FROM OBJECT TO SUBJECT:
PRESERVATION AND AWARENESS OF THE VULNERABLE CAPE GANNET

A MULTI-SPECIES COHABITATION APPROACH FOR CO-EXISTENCE BETWEEN HUMANS AND ANIMALS

Tilanie Oettle

Design Dissertation (APG5079W)
MArch (Professional)
University of Cape Town
2022

Supervisor: Mike Louw

DISSERTATION TITLE: From Subject to Object: Preservation and awareness of the vulnerable Cape Gannet
STUDENT NAME: Tilanie Oettle
SUPERVISOR NAME: Mike Louw

This dissertation is presented as part fulfilment of the degree of Master of Architecture (Professional) in the School of Architecture, Planning and Geomatics, University of Cape Town
Date:

"I hereby:

a. grant the University free license to reproduce the above dissertation in whole or in part, for the purpose of research.

b. declare that:

(i) The above dissertation is my own unaided work, both in conception and execution, and that apart from the normal guidance of my supervisors, I have received no assistance apart from that stated below:

_ _ _ _ _ _ _

(ii) Except as stated below, neither the substance or any part of the dissertation has been submitted for a degree in the University or any other university:

_ _ _ _ _ _ _

(iii) I am now presenting the dissertation for examination for the degree of Master of Architecture (Professional)"

Plagiarism Declaration:

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.
2. I have used the Chicago / Harvard convention for citation and referencing. Each contribution to, and quotation in, this report from the work(s) of other people has been attributed, and has been cited and referenced.
3. This report is my own work.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

Signed by candidate

_____

TABLE OF CONTENT

ABSTRACT..... 4
INTRODUCTION 6

PART 01

1.1 PROJECT AIMS.....9
1.2 PROJECT CHALLENGES.....9
1.3 PROBLEM STATEMENT.....10
1.4 RESEARCH QUESTION.....10

PART 02

2.1 FROM A THEORETICAL POINT OF VIEW.....13
2.2 MULTI-SPECIES COHABITATION APPROACH.....14
2.2.1 SYNANTHROPIC HABITATS.....15
2.2.2 CONTROL AND PERCEPTION.....16
2.3 ENVIRONMENTAL ETHICS AND EDUCATION.....17
2.3.1 LEARNING BY DOING.....18
2.3.2 PLACE.....18
2.4 ENVIRONMENTAL LITERACY.....19
2.5 THE CONTROL SPECTRUM.....21
2.6 CONCLUSION.....24

PART 03

3.1 CLIENTS AND USERS.....27
3.2 LOCAL MANAGEMENT INSTITUTIONS.....28
3.2.1 MONITORING.....29
3.3 A BRIEF HISTORY..... 29
3.4 CONTEXT.....31
3.5 SENSITIVITY ZONES/ACTIVITIES..... 32
3.6 SITE LOCATION.....33
3.7 ECONOMIC ACTIVITY.....34
3.8 SITE LOCATION.....35
3.9 ECOLOGICAL THREATS..... 37
3.10 CURRENT CONDITIONS.....43
3.11 SITE CONDITIONS..... 47
3.12 SITE IMAGES.....49
3.13 EXISTING BUNKERS.....51
3.14 SITE VEGETATION.....53
3.15 ANIMAL MOVEMENT.....55
3.16 OBSERVATION TOWERS.....57
3.17 MALGAS ISLAND..... 59
3.18 CAPE GANNET..... 63
3.19 CONCLUSION: TOWARDS A DESIGN.....65
3.20 SITE RESPONSE/ DESIGN PRINCIPLES.....67

PART 04

4.1 DESIGN BRIEF.....71
4.2 ACCOMMODATION SCHEDULE.....72
4.3 THE WESTEN VISITORS CENTRE.....73
4.4 GUTMAN VISITORS CENTRE.....75
4.5 BELL-LLOC WINERY.....77
4.6 ROOM REQUIREMENTS.....79

PART 05

5.1 CONCEPT 1: CONCRETE BUNKER/HIDE..... 84
BLENDING IN.....85
ANIMAL HABITATS..... 85
FRAMING VIEWS..... 86
5.2 CONCEPT 2: HIDE AND REVEAL.....87
5.3 CONCEPT 3: ROUTE/JOURNEY.....87
5.4 CONCEPT 4: EXTENSION OF THE LANDSCAPE.....87
5.5 CONCEPT MODEL 89
5.6 CONCEPT MODEL 92
5.7 BUILDING FUNCTIONS..... 93
5.8 FINDING FORM.....95
5.9 THE TECHNICAL SIDE.....97
5.10 EXPLORING IN SECTION..... 99
5.11 SITE MODEL.....101
5.12 FORM DEVELOPMENT.....103
5.13 RESPONSE DIAGRAMS
RESPONSE TO WEATHER CONDITIONS.....105
RESPONSE TO TYPOGRAPHY.....106
RESPONSE TO VIEWS..... 107
RESPONSE TO ANIMAL MOVEMENT AND VEGETATION.....108
5.14 ANIMAL MOVEMENT VS BUILDING FORM.....109
5.15PRELIMINARY SKETCHES, PLANS AND SECTIONS..... 111
5.16 CONTROL AND PERCEPTION.....129
5.17MULTI-SPECIES COHABITATION..... 131
5.18 MELLOR PRIMARY SCHOOL- ENGLAND..... 133
5.19 BREAKWATER AND ARTIFICIAL REEFS.....137
5.20 MATERIALITY.....139
CROSS-LAMINATED TIMBER..... 141
THE MAKING: CLT.....143
TOUCHING THE EARTH..... 145

PART 06

CONCLUSION.....151

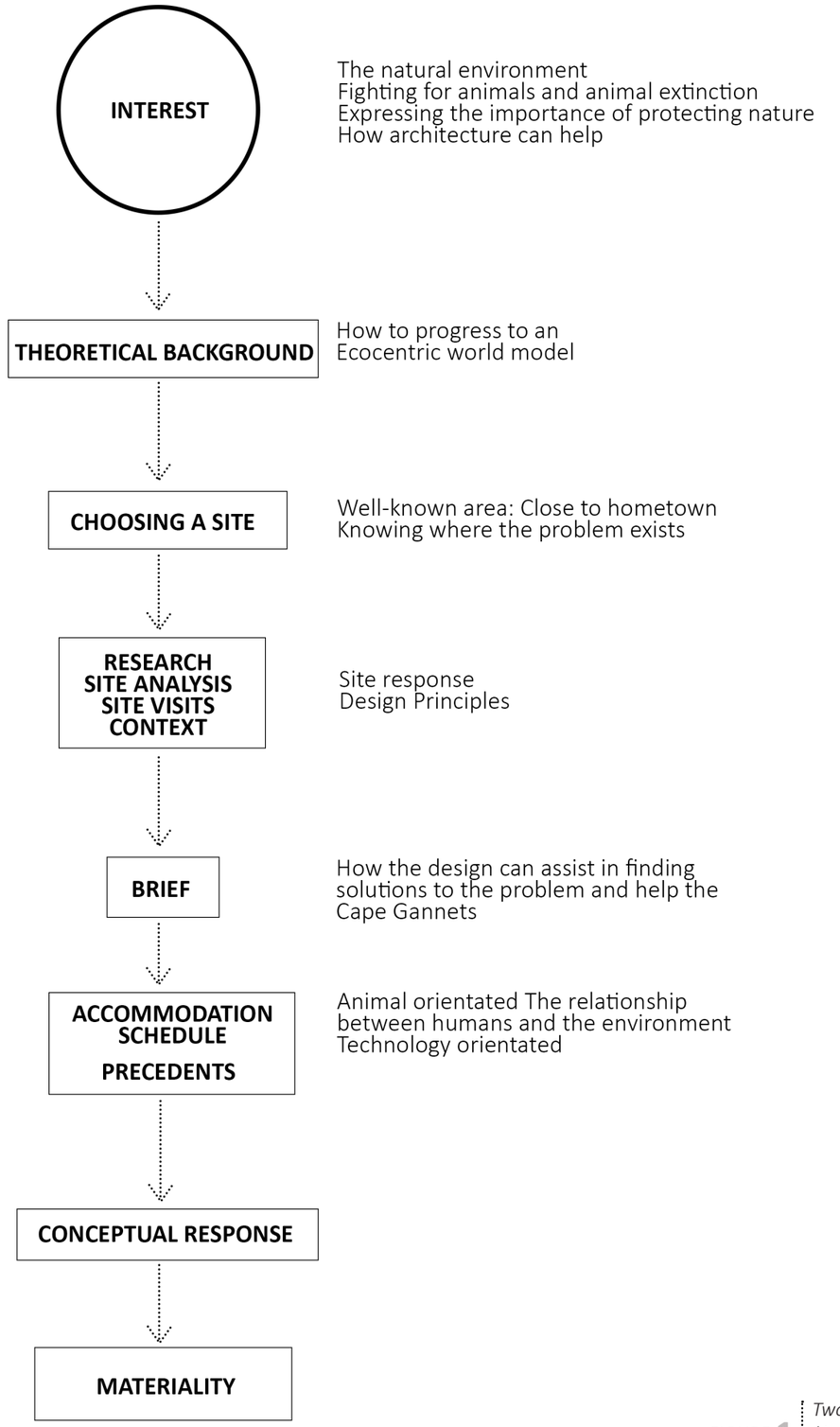




FIGURE 1 *Two sea birds (Author, 2022)*



The image represents the Cape Gannet marine bird. The pieces, making up the Cape Gannet, are slowly starting to part from one another, depicting the idea of the threats these species are currently facing. It is crucial to repair what is now starting to break which is the possible extinction of the Cape Gannet due to the decreasing numbers in their population.

FIGURE 2 *Cape Gannet marine bird classified as vulnerable (Author, 2022)*

ABSTRACT

This dissertation investigates and describes the concept of how an Ecocentric world model is possible by using architecture as a tool to achieve this. The relationship between humans and nature should be further investigated and developed as there is a current disconnect between these two. As a result, the natural environment is degrading, ecosystems are becoming dysfunctional and species extinction is increasing.

The Cape Gannet forms a critical element in the dissertation as there is a need to address the decrease in its population, especially on Malgas Island (located close to the site). The geographic location of this protected island is not visible from the land and thus most people are unaware of the threat these species are facing together with unethical activities taking place within and around the ocean of Saldanha Bay.

The design seeks to engage with this subject and find possible solutions as to how this issue can be addressed in Saldanha Bay, South Africa. The design draws individuals to the site, which is in close proximity to the island, to engage with these species, providing awareness and an educational basis regarding the species as well as the natural environment of the area. At the same time, the design seeks to enhance the existing landscape by making a positive impact.

The research topic also identifies ways in which architecture could engage with its surroundings through a multi-species cohabitation approach which could alleviate ongoing biodiversity losses in an Anthropocentric world model.

By incorporating stabilization and research facilities focused on the Cape Gannet, research and monitoring facilities focused on the ocean, as well as awareness and educational spaces, the design starts to form a basis to reverse the effects of the possible extinction of these species in the future, address the health of the ocean and provides solutions to how humans, the natural environment and animals can co-exist amongst each other in a symbiotic manner.



FIGURE 3 *Cape Gannets (africadotfilm, 2018)*

INTRODUCTION

This paper was shaped by my personal experience of the environment I grew up in. I was born in Langebaan, a small town on the West Coast of South Africa and I have been living close to the ocean for my whole life. Thus, the ocean, specifically the Langebaan lagoon and Saldanha Bay, formed a major drive for my design dissertation topic. Having a close relationship with Langebaan's lagoon and its rich fauna and flora, I became passionate about the species in this environment and the impact of humans on them. As I grew older, I became aware of the degradation of the area as a result of human actions, human activities, and the way we misuse the ocean for our benefit. This is causing a major disturbance in the ecology of the area. My architectural focus has shifted throughout the years from a human-centered design to a way in which humans can be reconnected to their natural environment and animals. This is a subject I feel so strongly about, and I can express my passion for the natural environment through my architectural designs.

I believe that the focus of the practice of architects and designers is placed on humans the majority of the time, and the natural environment is sometimes forgotten and left behind. Seldomly the building engages with its natural landscape, being in harmony with small elements, rather the design has the goal of having a beautiful presence in its context and the focus is placed on the facades and how humans perceive them. Something that I realized in my research was that the existence of animals is overlooked. Buildings are increasing and animal habitats are decreasing. This has become a major concern as buildings are destroying habitat spaces of species that we need to survive in the future. Unethical human actions and ignorance towards their environment have caused major disturbances. The only way I can express my attitude towards this problem is to find a way where architecture could form the basis for environmental literacy and education and be an example of how this could be possible through a multi-species cohabitation approach which could alleviate ongoing biodiversity losses.

The design dissertation investigates the proposal of a wildlife preservation and research center (Saldanha Wildlife Preservation and Research Center) in the SAS Saldanha military academy nature reserve. The investigation and design will focus on how architecture can enhance ecosystems through a multi-specie cohabitation approach, resulting in the co-existence between humans and animals. It will also investigate how the design can contribute to environmental literacy and education. Furthermore, the design seeks to make people aware of the Cape Gannet, the threats these species are currently facing, and how they are endangered to extinction in the wild. The project is rather a design where there is a balance between a building that benefits the wildlife, spreads awareness of the Cape Gannet, and provides a poetic experience for the researchers and visitors.

.

PART 0**1**

1.1 PROJECT AIMS
1.2 PROJECT CHALLENGES
1.3 PROBLEM STATEMENT
1.4 RESEARCH QUESTION



FIGURE **4** *North Lighthouse in SAS nature reserve (Author, 2022)*

1.1
PROJECT **AIMS**

The project's primary aim is to better the relationship between humans and their natural environment. In recent years these two subjects have become extremely disconnected while the population is increasing, and nature is declining.

The Cape Gannet, as mentioned earlier, plays a critical role in this project. The second aim is to make people aware of the threat these species are facing due to unethical human actions in Saldanha Bay and Langebaan. The goal is to provide people with education and knowledge regarding these species as well as the land and ocean ecology in the area.

The third aim is to enhance the ecosystems found on and around the site through the design. This is achieved through a multi-species cohabitation approach. A multi-species approach focuses on the co-existence between humans and animals where both are treated equally in the design process and equally important.

The last aim is for the building to complement its surroundings by having a positive effect on the animals and landscape. Where habitat spaces are removed for construction, they should be replaced and reused to positively impact land and ocean ecosystems.



Better relationship between humans and nature



Displace and replace materials and habitats



Habitats for animals



Environmental awareness and education

FIGURE 5 *Project aims (Author, 2022)*

1.2
PROJECT **CHALLENGES**

The design is located within a protected area (SAS military nature reserve) and the outcome should be a building that enhances the existing ecosystems rather than taking them away. The building should prove that its presence is beneficial to its landscape and that species are better off with the building than without it.



Building to be in harmony with its landscape

FIGURE 6 *Project challenges (Author, 2022)*

1.3
PROBLEM STATEMENT

The dissertation was shaped by the problem statement and the research question I asked myself. In recent years, the health of the Saldanha Bay ocean and its ecosystems have faced major disturbances caused by human activities. These activities are causing harm to the ocean ecology and marine species, especially the Cape Gannet, which is currently on the red list of vulnerable species. Another concern the Cape Gannets are facing is that people are unaware of their existence on Malgas island.

1.4
RESEARCH **QUESTION**

The dissertation builds on the following question asked in the theoretical section of this paper: How can we progress from an Anthropocentric to an Ecocentric world model to better the relationship between man and nature and achieve environmental sustainability? Following this question, a more site-specific research question was asked to which the design will respond.

MAIN RESEARCH QUESTION:

"What is the role of Architecture to shift to an Ecocentric world model to better the relationship between humans, Cape Gannets, and the natural environment in Saldanha Bay?

PART 02

2.1 FROM A THEORETICAL POINT OF VIEW
2.2 MULTI-SPECIES COHABITATION APPROACH
2.2.1 SYNANTHROPIC HABITATS
2.2.2 CONTROL AND PERCEPTION
2.3 ENVIRONMENTAL ETHICS AND EDUCATION
2.3.1 LEARNING BY DOING
2.3.2 PLACE
2.4 ENVIRONMENTAL LITERACY
2.5 THE CONTROL SPECTRUM
2.6 CONCLUSION

2.1
FROM A **THEORETICAL** POINT OF VIEW

Ecological destruction and animal extinction are on the rise in the Anthropocene Epoch. The Anthropocene is defined as the new Epoch where humans are placed in the center of the universe, above nature. McHarg states that Western culture is the legitimate force behind this dominance and separation of man and nature (Herrington, 2010). The word “Anthropocene” is an umbrella term for multiple discussions around humans and nature and is guided by the fact that the existence of humans is privileged above the existence of non-humans. The effects of the Anthropocene are unspoken of in today’s world, and humans are not aware of its deeper meaning and the consequences of their unethical actions.

In the Anthropocene Epoch, we have an ethical obligation to save biodiversity for the benefit of our own sake and human survival (Kopnina & Shoreman-Quimet, 2015: 352). Humans need to start thinking of ways to save the current ecosystems and repair the damage that we have introduced. The term, “environmental ethics”, is introduced in connotation with Anthropocentrism (Schmidt, Brown, & Orr, 2016:194). Ethics in the Anthropocene deals with ethical actions and must acknowledge and grapple with how individuals behave towards environmental challenges and problems (Schmidt, Brown, & Orr, 2016: 191). Through this, certain ethical challenges exist regarding the new framing of human and non-human relationships and how to improve them (Schmidt, Brown, & Orr, 2016:193).

This dissertation recognizes the divide between man and nature in the Anthropocene and seeks to explore and study new possibilities to progress to a more sustainable, Ecocentric world model, where both subjects are equal. An Ecocentric world model is the opposite of an Anthropocentric one because humans and animals are considered equal. Washington (2017:40) states that a sustainable future is not likely to be possible without a shift to Ecocentric values, and it is a necessary path toward the flourishing of life on Earth. The series of theoretical concepts and technical studies discussed in this paper introduces key concepts in moving towards a sustainable future by identifying the problems and finding suitable solutions, which it argues should be implemented. Specifically, this includes actions to be taken by humans regarding the role they play in the environment.

Sustainability is the goal that lives within an Ecocentric world model. It is almost the same as the term ‘surviving’ and sits in-between ‘degeneration’ and ‘regeneration’. The United Nations World Commission on Environment and Development (1987: 43) states that “Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Humans must start making good decisions now so that we do not have to face challenges in the future.

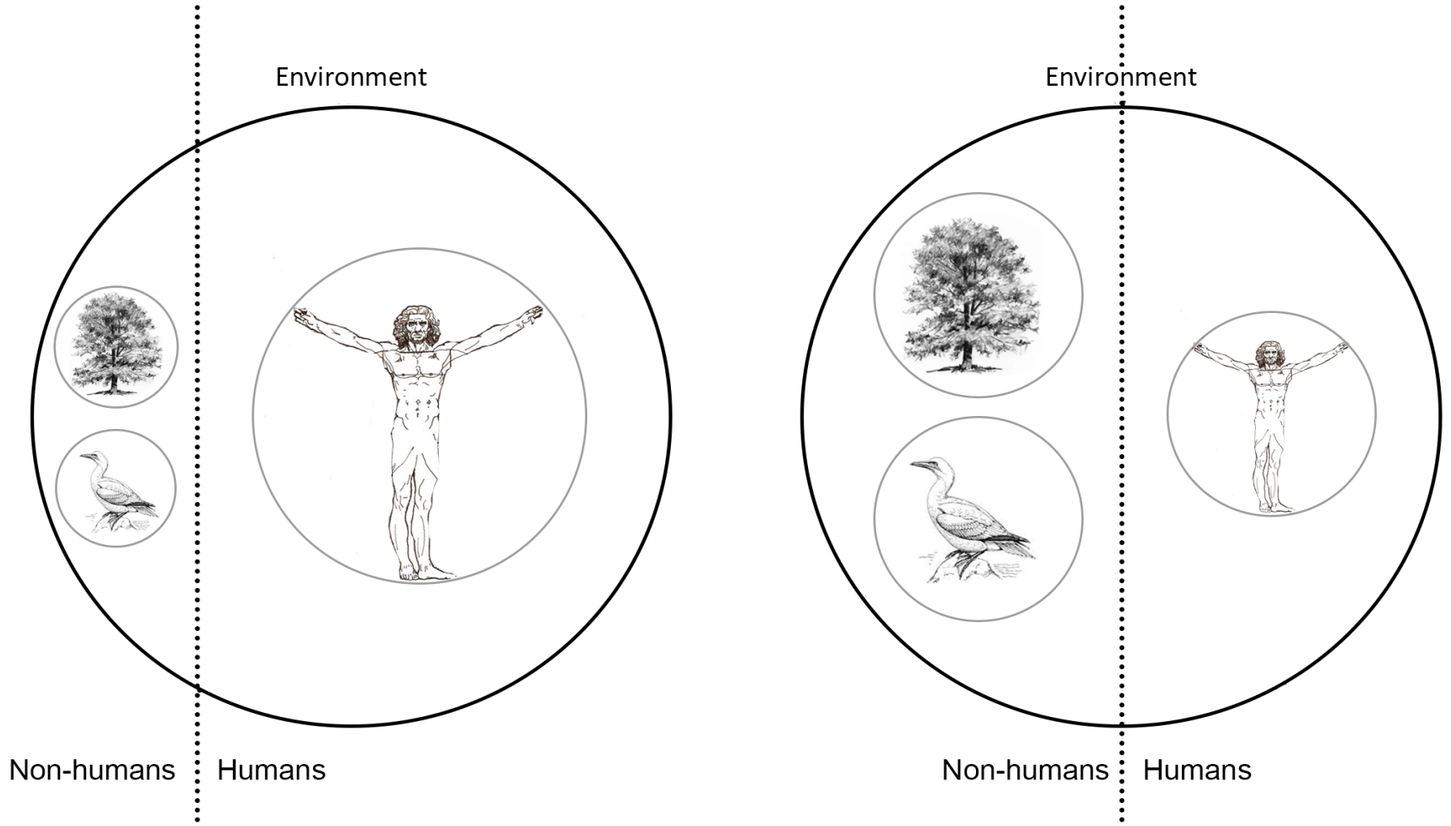


FIGURE 7 *Anthropocentric vs Ecocentric (Author, 2022)*

“All living things ought to be sustained, equally people and nature, and these two go together.” (Kopnina & Shoreman-Quimet, 2015: 67)

2.2
MULTI-SPECIES COHABITATION

The multi-species cohabitation approach builds on the principles of the ecosystem approach and could be a key tool to address animal extinction, and damaged ecosystems. It is an alleviator for the global crisis. This paper will focus specifically on indigenous wild and marine species and their relationship with human habitats. The covid-pandemic was a perfect example of what happens to the well-being and health of humans when there is no engagement with ecosystems (Roudovski, 2020:731).

Seldomly do designers and architects think of animals as part of the building process, and they are rather discarded. The exclusion of non-humans leads us to a planetary crisis when they are not taken into perspective (Roudovski, 2020:732). Their habitat gets obliterated and unfortunately, they are faced with the consequences. We sometimes forget that human life and long-term survival depend on other species so without them it is impossible to survive the Anthropocene. Endangered species need to be preserved and for an ecosystem to be healthy, we need to live amongst these species (Dodington, 2014). For animals, the ecosystem approach methodology assists them in helping existing ecosystems on and around a site. Dodington (2014) writes that within the building industry, too often the environmental context is forgotten, which is the case in the Anthropocene. This leads to a major problem in terms of cohabitation between humans and non-humans (Roudovski, 2020:734). Thus far, architecture until today has failed to address this approach, leading to further degradation of ecosystems. As Smith and Bardzell (2017:1717) state "to decenter the human from design", will be a crucial shift. This does not mean to exclude or place animals above humans, but to emphasize the interconnectedness, blurring the boundaries, and promote new technological development from multiple standpoints (Smith, Bardzell, & Bardzell, 2017:1717).

In the article "Multi-species Cohabitation and Future Design", the author mentions that it is necessary to design 'with' animals, rather than 'for' them. This implies that we recognize the overlapping relationship between humans and non-human occupants which includes spaces, behaviors, stories, and memories. This can only be achieved where there is an ethical obligation to consider the interactions between species and individuals. The topic of ethics will be further discussed in this paper. (Roudovski, 2020)

2.2.1 SYNANTHROPIC HABITATS

Gunawan (2015:9) writes that synanthropic animals are categorized as wild species. They benefit from humans and live in a cohabitational way with us. They are species that are between domestic and wild and include mice, rats, birds, falcons, bats, owls, insects, and certain mammals. Pigeons and baboons also fall under this category and are currently unwelcome in or near human spaces. I believe that better solutions could be integrated into the design to cater to these kinds of species that harm humans and the built environment.



FIGURE 8 *The 'Habitat Wall' provides different habitats for insects and small animals (Lane, 2017)*

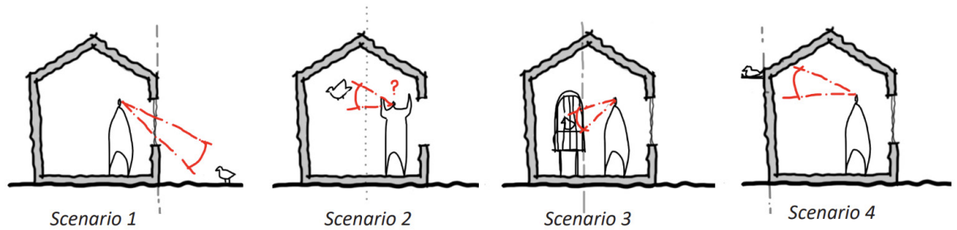


FIGURE 9 *Control and perception scenarios (Author, 2022, based on Gunawan, 2015)*

There are two fundamental elements regarding the relationship between humans and non-humans which are: Biological interaction and spatial condition. The first is where there is a direct connection between the behavior of humans and species, which happens in a common physical space. The second is the environmental elements that are shared amongst species and are further divided into physical and conceptual limits. Physical limits are constructed boundaries whereas conceptual limits are from a human perspective and perceived values to physical space, which differs from the perspectives of animals. (Gunawan, 2015: 9-20)

2.2.2 CONTROL AND PERCEPTION

Architecture can be used to manage the relationship between humans and animals by using physical and conceptual boundaries which manage 'control' and 'perception'. For the relationship to succeed between humans and animals, there needs to be a balance between 'control' and 'perception' to achieve a symbiotic outcome where both benefit in the process. I believe that scenarios 1 and 4 allow for a symbiotic effect where neither human nor animal is harmed or unsatisfied by the circumstances.

Cohabitation spaces are created when the line of separation and division is blurred and the exterior and interior co-benefits from each other at the line of the boundary. The boundary is no longer seen as a line of separation but gains the identity of coexistence. The coexistence of elements allows for a synanthropic space to exist which delineates territories and creates new ecological, political, and cultural relationships between the two elements involved (humans and animals). Architecture can create boundaries between humans and animals and create synanthropic habitats. Furthermore, it can divide climatic zones, habitats, and territories. (Cheryl, 2020:45)

Birds are free-moving animals and there exist no boundaries for them. Thus, they perceive the hard boundaries we create. It is important to rethink the way we construct boundaries between animals and humans to not exclude species but rather create functional spaces. (Cheryl, 2020:41)

A scenario where there is a positive perception, and less control would be beneficial for a better relationship between humans and animals.

2.3
ENVIRONMENTAL ETHICS AND EDUCATION

Environmental ethics falls under the ecosystem approach and is related to the practice of architecture: decisive ethical design criteria (Delancey, 2004:147) as well as the way humans act toward their environment. The definition of environmental ethics introduces a form of responsibility of individuals towards the environment they live in (King, 2000:115) and is described as the moral relationship between humans and nature to protect the ecological systems and sustain biodiversity (Minteer, 2014). It is also concerned with people becoming aware of the deterioration of Mother Earth's natural environment. Environmental ethics answers the question regarding the use of the Earth's resources, how we treat other species, and how humans can relate to their surroundings (Taneja & Gupta, 2015:398).

An ecological theorist, Aldo Leopold advocated an expansion of the word 'ethics' and proposed the following ethic, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold, 1949:224). The loss of the ethical ability to act responsibly has major impacts and consequences, which should be addressed (Boenhert, 2017:54).

Environmental ethics theory in terms of architecture is divided into two categories which are both considered Ecocentric. They are biocentric individualism and ecological ethics. The first considers that all living organisms deserve moral respect which means helping them to flourish. The second view suggests that ecosystems are seen as wholes for example respect towards the health of the complete ecosystem. These two views are closely related given the fact that an individual organism requires a healthy ecosystem to thrive and survive and are defined as shared environmental goals. (Delancey, 2004:150)

Environmental ethics can only be achieved when there is an educational base to work from and this counts for not only persons in the design field, but for the ordinary human as well. Taneja & Gupta (2015:400) describe ethics as belonging to a set of values that humans should follow to conserve, preserve, and manage the environment. The values of decisions, actions, and choices are part of our moral obligations towards the environment and can only be achieved through education (Taneja & Gupta, 2015: 400). Environmental education is an important way to increase public awareness, consciousness, and knowledge about environmental problems (Ferreira, et al., 2021: 1). It provides tools for people to make responsible decisions and contribute to sustainable development (Ferreira, et al., 2021: 1). This means that there is the responsibility for educational institutions to teach values and ethics, which leads to an environmentally ethical human being.



FIGURE 10 *Educating kindergarten children about green peas (Oettle, 2022)*



FIGURE 11 *Kindergarten children sorting out beetroots (Oettle, 2022)*

2.3.1 LEARNING BY DOING

John Dewey, an American philosopher, placed his focus on the experience of education and believed in 'continuity of all experiences' (Mitchell, 2009:14). He considers viewing education as building on the past in terms of cultural traditions and connecting the present with the future by using 'experiential education' as a tool or 'learning by doing' (Mitchell, 2009:15). This tool ensures that people are participators and active researchers in a project within an environment where there is a strong thread of communication in mind (Mitchell, 2009:16). Dewey takes the definition of environmental education further by introducing context where experience evolves and expresses the need for children to not only understand ecology but also experience it in real life within its context (Capra, 2007:17). My mom, who is a teacher herself, taught me through the process of 'learning by doing'. There is no feeling better than planting a vegetable or seed by yourself and seeing its growing process or having silkworms as pets, learning about their life cycle. These experiences, physically being in the garden, made me better understand the meaning of things, how things happen, and the reason behind them first-hand. Thus, I fully agree with Dewey that environmental education should start being incorporated within the teaching field of young children and let them experience it by themselves. Experience is what makes you remember things.

2.3.2 PLACE

In a journal article written by Orr (1992:184), he explains the importance of place within the field of environmental education and its significance as an educational tool. The study of place involves intellectual knowledge of how we experience it, its dimensions, and the way it makes us feel. Place provokes certain emotions and feelings, one step further than education. These feelings allow us to respond to situations, might they be fear or love, and what our intellectual response to these situations is. Place is a very powerful word that can only be described by experience and equips us with knowledge, care, and love. Experience with learning environments should be an integral part of education, especially in environmental education (Mitchell, 2009:11).

2.4
ENVIRONMENTAL LITERACY

Environmental literacy is the primary goal of environmental education. For this section of the theory paper, the work of David Orr, an environmental study and politics professor, and Dewey will be investigated to express the importance of environmental literacy. Environmental literacy, introduced by Orr is described as the concern and awareness of the environment (McBride, Brewer, Berkowitz, & Borrie, 2013:3). It is to possess the knowledge and skills to improve the existing environmental problems we are facing and to work towards solutions to prevent more harm to natural systems (McBride, Brewer, Berkowitz, & Borrie, 2013:3). Environmental literacy is not yet seen as an important factor in our society, which indicates a hole in the education system, preventing current problematic solutions to be solved. In the article 'What is education for?', Orr (1991:52) questions the educational paradigm up until today and the monster it has created in this era. He writes that "education has no guarantee of decency, prudence, or wisdom" in a world where humans dominate nature (Orr, 1991:52). He stresses that all education is environmental education, and the knowledge we gain from this carries a responsibility to be used correctly (Orr, 1991:55).

Aldo Leopold asked, "if education does not teach us these things, then what is education for?" (Orr, 1991:59).

