILETS (INCLUDING DISABLED TOILET)
20. RESTAURANT (OUTDOOR SEATING)
21. INDOOR WEAVERY (MAKING OF SILK PRODUCTS ON TIMBER LOOMS)
22. OUTDOOR WEAVERY
23. AFRICA SILKS SHOP
24. STORAGE
25. GALVANISED STEEL GRID WALKWAY
26. SERVICE YARD
27. DELIVERY ROAD
28. GARDEN STORE
29. STAFF KITCHEN
30. STAFF LOCKER ROOMS




MULBERRY PLANTS
MULBERRY PLANTS
MULBERRY PLANTS
MULBERRY PLANTS
MULBERRY PLANTS
EXISTING TJHABELANG PRIMARY SCHOOL ASSEMBLAGE
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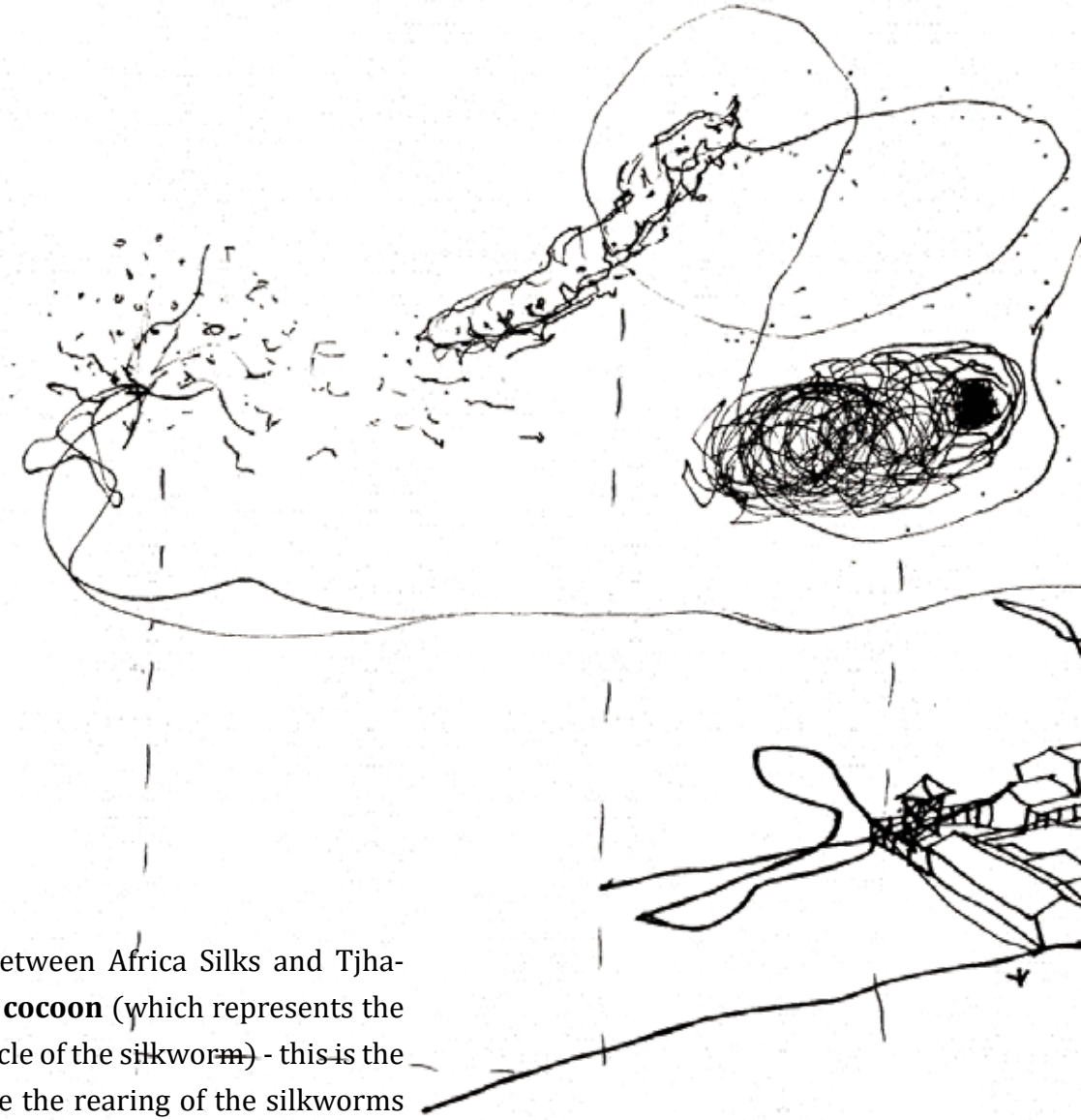
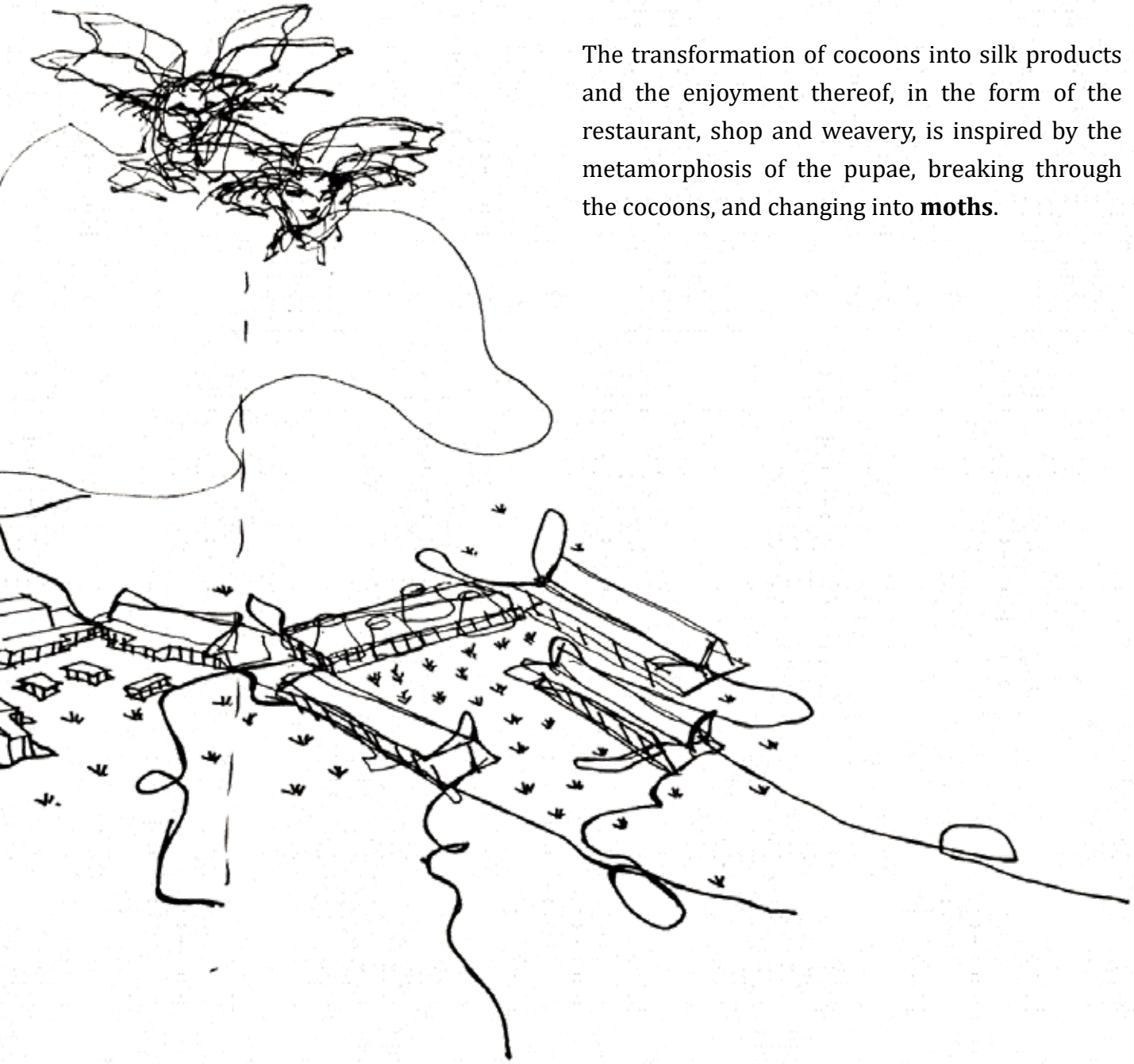
29

The extension of Tjhabelang Primary School can be seen as the **eggs**, being the start/ beginning of the life cycle journey. A form of education (extension of existing education process at Tjhabelang) being the information room where the history and process of sericulture is discussed at the start of a visitor's tour.



The in between space between Africa Silks and Tjhabelang is inspired by the **cocoon** (which represents the liminal stage in the life cycle of the silkworm) - this is the four different pods where the rearing of the silkworms will take place, an in between stage that determines the success of Africa Silks and essentially creating a pathway out of poverty.



The transformation of cocoons into silk products and the enjoyment thereof, in the form of the restaurant, shop and weavery, is inspired by the metamorphosis of the pupae, breaking through the cocoons, and changing into **moths**.

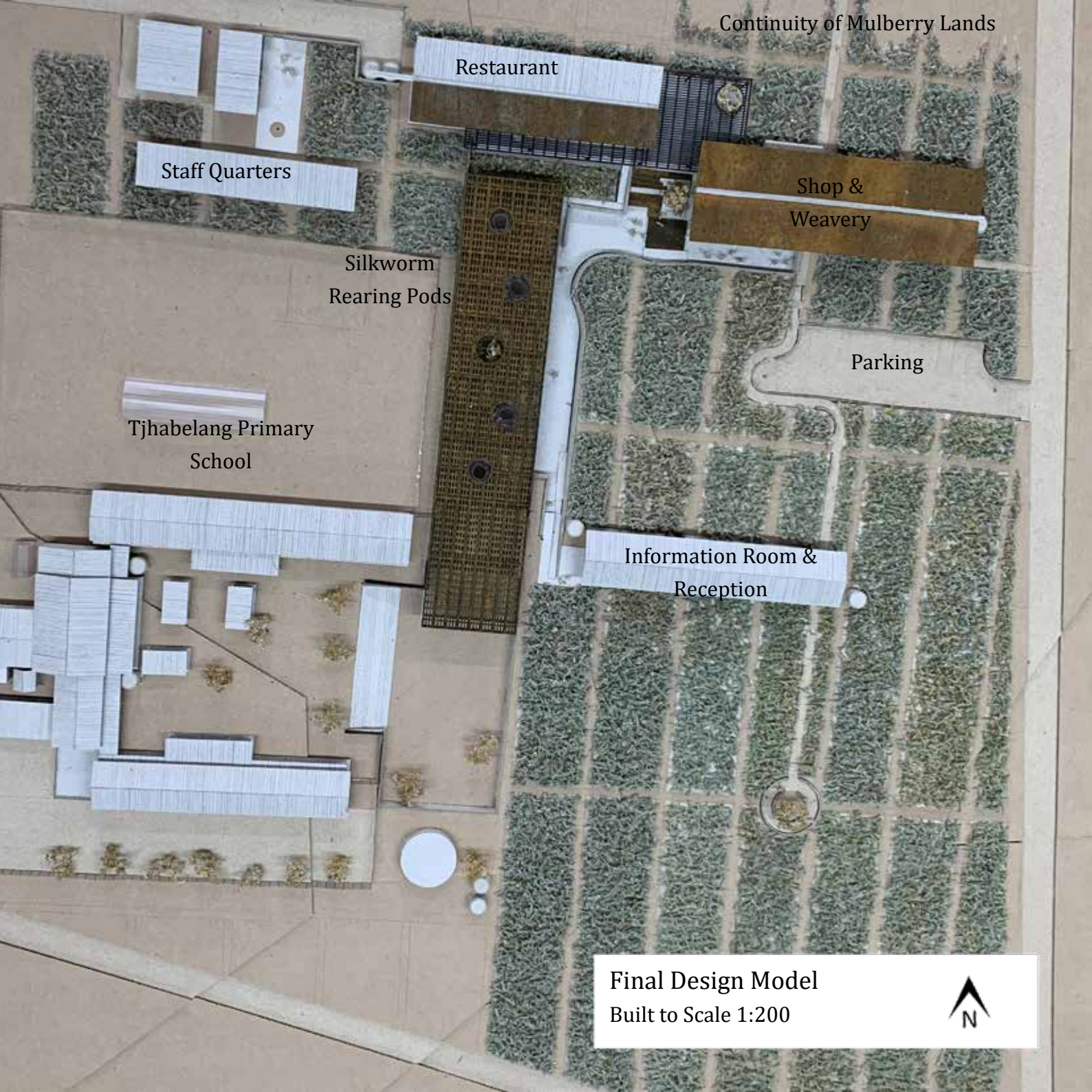
Silkworm Rearing Pods

Information Room

Africa Silks Shop & Weavery

Tjhabelang Primary School

Restaurant
& Africa Silks Shop & Weavery


Continuity of Mulberry Lands
Restaurant
Staff Quarters
Shop &
Weavery
Silkworm
Rearing Pods
Parking
Tjhabelang Primary
School
Information Room &
Reception
Final Design Model
Built to Scale 1:200
N