If someone is illiterate, they will not have the knowledge capacity to know the consequences of their wrongful actions to the environment and will keep living their selfish life benefiting from nature. As an individual who has strong motives for the education of nature, I believe too many individuals are not environmentally educated. These individuals are ignorant of their environment and not informed about environmental issues and problems in opposition to environmentally literate citizens who have the skills in acknowledging and solving problems (McBride, Brewer, Berkowitz, & Borrie, 2013:7). Orr (1990:51) writes that "Knowing, caring and practical competence form the basis for ecological literacy".

In the Anthropocene, design disciplines have an important role in sustainable ways of designing and thus ecological knowledge should form the base of decision-making. If there is no knowledge foundation about the environment's deeper meaning, then architects should make an effort to rethink their human-based design. 'Ecologically literate education' as Boenhert (2015:1) describes it, is the basis for design practices. The aim for this planet is to become environmentally literate and the aim for designers should be to design in an environmentally sustainable way (Boenhert, 2015:1).

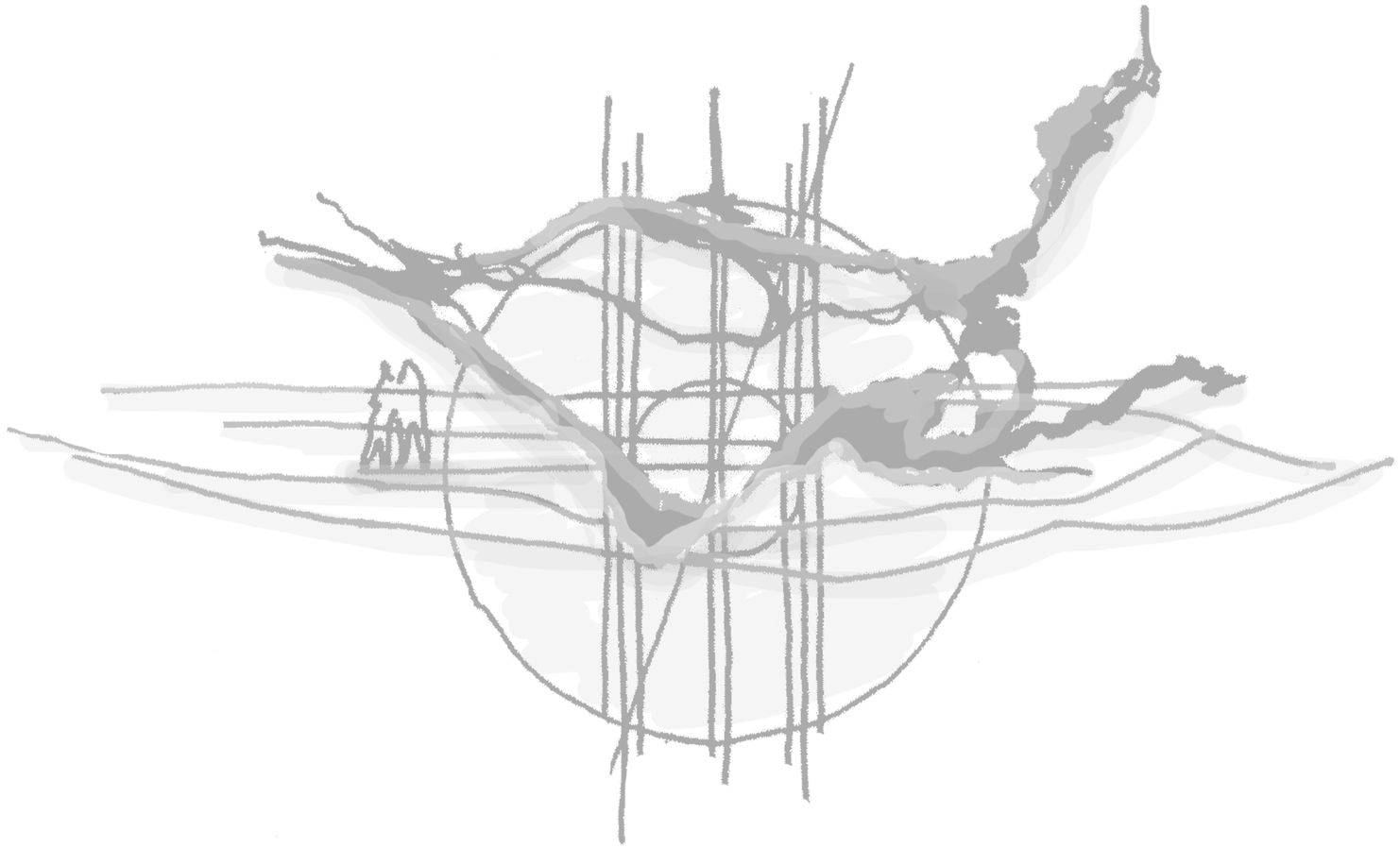


FIGURE 12 *The connection between humans and the landscape (Author, 2022)*

2.5
THE CONTROL SPECTRUM

With the Cape Gannet in mind, it is also vital to look at ‘control’ in terms of wild species other than synanthropic ones who live close to humans. In an article by Sereneri (2020:105), he states that the built environment should be improved to better incorporate wildlife, especially birds. He writes that the relationships between humans and animals can be placed on a spectrum (Serenari, 2021:107). This spectrum illustrates the varying levels of control that humans have over wild animals.

On the far left, structures include zoos and aquariums. They draw energies from wildlife and exist for the benefit of humans by educating us about nature. The interactions are highly controlled, and the welfare of the animals depends on humans. Sanctuaries and reserves are a step further than zoos and aquariums. Human control still exists but it is less than those on the left of the spectrum. They also provide education and have rehabilitation facilities for the well-being of animals. In the middle of the spectrum is wild-life game ranches. Boundaries between humans and animals are constructed through the natural environment. Wildlife can roam free and ‘still pressure their biological inclinations’. More towards the right, the properties of natural and wildlife systems are more pronounced, and they include wildlife versions of retirement homes for animals. On the far right of the spectrum, is national parks where wildlife and natural properties dominate. Wildlife is not disrupted by humans, and they can still be observed and interacted with. On this level, humans can still be educated while there are no physical boundaries restricting these species from moving around and hunting. (Serenari, 2021:107-114)

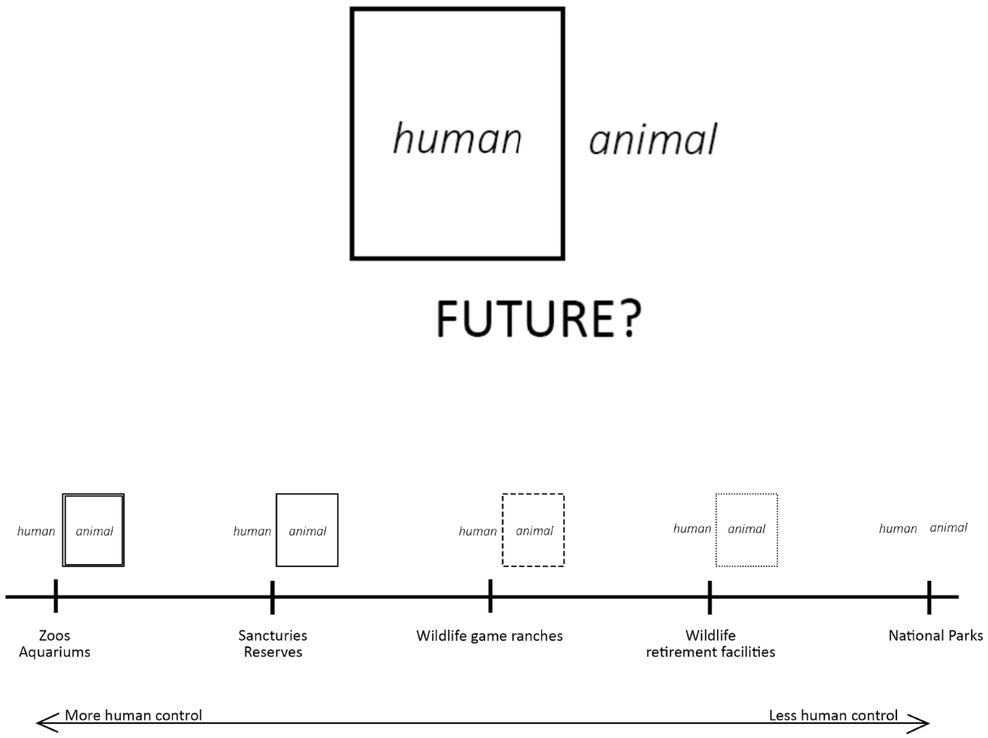


FIGURE 13 *The control spectrum*
(Author, 2022, based on the text of Serenari, 2021)

Towards the right of the spectrum, there is a balance of control between humans and animals. Animals should roam freely in their habitat without humans dominating their space. We perceive them as not intrusive while there exist boundaries within the conceptual space. I strongly believe moving towards the right of the spectrum will not only improve the relationship between humans and animals but create better spaces for them to not feel controlled and violated. Wild animals do not need to be placed in closed, controlled spaces to be studied and learned about. What if it were to be the other way around? What if we were placed in a closed space for animals to roam freely? In a documentary by David Attenborough, he states that we need to live with nature and not against it, and if we were to continue living the way we currently do, making no changes, we are heading toward a disaster (Fothergill, Hughes, & Scholey, 2020). He says that Chernobyl was just one of many human errors and the tragedy of the world is still uncurling slowly, while biodiversity is declining (Fothergill, Hughes, & Scholey, 2020). We depend on biodiversity and without it, we soon will disappear. A radical shift needs to happen, very soon and it can only happen if every single individual wants to make these changes.

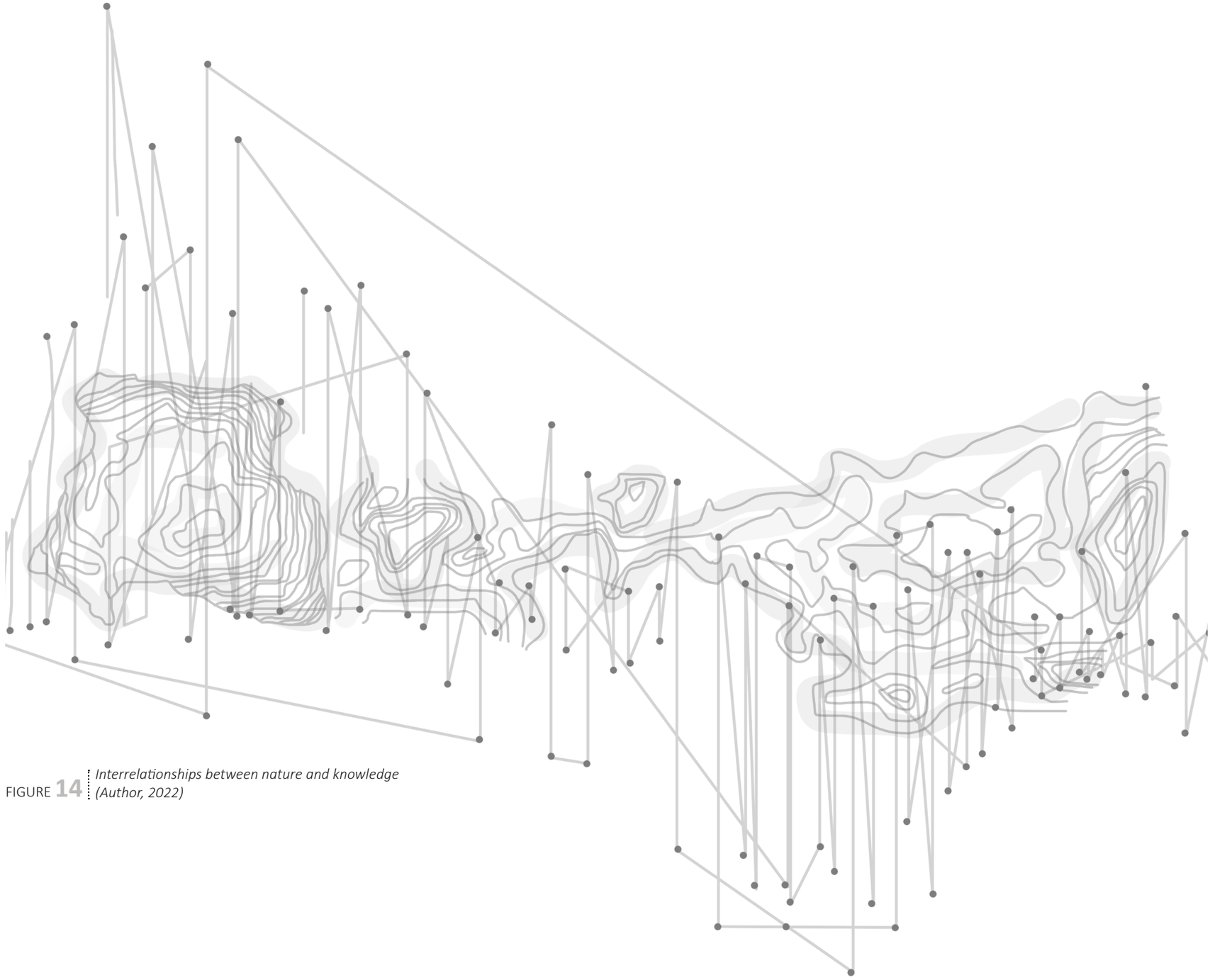


FIGURE 14 *Interrelationships between nature and knowledge (Author, 2022)*

2.6
THEORY **CONCLUSION**

In conclusion, in this section, the theoretical question of “How can we progress to an Ecocentric world model to better the relationship between humans and nature and achieve environmental sustainability?”, was answered with three key concepts namely, a multi-species cohabitation approach, environmental literacy, and environmental education. These are all possibilities to prove that an Ecocentric world model is possible if these concepts were to be put in place and utilized. These concepts laid out the foundation for the design dissertation.

The extinction of species in the Anthropocene is a concerning topic. The multi-species cohabitation approach could be a key to approaching the problem of animal extinction, and damaged ecosystems, and it can be an alleviator for the global crisis. Through the elements of ‘control’ and ‘perception’, we can manage the relationship between animals and humans, where both equally benefit from one another. Since the Cape Gannet forms an integral part of the dissertation, it will be necessary to explore ‘control’ and ‘perception’ on the right side of the ‘control spectrum’ introduced within this paper. This allows for a symbiotic relationship between humans and species and education can still exist within these boundaries.

Environmental education and literacy play an important role in moving toward an Ecocentric model. There should be a change in the education field to incorporate such a knowledge base. When this is achieved, people can ethically respond to situations within the natural environment and be more aware of the current crisis we are facing. “In architectural practice, environmental ethics may motivate buildings that serve not only humans but other non-domesticated organisms” (Delancey, 2004:155).

The theoretical research provided a basis for a design where a multi-species cohabitation approach, environmental literacy and education, and the control spectrum will be used which could assist in animal extinction and progressing toward an Ecocentric world model. With the Cape Gannet and the natural environment as the focal point of the project, the theoretical background fits in with the context and provides a base from where a successful building can grow from.

PART 03

3.1 CLIENTS AND USERS
3.2 LOCAL MANAGEMENT INSTITUTIONS
    3.2.1 MONITORING
3.3 A BRIEF HISTORY
3.4 CONTEXT
3.5 SENSITIVITY ZONES/ACTIVITIES
3.6 SITE LOCATION
3.7 ECONOMIC ACTIVITY
3.8 SITE LOCATION
3.9 ECOLOGICAL THREATS
3.10 CURRENT CONDITIONS
3.11 SITE CONDITIONS
3.12 SITE IMAGES
3.13 EXISTING BUNKERS
3.14 SITE VEGETATION
3.15 ANIMAL MOVEMENT
3.16 OBSERVATION TOWERS
3.17 MALGAS ISLAND
3.18 CAPE GANNET
3.18 CONCLUSION: TOWARDS A DESIGN
3.19 SITE RESPONSE/ DESIGN PRINCIPLES

3.1
CLIENTS AND USERS

The Saldanha Wildlife Preservation and Research Centre's client entity consists of a joint venture between FIVE bodies: The Saldanha Bay Water Quality Forum Trust (SBWQFT), SANParks, Marine bird rehabilitation centers (SANCCOB, SAPREC, APSS), University of Cape Town and Ocean research facilities (VRCA, Ocean Research, and SAAMBR).

The Saldanha Wildlife Preservation and Research Centre serve as a public visitor's centre as well as a space for research, monitoring, and rehabilitation. These 5 bodies work in collaboration to provide education, raise awareness, preserve the natural environment, monitor the ocean, and stabilize Cape Gannets and marine birds. It serves as a facility where researchers can make use of their knowledge and where students can learn.

Other clients consist of animals around the site. The building caters to these species and they are as important as the human clients if not more important. They are handled with care and respect throughout the design process.

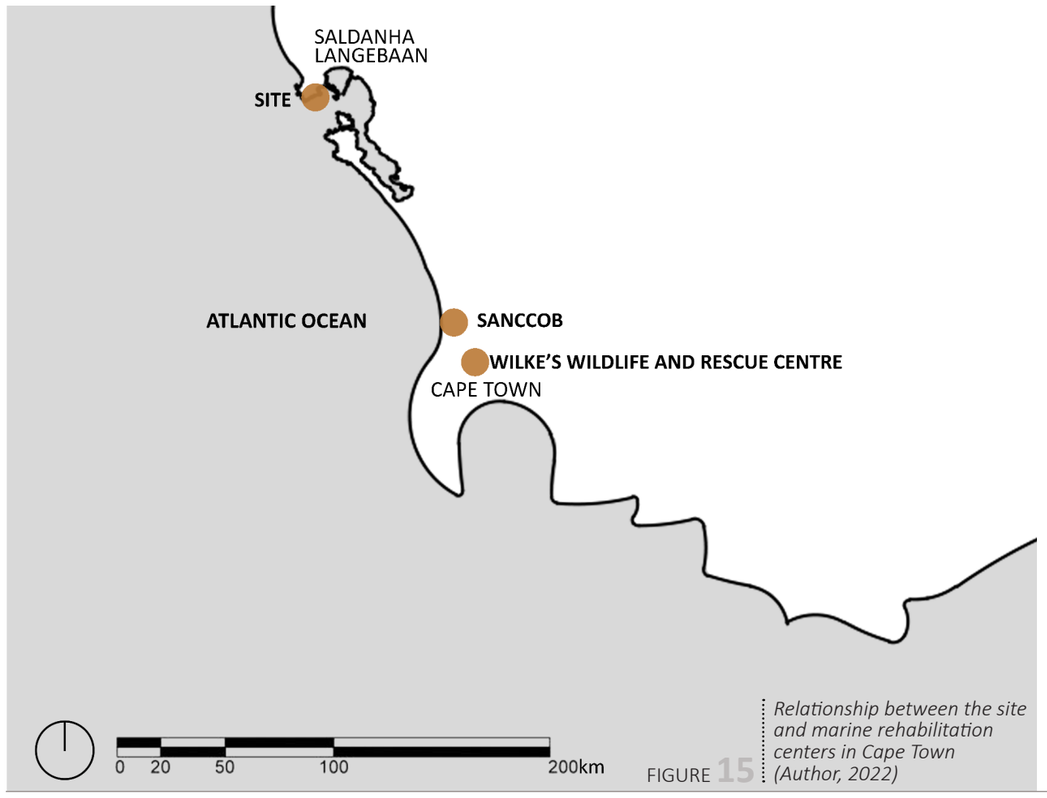


FIGURE 15 *Relationship between the site and marine rehabilitation centers in Cape Town (Author, 2022)*

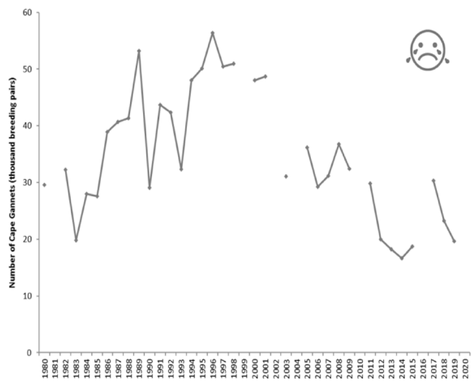


FIGURE 16 *Trends in the breeding population of Cape Gannets at Malgas Island, Saldanha Bay from 1980 – 2014 (Clark et al, 2016)*

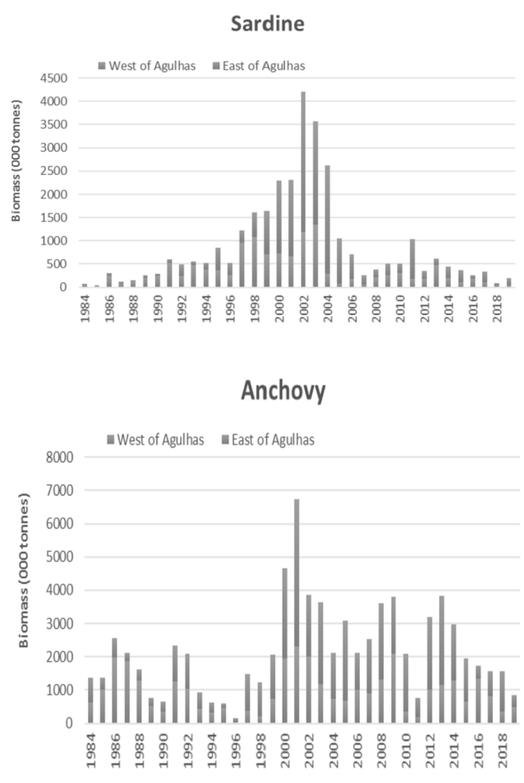


FIGURE 17 *Data collected for monitoring (Clark et al, 2016)*

3.2
LOCAL MANAGEMENT INSTITUTIONS

The Saldanha Bay Water Quality Forum Trust (SBWQFT) produces a "State of Saldanha Bay and Langebaan Lagoon" to report on available data on biological and physical parameters which also includes activities affecting the health of the bay, the water quality, sediment quality, ecological indicators, aquatic macrophytes, benthic macrofauna, fish and birds. The concerns are identified after a monitoring process and further action is taken to improve the existing environmental monitoring program for the area. The trust commissions scientific research and supports sustainable management of the ecosystems in the area. They consist of a voluntary organization, relevant stakeholders, and local industries. (Clark et al, 2016: 2-3)

An Environmental Management Framework (EMF) for Saldanha and Langebaan were introduced by The Department of Environmental Affairs and Development Planning (DEADP) for the conservation and protection of the area. This framework was put in place to prevent further negative impacts on the natural environment. (Clark et al, 2016: vi)

The area has important conservation importance and scientific studies have been conducted in the area for a long time due to its key features and rich marine life.

3.2.1 MONITORING

"Regular, long-term environmental monitoring is essential to identify and to enable proactive mitigation of negative human impacts on the environment (e.g. pollution), and in so doing maintain the beneficial value of an area for all users." (Clark et al, 2016: iii)

The monitoring of the concentration of contaminants is important at an early stage before they pose a major risk to the environment and human health. Pollutants are the main cause of concern and are generated by humans and discharged into the environment. Ways how pollution can be monitored are: through the analysis of pollutant concentrations in the water, in sediments, in living organisms, in pollutant concentrations, and analyzing concentrations of contaminants in the biota. (Clark et al, 2016: 8-9)

3.3

A BRIEF **HISTORY**

The historical background of Saldanha Bay provided me with valuable information about the rich ecosystems, the ecological threats, and where it all started. The following timeline represents the growth of Saldanha Bay as a result of a lack of fresh water in Cape Town and how the rich ecology played a role in the development of the town.

Fast forwards to 1935, a small harbor and military quay were established whereafter human settlement started developing. In 1945, after Word War 2, the town expanded drastically and in 1947 a whaling station was established in Donkergat. (Van der Waag, n.d.)

This was yet again another form of humans misusing the ocean for their own needs. Thousands of whales were killed during that time to sell whale oil.

Saldanha Bay is the largest natural harbor in South Africa and thus this led to many shipping-related developments, all having a drastic impact on the marine ecology and natural environment. As the harbor and iron ore started expanding, Saldanha Steel came into existence, polluting the area with red steel dust still visible in the environment. (Van der Waag, n.d.)

Today, the natural environment is facing a major concern, yet to be uncovered as to how we can reverse the effects. Currently, these ecological threats are causing major disturbances not only to the environment but especially the Cape Gannet.

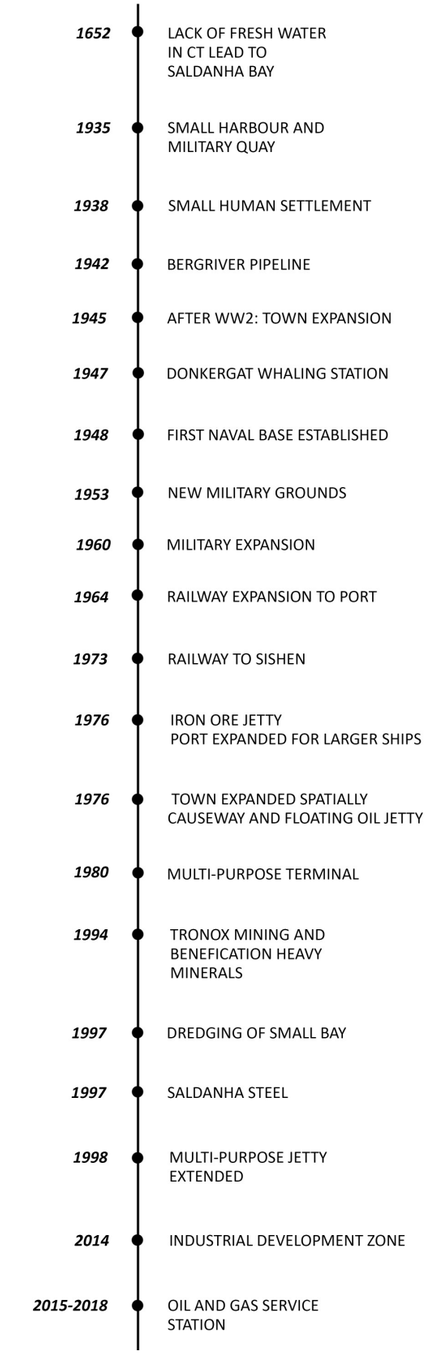


FIGURE 18 *Saldanha historical timeline (Author, 2022)*



FIGURE 19 *The whaling yards at Donkergat (Hilton, 1949)*



FIGURE 20 *Land Locked Harbour and Whaling Station, 63 miles from Cape Town (Hilton, 1949)*

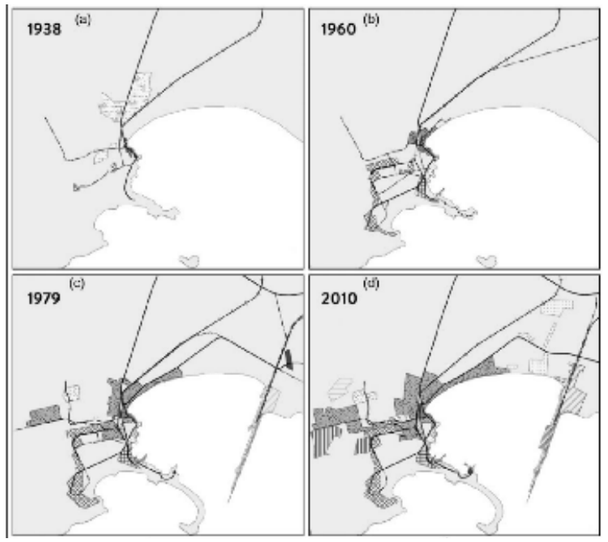


FIGURE 21 *Co-evolution of Saldana Bay town and its port (Welman, L., Lacea, S. and Ferreira, A., 2016)*

3.4
CONTEXT

The site is located in South Africa, 100km from Cape Town. Having such a close relationship with Langebaan and the lagoon, I felt the need to locate the site in an area I was familiar with and where the design could make a difference.

This chapter deals with the topography and investigates elements that influence the design. A macro and micro site analysis was done to look at the bigger area as well as zooming into smaller elements on the site such as the type of animals and vegetation.

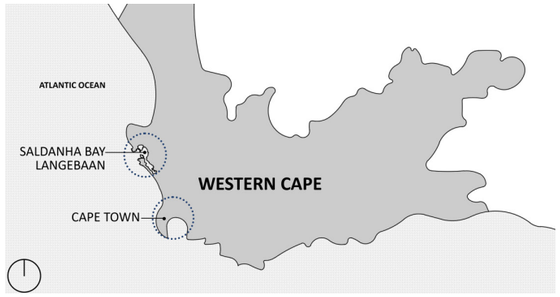


FIGURE 22 *Site location in relation to Cape Town (Author, 2022)*

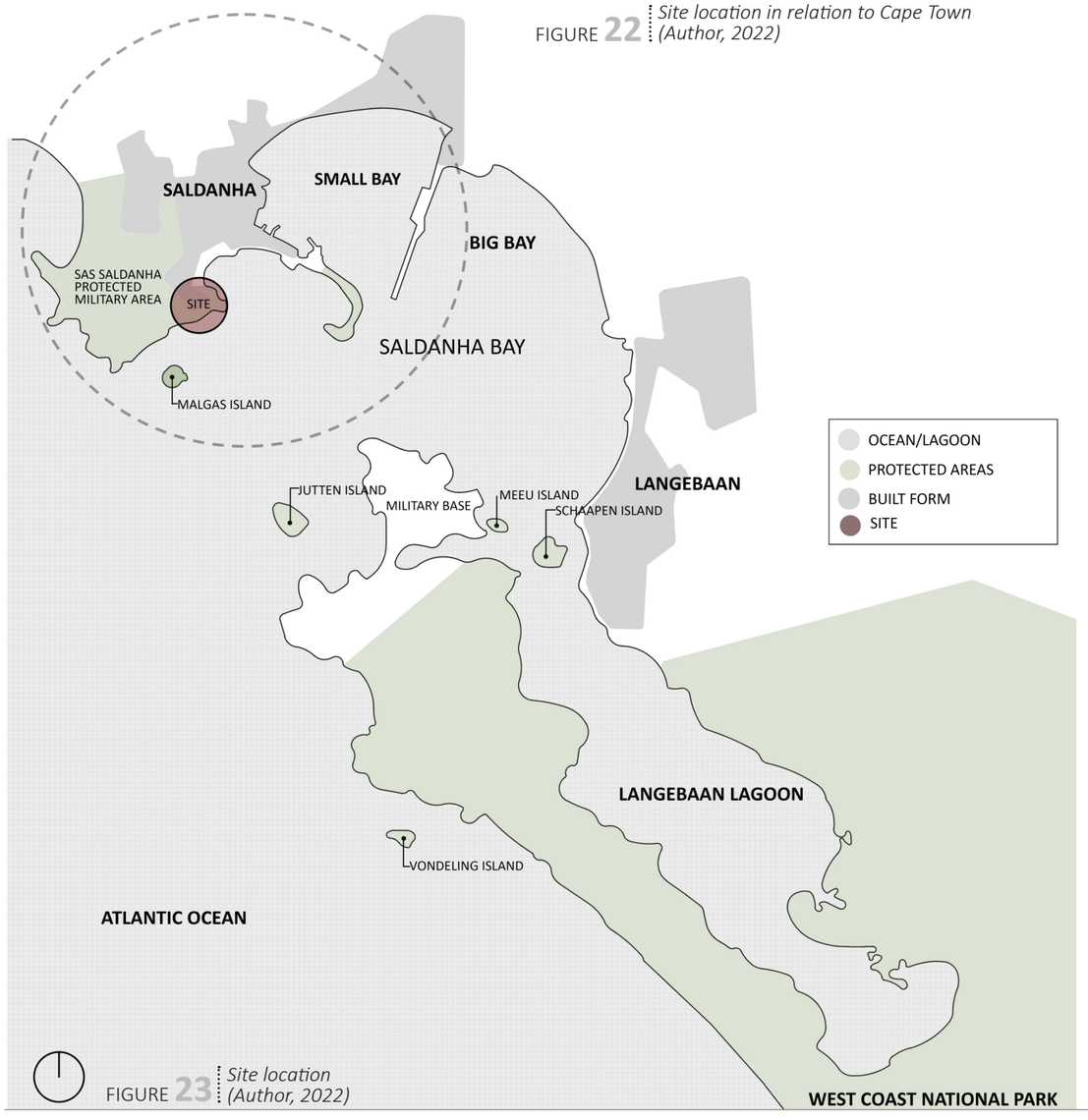
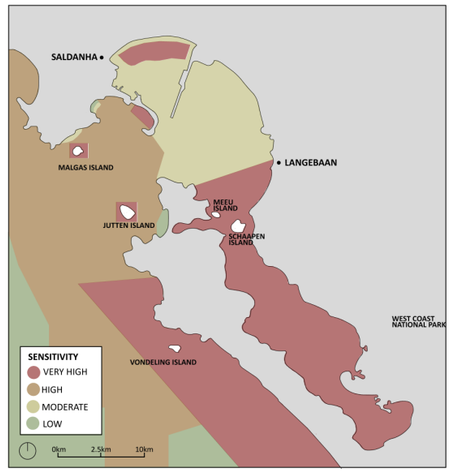
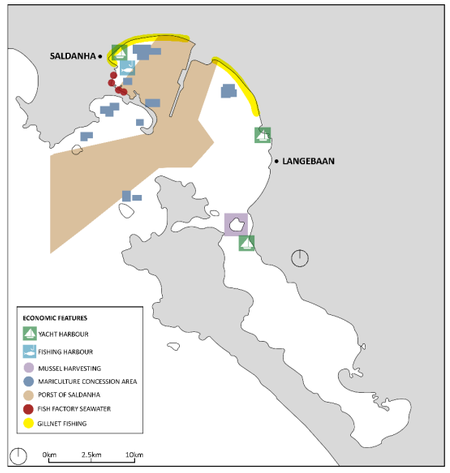


FIGURE 23 *Site location (Author, 2022)*





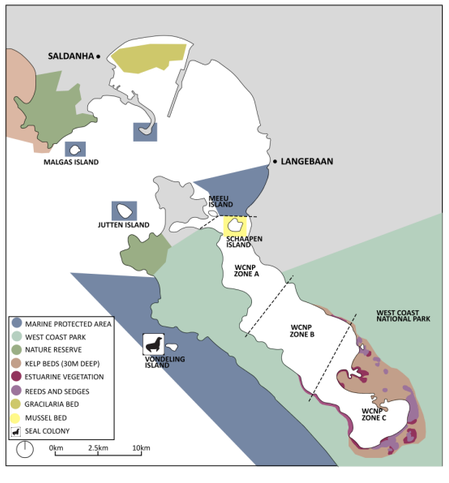


FIGURE 24 *Sensitivity and Activity zones (Author, 2022, based on Chapman et al, 2019)*

3.5
SENSITIVITY ZONES | ACTIVITIES

The top left map is a spatial representation of sensitivity zones in Saldanha and Langebaan. The red is an indication of important marine flora aggregate which include significant breeding, nursery, and feeding sites for marine biota (Chapman et al, 2019). This can also be seen in the area around Malgas island, where a variety of marine species and organisms can be found and they should thus be protected. The site is located in a moderate sensitive area and thus the location of the site and interventions in the ocean would not disturb the marine ecology.