Reception and Information Room

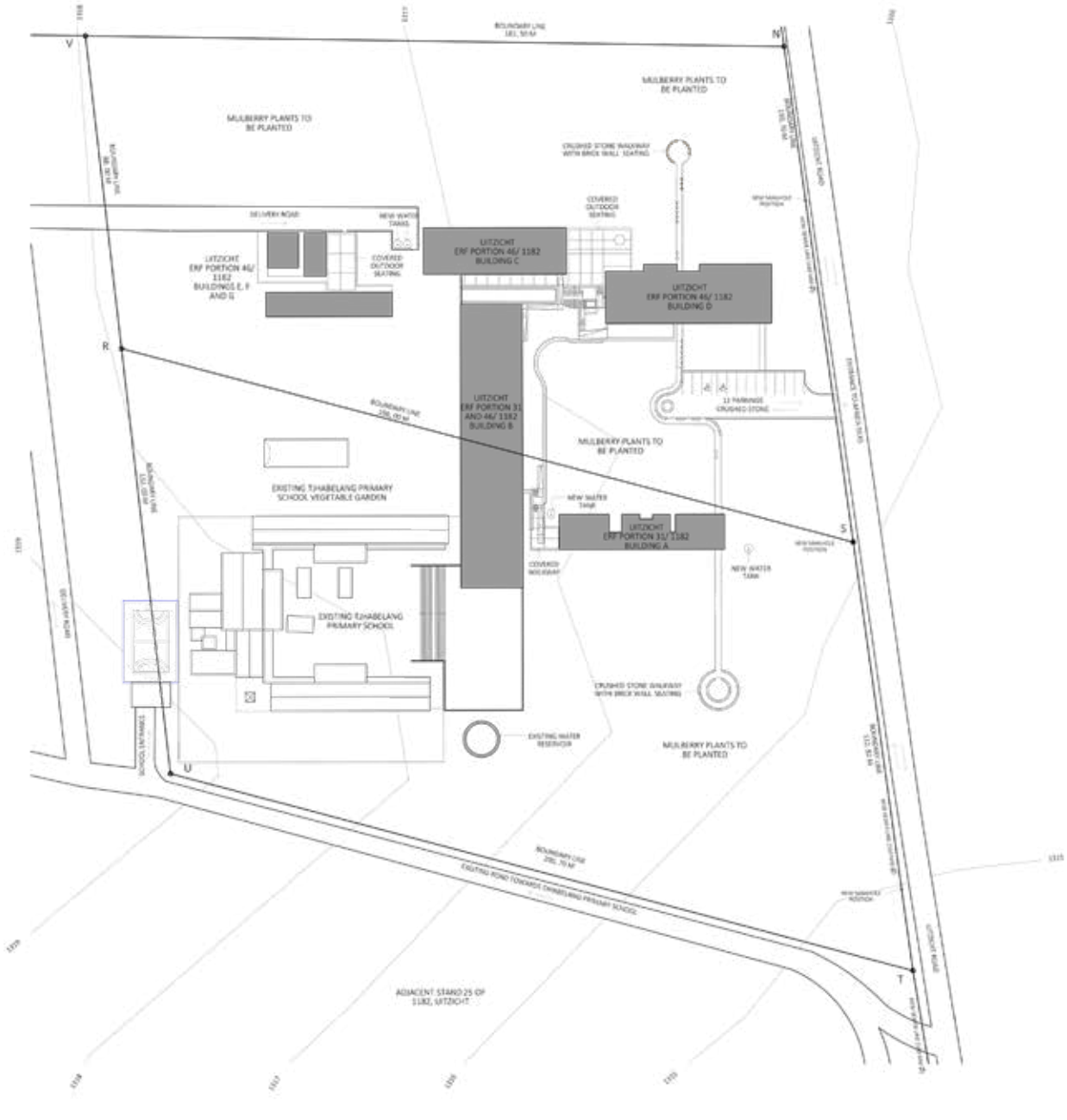

Rearing Pods


Africa Silks Shop and Weavery


Restaurant

Restaurant (Left), Weavery and Shop (Right)

Africa Silks Farm and Weavery, Bainsvlei, Bloemfontein


MULBERRY PLANTS TO BE PLANTED
MULBERRY PLANTS TO BE PLANTED
CRUSHED STONE WALKWAY WITH BRICK WALL SEATING
COVERED OUTDOOR SEATING
DELIVERY ROAD
NEW WATER TANKS
LITZICHT ERF PORTION 46/ 1182 BUILDINGS E, F AND G
COVERED OUTDOOR SEATING
LITZICHT ERF PORTION 46/ 1182 BUILDING C
LITZICHT ERF PORTION 46/ 1182 BUILDING D
LITZICHT ERF PORTION 31 AND 46/ 1182 BUILDING B
11 PARKINGS CRUSHED STONE
MULBERRY PLANTS TO BE PLANTED
EXISTING TJHABELANG PRIMARY SCHOOL VEGETABLE GARDEN
NEW WATER TANK
LITZICHT ERF PORTION 31/ 1182 BUILDING A
COVERED WALKWAY
NEW WATER TANK
EXISTING TJHABELANG PRIMARY SCHOOL
CRUSHED STONE WALKWAY WITH BRICK WALL SEATING
EXISTING WATER RESERVOIR
MULBERRY PLANTS TO BE PLANTED
EXISTING ROAD TOWARDS TJHABELANG PRIMARY SCHOOL
ADJACENT STAND 25 OF 1182, LITZICHT
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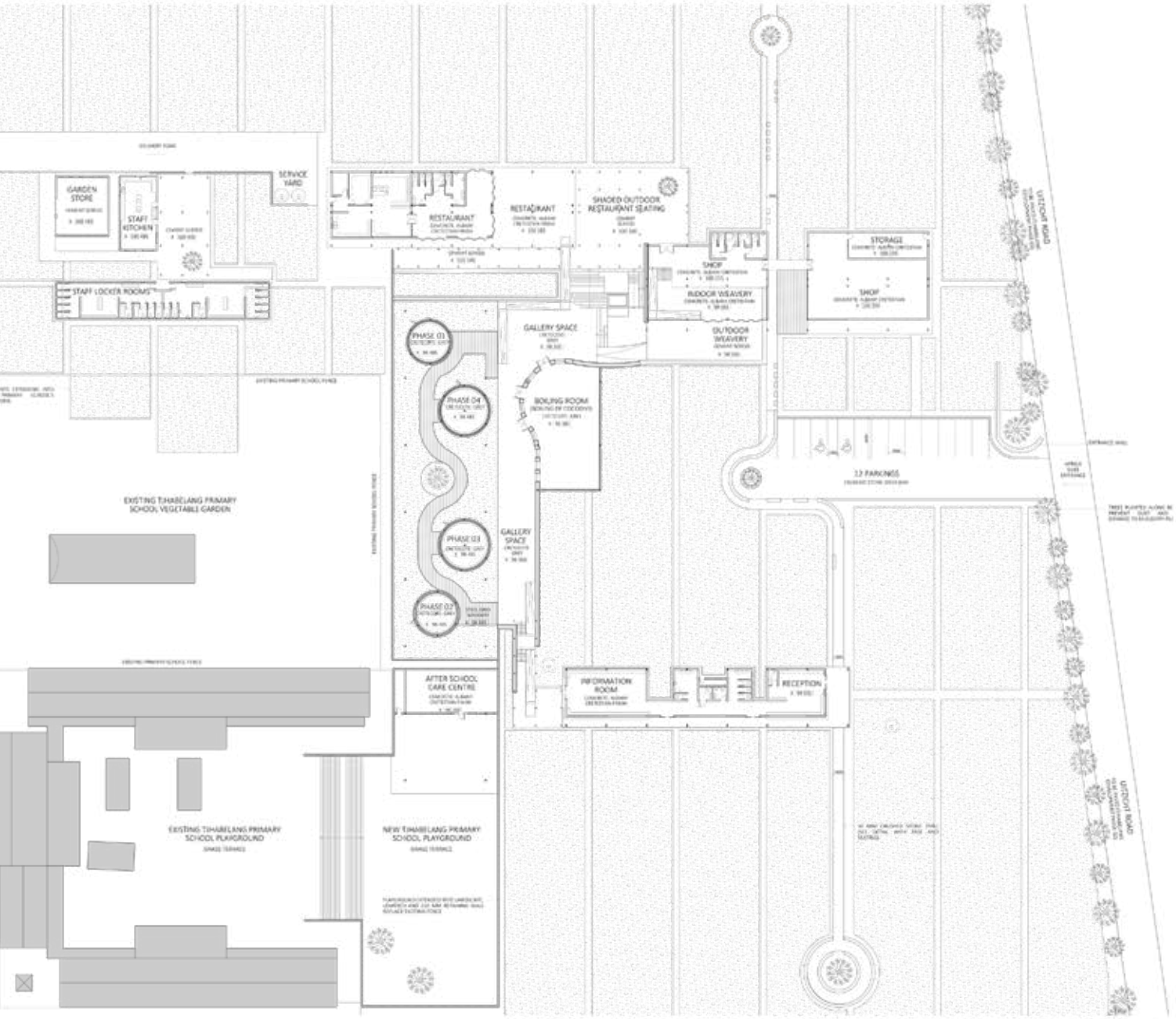
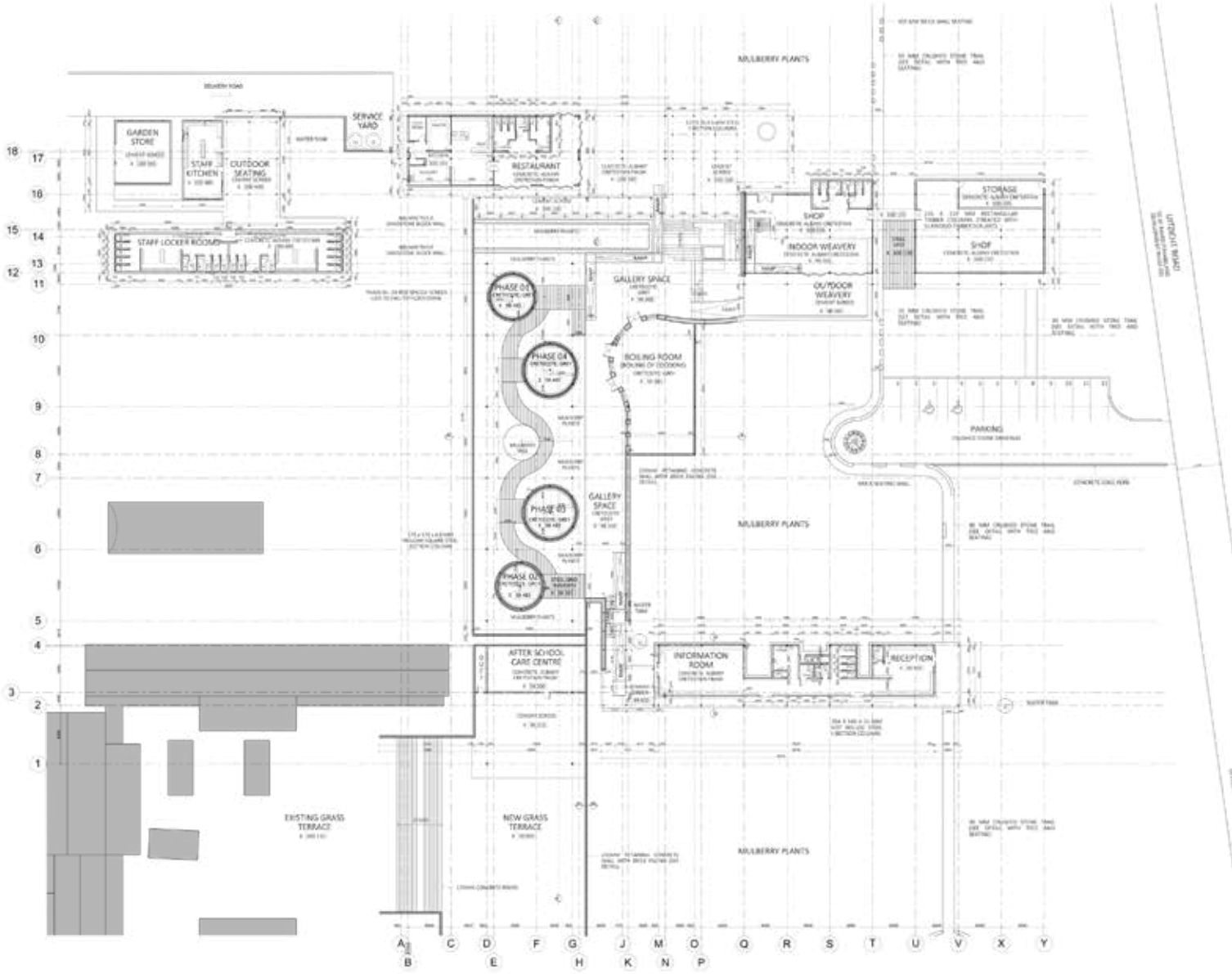
Block Plan