Saldanha and Langebaan are home to thousands of marine species and organisms. The maps show which areas of the lagoon are protected, the activities taking place, and the biodiversity. The Langebaan lagoon is divided into areas where human activities can take place and are fairly well maintained with parts such as the West Coast national park where certain activities are prohibited. Although control measures are put into place in the Langebaan area, the problem shifts towards Saldanha Bay where fewer control measures exist.

3.6
SITE **LOCATION**

Saldanha Bay is close to one of the world's only saltwater lagoons and nestled within a fynbos covered landscape. It is embedded in a sensitive ecosystem and thus it should be handled with great care.

The site is located in the SAS Saldanha nature reserve (Fig.25) and far away from Saldanha Bay town. The nature reserve is overlooked by the Saldanha military academy and is only accessible for leisure purposes(hiking) and maintenance. The area is well maintained and preserved as it was also home to soldiers during WW2. The site sits within a natural bay called the "Outer Bay", which is protected from the wind and waves.

The reason for the location was for the site to be close to Malgas island, the house of the Cape Gannets. As the site is close to the open Atlantic Ocean, it was necessary to choose a site that is protected from harsh winds and rain. Close to the site, there is also an existing jetty, which forms an integral part of the journey to Malgas island for visitors to observe these species.

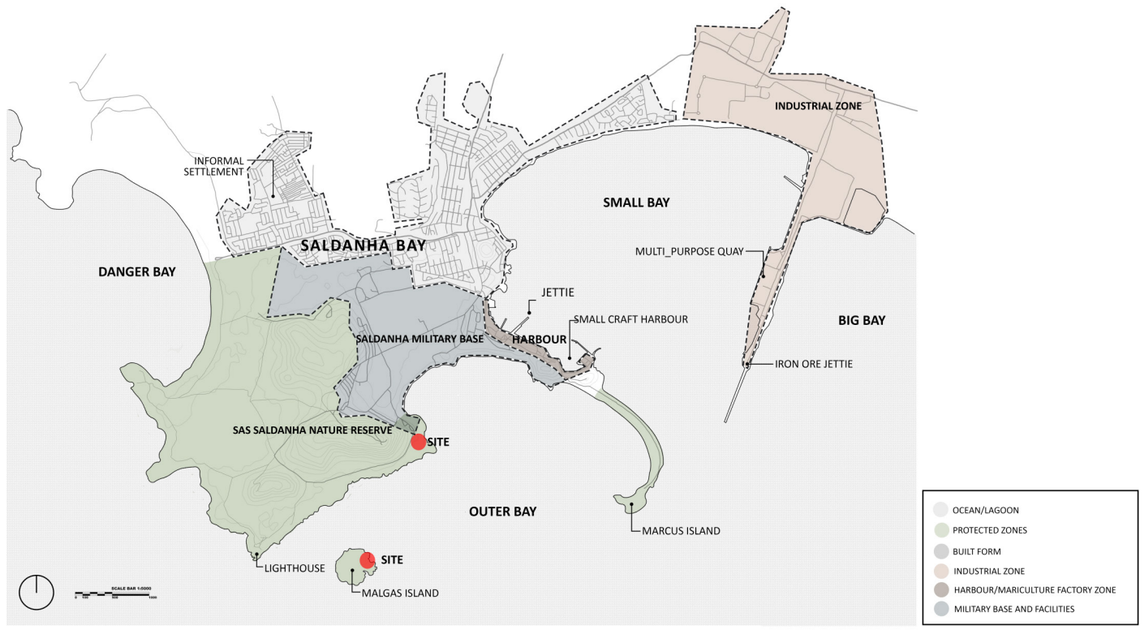


FIGURE 25 *Site Location in relation to Saldanha Bay (Author, 2022)*

3.7
ECONOMIC **ACTIVITY**



FIGURE 26 St Helena Bay (Saldanha Bay Municipality, 2019)



FIGURE 27 Struisbaai Ocean Traditional Fishermen (OCEANS, n.d.)



FIGURE 28 *The Saldanha Bay Industrial Development Zone (HOME FRONT, 2019)*

Saldanha consists of different zones such as an industrial area, the town itself, the military academy, and the national park (Fig.25). The dominant economic sector is the manufacturing industry, making up 32.9% of the economic circle. (Demacon, 2016:vi)

Saldanha bay had revolved around the ocean and its rich fishing communities span thousands of years ago. The ritual of fishing has been carried through the years and men would go out fishing all day long to bring fresh fish to the dinner table. (Knight and Tobias, 2019)

Job opportunities are created with the rise of the Saldanha Wildlife Preservation and Research Centre. The residents know the area very well and have been living in Saldanha for many generations. The fishing season for recreational fishing on the west coast is from mid-November till mid-April and thus allows the fishermen to partake in activities in and around the building to share their knowledge and experiences as they know the ocean of Saldanha by heart. Jobs are also created for the fishermen to pilot the research and visitor boats to Malgas island.

3.8

SITE **LOCATION**

The site location is approximately 1.2km from Malgas island, which makes it a sufficient distance for the visitors to experience the journey via boat to view the Cape Gannets and other marine species.



FIGURE 29 *Focus area of the site and Malgas Island (Author, 2022)*

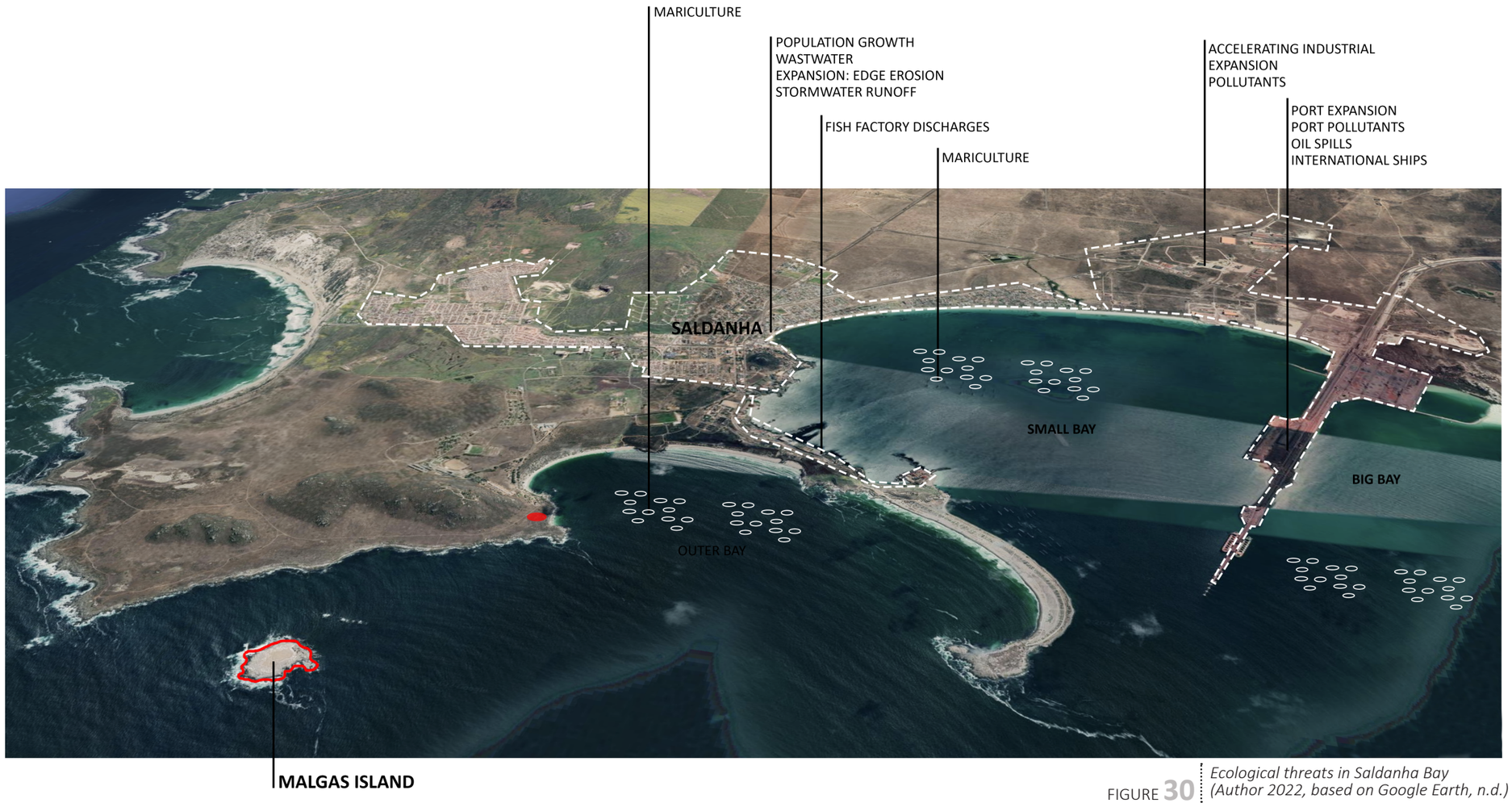


FIGURE 30 *Ecological threats in Saldanha Bay (Author 2022, based on Google Earth, n.d.)*

3.9
ECOLOGICAL **THREATS**

Pollutants are the main cause of concern. They are generated by humans and discharged into the environment. The increase in mariculture activities in the bay has caused concern for these fishermen who are opposing an approved plan for developing floating fish factories in the area where they catch their daily fish. These factories in the water are causing a disturbance and degradation of protected marine areas containing vulnerable species and taking up local fishing space. The bay is responsible for up to 50% of marine aquaculture in South Africa. (Knight and Tobias, 2019)

The lagoon houses several vulnerable species and thousands of diverse seabirds. The locals are afraid that fish farms would cause the rich ecosystem to fall apart due to fish and food waste on the lagoon floor and the growth of dangerous algae (Knight and Tobias, 2019).

Developments such as the extension of the port, the establishment of 3 craft harbors, mariculture farms, and processing factories cause anthropogenic pollutants and waste to be found in the bay. Another form of pollutant is contaminated stormwater run-off via multiple stormwater drains and tarred surfaces. Wastewater from fish industries into the water is also causing major disturbances. (Clark et al, 2016: v) . All these pollutants and unethical activities are causing a decline in the Cape Gannet population.

The site sits in proximity to the elements causing a disturbance to the ecosystems. Knowing what problems exist within Saldanha and Langebaan and what their effects are, allowed the design to respond to these by providing sufficient support and enhancing existing ecosystems around the site. Throughout the process, a sensitive approach was taken in the design process to protect as much fauna and flora as possible.

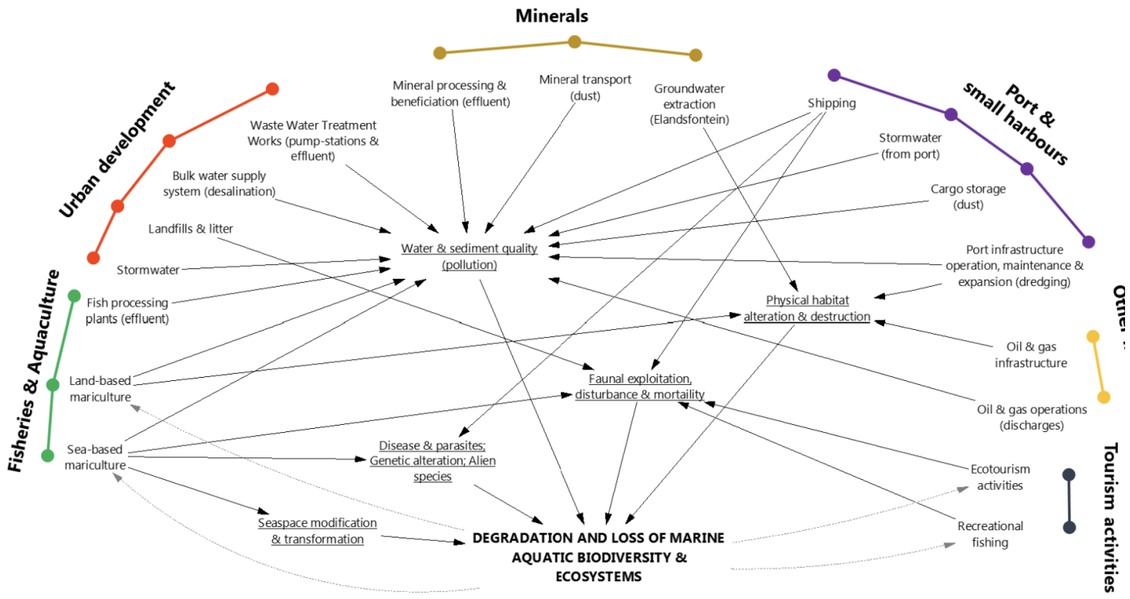


FIGURE 31 *Peacock diagram for the degradation and loss of marine aquatic biodiversity and ecosystems (Chapman et al, 2019)*



FIGURE 32 *Ecological threats in Saldanha Bay collage (Author, 2022)*



FIGURE 33 *Cape Gannet announced Bird of the Year for 2022 (Froneman, 2021)*

3.10
CURRENT **CONDITIONS**



FIGURE 34 *Pollution of Saldanha Bay by particulate iron carried by stormwater runoff (Kotze, 2014)*



FIGURE 35 *Investigation of a green substance which was noticeable in the entire bay – Saldanha side (Clark, n.d.)*



FIGURE 36 *The environmentally compromised site of the now mothballed Saldanha Steel plant, 14.5km from the Boulders wind farm (Peter & Beverly Pickford Wildlife Photography, 2020)*

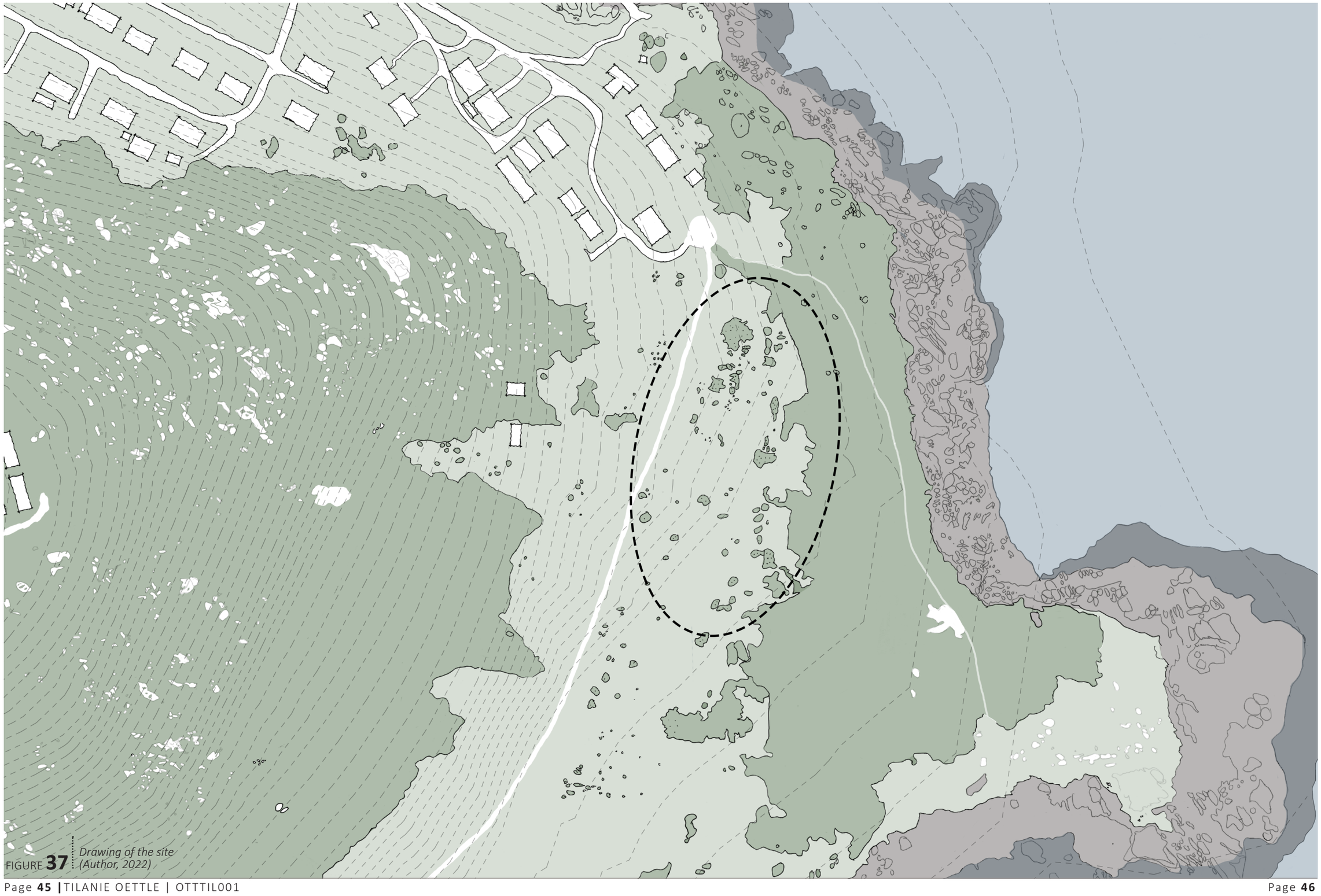


FIGURE **37** *Drawing of the site (Author, 2022)*

3.11
SITE CONDITIONS

Experiencing the site in person was a valuable way of knowing what the conditions were like, what kind of animals there were, the water conditions, and the views. The experience was something phenomenal and it made me realize how fortunate I was to be placing the design in this location. I felt the need for people to experience this landscape in real life. It made me realize how sensitive the area was and that the building should enhance the ecological system rather than disturb it.

I started documenting the area, the vegetation, the animals I saw, and where everything was located. Views all around the site allowed me to frame elements within the surroundings such as Malgas island, being the most important element. The existing hiking routes acted as anchoring points that could be extended from the design to the observation towers, thus enhancing the user's experience of the landscape

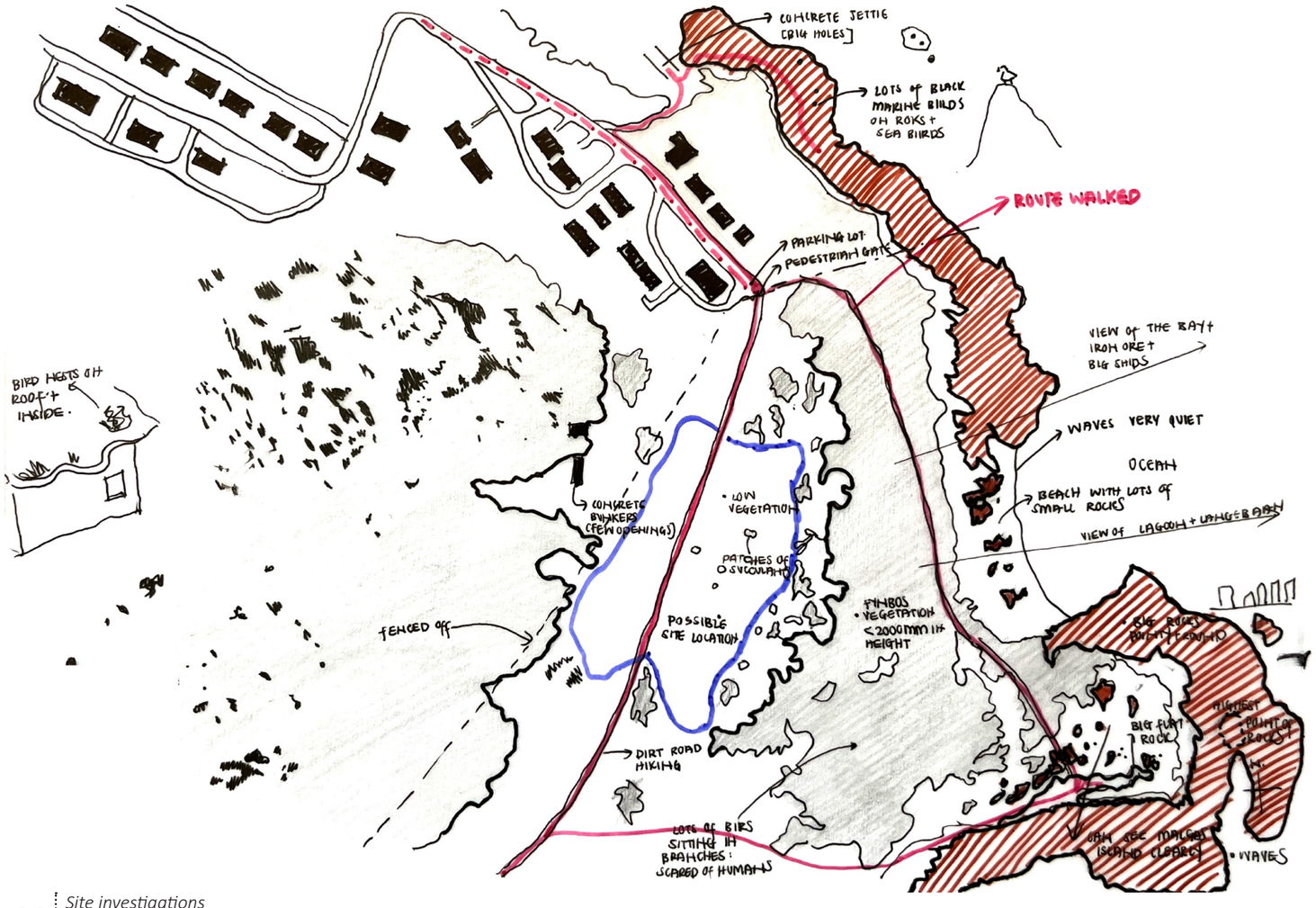


FIGURE 38 *Site investigations (Author, 2022)*

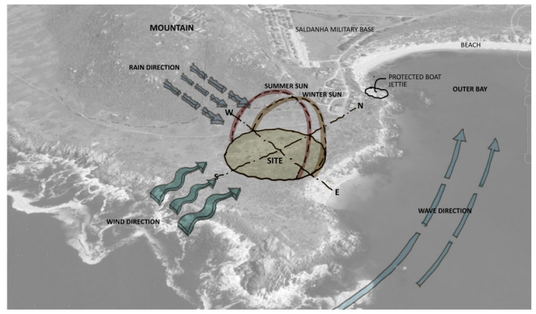


FIGURE 39 *Site weather conditions (Author, 2022)*

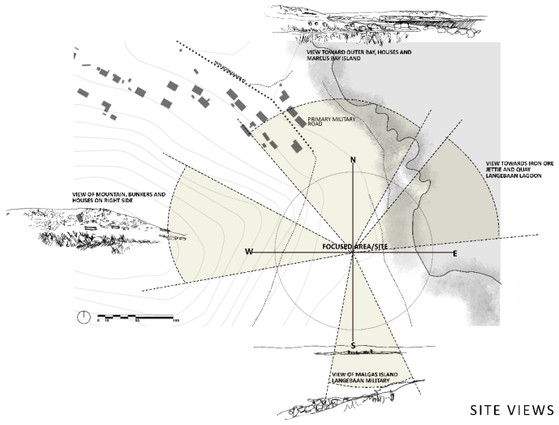


FIGURE 40 *Site viewing opportunities (Author, 2022)*

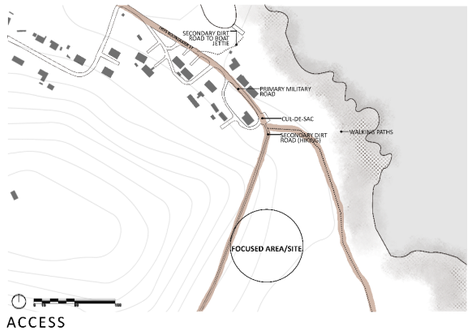


FIGURE 41 *Site access routes (Author, 2022)*

3.12
SITE IMAGES



FIGURE 42 *View from jetty location of the bay (Author, 2022)*



FIGURE 43 *Malgas Island in the distance (Author, 2022)*



FIGURE 44 *Existing concrete jetty close to site (Author, 2022)*



FIGURE 45 *View of Marcus Island extension (Author, 2022)*



FIGURE 46 *Inside a concrete bunker (Author, 2022)*



FIGURE 47 *View from hiking route (Author, 2022)*

3.13
EXISTING **BUNKERS**

The existing concrete bunkers in the nature reserve date back to World War 2 whereafter Saldanha Bay assumed great importance. The area was a perfect spot to observe submarines entering the bay, for protection and defense. (Saldanha Nature & History, 2015)

Today, the concrete bunkers are visible all over the nature reserve, hiding behind the vegetation, and blending in with its surrounding. Some are in a great state and some are inhabited by birds. These bunkers gained great importance in the design dissertation, and they are used as a metaphor for the design. The concept of the concrete bunkers will be elaborated on at a later stage.

Also on the site, there are multiple informal dirt roads, which are only accessible by the military for patrol and maintenance of the lighthouse. Secondary informal routes are established for hiking purposes, and they are also important as the existing routes are utilized for routes to the observation towers.

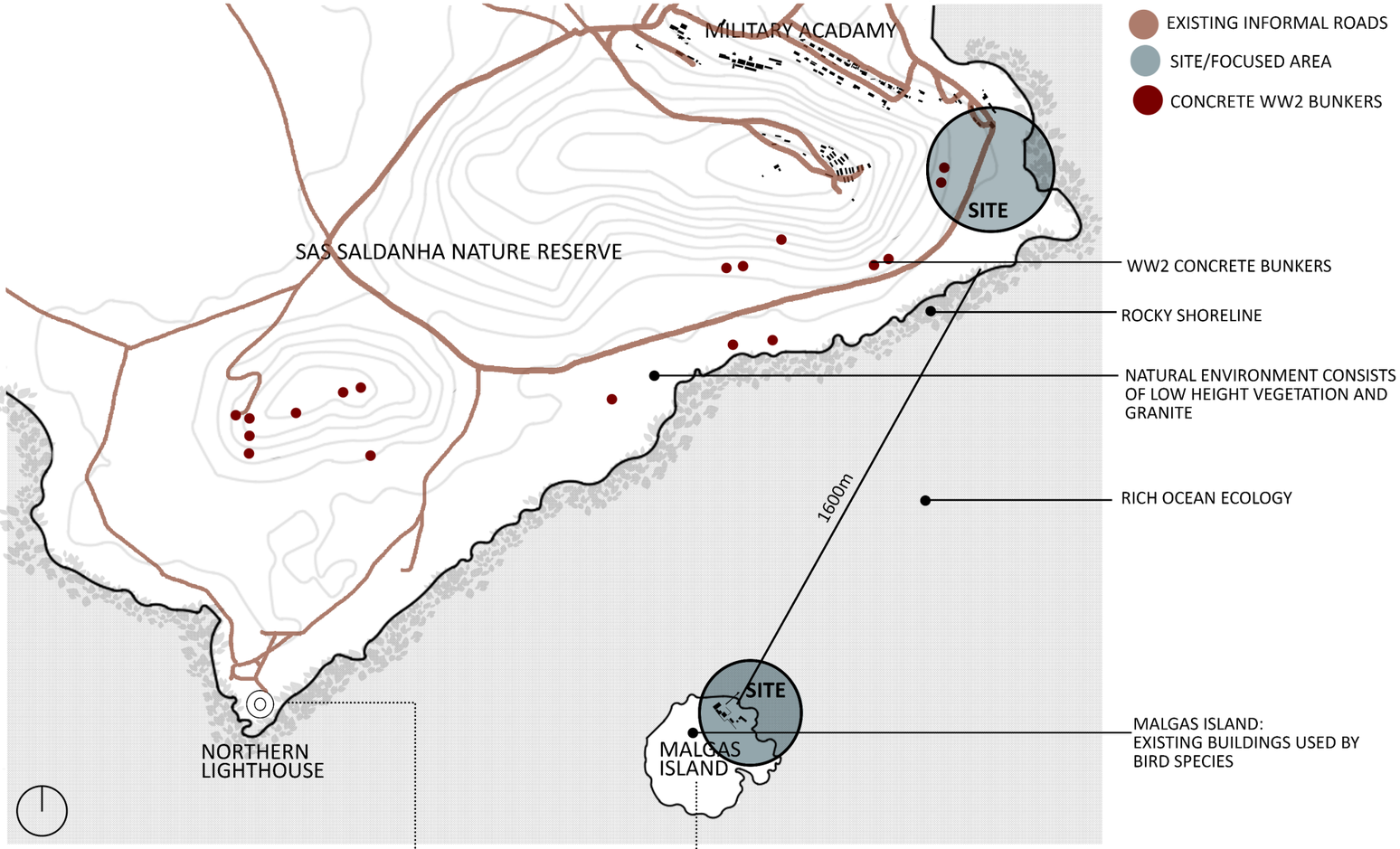




FIGURE 48 *Existing concrete bunker (Author, 2022)*



FIGURE 49 *Two concrete bunkers close to the site (Author, 2022)*



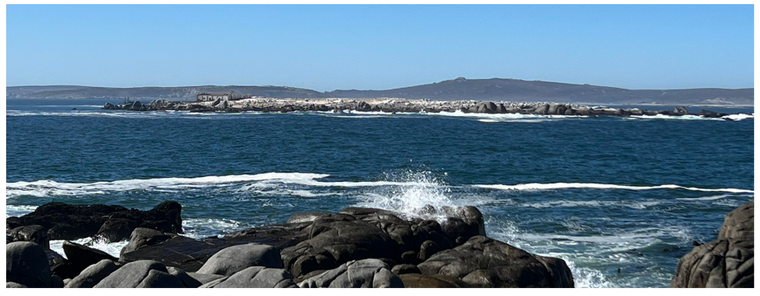


FIGURE 50 *Existing elements around the site (Author, 2022)*

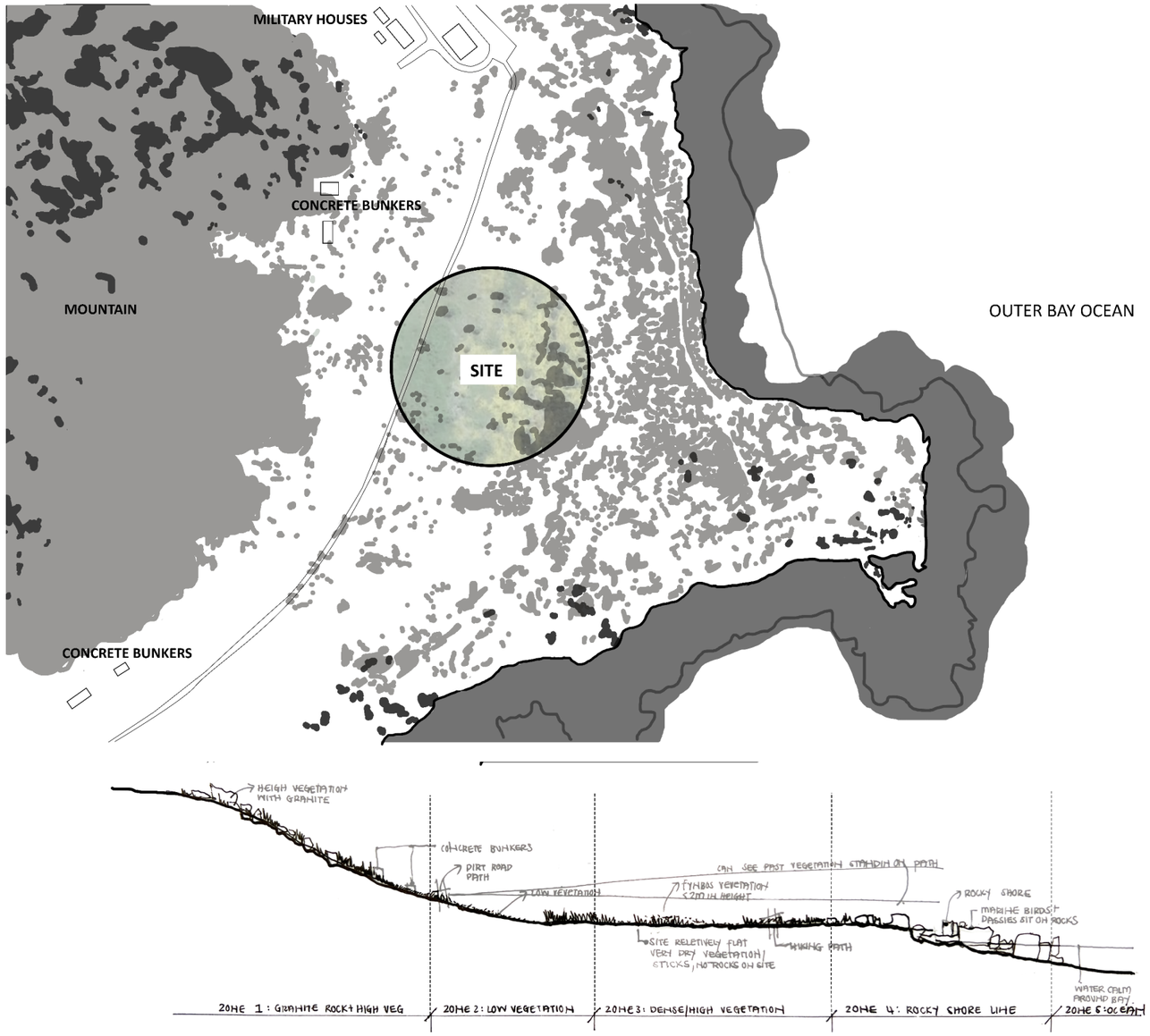


FIGURE 51 *Vegetation (Author, 2022)*

3.14
SITE **VEGETATION**

The SAS nature reserve has a rich diversity of fauna and flora which results in there being a lot of animal habitats hiding in the vegetation. The majority of the area is covered in Fynbos and in the spring months, it is covered in colorful yellow, white and pink flowers.