Site Development Plan

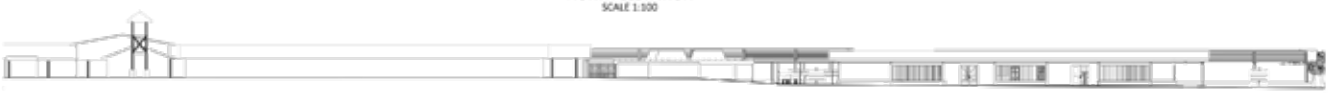

MULBERRY PLANTS
SERVICE YARD
GARDEN STORE
STAFF KITCHEN
OUTDOOR SEATING
RESTAURANT
STAFF LOCKER ROOMS
SHOP
INDOOR WEAVERY
OUTDOOR WEAVERY
STORAGE
SHOP
GALLERY SPACE
PHASE 03
PHASE 04
BOILING ROOM
PHASE 05
GALLERY SPACE
PHASE 02
PARKING
AFTER SCHOOL CARE CENTRE
INFORMATION ROOM
RECEPTION
EXISTING GRASS TERRACE
NEW GRASS TERRACE
MULBERRY PLANTS
MULBERRY PLANTS
A B C D E F G H J K M N O P Q R S T U V X Y
18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Floor Plan

Elevations

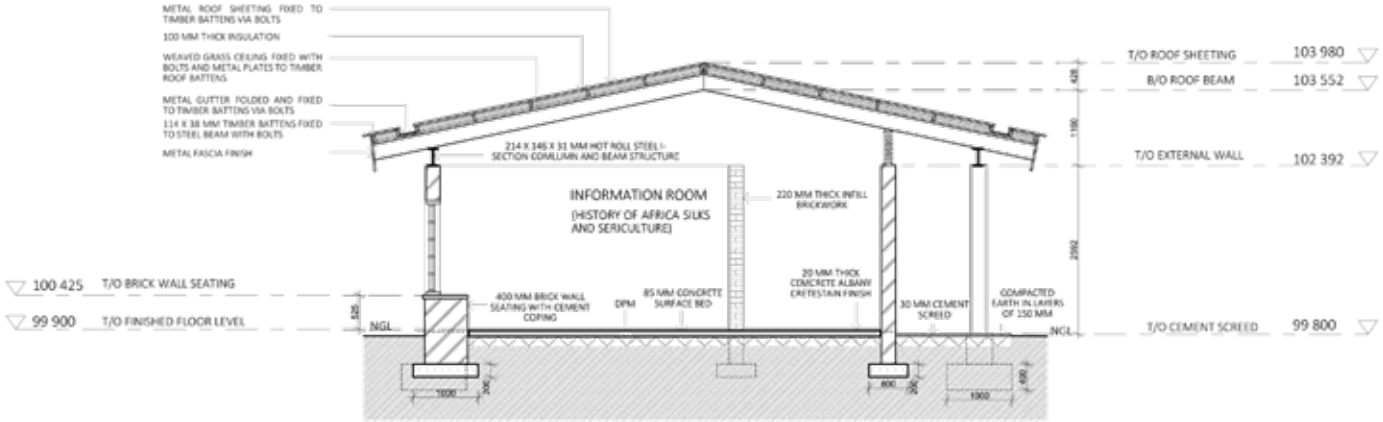
EAST ELEVATION
SCALE 1:100

NORTH ELEVATION
SCALE 1:100

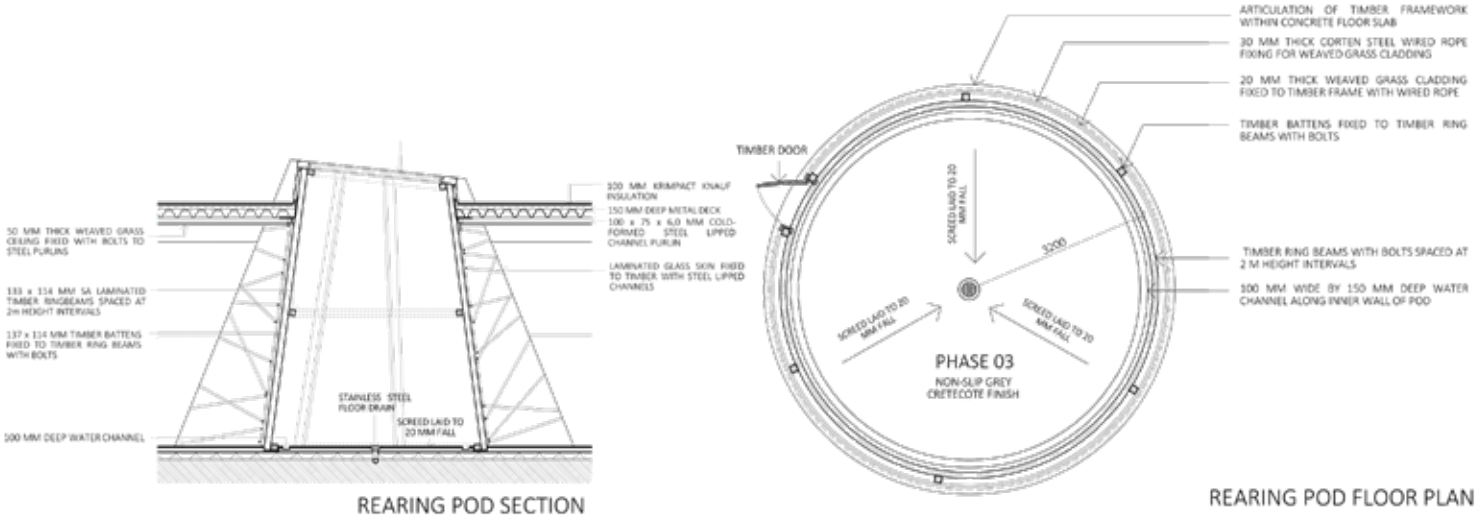


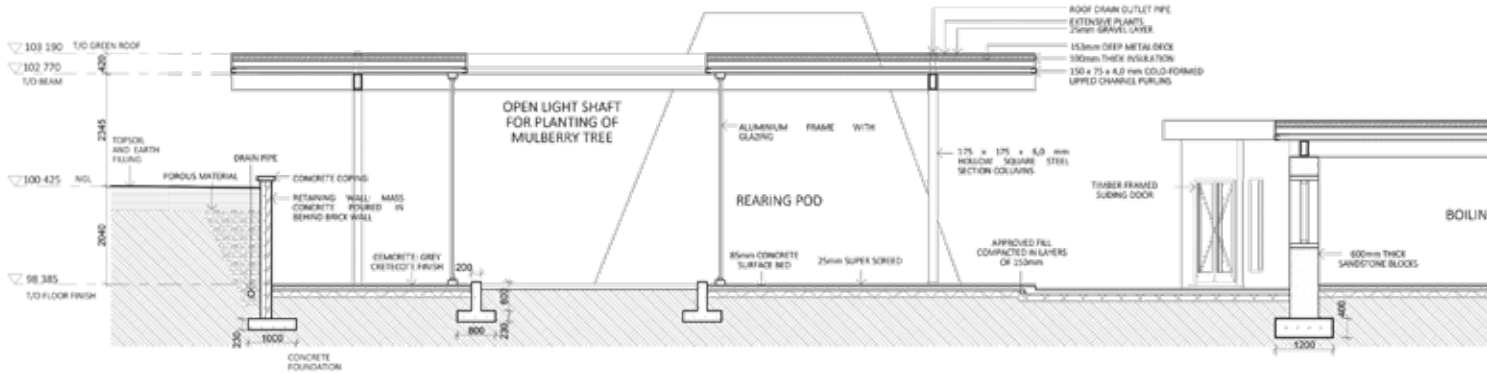
SOUTH ELEVATION
SCALE 1:100

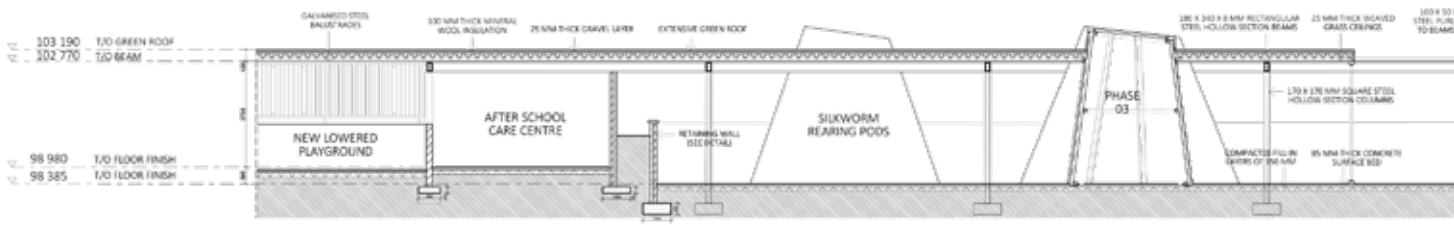
Sections and Details

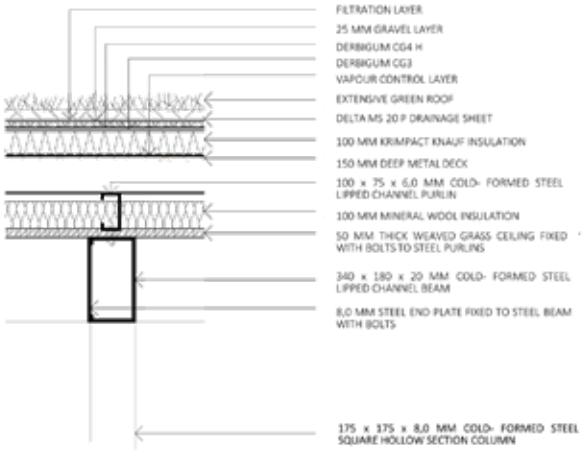


SECTION C- C
SCALE 1:50

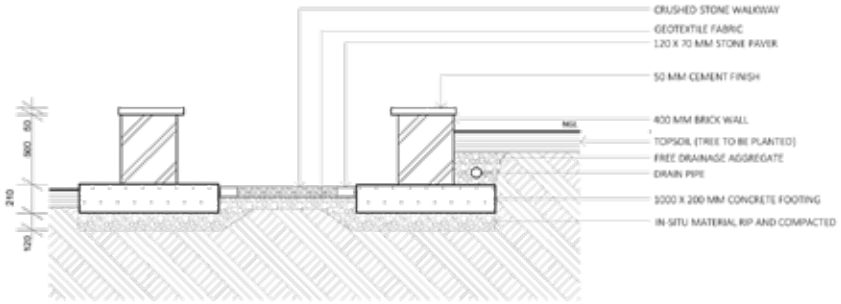

50 MM THICK WEAVED GRASS CEILING FIXED WITH BOLTS TO STEEL PURLINS
133 x 114 MM SA LAMINATED TIMBER RINGBEAMS SPACED AT 2m HEIGHT INTERVALS
137 x 114 MM TIMBER BATTENS FIXED TO TIMBER RING BEAMS WITH BOLTS
100 MM DEEP WATER CHANNEL
100 MM KRIMPACT KNAUF INSULATION
150 MM DEEP METAL DECK
100 x 75 x 6.0 MM COLD-FORMED STEEL LIPPED CHANNEL PURLIN
LAMINATED GLASS SKIN FIXED TO TIMBER WITH STEEL LIPPED CHANNELS
STAINLESS STEEL FLOOR DRAIN
SCREED LAID TO 20 MM FALL
REARING POD SECTION
SCALE 1:50
TIMBER DOOR
ARTICULATION OF TIMBER FRAMEWORK WITHIN CONCRETE FLOOR SLAB
30 MM THICK CORTEN STEEL WIRED ROPE FIXING FOR WEAVED GRASS CLADDING
20 MM THICK WEAVED GRASS CLADDING FIXED TO TIMBER FRAME WITH WIRED ROPE
TIMBER BATTENS FIXED TO TIMBER RING BEAMS WITH BOLTS
TIMBER RING BEAMS WITH BOLTS SPACED AT 2 M HEIGHT INTERVALS
100 MM WIDE BY 150 MM DEEP WATER CHANNEL ALONG INNER WALL OF POD
SCREED LAID TO 20 MM FALL
5000
PHASE 03
NON-SLIP GREY CRETECOTE FINISH
REARING POD FLOOR PLAN
SCALE 1:50


103 190 T/O GREEN ROOF
102 770 T/O BEAM
100 425 NGL
98 385 T/O FLOOR FINISH
TOPSOIL AND EARTH FILLING
DRAIN PIPE
POROUS MATERIAL
CONCRETE COPING
RETAINING WALL: MASS CONCRETE POURED IN BEHIND BRICK WALL
CEMCRETE: GREY CRETECOT FINISH
CONCRETE FOUNDATION
OPEN LIGHT SHAFT FOR PLANTING OF MULBERRY TREE
REARING POD
ALUMINIUM FRAME WITH GLAZING
175 x 175 x 6.0 mm HOLLOW SQUARE STEEL SECTION COLUMNS
TIMBER FRAMED SLIDING DOOR
85mm CONCRETE SURFACE BED
25mm SUPER SCREED
APPROVED FILL COMPACTED IN LAYERS OF 150mm
ROOF DRAIN OUTLET PIPE
EXTENSIVE PLANTS
25mm GRAVEL LAYER
153mm DEEP METAL DECK
100mm THICK INSULATION
150 x 75 x 6.0 mm COLD-FORMED LIPPED CHANNEL PURLINS
600mm THICK SANDSTONE BLOCKS
BOILIN

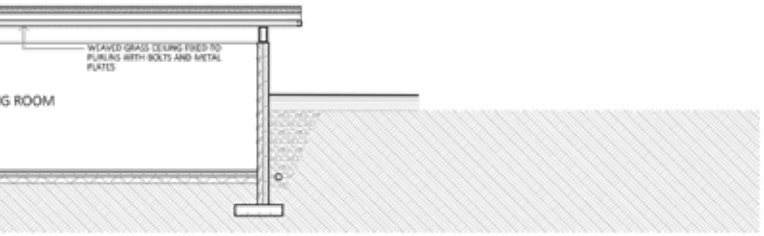

103 190 T/O GREEN ROOF
102 770 T/O BEAM
98 980 T/O FLOOR FINISH
98 385 T/O FLOOR FINISH
GALVANISED STEEL BALUSTRADES
100 MM THICK MINERAL WOOL INSULATION
25 MM THICK GRAVEL LAYER
EXTENSIVE GREEN ROOF
NEW LOWERED PLAYGROUND
AFTER SCHOOL CARE CENTRE
RETAINING WALL (SEE DETAIL)
SILKWORM REARING PODS
PHASE 03
180 X 340 X 8 MM RECTANGULAR STEEL HOLLOW SECTION BEAMS
25 MM THICK WEAVED GRASS CEILINGS
170 X 170 MM SQUARE STEEL HOLLOW SECTION COLUMNS
COMPACTED FILL IN LAYERS OF 150 MM
85 MM THICK CONCRETE SURFACE BED