The dense vegetation in front of the site houses several animal habitats for birds, mammals, and insects as well as a source of food for a variety of animal species. The density of the vegetation and the type of vegetation around the site have a direct relationship with the type of animals that roam in the area. As one gets closer to the mountain, the vegetation is about 2m in height, and granite peaks out of the bushes. The location of the site does not interfere with the dense vegetation but is rather situated in a dry area (Fig. 51). This allowed for the building to be used by animals for shelter, food, and water in an area where there is a lack of these



FIGURE 52 *Images of flower in area (Author, 2022)*



FIGURE 53 *Dry vs green vegetation on the site (Author, 2022)*

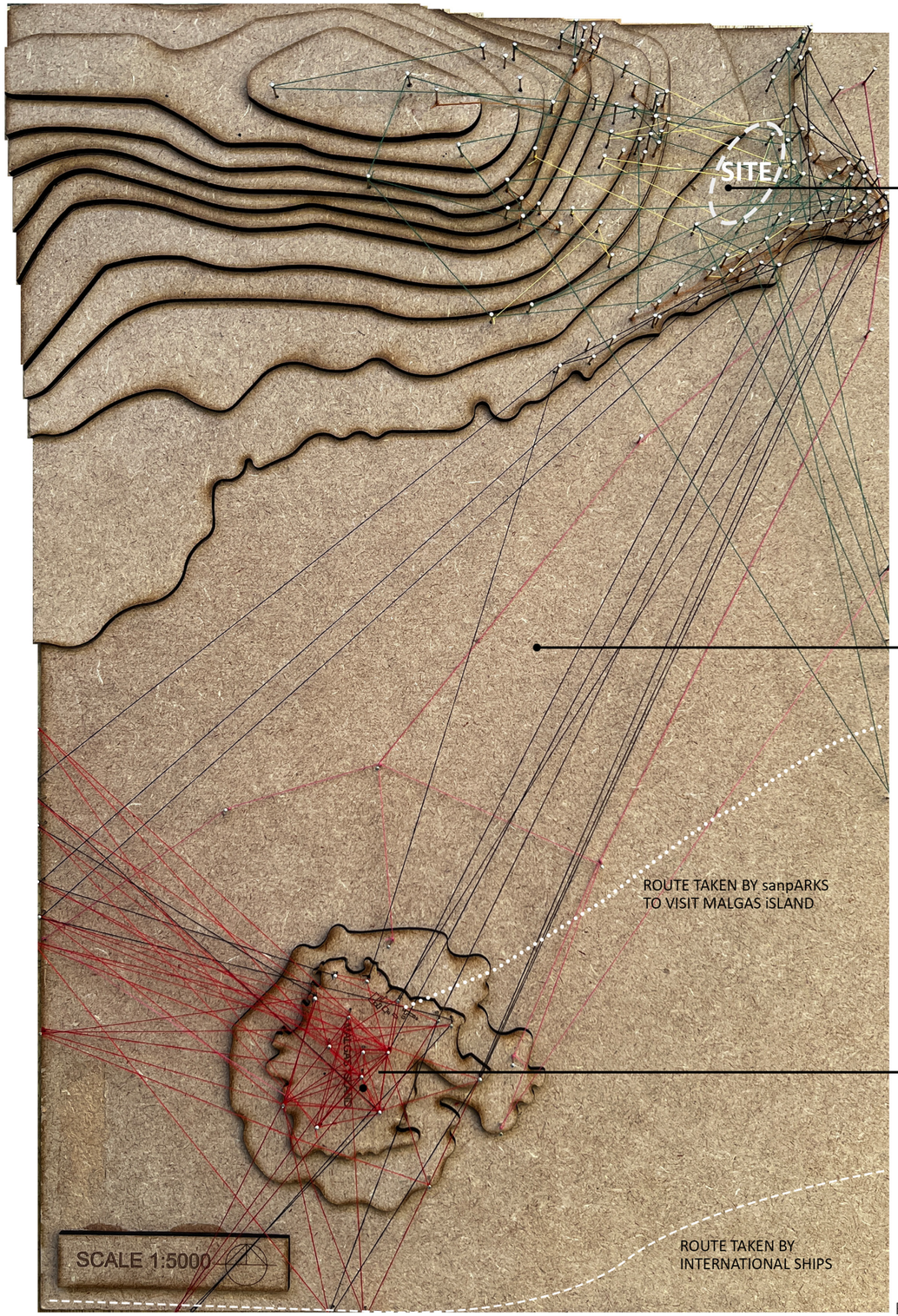


FIGURE 54 *Animal movement mapping (Author, 2022)*

3.15
ANIMAL MOVEMENT

As a result of the site being in a preserved area, it was necessary to investigate the types of animals as well as their movement pattern for the building and interventions to least interfere with these systems. To achieve this, spending sufficient time on site was crucial to observe the behavior and movement of species. Being on site, together with research helped me to identify the animals in the area during the day and the animals appearing at night.

The majority of the movement mapping was done on animals such as bucks, land birds, dassies, marine birds, Gape Gannets, and marine mammals. Knowing what habitats the animals prefer and their prey choice, I could also start mapping it. A movement pattern model was made to identify dense movement zones and to establish the areas of conflict. The observation towers were positioned to allow visitors the opportunity to observe multiple species during daytime and nighttime.

As animals do not move in a straight line, it was difficult to be accurate in the mapping, but it provided valuable results which justify where the observation facilities should be placed.

3.16
OBSERVATION TOWERS

The observation towers are designed to observe all these different kinds of species and make the user aware of the ecology in the area and provide educational background about these species. Multiple observation towers are placed in areas that allow for viewing opportunities and to observe the animals moving past.

The denseness of animals has a lot to do with the type of vegetation in the area. Where there is dense vegetation, there are a variety of animal species, and where the area is dry, there are not many animal habitats, thus not many animals. Birds use the thick bushes as habitats for nests resulting in the design weaving through this vegetation rather than removing it. By placing the building in an area with less vegetation and bushes, animal habitats could be provided through the design to enhance this space.

The height of the movement determined the height of the building as well as the height of the observation towers. Placing the observation towers on the same levels as birds allow for another opportunity to see these species during their flight.

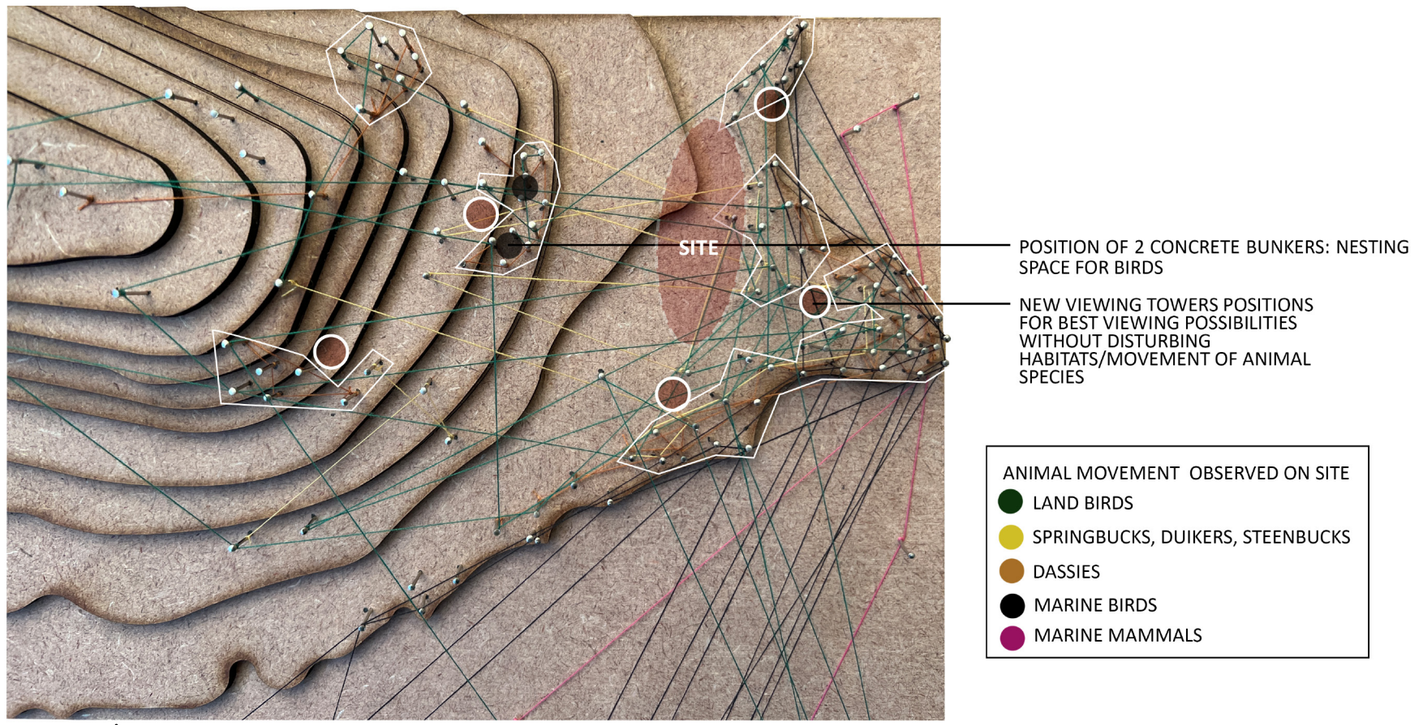


FIGURE 56 *Mapping of viewing towers (Author, 2022)*

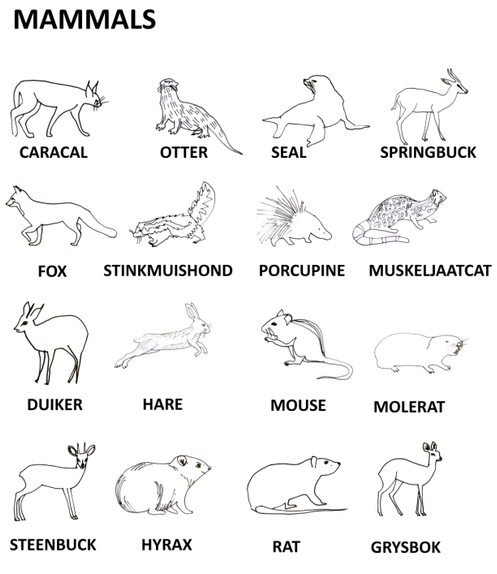


FIGURE 55 *Types of wildlife in the area (Author, 2022)*

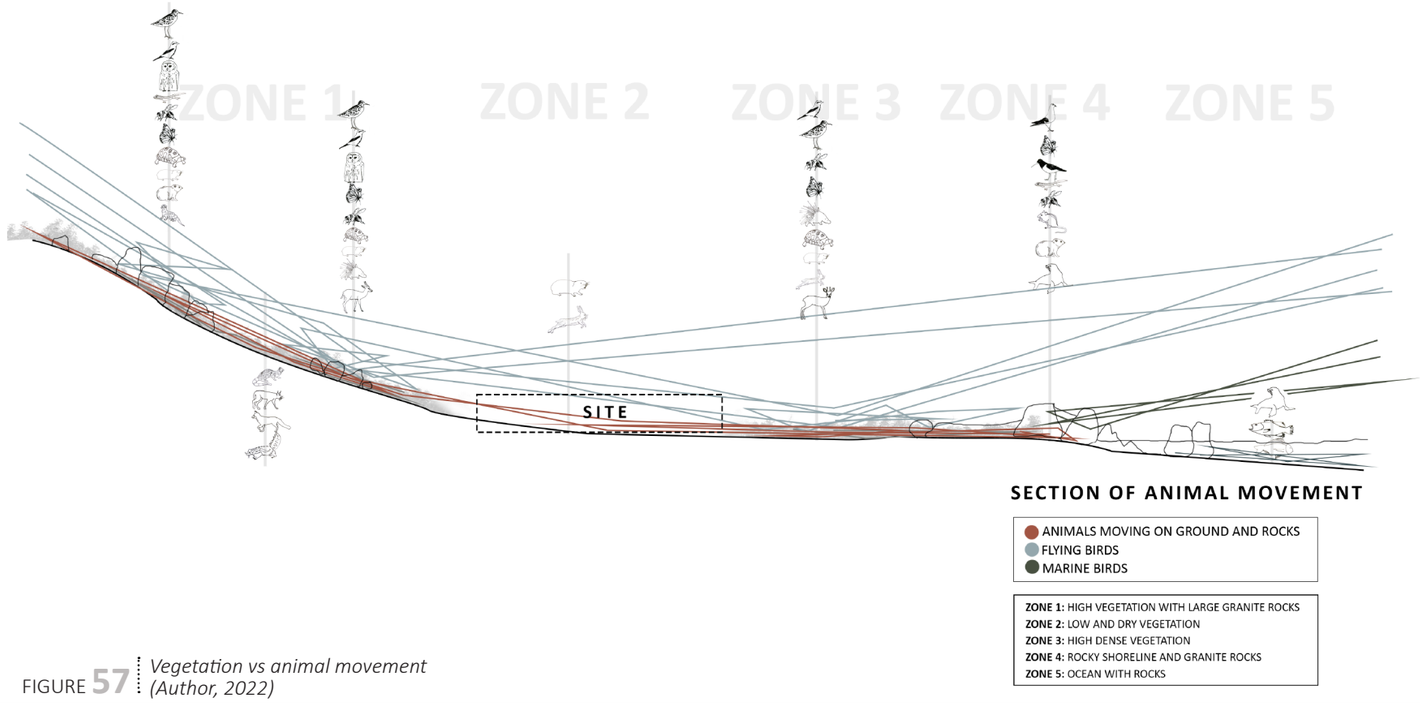


FIGURE 57 *Vegetation vs animal movement (Author, 2022)*

3.17

MALGAS ISLAND

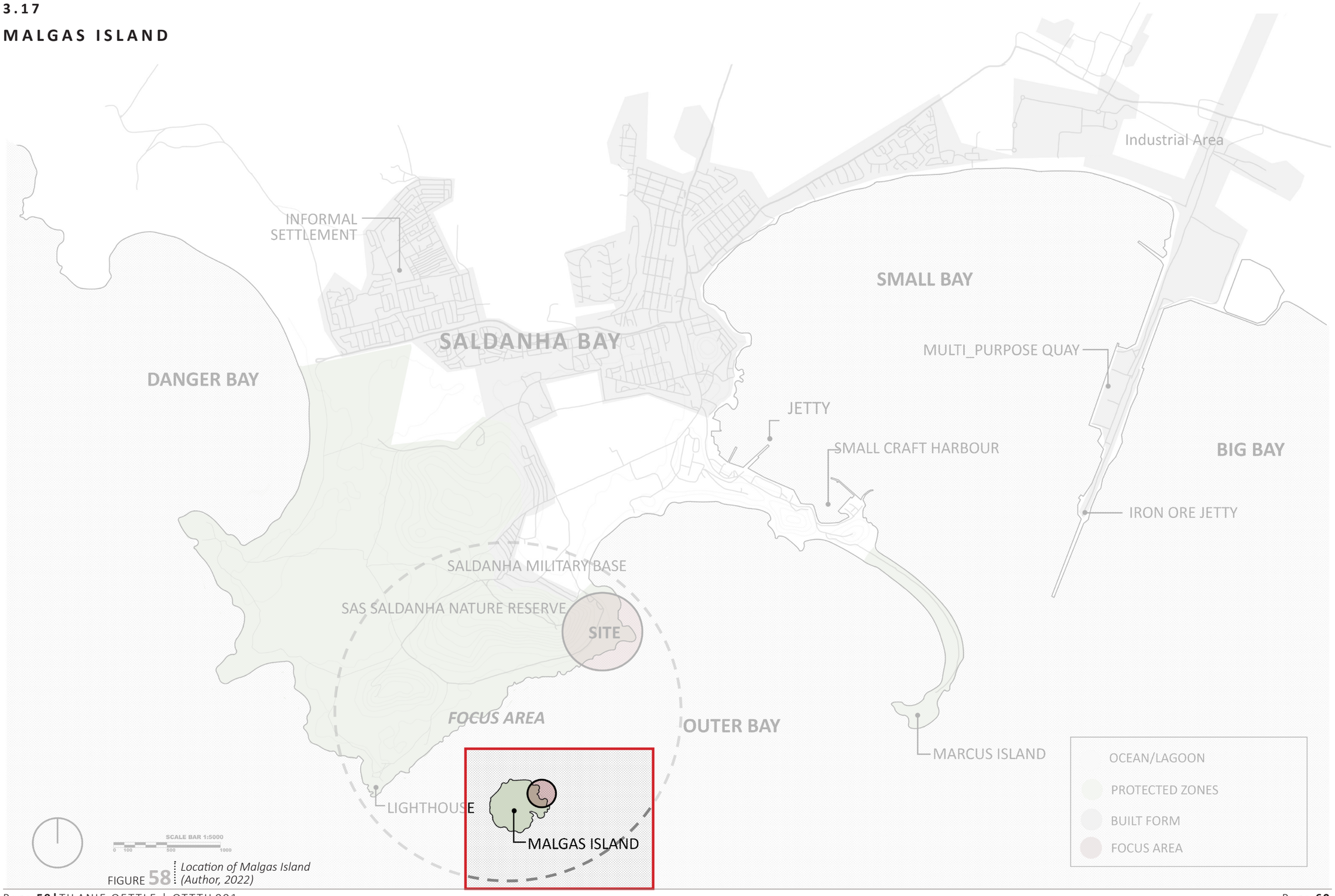


FIGURE 58 *Location of Malgas Island (Author, 2022)*

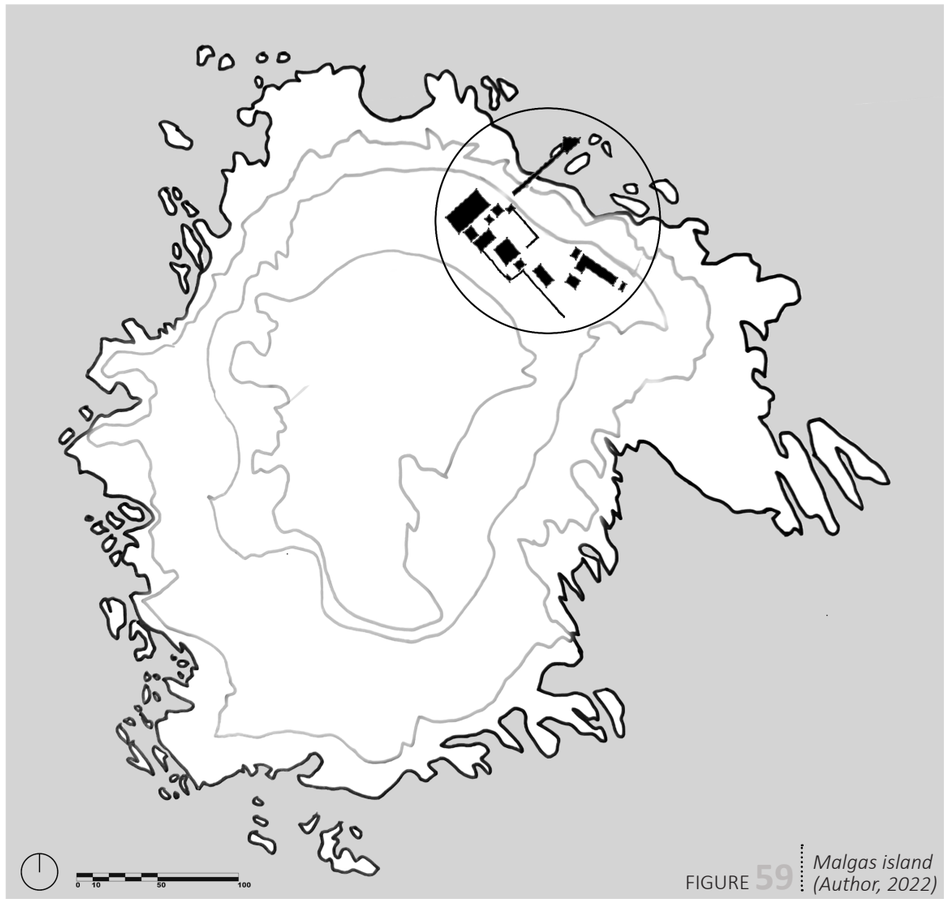
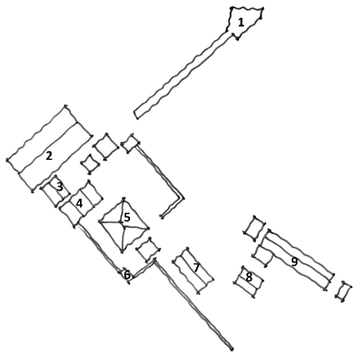


FIGURE 59 *Malgas island (Author, 2022)*



1. Existing timber Jettie for access to Malgas Island
2. Warehouse (abandoned)
3. Storage (abandoned)
4. Living unit (abandoned)
5. Current research and accommodation
6. Observation
7. Living unit (abandoned)
8. Kitchen (abandoned)
9. Warehouse (abandoned)

The buildings on Malgas island were constructed during the times when guano was collected and were built for the workers. Currently, they are inhabited by marine birds and only one building is used by researchers but is not in a liveable state. A variety of marine birds live on Malgas island. (Stephen, 2018)

Figure 60 shows a movement route and foraging range of the Cape Gannets, meaning that these species are not found close to the site, thus a visual connection is obtained on the main site and visitors also have the opportunity to visit Malgas island.

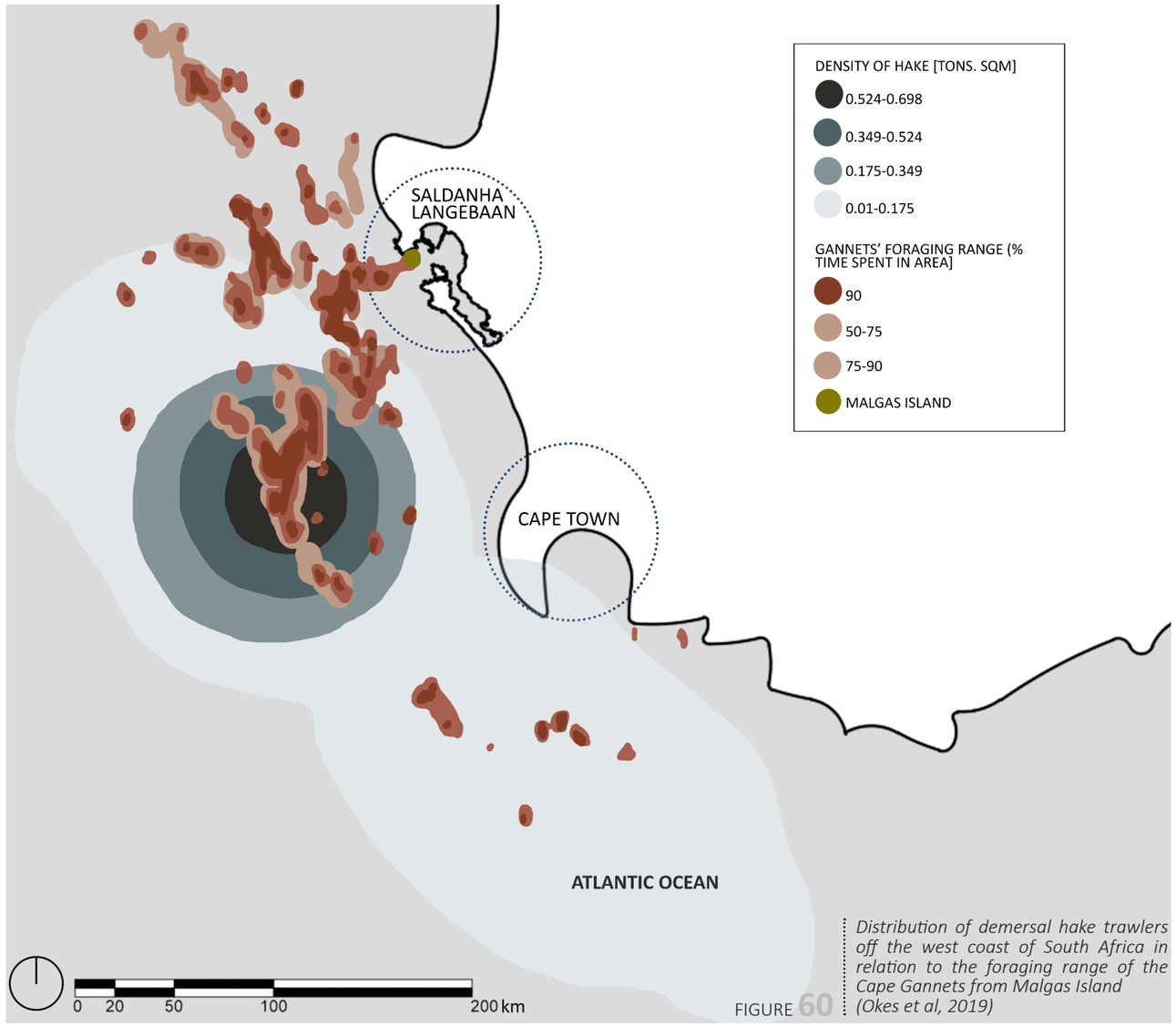
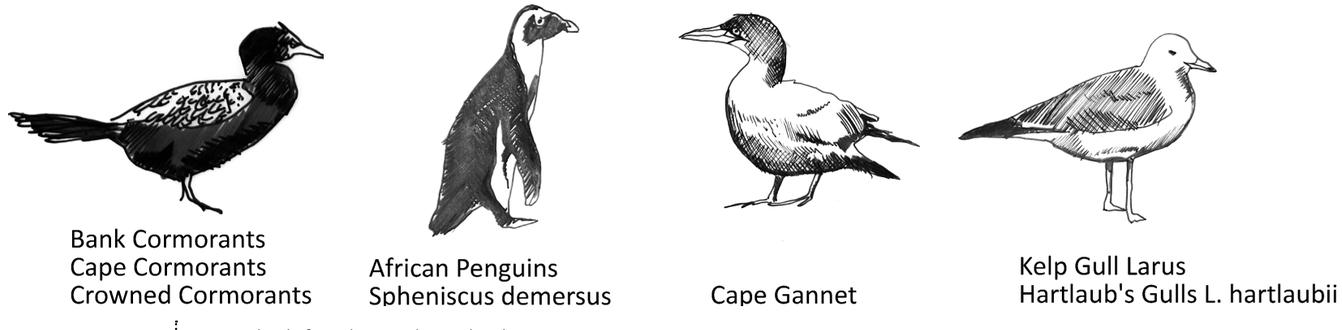


FIGURE 60 *Distribution of demersal hake trawlers off the west coast of South Africa in relation to the foraging range of the Cape Gannets from Malgas Island (Okes et al, 2019)*



Bank Cormorants
Cape Cormorants
Crowned Cormorants

African Penguins
Spheniscus demersus

Cape Gannet

Kelp Gull Larus
Hartlaub's Gulls L. hartlaubii

FIGURE 61 *Marine birds found on Malgas Island (Author, 2022)*



FIGURE 62 Cape Gannet (SA-V, n.d.)



FIGURE 63 *Cape Gannets on Malgas Island (Chadwick, n.d.)*

3.18
CAPE GANNET

Birds live for 6-15 years and are valuable in monitoring environmental and long-term changes. These species are susceptible to disturbances by pollution, infrastructure development, and the availability of food supplies. The five islands in the area of Saldanha and Langebaan provide an extensive number of habitats for marine birds. (Clark et al, 2016: 245)

The Cape Gannet is a marine bird found on the coast of Africa and breeds on 6 islands including Malgas Island. Due to the population decline, they are currently classified as vulnerable and placed on the IUCN's global Red Data List. They are non-migratory and breed in large colonies on the islands. (Clark et al, 2016: 252)

The reason for the declining number of the Cape Gannet can be traced to food shortages of sardines and anchovy, oil spills from the ships, disease outbreaks, getting tangled into fishing gear thus drowning or starving, getting caught as bycatch, and predation (Strydom, 2022). One of the strategies of the design is to make locals and tourists aware of these species and why they are classified as vulnerable as well as what we can do to help save them. A sensitive approach is taken toward these species and the design does not interfere with their habitat or movement routes.