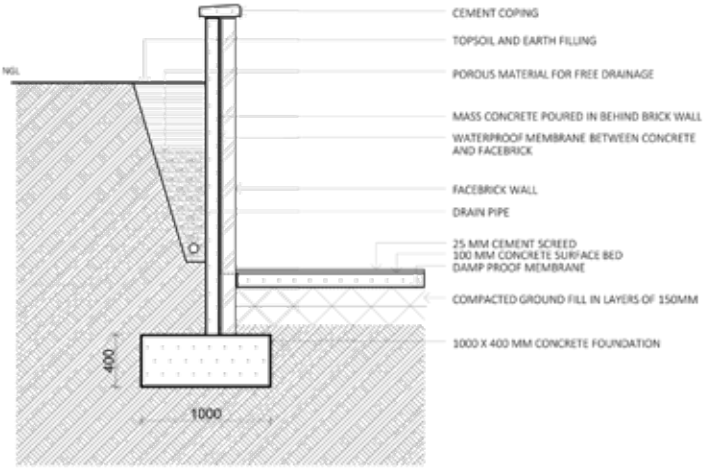
GREEN ROOF DETAIL
SCALE 1:10



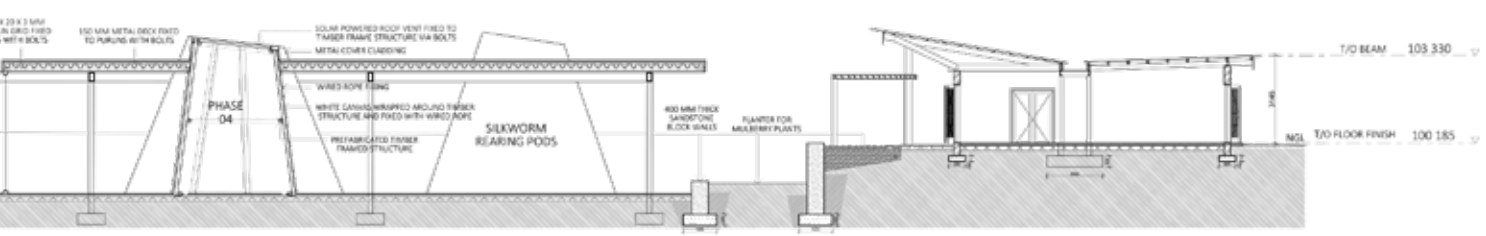
SECTION D- 2
SCALE 1:50



SECTION C- C
SCALE 1: 20



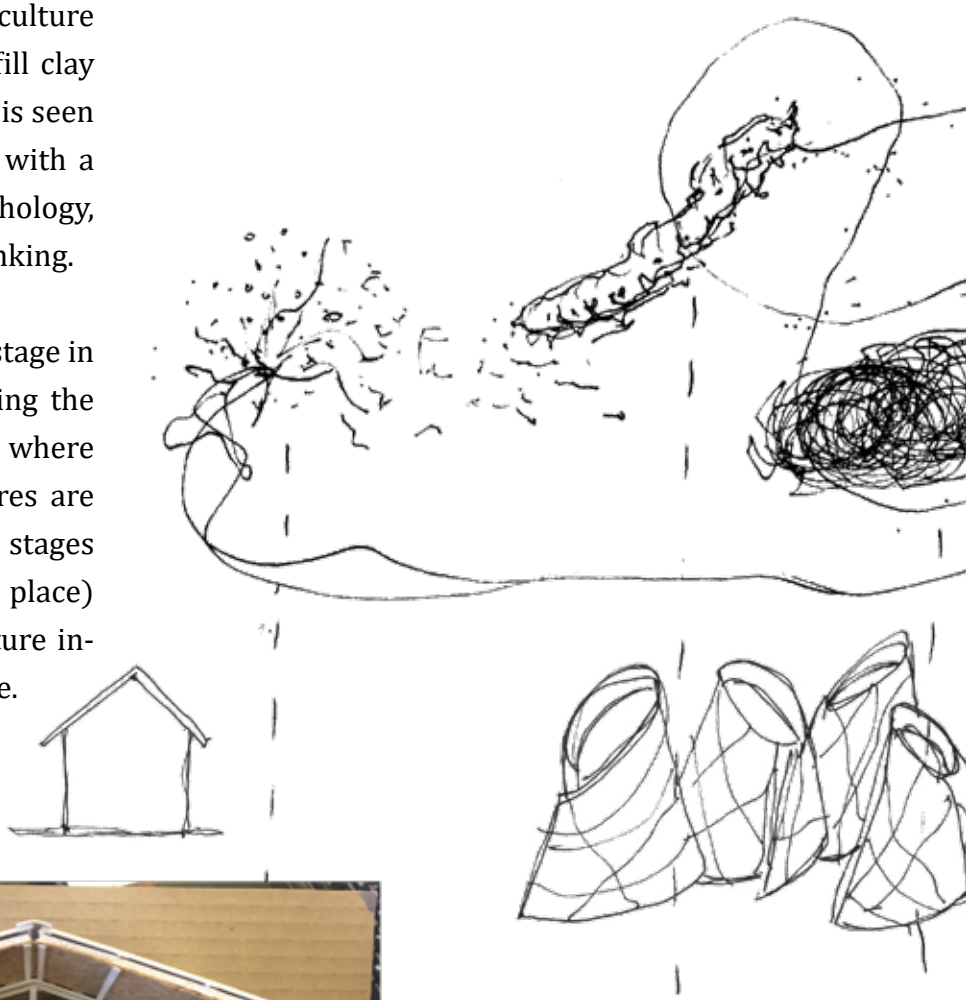
SECTION D- 1
SCALE 1:50

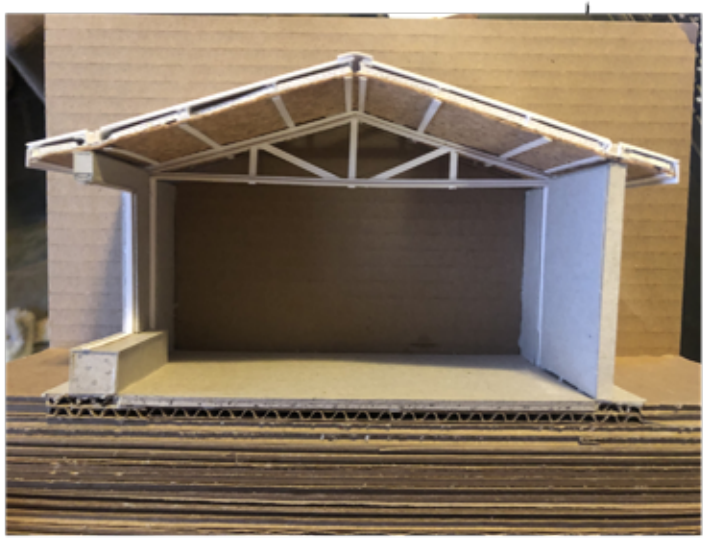


SECTION A-A
SCALE 1: 100

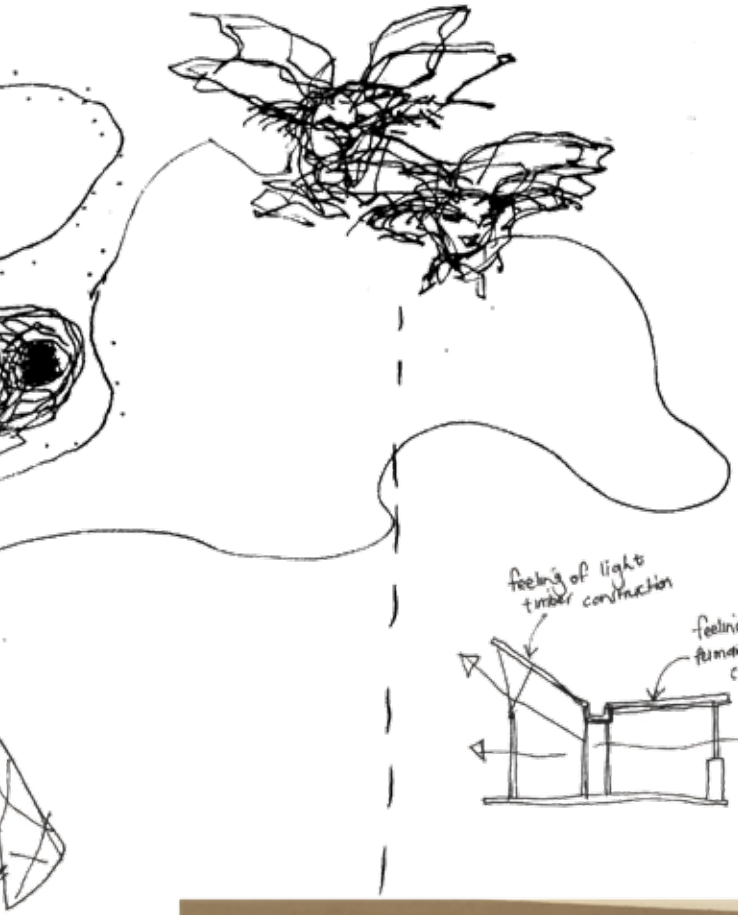
Inspired by the Free State building culture the use of steel construction with infill clay brick walls and thick sandstone walls is seen as an extension of Tjhabelang along with a typical farmhouse pitched roof morphology, that reflects the traditional way of thinking.

Lowered into the ground, the liminal stage in the design, inspired by moths escaping the cocoons, introduce temporariness, where prefabricated treated timber structures are used for the pods (wear the different stages in the silkworm rearing process take place) in contrast to a flat steel mesh structure inspired by the vast Free State landscape.

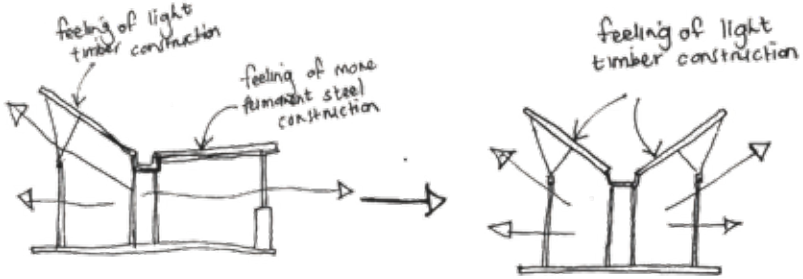


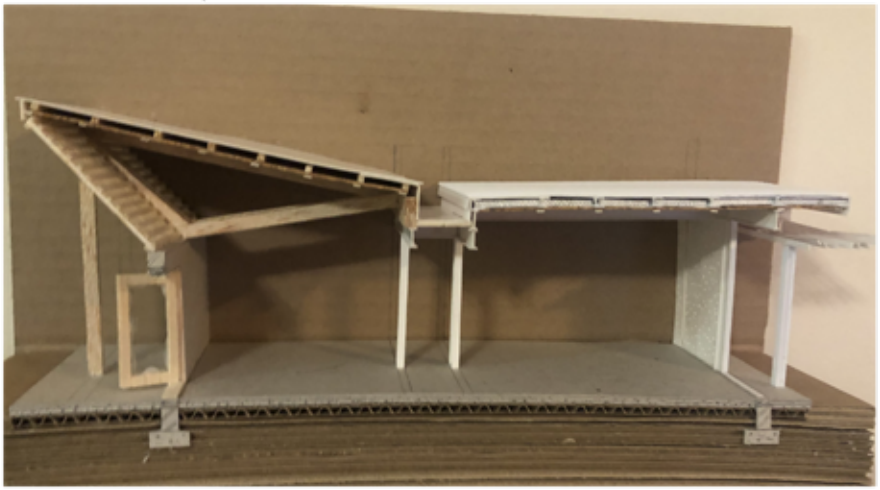


The metamorphosis of pupaes into moths inspired the design of the restaurant, shop and weavery structures.



Moving towards complete transformation of inverting the traditional farmhouse morphology pitch roof, the restaurant consist of both elements of the old and new, where one half of the building is still very much grounded in the landscape, using steel construction and a monopitched roof, and the other half speaks of temporariness with treated timber structures opening up to the landscape. The shop and weavery further develops to complete transformation where the traditional pitch roof is completely inverted and the use of treated timber structures inspired by tra-





ditional weaving looms create open spaces where woman and men weave next to each other, whilst singing traditional songs.

PART 04

EVALUATION AND SOURCES

Rhizomatic thinking makes becoming possible. This happens when a subject is connected to other diverse subjects in an assemblage. By disturbing Tjhabelang Primary School and thinking differently in terms of the subjectivities related to typical farmhouse morphologies, this assemblage (connecting to Africa Silks) has the potential for new connections and change within the existing poverty cycle of the rural Bainsvlei, starting with children. This part includes a reflection on the work investigated as well as the design development. Further development to the final design will also be discussed and a list of references used in this dissertation.

4.1 Reflection

This dissertation aims at disrupting existing patterns in order to create new ones, to introduce connections and opportunities in the form of employment, trade and agriculture, ones that the rural community of Bainsvlei already know. I believe this process of breaking away from traditional images of thoughts creates that disruption within the existing Tjhabelang community that is needed. These disruptions are in the form of disrupting subjectivities related to typical farmstead morphologies, the use of materials at Tjhabelang Primary School and disrupting the poverty cycle by introducing Africa Silks.

The design development went through 3 main phases (in general). The first part focused on the conceptual development and the landscape. The second part focused on conceptual development, the landscape and the program (Africa Silks). This created confusion where there were to many factors dictating the different spaces created and this created unnecessary complexities that made me question the design completely. A reflection was done on the needs of Tjhabelang Primary School and the larger community of Bainsvlei, which is that of change and transformation.

The third phase is based on the theoretical grounding of this dissertation and two main elements that motivated the decisions made in this development, is rhizomatic thinking introduced by Deleuze and Guittari (1987) and liminality by Van Gennep (1960) and Turner (1974; 1982).

I believe the final design has the potential to create meaningful spaces where the architecture acts as a hybrid model that symbolizes change and transformation through a combination of traditional building methods and materials that are articulated with new ones inspired by Africa Silks. Further development to the final design development includes the following:

- The re-introduction of an after-school care centre for the children of Tjhabelang Primary School. This creates an even stronger connection between the two assemblages.

- The connection between the rearing of silkworm pods (phase 01- 04), the information room and the Northern classroom wing of Tjhabelang, see figure 231. This in-between space is in question, and it is proposed to maybe remove the flat roof completely and rather introduce shading nets and mulberry plants in-between the pods as the flat roof introduce a lot of dead spaces (when there are no visitors). These shading nets will still relate to the inspiration of a cocoon.

- The showroom (weavery) spaces are to be further developed to still act as a kind of gallery hall, but so that there are provisions made during winter, as the gallery hall is currently open.

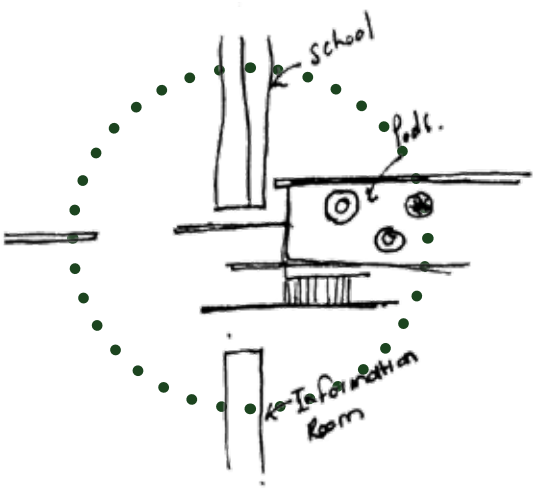


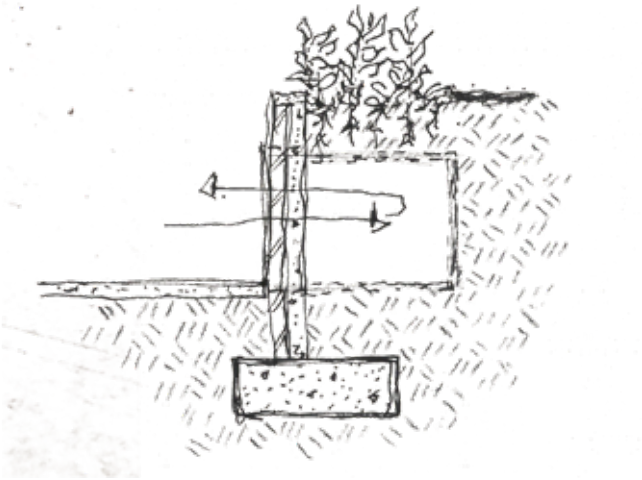
Figure 231: Connection between Africa Silks and Tjhabelang (Caldeira, 2019: drawing).

- Further detailing in terms of the feeling of the different spaces will be done and 3d explorations of the design that reveal the spaces, materiality, structure and connection to the landscape.

External Review:

I believe the idea of regenerating the threshold between Tjhabelang Primary School and the next step for the future of the children at Tjhabelang has been created through a hybrid architectural model that speaks of change and transformation. I do however believe that there are more possibilities for the school of Tjhabelang to further extend their physical boundaries.

By lowering the playground into the ground, and disgarding the fence, creates the illusion that the school melts into the landscape and becomes one with the new Africa Silks assemblage. This also allows one to create an interactive wall where underground looped tunnels allow for children to transcend the physical boundaries of the site in a playful manner. It is proposed that this lowered area with steps, also acts as an after school day care centre and an event space for the school, as well as Africa Silks where the products made by the rural community can be auctioned off during fundraising events (for the Clinvet community development and education trust) to the larger community of Bloemfontein.



4.2 Conclusion

The investigated theories and precedents support the ideas of change, transformation, and connectivity in terms of disrupting existing boundaries. Through rhizomatic thinking, this development of Africa Silks speaks of change and transformation in terms of activity and architecture. By creating employment where traditional activities such as agriculture and weaving are celebrated, and where the architecture involves the rural community through skill development and design (traditional influences of weaved ceilings, furniture and shading), this design development symbolizes a rite of passage, where the poverty cycle within the rural community become a part of the past, and a new life, with a better future for the children and larger rural community of Bainsvlei is born.

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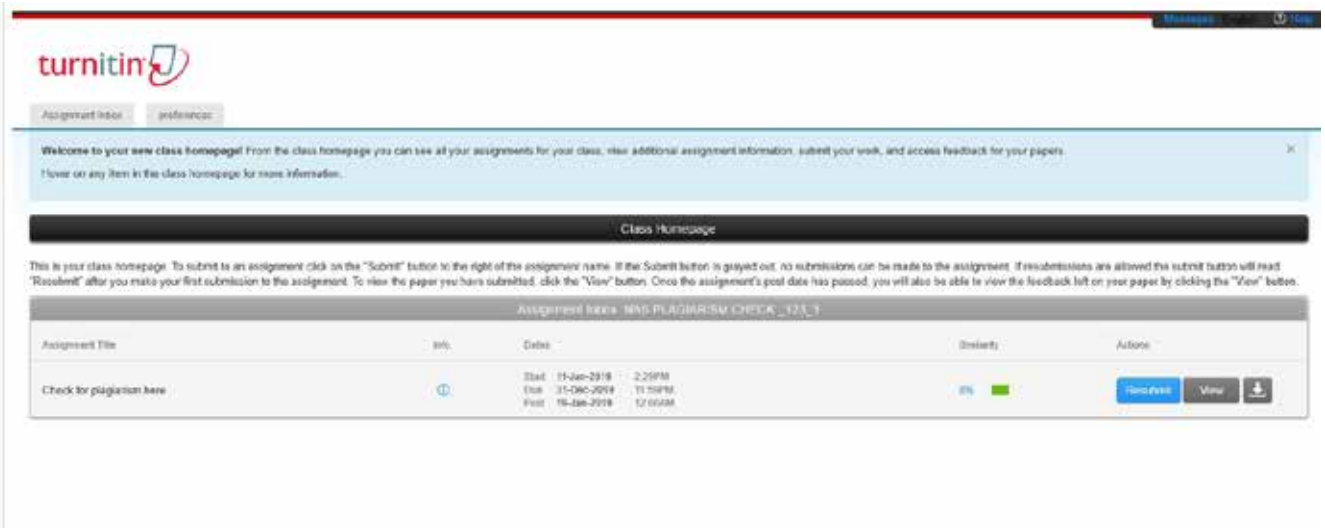
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This is your class homepage. To submit to an assignment click on the "Submit" button to the right of the assignment name. If the Submit button is grayed out, no submissions can be made to the assignment. If resubmissions are allowed the submit button will read "Resubmit" after you make your first submission to the assignment. To view the paper you have submitted, click the "View" button. Once the assignment's post date has passed, you will also be able to view the feedback left on your paper by clicking the "View" button.
Assignment Inbox: NHS PLAGIARISM CHECK_123_1
Assignment Title
Info
Dates
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