The second design phase focuses on adapting one of the buildings for researchers to stay in during their visit and for research purposes. A sensitive approach will be taken, bringing visitors to Malgas island and only a few will be allowed at once. Visitors will be kept at a safe distance from species and are not allowed outside the viewing spots. Weekly swells will make the Malgas island inaccessible for anyone to approach it, thus there will be cameras placed on the island to observe the Cape Gannets from the main site.

3.19
CONCLUSION
TOWARDS A **DESIGN**

I believe that in the Anthropocene of today we cannot reverse the effects of human actions on the environment, but we could find possible solutions to lessen the disturbance to the environment. The world will never be the same and no effect could be reversed but architecture could potentially help to slow down the rate of destruction even if it is through a design that spreads awareness and provides education.

After researching what harms the marine ecology and the natural environment in Saldanha Bay, I asked myself the question: How can the new intervention assist the existing ecology and essentially reverse the effects of the Cape Gannets going extinct in the future? The answer was through monitoring the environment and Cape Gannets, assessments, research, public awareness, environmental education, and enhancing the existing land and marine ecologies. This led to a brief and program for the site resulting in a wildlife preservation and research center.

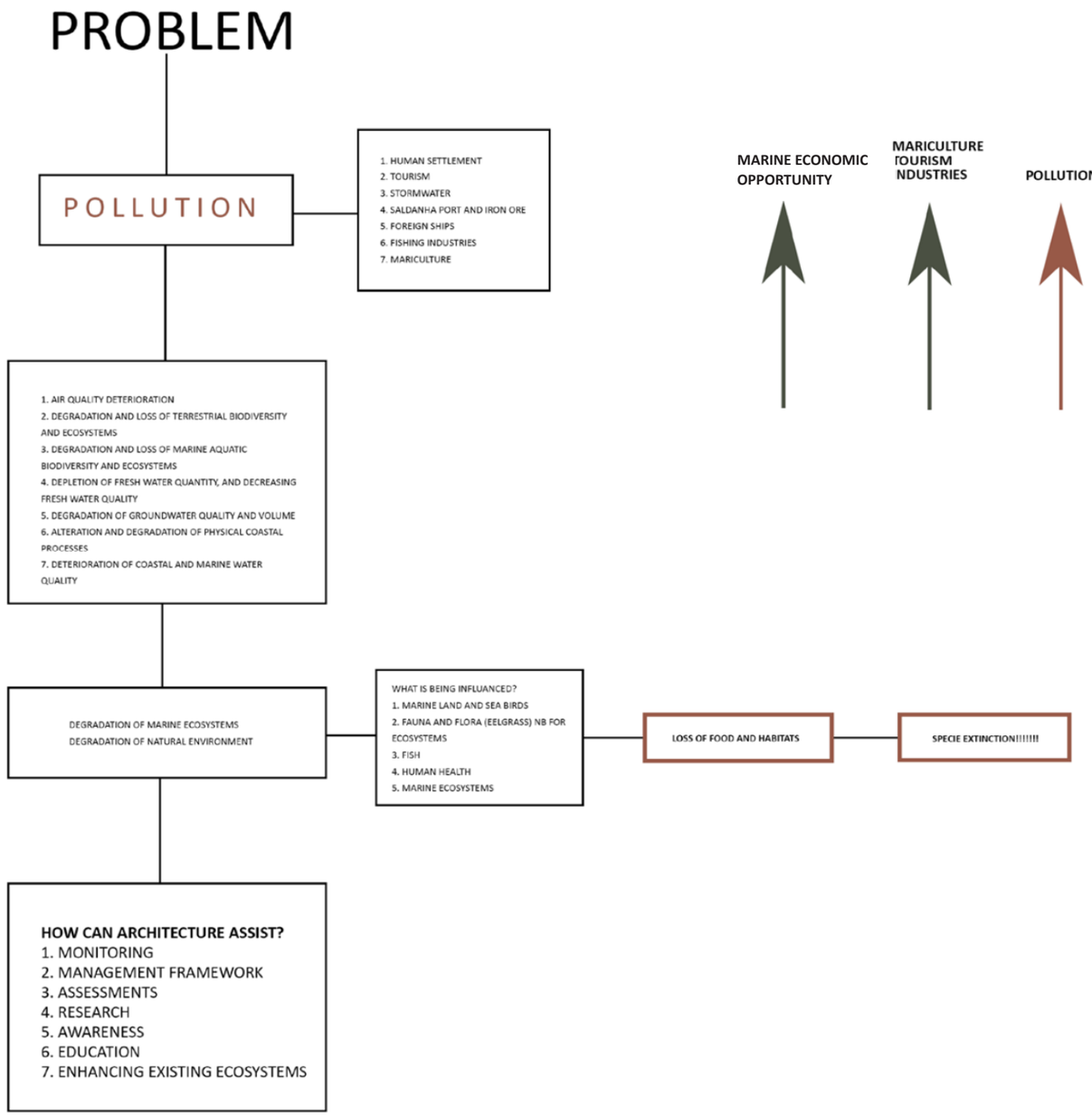


FIGURE 64 *Towards a design (Author, 2022)*

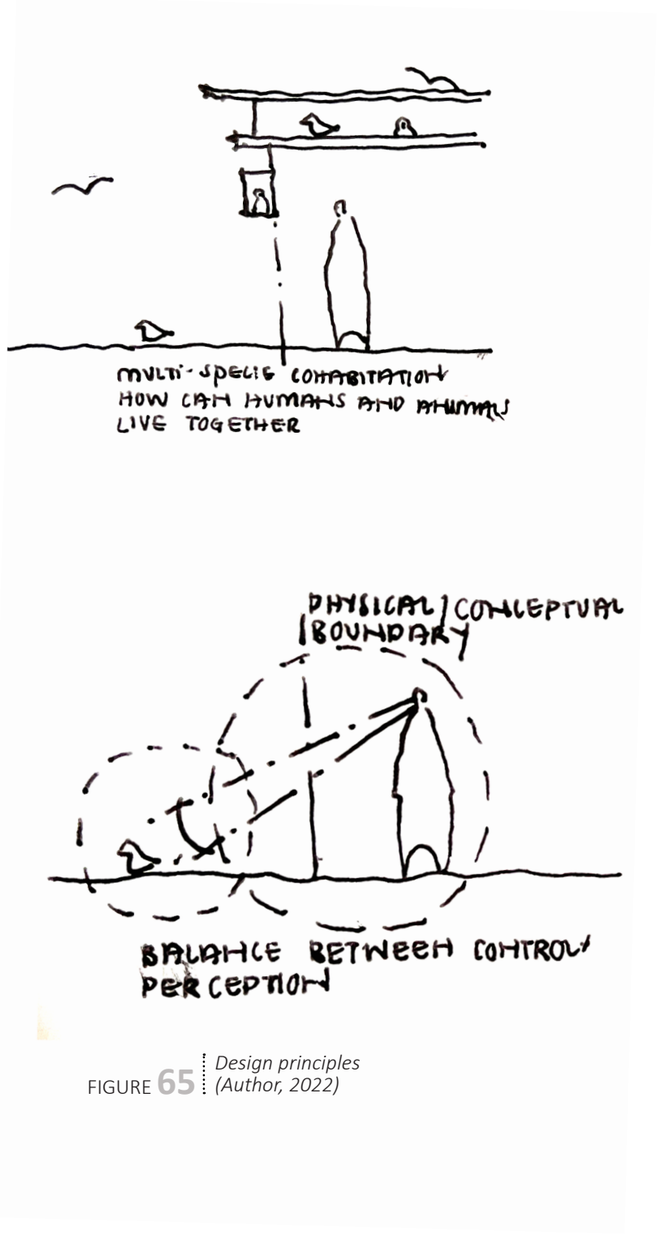


FIGURE 65 *Design principles (Author, 2022)*

3.20
SITE **RESPONSE**
DESIGN **PRINCIPLES**

The following site responses were established which formed a seed for the building to grow from:

1. Having a sensitive approach to the site was a key goal. The building should prove that it enhances/improves the existing ecosystems. By knowing the type of species in the area, I could use the **multi-species cohabitation approach** to create habitat spaces for them within the envelope of the building. This is proven to prevent ongoing biodiversity losses.

2. The building should allow for a **co-existence** between humans and animals. The design acts as a mediator between these two. Through the use of a control and perception technique, one can understand the relationship between these elements. The site and the building start to co-exist and a poetic exploration of the landscape would be a key goal.

3. The building should **blend in** with its landscape and be a metaphor for a bunker/bird hide. The building should be an extension of the landscape as if a nature blanket was thrown over the design. The sharp distinction between the building and the landscape becomes blurred.

4. **Awareness** is a crucial aspect and through research, it is proven that awareness and environmental education can be the key to environmental literacy thus forming a response towards progressing to an Ecocentric world model.

PART 04

4.1 DESIGN BRIEF
4.2 ACCOMMODATION SCHEDULE
4.3 THE WESTEN VISITORS CENTRE
4.4 GUTMAN VISITORS CENTRE
4.5 WELL-LLOC WINERY
4.6 ROOM REQUIREMENTS

4.1
DESIGN BRIEF

The program is consists of four departments:

1. Public facilities
The dissertation focuses on making individuals aware of the threat to Cape Gannets and the ecological issues in the area and thus it was necessary to provide facilities that could assist in environmental education and awareness.

2. Ocean monitoring, research, and testing
The monitoring of the ocean plays a vital part which is correlated to its health. Thus, continuous monitoring should take place to know what the state of the waters is and how progress should take place. Sample testing is done often where the marine biota are tested to know the state of the ocean. Through this, they can make further decisions and assessments.

3. Offices and meeting rooms for the Trust and clients
Offices are provided for the Trust where all meetings will happen as they form a key role player in the health of the ocean and communicate the state to the different sectors. They have to make sure that the local ecology is not influenced in any negative way and keeps rules in place.

4. Preservation facilities for marine birds
Preservation in terms of the Cape Gannet is also important and this is done through research, monitoring, and stabilization of injured Cape Gannets and marine birds before they are taken to a rehabilitation center such as SANCCOB in Cape Town.

During an interview with Zanri Strydom (PhD candidate, Nature Conservation Nelson Mandela University, Seabird researcher and seabird rehabilitation), she mentioned that there is a need for a stabilization overnight facility for Cape Gannets before they get transported to SANCCOB to be further rehabilitated. It was mentioned that some birds are rescued from Malgas island late in the evening when there is a lack of transportation to SANCCOB and thus such a facility will be beneficial until the birds are transported to get further treatment. The researchers will visit the island from August to April and visit the island once every 9 months or once every breeding season. (Strydom, 2022)

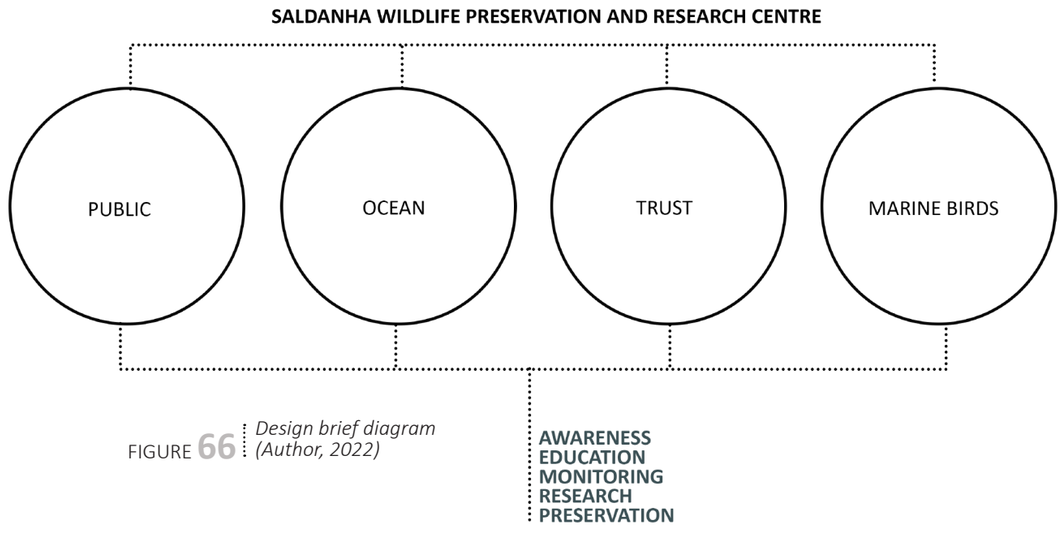


FIGURE 66 *Design brief diagram (Author, 2022)*

4.2 ACCOMMODATION

Public functions
Foyer 206.2 sqm
Shop/Information 88 sqm
Cafe 97.9 sqm
Kitchen 25.3 sqm
Exhibition 122.2
Educational classroom 98.7
Classroom storage 20 sqm
Unisex Bathrooms 25 sqm
Interpretation 60 sqm
Main viewing 174.4 sqm
Camera room 36.2 sqm
Viewing space 103 sqm
South viewing space 61.2
Amphitheatre 201 sqm

General
Female bathrooms 16.7 sqm
Male bathrooms 18.4 sqm
Disabled bathroom 6.9 sqm
Reception 30 sqm
Technical room/storage 15.2 sqm
Circulation/ outside space 989.2 sqm
Boat Storage/
Equipment storage 20 sqm
Waste 9 sqm

The Saldanha Bay Water Quality Forum Trust (SBWQFT)
Main office 7.8 sqm
Meeting room 13 sqm
Storage 7 sqm
Kitchen/Lounge/Office 54.5 sqm
Bathroom 7 sqm

Ocean Monitoring
Sample testing room/research 16.3 sqm
Monitoring and data capture 5.4 sqm
Storage 4.3 sqm
Kitchen/Lounge 19.7 sqm
Bathroom 7 sqm

Stabilization facility for Marine Birds
ICU Room 30 sqm
Quarantine room+ storage 15.5 sqm
Oiled birds room+ storage 15.5 sqm
Outside area with netting 87 sqm
Storage 7.5 sqm

Cape Gannet Research Facility
Research lab 22.1 sqm
Computer room 8 sqm
Bathrooms 7 sqm
Storage 8 sqm
Kitchen/Lounge 31.6 sqm

Accommodation for Researchers and students
3 Bedrooms 29.3 sqm
Lounge/Kitchen 41.2 sqm
Bathroom 5 sqm
Storage 2.4 sqm
Outside deck 26.3 sqm

4.3
THE WESTEN VISITORS CENTRE

The Westen visitor's centre had a similar approach towards the landscape as the approach I wanted the design to take and that is to blend in with the surroundings. The building emerges from the landscape of the Yorkshire Sculpture Park in England and its functions include a gallery, interpretation space, restaurant, and shop. (Pintos, 2019)

The building sits low in its landscape due to the weather conditions and this formed an excellent example of protection. This was an idea I had from the beginning of the design: to set the building into the ground. The building has a contrast between solid and transparent walls. The solid wall at the entrance creates curiosity when the visitor is drawn into the centre and when you reach the center, panoramic views start to greet you through the transparent windows with warm, light wood frames. The curved facade holds and frames the landscape in front of it. (Pintos, 2019)

1. SOLID VS TRANSPARENT
2. CURVED SHAPE
3. HIDDEN IN THE LANDSCAPE
4. PROGRAMME







FIGURE 67 *The Westen Visitors Centre (Cook, 2019)*



FIGURE 68 *Section through The Westen Visitors Centre (Author, 2022, based on FEILDEN FOWLES, N.D.)*

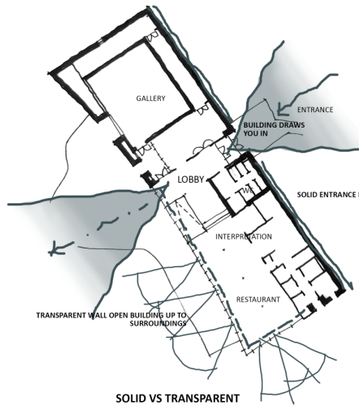


FIGURE 69 *The Westen Visitors Cenetre floorplan showing solid vs transparent (Author, 2022 based on FEILDEN FOWLES, N.D.)*

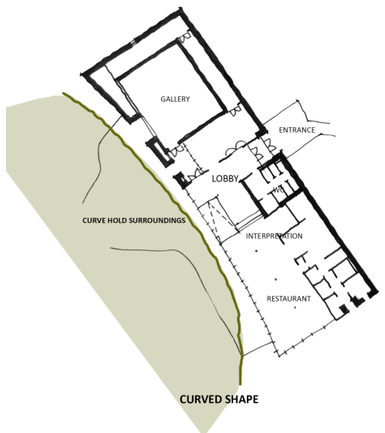


FIGURE 70 *The Westen Visitors Centre floorplan showing curved facade (Author, 2022 based on FEILDEN FOWLES, N.D.)*

4.4
GUTMAN VISITORS CENTRE

The Gutman visitor's centre uses a multi-species cohabitation approach to allow for animal habitats on the envelope and roof. The building was designed as an extension of the Jerusalem Bird Observatory and the concept of urban nature was tested through the design. (ArchDaily, 2011)

The building is also set into the ground and its rock construction allows the building to blend in with its surroundings. (ArchDaily, 2011)

It is a valuable example of how an animal approach can be used on any scale building as small as this one. The building respects its landscape and inhabitants. The rock construction, being aesthetically pleasing, gave me an idea to also incorporate granite into the design, as the site sits in a granite rich area.

1. SENSITIVE APPROACH TO LANDSCAPE
2. ANIMAL HABITAT SPACES
3. SET INTO GROUND
4. MATERIALITY
5. SIMPLICITY







FIGURE 71 *Gutman Visitor Center at the Jerusalem Bird Observatory / Weinstein Vaadia Architects (Balaban, 2011)*

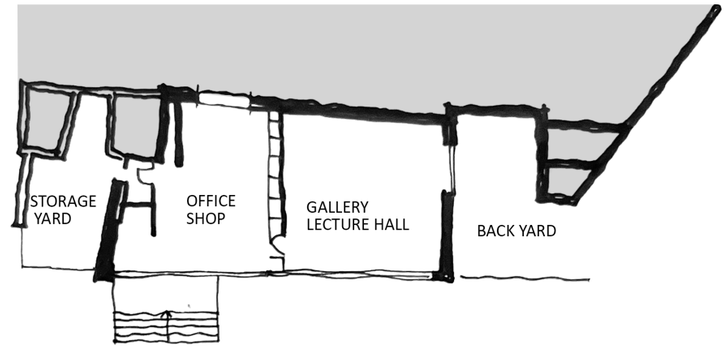


FIGURE 72 *Gutman Visitors centre floorplan*
Author, 2022, based on Weinstein Vaadia Architects, 2011)

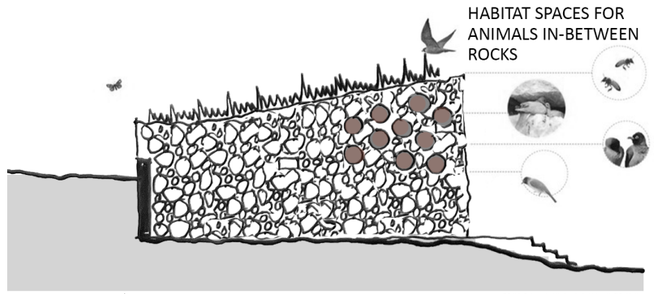


FIGURE 73 *Habitats on elevation*
Author, 2022, based on Weinstein Vaadia Architects, 2011)

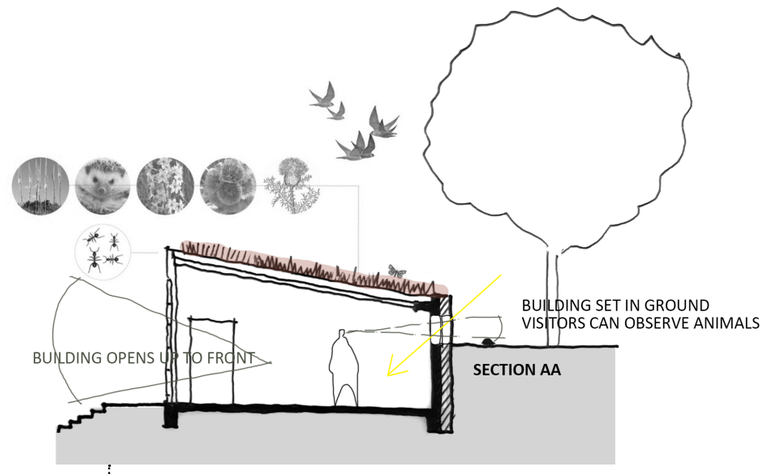


FIGURE 74 *Gutman Visitors centre section showing vegetated roof for animals*
Author, 2022, based on Weinstein Vaadia Architects, 2011)

4.5
BELL-LLOC WINERY

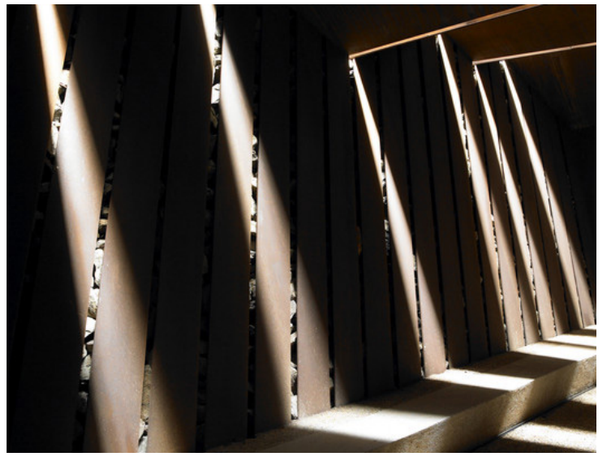
The Bell-lloc winery was used as a precedent for its relationship with the ground and the route through the building, allowing the visitor to experience not only the wine but feel part of the earth. (Bell-lloc Winery / RCR Arquitectes, 2014)

The walkway takes the visitor underground on a journey to the different parts of the design. The building is not a single site but a form of walkway to discover many different elements. (Bell-lloc Winery / RCR Arquitectes, 2014)

This precedent was found very valuable as I wanted to create a form of experience for the visitor where they could experience the landscape through the building on their journey to Malgas island. As the precedent is set into the ground, it forces your attention to a deeper level where you feel connected to the ground and its weight.

1. JOURNEY/ROUTE
2. SETTING INTO GROUND
3. POETIC EXPERIENCE
4. RELATIONSHIP WITH THE GROUND





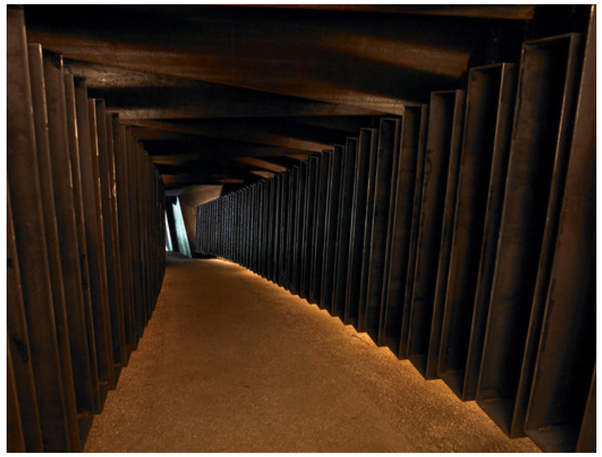


FIGURE 75 *Bell-lloc Winery / RCR Arquitectes (Pons, 2014)*

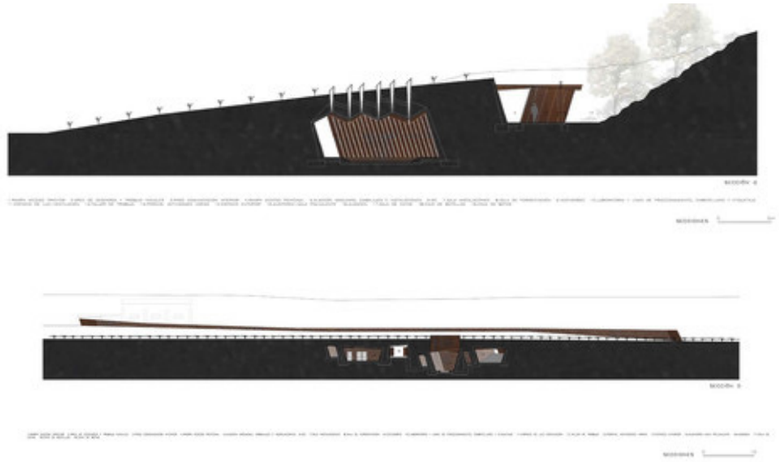


FIGURE 76 *Bell-lloc Winery / RCR Arquitectes sections* (Bell-lloc Winery / RCR Arquitectess, 2014)

FIGURE 77 *Bell-lloc Winery / RCR Arquitectes Floorplan* (Bell-lloc Winery / RCR Arquitectes, 2014)

4.6
ROOM REQUIREMENTS

STABILISATION FACILITIES FOR MARINE BIRDS

1. Quarantine room
- birds showing symptoms of Avian Influenza

2. Room for oiled birds

3. ICU room
- for severely hydrated or malnourished birds needing a drip

4. Outside area
- an outside area with shade netting for large numbers of abandoned Cape Gannet chicks

-All rooms required different pens on the ground story
- one-sided glass window in the rehabilitation facility to observe the Cape Gannets
-visitors should stay 30-50m away from the colony if they visit the island

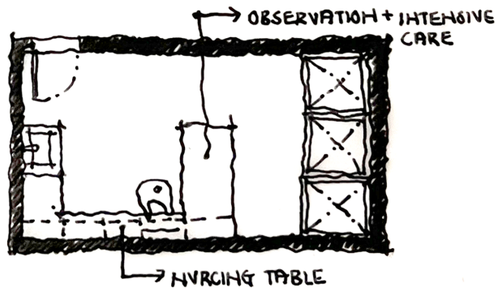
Information gathered in an interview with Zanri Strydom (PhD candidate, Nature Conservation Nelson Mandela University, Seabird researcher and seabird rehabilitator), 2022

RESEARCH FACILITY FOR CAPE GANNETS

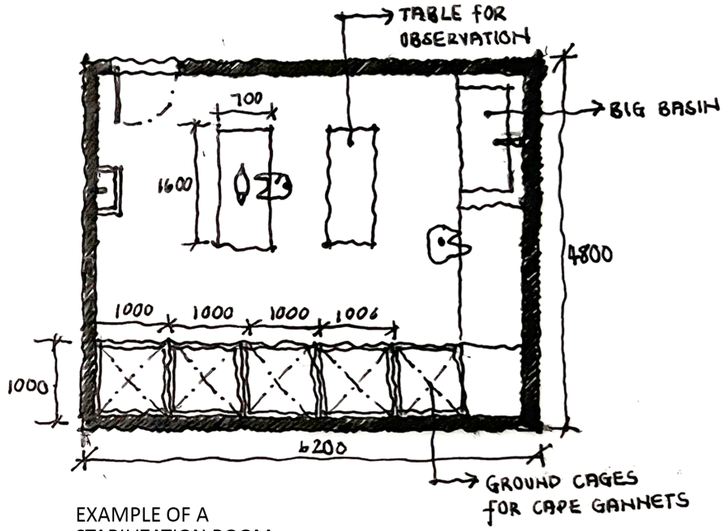
1. Genetics laboratory with microscopes to assess blood smears and monitor their health
2. Computer room

RESEARCH CONDUCTED ON CAPE GANNETS

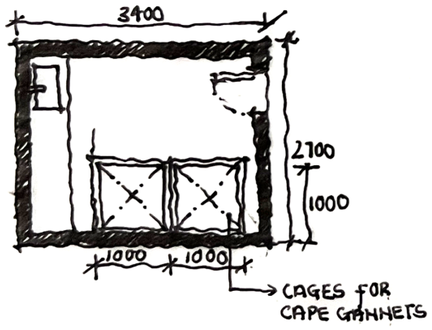
1. Tracking GPS devices on birds
2. Weighing Cape Gannet chicks
3. Obtain sardine and anchovy abundance data to compare with Gannet data
4. Annual ringing of chicks
5. Estimating the annual size of the Cape Gannet colony
6. Diet sampling
7. Determining general health of the colony on Malgas Island



EXAMPLE OF A SMALL-SCALE ICU ROOM



EXAMPLE OF A STABILIZATION ROOM



EXAMPLE OF SMALL ROOM FOR STABILIZATION

FIGURE 78 *Marine stabilization room requirements (Author, based on Strydom, 2022)*

PART 05

5.1 CONCEPT 1: CONCRETE BUNKER
5.2 CONCEPT 2: HIDE AND REVEAL
5.3 CONCEPT 3: ROUTE/JOURNEY
5.4 CONCEPT 4: EXTENSION OF THE LANDSCAPE
5.5 CONCEPT MODEL
5.6 CONCEPT MODEL
5.7 BUILDING FUNCTIONS
5.8 FINDINF FORM
5.9 THE TECHNICAL SIDE
5.10 EXPLORING IN SECTION
5.11 SITE MODEL
5.12 FORM DEVELOPMENT
5.13 RESPONSE DIAGRAMS
5.14 ANIMAL MOVEMENT VS BUILDING FORM
5.15 PRELIMINARY DRAWINGS
5.16 CONTROL VS PERCEPTION
5.17 MULTI-SPECIES COHABITATION
5.18 MELLOR PRIMARY SCHOOL: ENGLAND
5.19 BREAKWATER AND ARTIFICIAL REEFS
5.20 MATERIALITY



FIGURE 79 *Concrete bunker (Author, 2022)*

5.1
CONCEPT 1:
THE CONCRETE BUNKER

The concrete bunkers played a significant role in the design dissertation. These bunkers, hidden behind the thick vegetation and some standing in the open, intrigued me. The idea behind the bunker is to hide from enemies yet have a clear view of them through small windows on the envelope. It was a form of habitat for the guns during WW 2 and a form of protection from exterior conditions.

BUNKER= BIRD HIDE

The site is situated in a very sensitive area, thus the relationship the building has with its surroundings plays a key role in a successful design. The concrete bunker is used as a metaphor for the design, and it starts to gain the qualities of the bunker. The term 'bunker' then translates into the term 'bird hide' as animals are observed from the inside, not enemies. The relationship the bunker has with its surrounding is the same relationship I wanted to achieve and thus the whole design can be seen as a big bird hide, where visitors observe the surroundings from the inside in the same way enemies were observed from the bunkers in the past.

Elements of the bunker were used as valuable examples of what makes them successful and how this could be incorporated into the Saldanha Wildlife Preservation and Research Centre:

1. Blending in
2. Animal habitats
3. Framing views

BLENDING IN

Ships from far would not have seen some of these bunkers because they are camouflaged behind the Fynbos and granite rocks. The color of the concrete makes it blend in with the granite and pale streaks of the vegetation. The building becomes an extension of the landscape, and the boundary between the building and the landscape becomes blurred.



FIGURE 80 *Hidden concrete bunker (Author, 2022)*

ANIMAL HABITATS

It is visible that animals such as birds have chosen these bunkers as their habitats. Nests were observed in holes on the exterior, in the vegetation on the roof, and in the building itself. The building protects these species from weather conditions and provides them with the necessary protection they need to survive.

This made me realize how the multi-species cohabitation approach ties in perfectly with this. Allowing the species to co-exist with humans in the design, creates a habitat opportunity for them on the enve-lope and provides them with shelter, food, and water.



FIGURE 81 *Birds making nests in holes of bunker (Author, 2022)*



FIGURE 82 *Bird nests in the interior of the bunker (Author, 2022)*

FRAMING VIEWS

The dark frames start to frame the blue shade of the ocean and the surroundings standing on the inside of these bunkers. It forms a picturesque image and creates a moment of pause to take in the magnificence of the surroundings and Malgas island in the distance.

This is something I intend to achieve within the design which is to make the visitor aware of their sur-roundings by allowing them to observe it from a different perspective may it be through a narrow or panoramic view. The building starts to frame its surroundings through its form and for a moment, the landscape becomes the most important aspect creating moments of pause in contrast with a design where free flow is also important.

.



FIGURE 83 *Concrete bunker framing ocean views (Author, 2022)*



FIGURE 84 *View of ocean through bunker window (Author, 2022)*

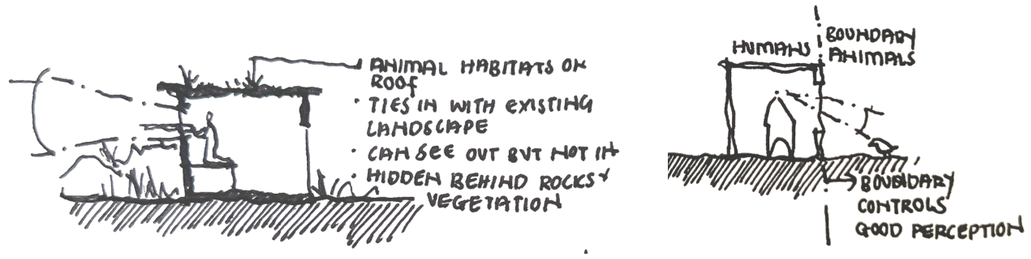


FIGURE 85 *Bunker observation (Author, 2022)*

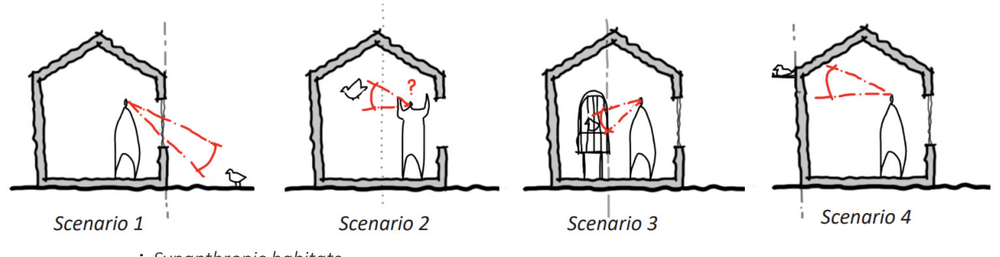


FIGURE 86 *Synanthropic habitats (Author, 2022, based on Gunawan, 2015)*

5.2
CONCEPT 2: HIDE AND REVEAL

5.3
CONCEPT 3: ROUTE/JOURNEY

5.4
CONCEPT 4: EXTENSION OF LANDSCAPE

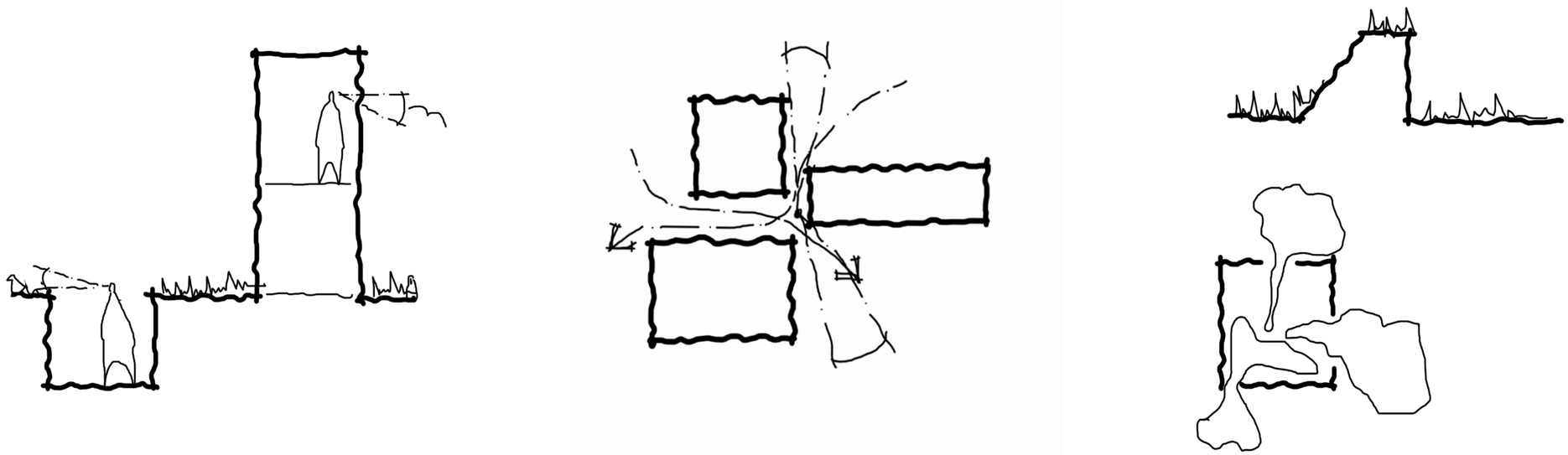


FIGURE 87 *Concepts (Author, 2022)*

The second concept is ‘decentering humans’. This does not mean a design where non-humans are chosen as more important but rather where these two can be equally important and co-exist. Parts of the design are set into the ground to bring visitors closer to their surroundings and on the same eye level as the animals. Other parts of the design bring the visitor up in the air to observe the landscape from a different perspective. The way that animals hide and reveal themselves plays out throughout the building where the structure itself starts to hide but also reveals itself.

The framing of view as mentioned earlier and the route/journey the visitor experience are closely related. The third concept is for the visitor to experience the landscape through the building. The form starts to shape a route where the landscape can be framed in narrow and panoramic views. The route of the design sparks curiosity for the visitor and makes them want to engage with the design as well as the surroundings.

The fourth concept is for the building to be an extension of the landscape. The materials that are removed for construction, are replaced in the design and used for animal habitats. By allowing the building to become the landscape, there is a constant negotiation between the environment and the architecture. The building becomes the landscape and creates habitat opportunities for species.

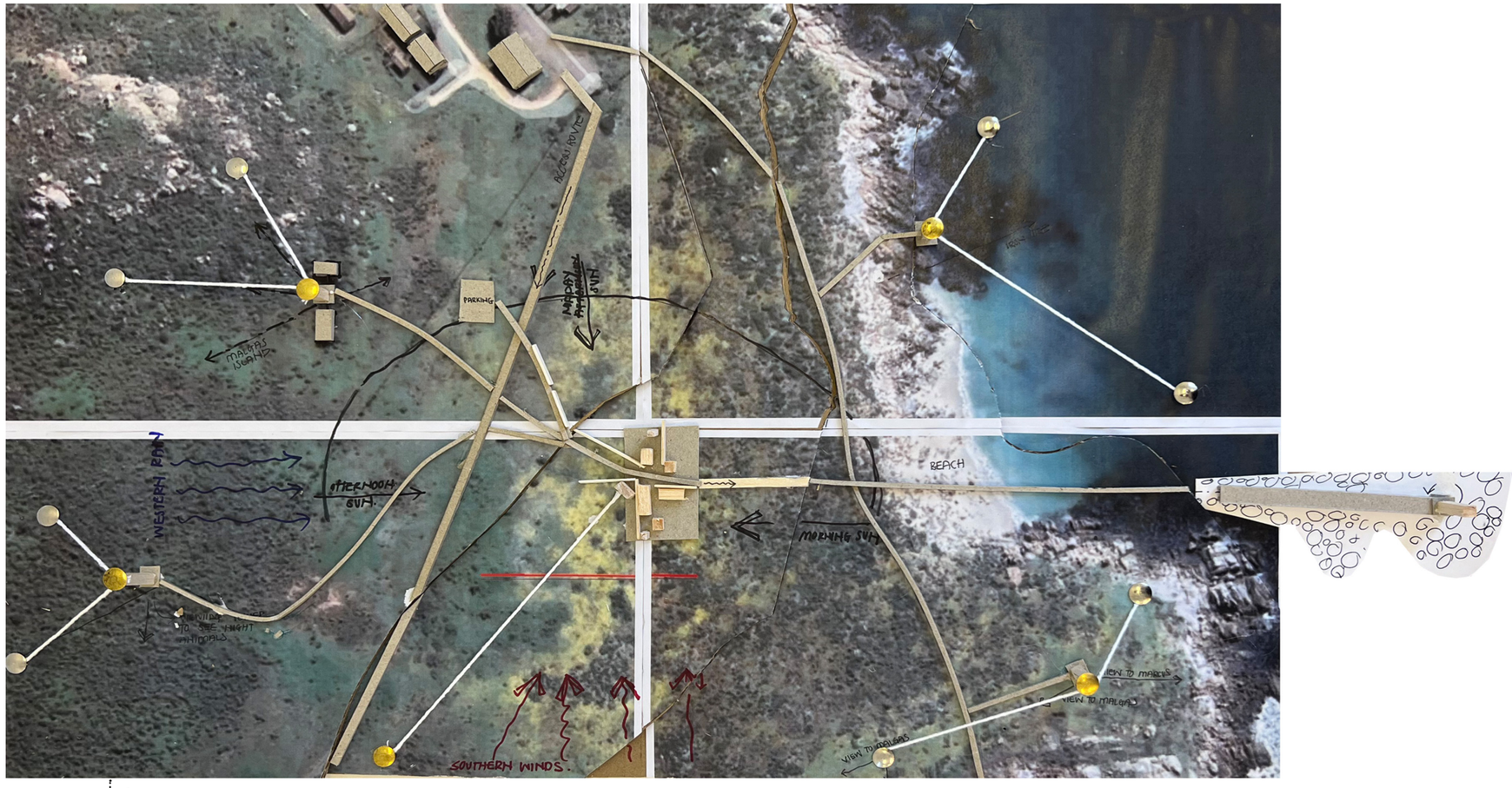


FIGURE 88 *Concept model (Author, 2022)*

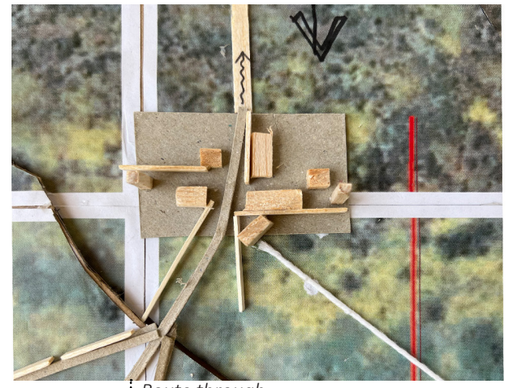


FIGURE 89 *Route through (Author, 2022)*

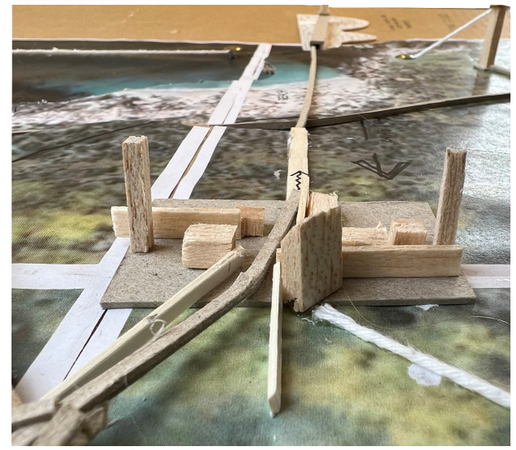


FIGURE 90 *Hide and reveal (Author, 2022)*

5.5
CONCEPT MODEL

The concept model tries to convey the idea of routes, framing of views, and tying the elements on the site together. After establishing the position of the viewing towers using the animal movement model, it had to be connected to the rest of the design to form a whole.

The idea of the route can be seen in Fig.89 where the circulation and movement strive to be continuous through the building toward other parts of the site. It was important to allow the visitor to explore the design and the landscape and thus these routes take them to various parts of the site. The site consists of movement veins where the building forms the heart from which they are connected. The routes allow the visitor to freely explore the landscape.

It can also be seen how the fragmentation of the building masses allows for various openings in between which would essentially start to frame the landscape.

Some parts are extruded up into the air which gives the feeling of hiding and revealing. These elements protruding out of the surface start to become a beacon on the site which the visitor can see approaching from the parking.

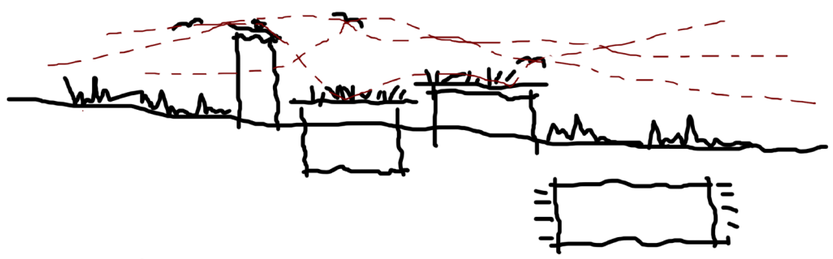


FIGURE 91 *The idea of hide and reveal (Author, 2022)*

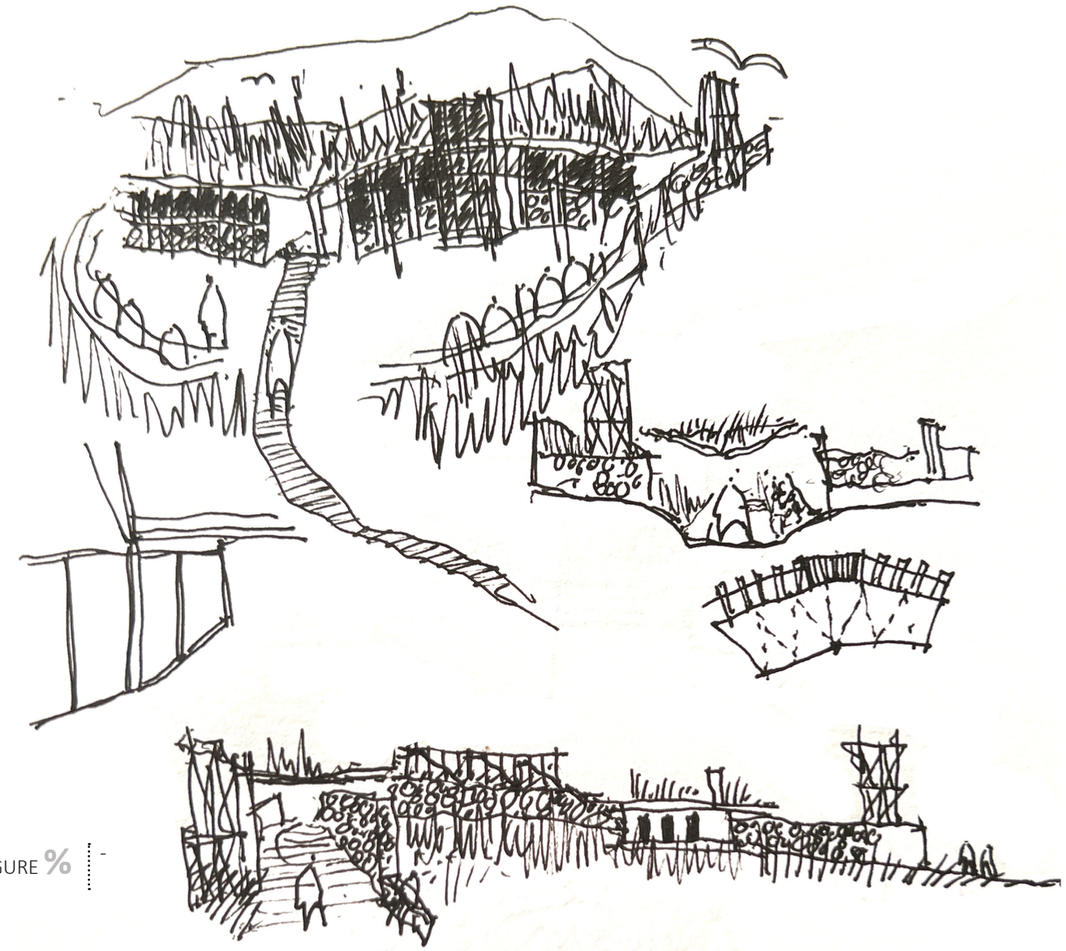


FIGURE % -

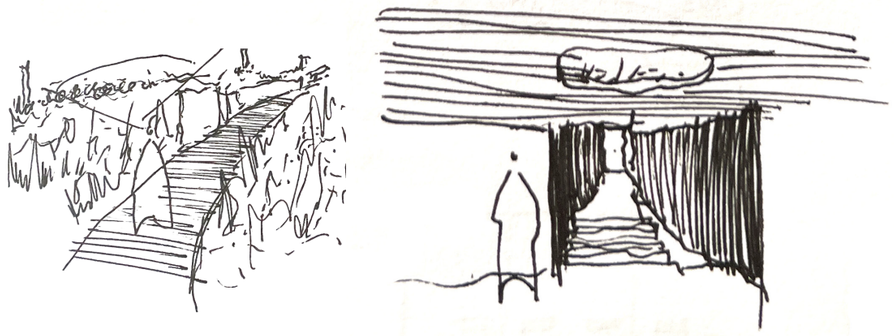


FIGURE 92 *Preliminary drawings (Author, 2022)*

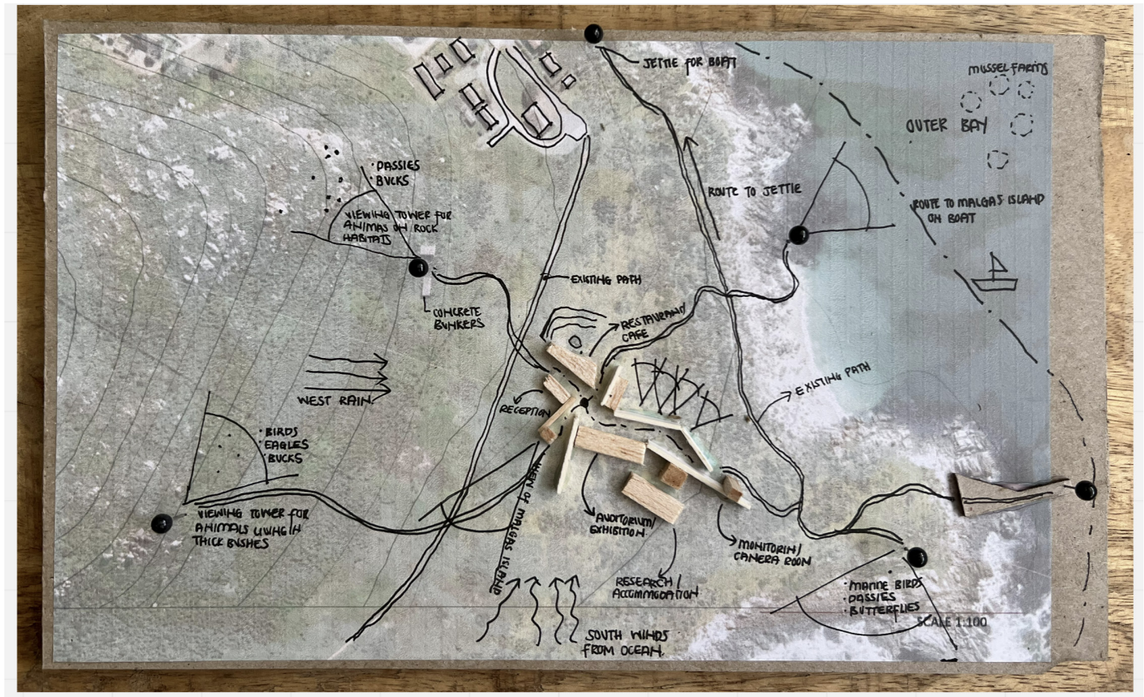


FIGURE 93 *Archi Maki concept model (Author, 2022)*

5.6
CONCEPT MODEL

In a design exercise, we were asked to make a concept model and start to explore the essence of the design. A picture of the site was used as a base to establish the boundaries and to take the existing factors like vegetation and views into consideration.

I found it challenging to start placing the masses on the site as there were not any anchoring points to start shaping the form of the design. Thus, this exercise helped me to rather think about views, fluidity, and movement.

The massing consists of high blocks and low blocks to start thinking of the idea of 'hide and reveal'. The blocks are spaced to achieve a broken-up feeling to allow for movement patterns in-between the built form. This also allows for views of the landscape to be farmed.

.

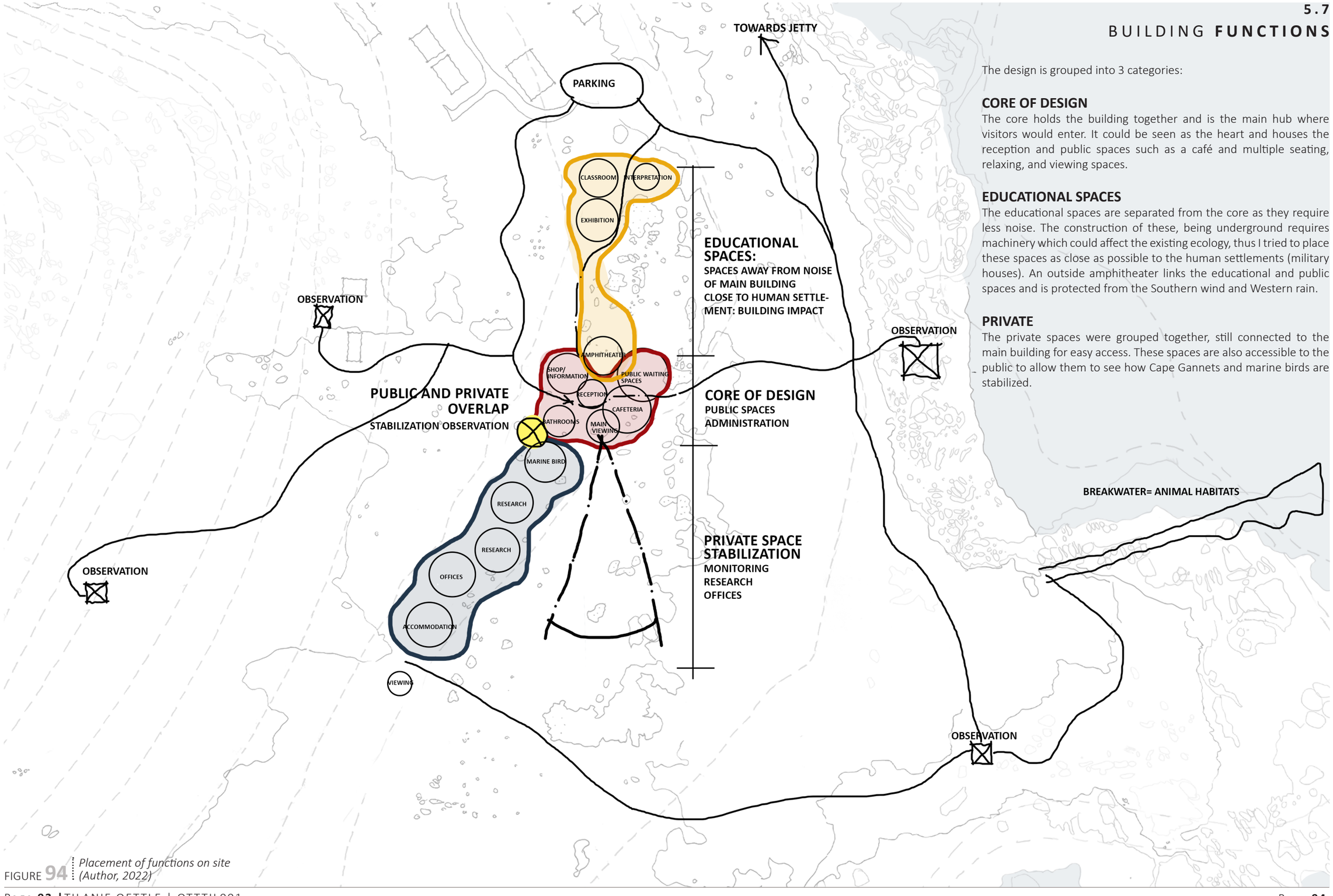


FIGURE 94 *Placement of functions on site (Author, 2022)*

The design is grouped into 3 categories:

CORE OF DESIGN

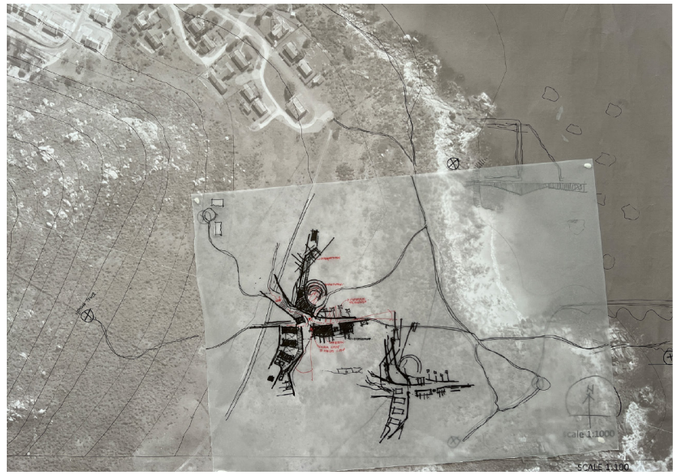
The core holds the building together and is the main hub where visitors would enter. It could be seen as the heart and houses the reception and public spaces such as a café and multiple seating, relaxing, and viewing spaces.

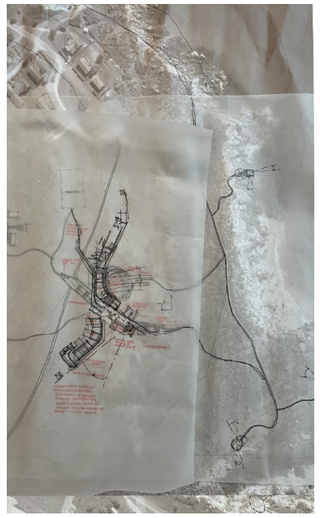
EDUCATIONAL SPACES

The educational spaces are separated from the core as they require less noise. The construction of these, being underground requires machinery which could affect the existing ecology, thus I tried to place these spaces as close as possible to the human settlements (military houses). An outside amphitheater links the educational and public spaces and is protected from the Southern wind and Western rain.

PRIVATE

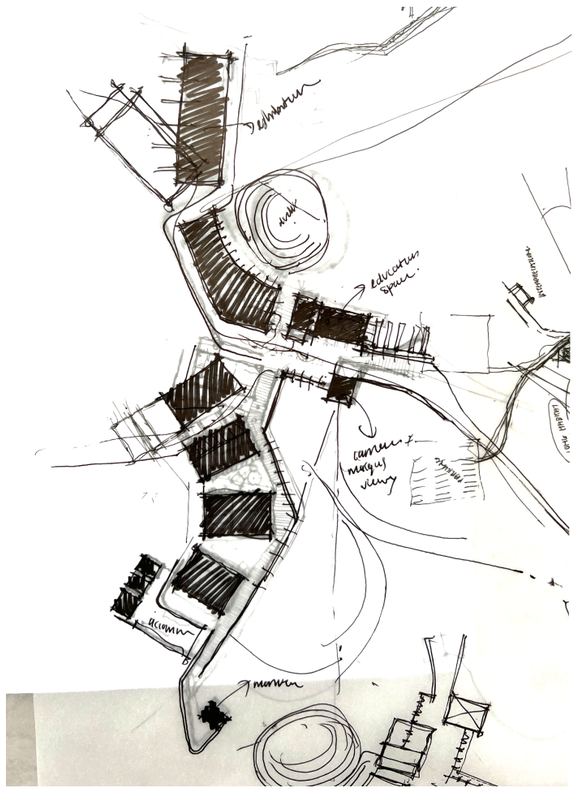
The private spaces were grouped together, still connected to the main building for easy access. These spaces are also accessible to the public to allow them to see how Cape Gannets and marine birds are stabilized.

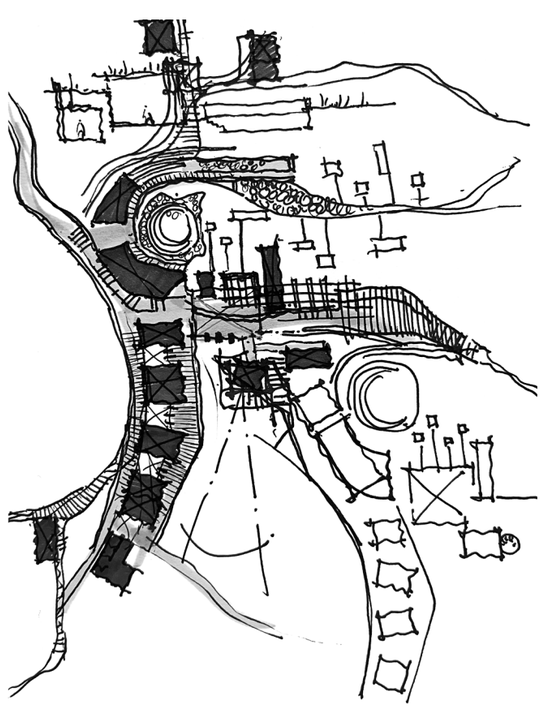












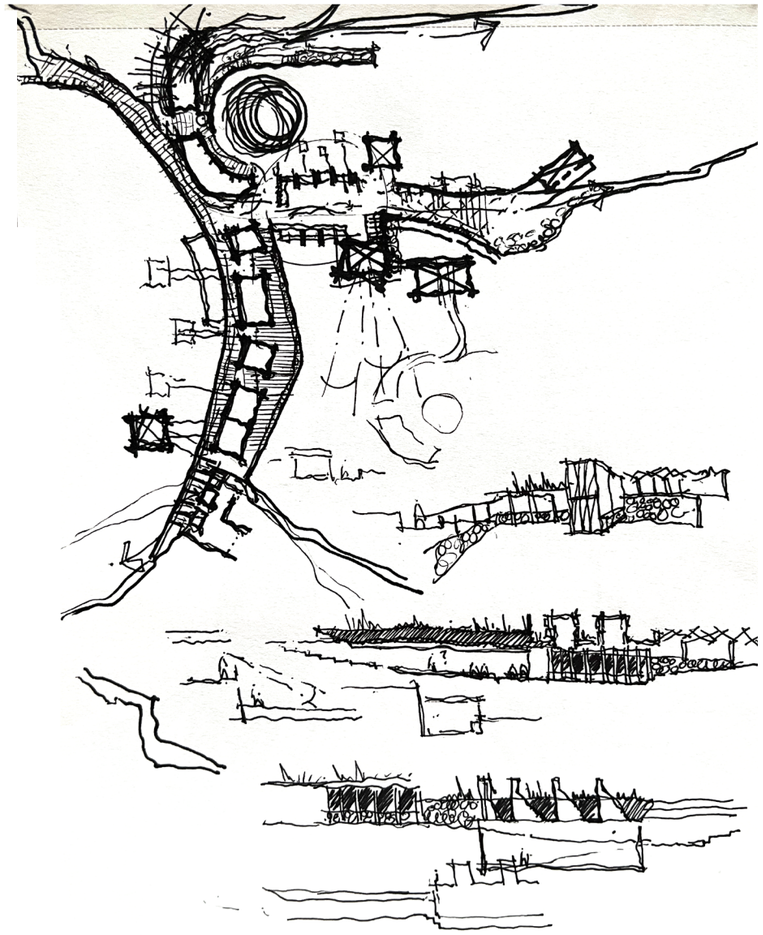


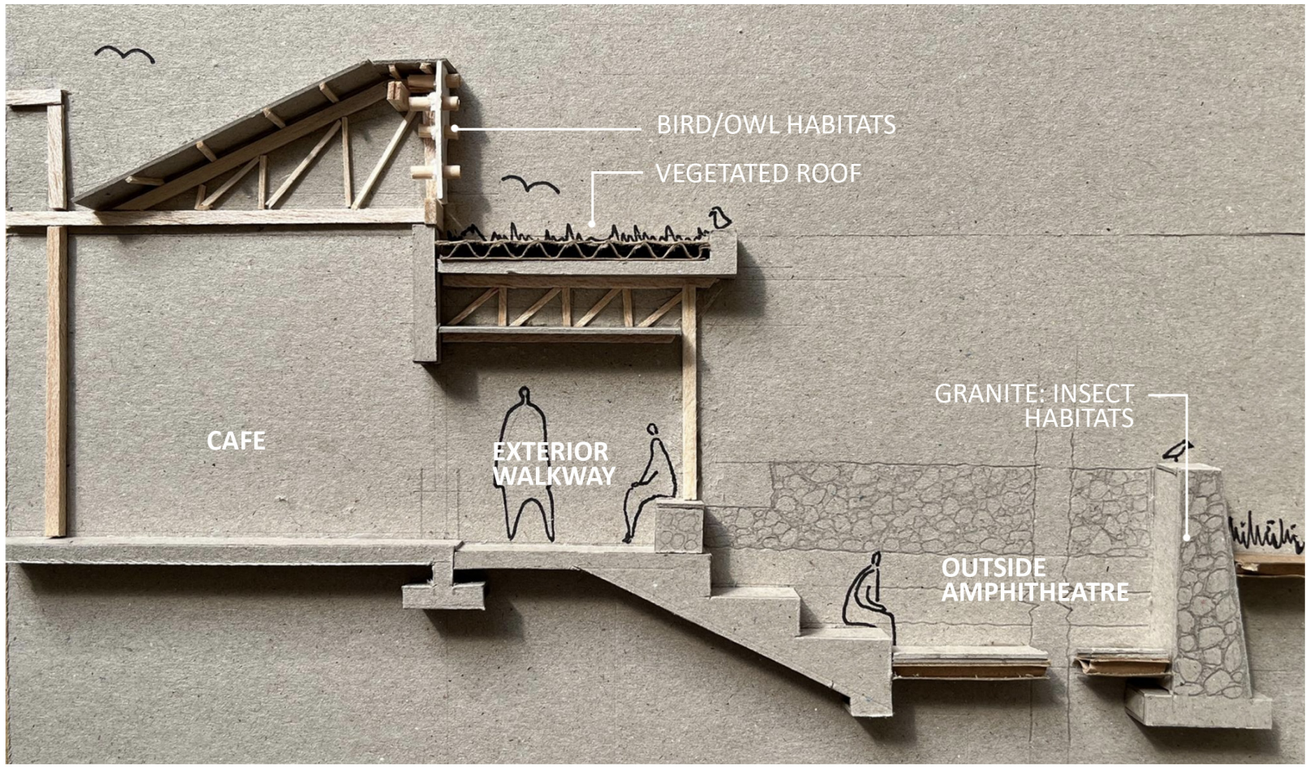
FIGURE 95 *Preliminary floorplans (Author, 2022)*

5.8
FINDING **FORM**

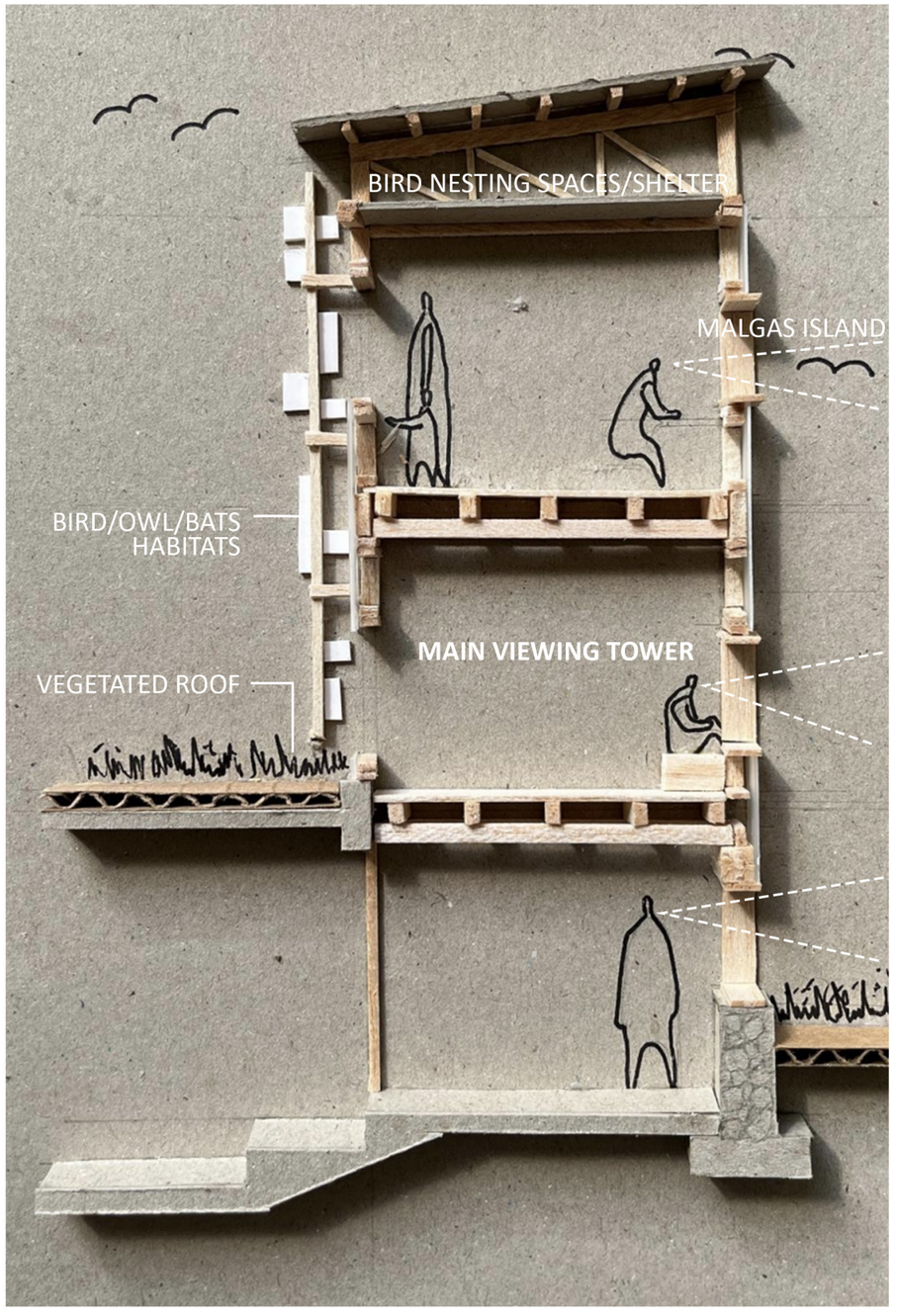
As the building is not in an urban context to restrict its form on a site, I found it very challenging to know where the form is heading to. I strived to create a continuous movement route to create a journey through the landscape and architecture. The form started with 2 semi-circles which are divided into public and private.

5.9
THE TECHNICAL SIDE

A design exercise required us to build a technical model. Although this was still very early in the design process, ideas started to come up of how a multi-species cohabitation approach could be taken into consideration and how these spaces could be incorporated into the envelope. In terms of materiality, I knew the building would be constructed out of granite and timber with a vegetated roof to benefit many species.



PRELIMINARY SECTION MODEL OF CAFE AND EXTERIOR AMPHITHEATRE



PRELIMINARY SECTION THROUGH MAIN VIEWING TOWER

FIGURE 96 *Technical concept sectional models (Author, 2022)*

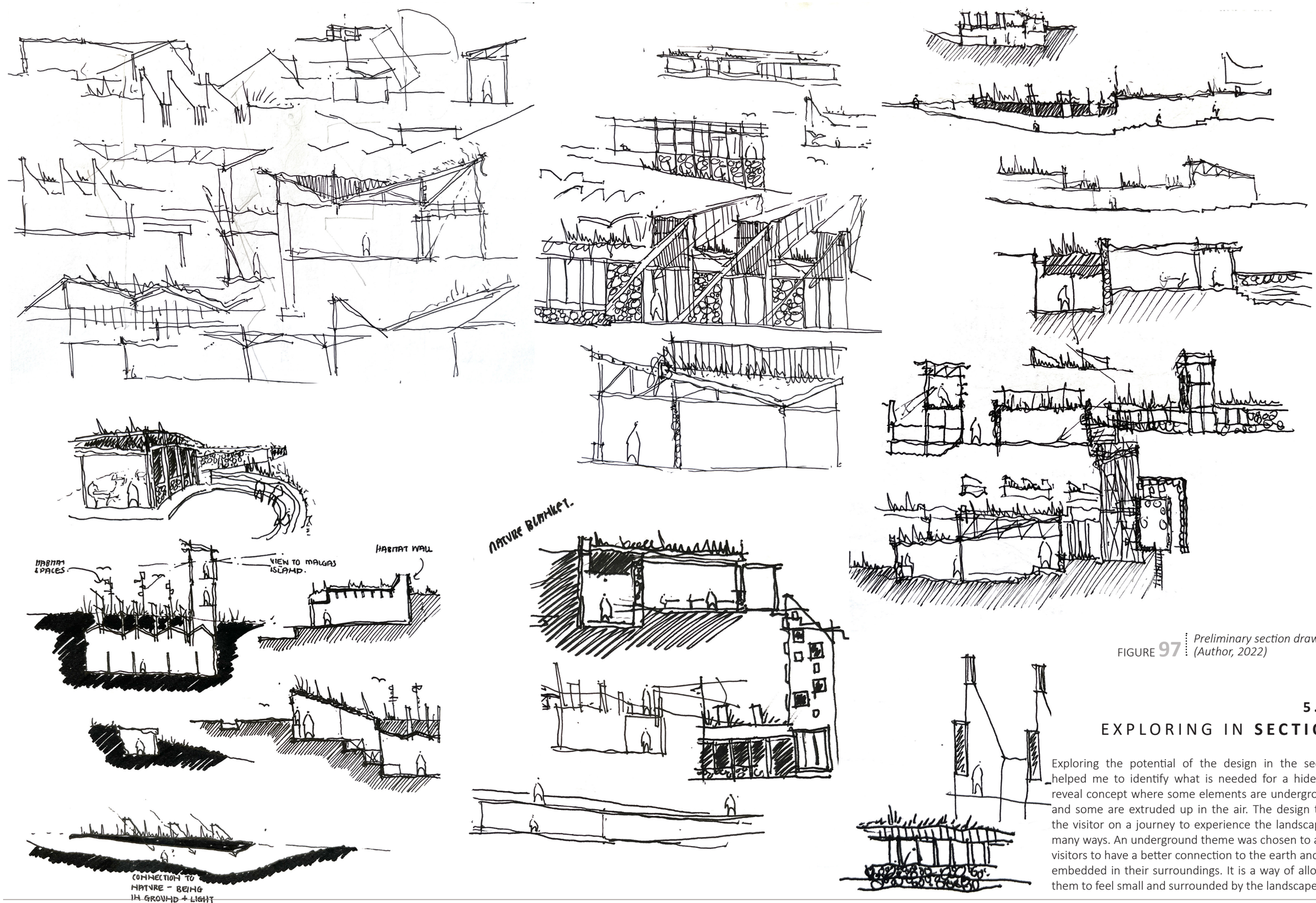


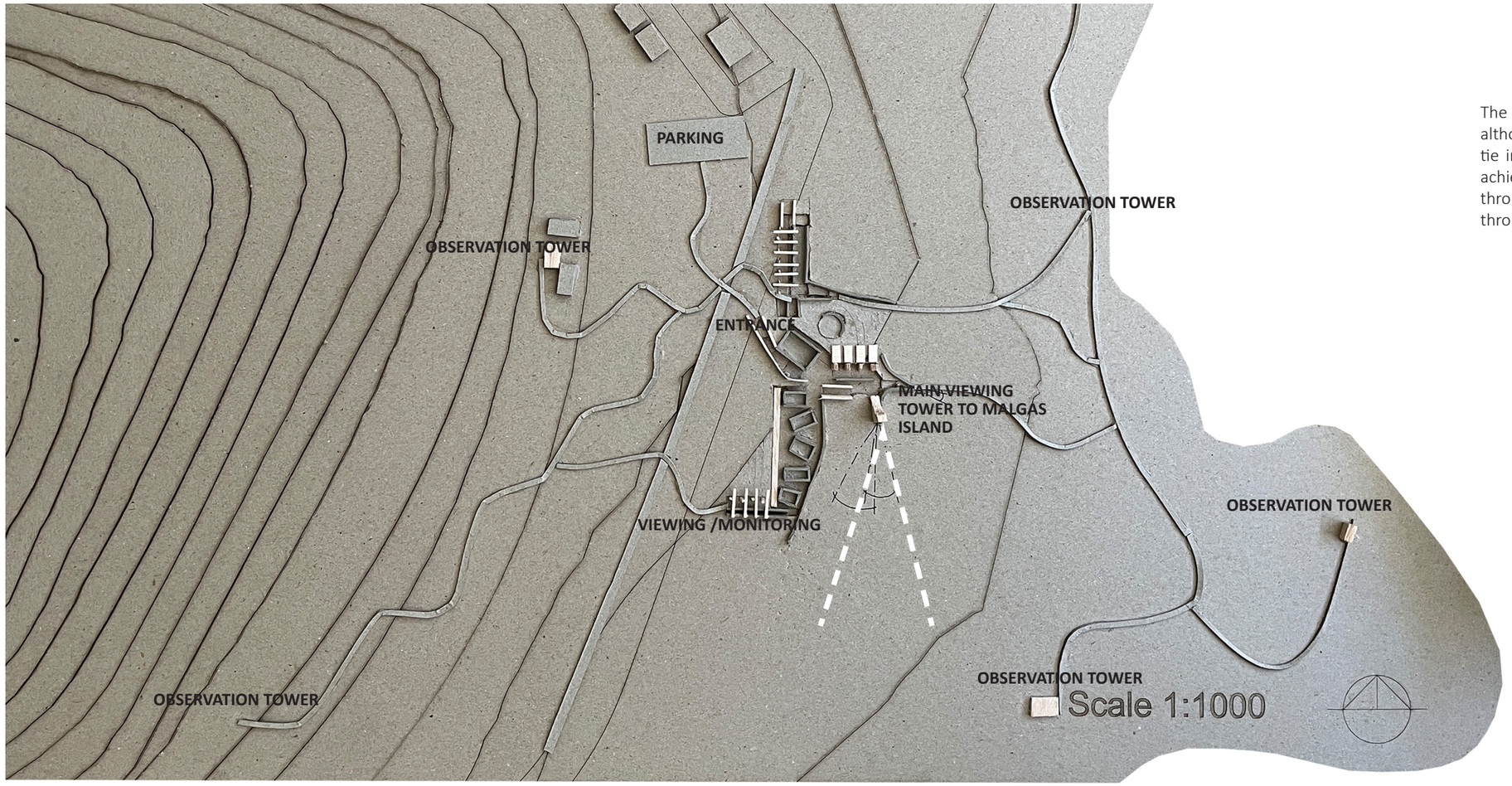
FIGURE 97 *Preliminary section drawings (Author, 2022)*

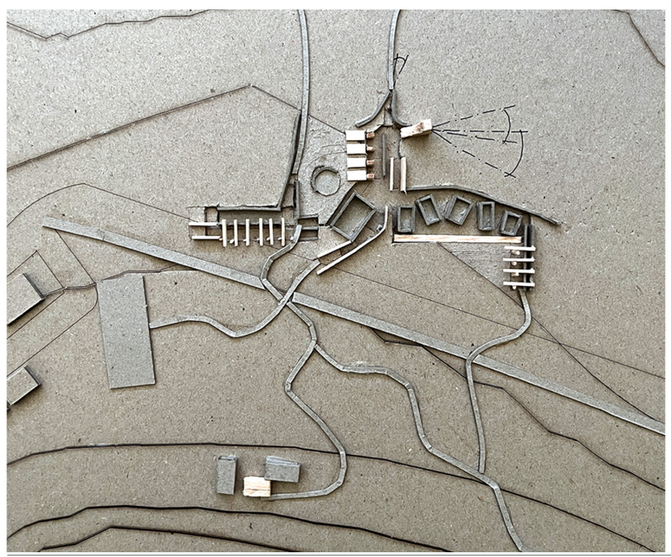
5.10
EXPLORING IN **SECTION**

Exploring the potential of the design in the section helped me to identify what is needed for a hide and reveal concept where some elements are underground, and some are extruded up in the air. The design takes the visitor on a journey to experience the landscape in many ways. An underground theme was chosen to allow visitors to have a better connection to the earth and feel embedded in their surroundings. It is a way of allowing them to feel small and surrounded by the landscape.

5.11
SITE MODEL

The form slowly started to come together on the site although I felt like it was a bit tight and rigid and did not tie in with the topography and concepts I intended to achieve. I wanted to achieve a free-flowing circulation through the building in the same way one would move through the landscape to the observation towers.





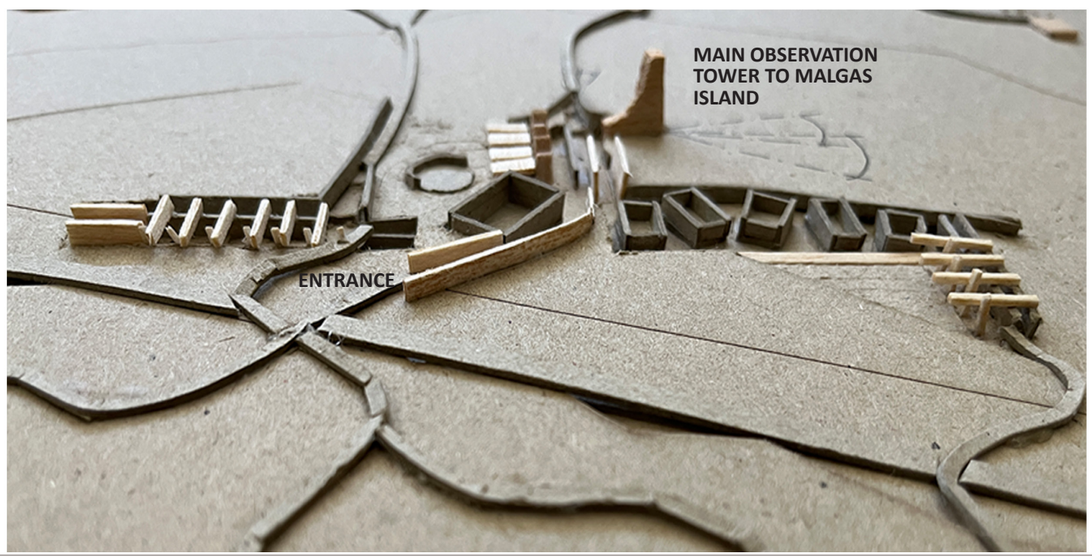


FIGURE 98 *Site model (Author, 2022)*

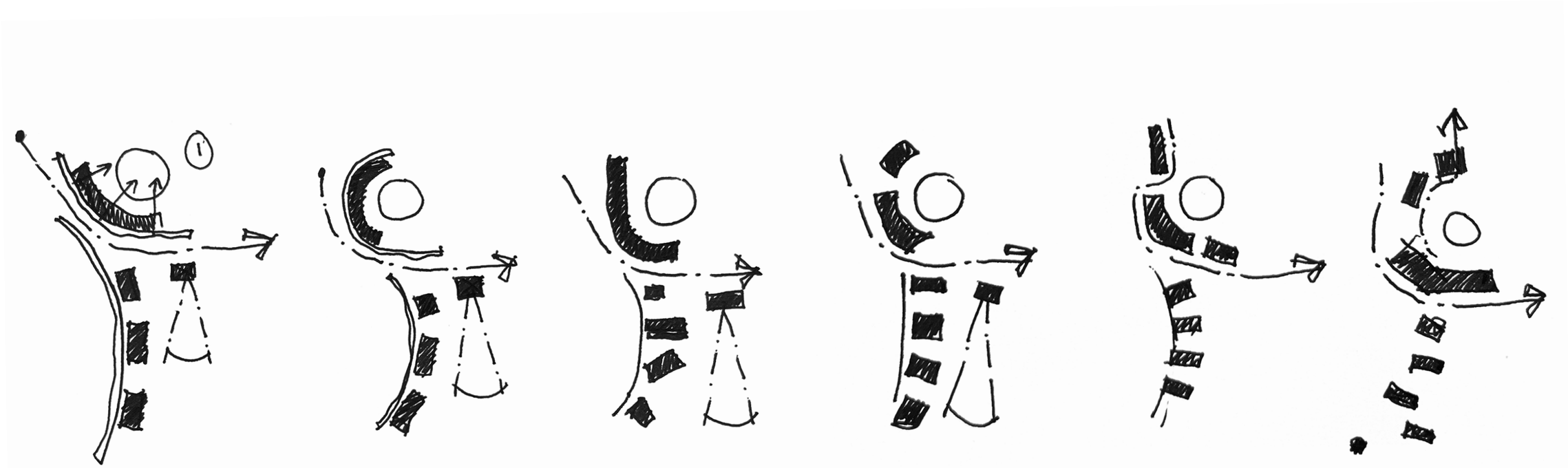
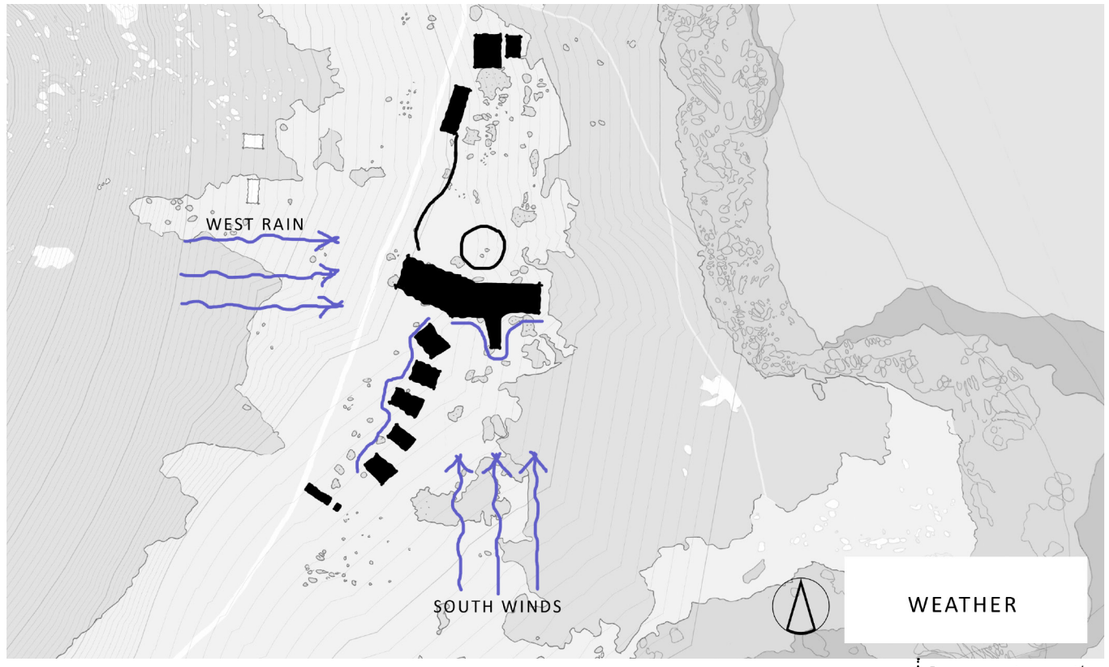


FIGURE 99 *Form development (Author, 2022)*

A curved shape was initially chosen to protect the outside amphitheater and a more loose fit was applied to the other buildings. I soon realized that the two shapes did not speak to one another. Although the shape of the small buildings stayed the same, the heart of the building changed into a more rectangular shape, still protecting the outside amphitheater. This was the shape I intended to achieve, where the buildings are loosely fitted, with many benefits further discussed in the paper.

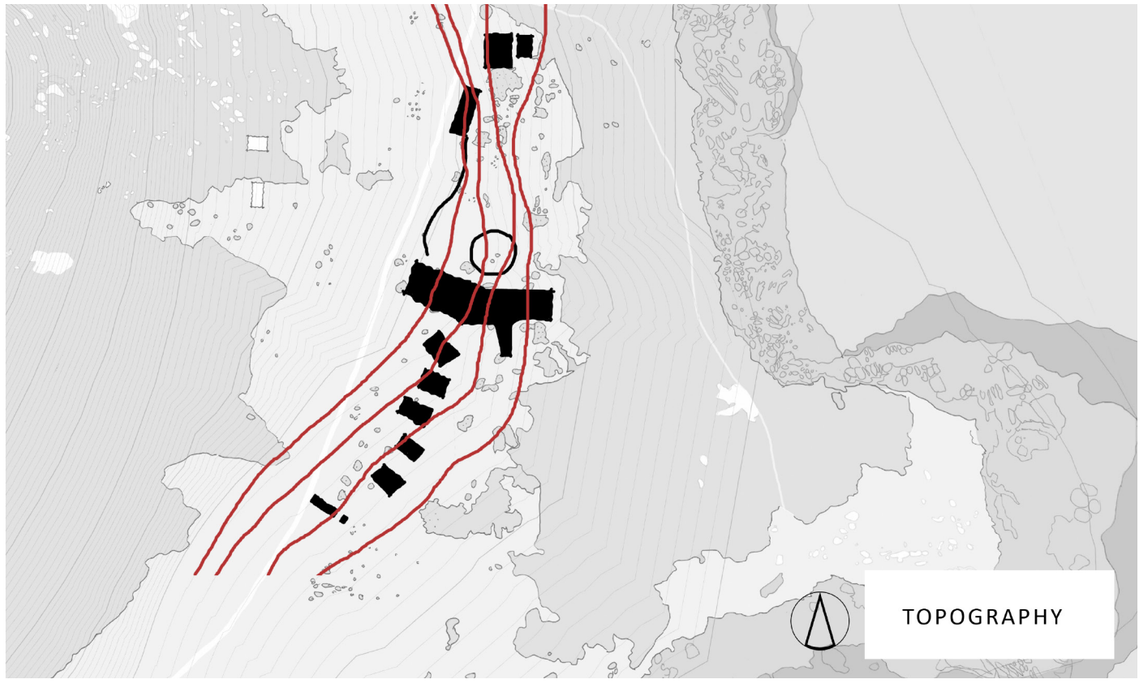
5.13
RESPONSE TO **WEATHER CONDITIONS**



The form protects public spaces from harsh southern/ southwestern winds and western rain. The building wraps itself around the exterior amphitheater to create a comfortable educational space. Setting the building into the ground will also help to protect spaces.

FIGURE 100 *Response to weather (Author, 2022)*

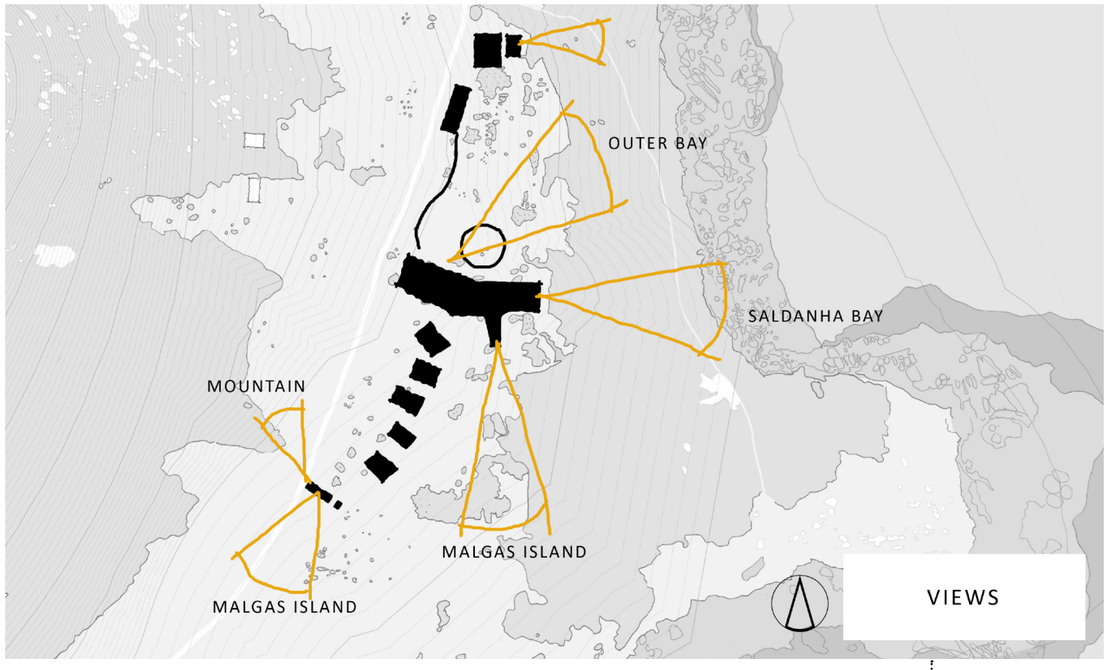
RESPONSE TO **TOPOGRAPHY**



The shape and orientation of the smaller masses follow the contours of the landscape. The main building faces North and North-East and runs against the contours to allow for Northern light to reach interior spaces.

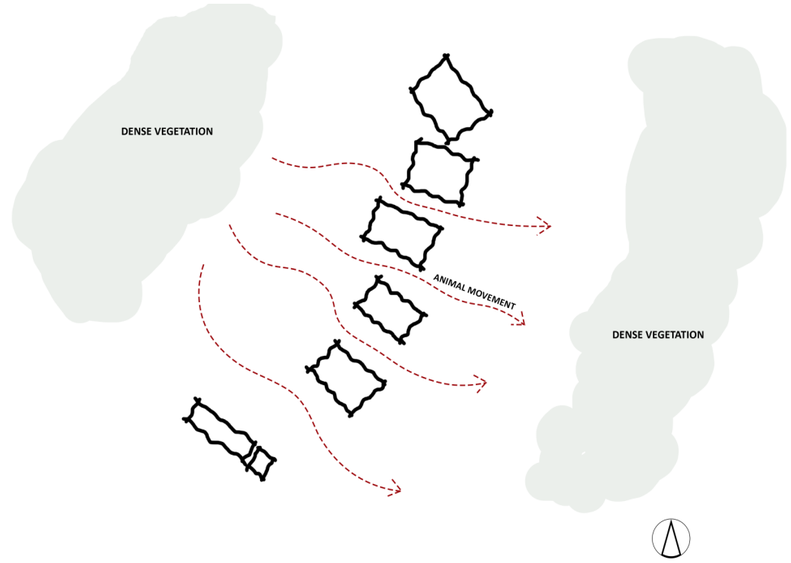
FIGURE 101 *Response to topography (Author, 2022)*

RESPONSE TO **VIEWS**



Too many view opportunities are not always a good thing. The site allows for many spectacular views of the mountain, ocean, and Malgas island. The design places one's attention on specific landscape elements, including Malgas island on the South, and starts to frame views in a narrow and panoramic way.

FIGURE **102** *Response to views (Author, 2022)*



RESPONSE TO **ANIMAL MOVEMENT** AND **VEGETATION**



Placing the design in this location, allowed me to enhance spaces where the vegetation is absent and rather create better habitat spaces through a multi-species cohabitation approach. The form was split up and lifted from the ground to allow for animal movement and thus does not interfere with the movement patterns of various species.

FIGURE **103** *Response to vegetation and animal movement (Author, 2022)*



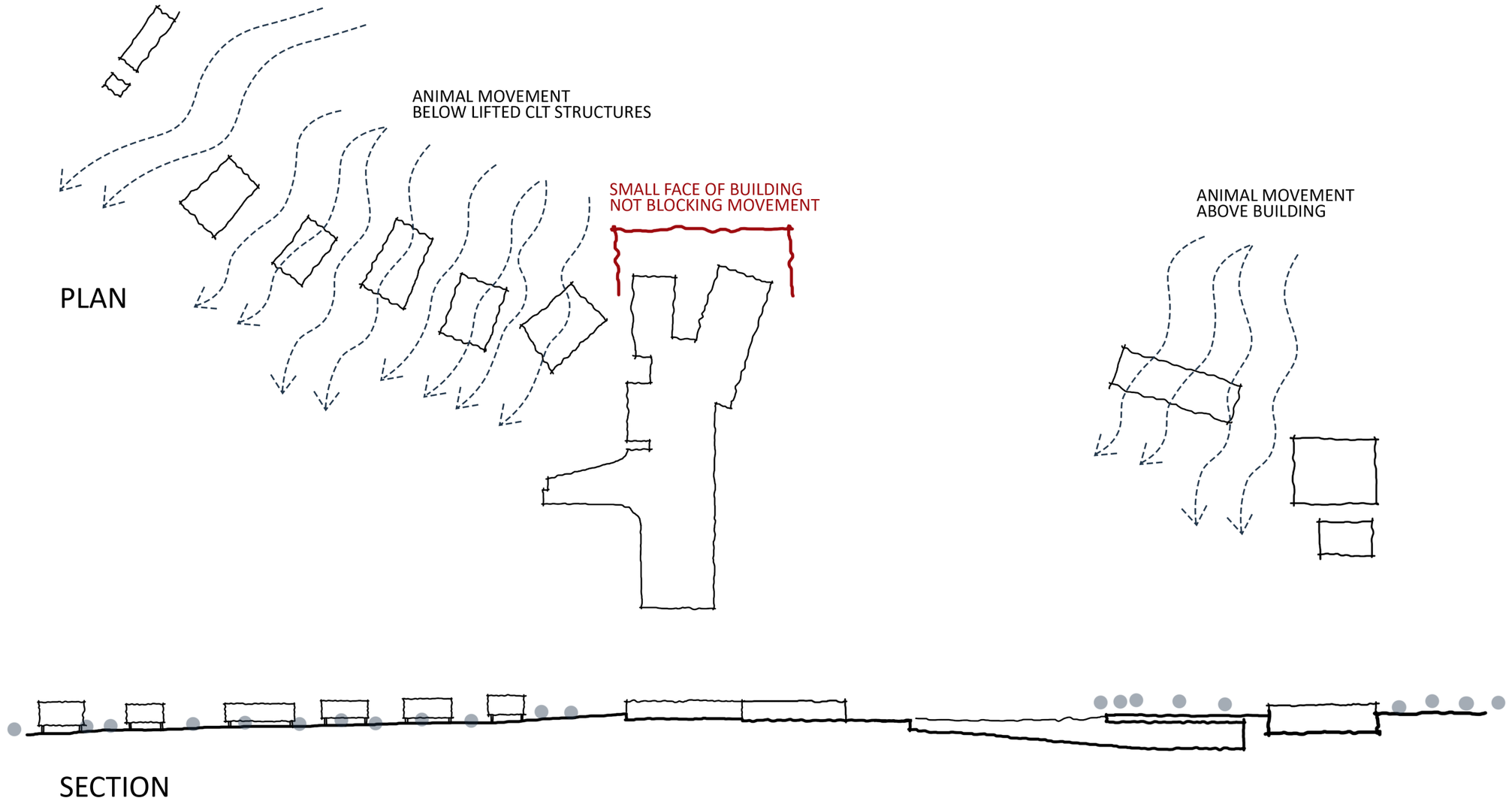


FIGURE 104 *Animal movement vs building form (Author, 2022)*

The following plan and section diagrams show how a sensitive approach was taken to not disturb animal movement. The buildings on the left are lifted above the ground and separated from one another to allow for movement below and in between the built form. The heart of the building is embedded into the ground thus anchoring the design. The buildings on the left are further set into the ground to allow for movement above.



FIGURE 105 *Perspective of main observation tower (Author, 2022)*

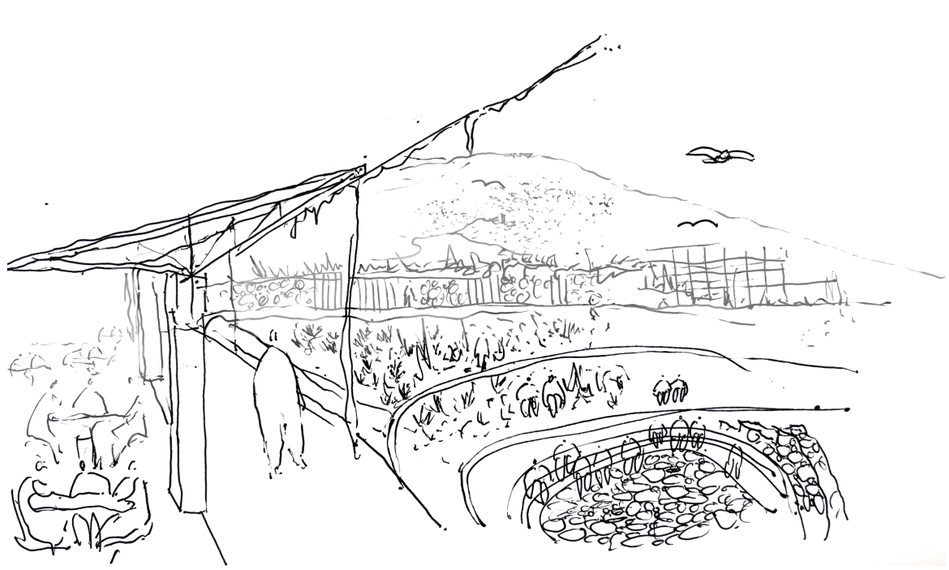
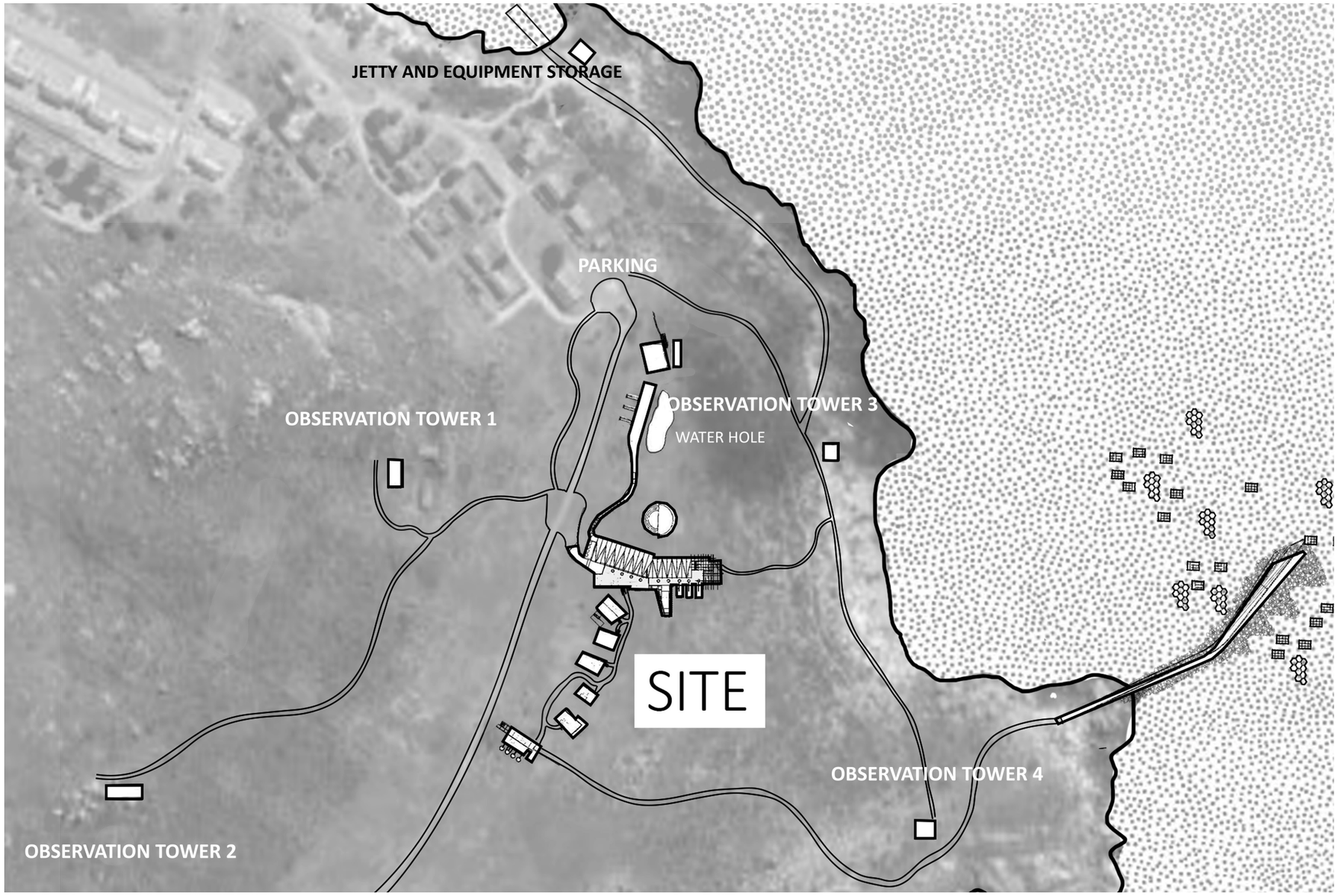


FIGURE 106 *Perspective of the outside amphitheatre (Author, 2022)*



FIGURE 107 *Site in relation to Malgas Island (Author, 2022)*



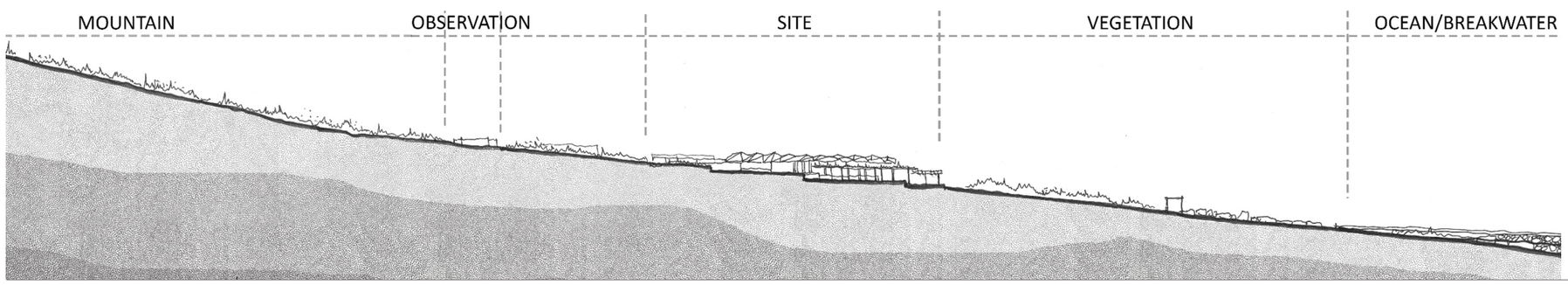


FIGURE 108 *Site plan and site section (Author, 2022)*

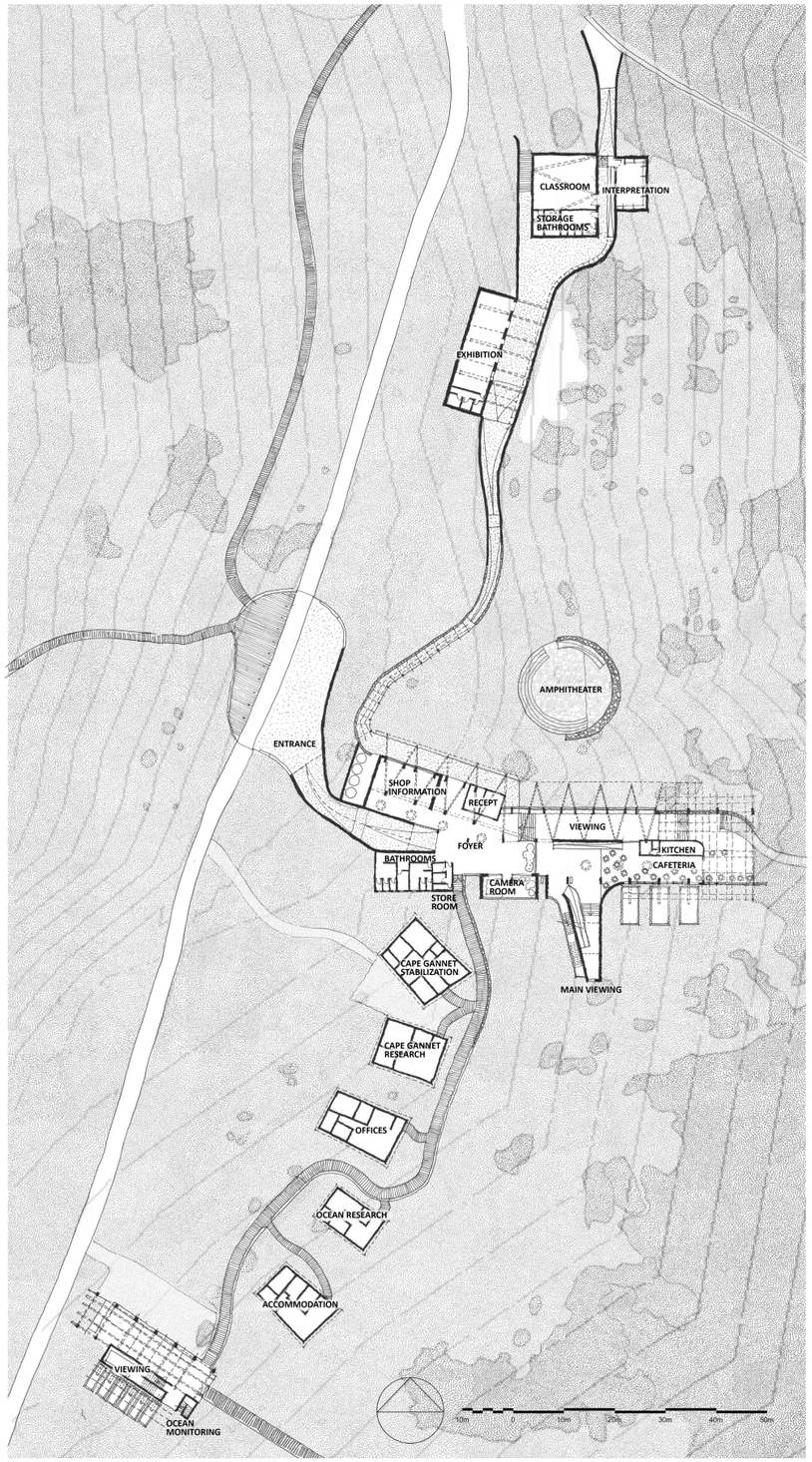


FIGURE 109 *Floorplan (Author, 2022)*

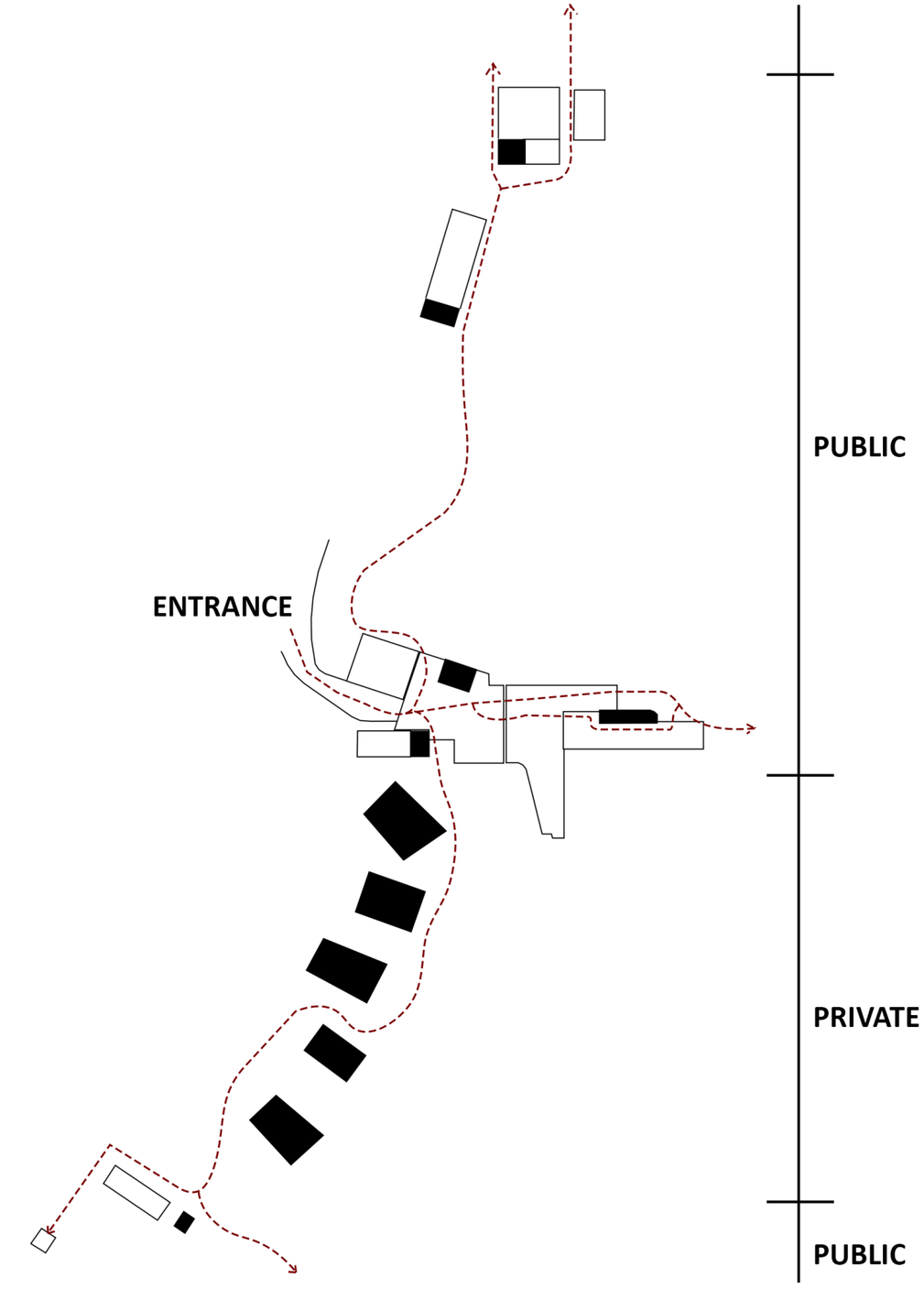
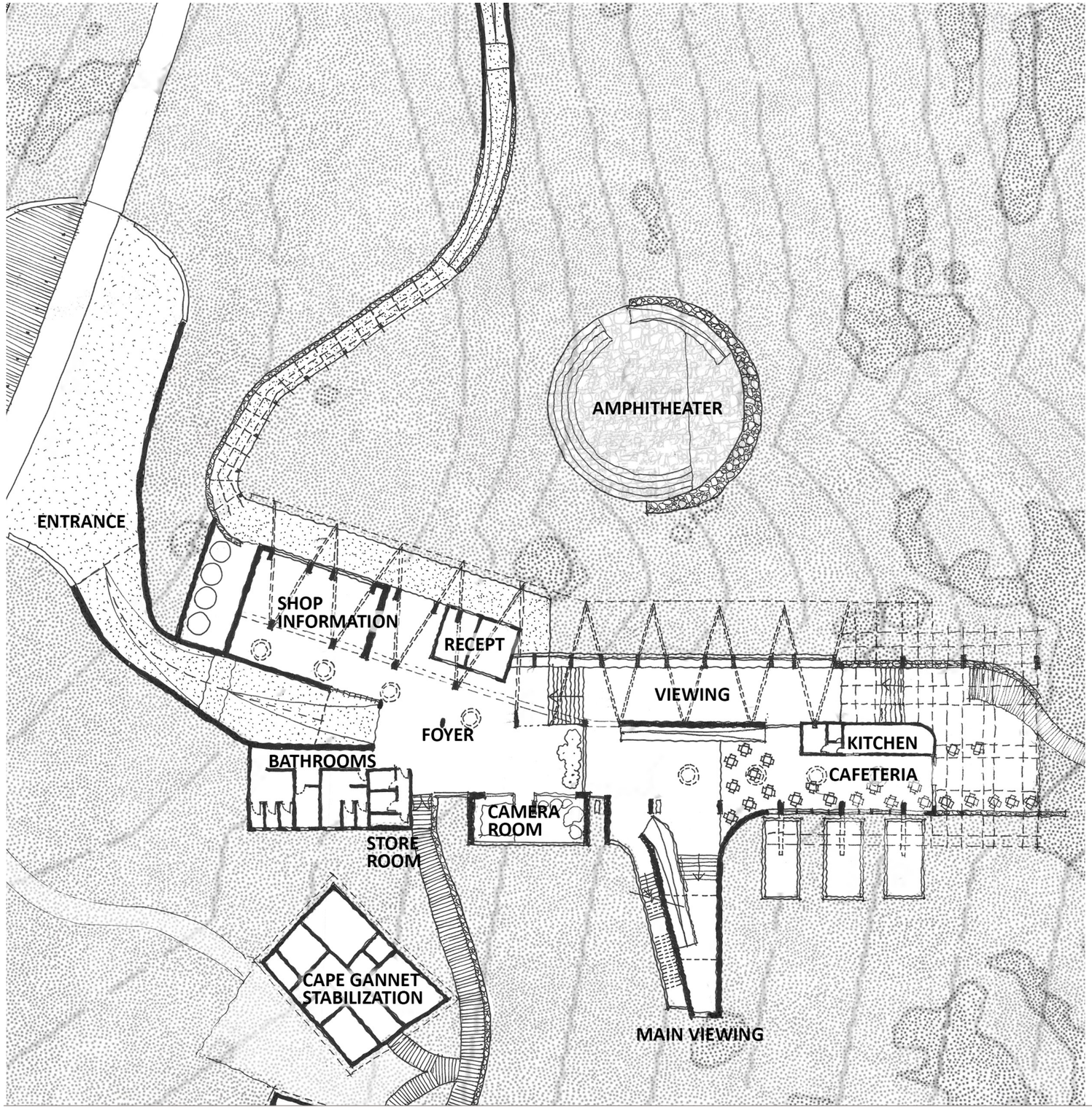
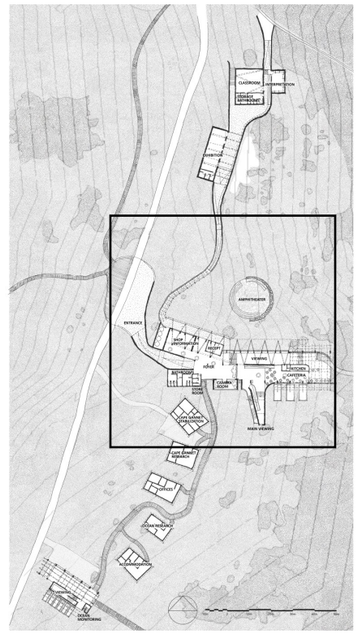
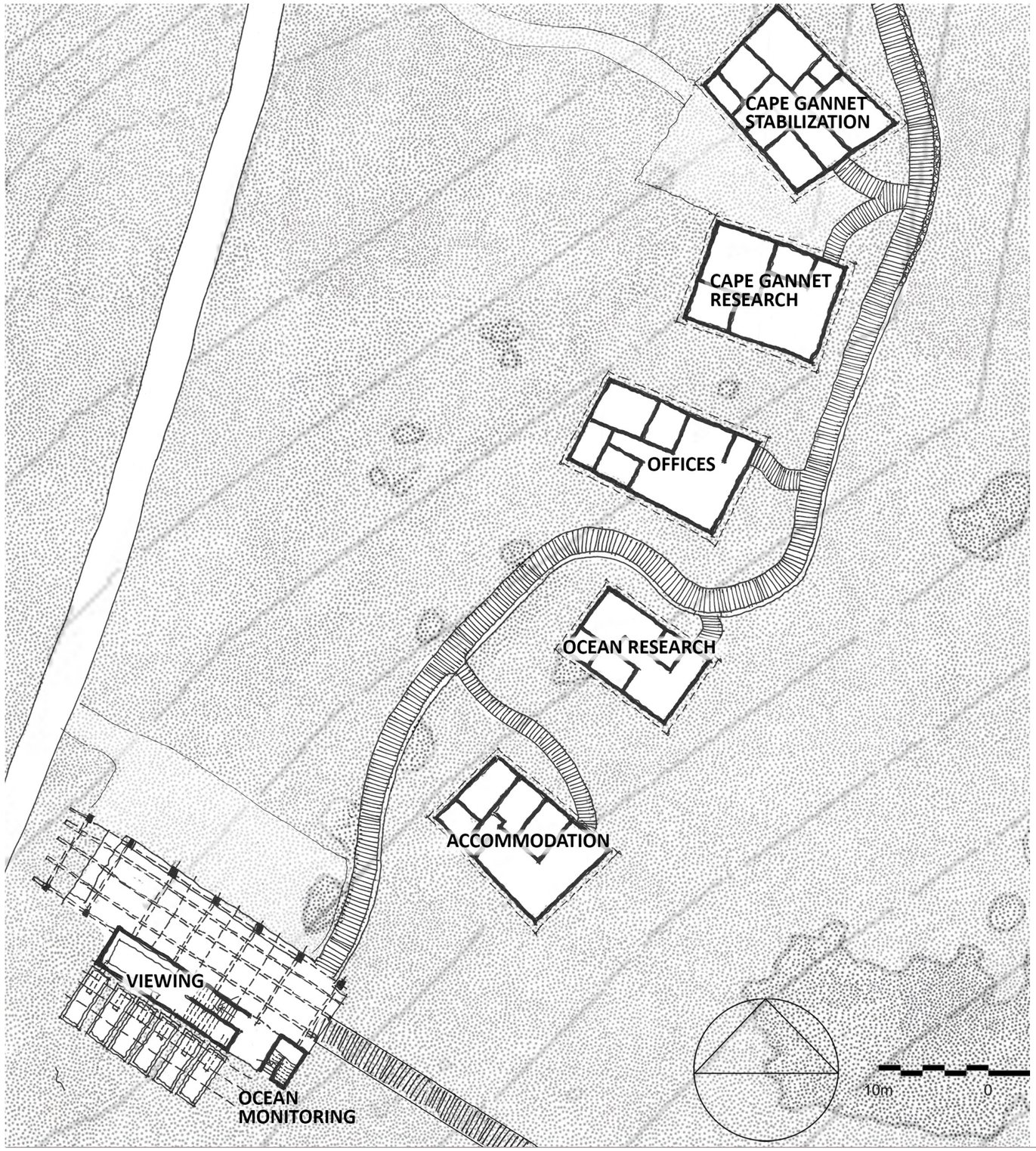


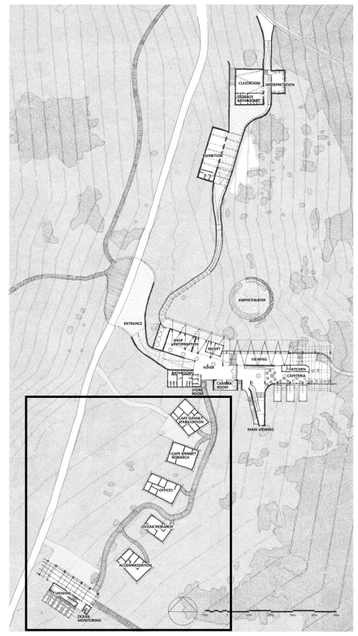
FIGURE 110 *Public vs private (Author, 2022)*



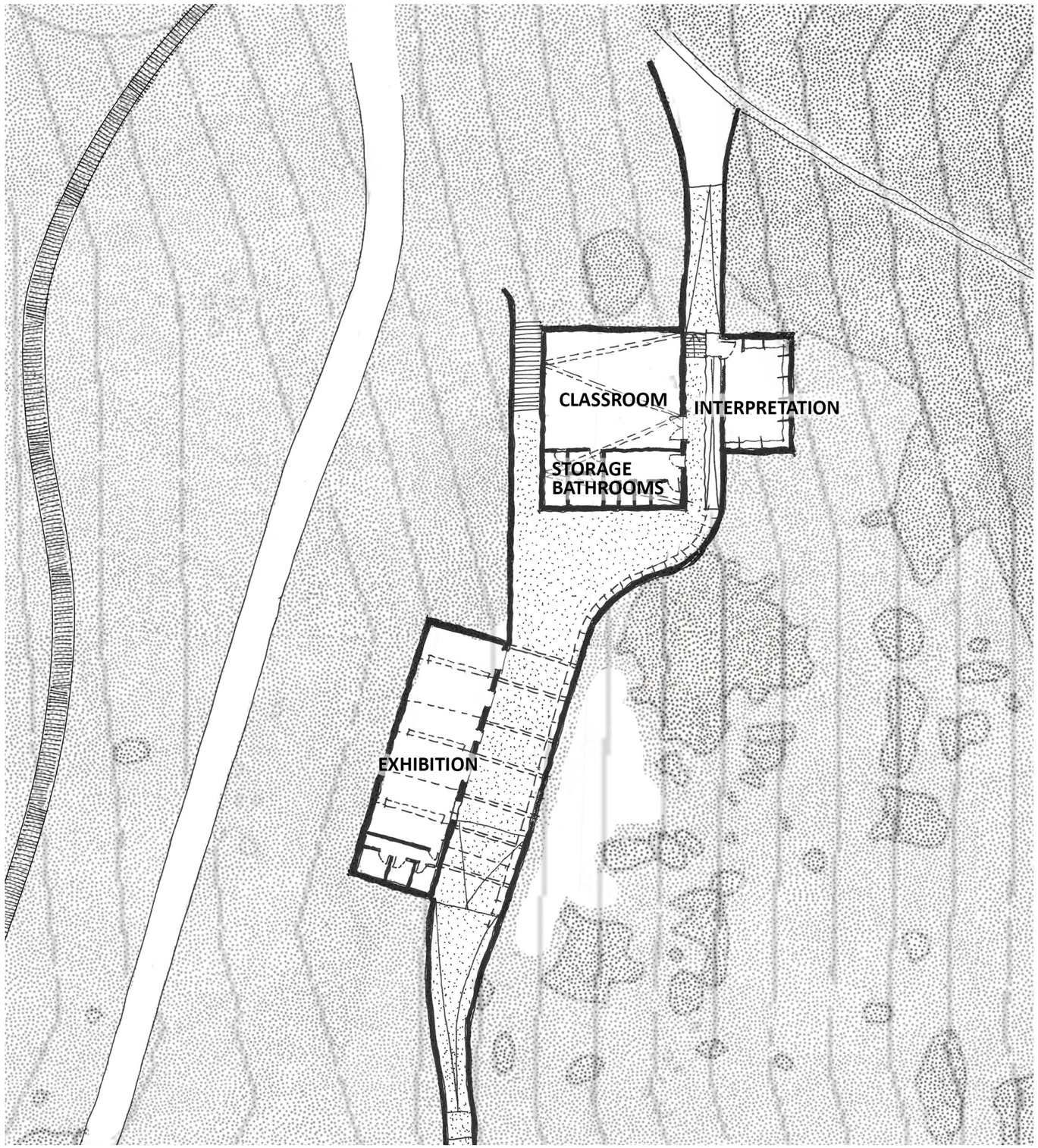


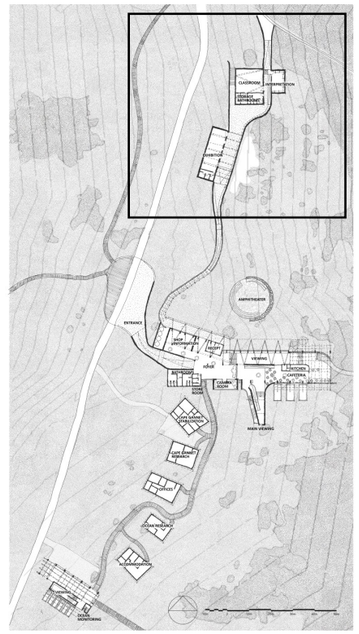
A visitor would park their car on the North of the site and take a scenic walk to the entrance of the Saldanha Wildlife Preservation and Research Centre via a raised timber walkway. In the distance, they would see the main viewing tower 'poking' through the landscape and a folding planted roof. As they enter, they are drawn further into the landscape, not knowing what awaits at the end. Once the visitor is in the heart of the design, they have the option to go to the cafe while being surrounded by birds or take a seat and take in the beauty of the surroundings. They also have the option to visit the main observation tower, where they will have the first glance of Malgas island in the distance (South). From here they can proceed to either the North or South of the site.





Private facilities for monitoring and research as located on the South side and visitors are allowed to move through these spaces and observe how the Cape Gannets and marine birds are stabilized and treated before they are taken to a larger care facility in Cape Town. The visitors can then proceed to another observation tower where they can sit in silence and make use of their photography skills to take pictures of animals approaching the water holes and nests. There is also a monitoring facility, where researchers will monitor the conditions of the ocean and Malgas island.





From the heart of the design, visitors can proceed to the exhibition space, classroom, or interpretation room via a ramped walkway that takes them underground. Here they will be educated on the Cape Gannets as well as many other species found in the area. An educational talk would be given to individuals or a group of scholars in the classrooms before they proceed to Malgas island via a boat to observe the Cape Gannets. Foreigners who have difficulty understanding English will have the opportunity to gain knowledge in the interpretation room. Once the visitors are done, they can either proceed back to the main building, to their car, or to Malgas island.

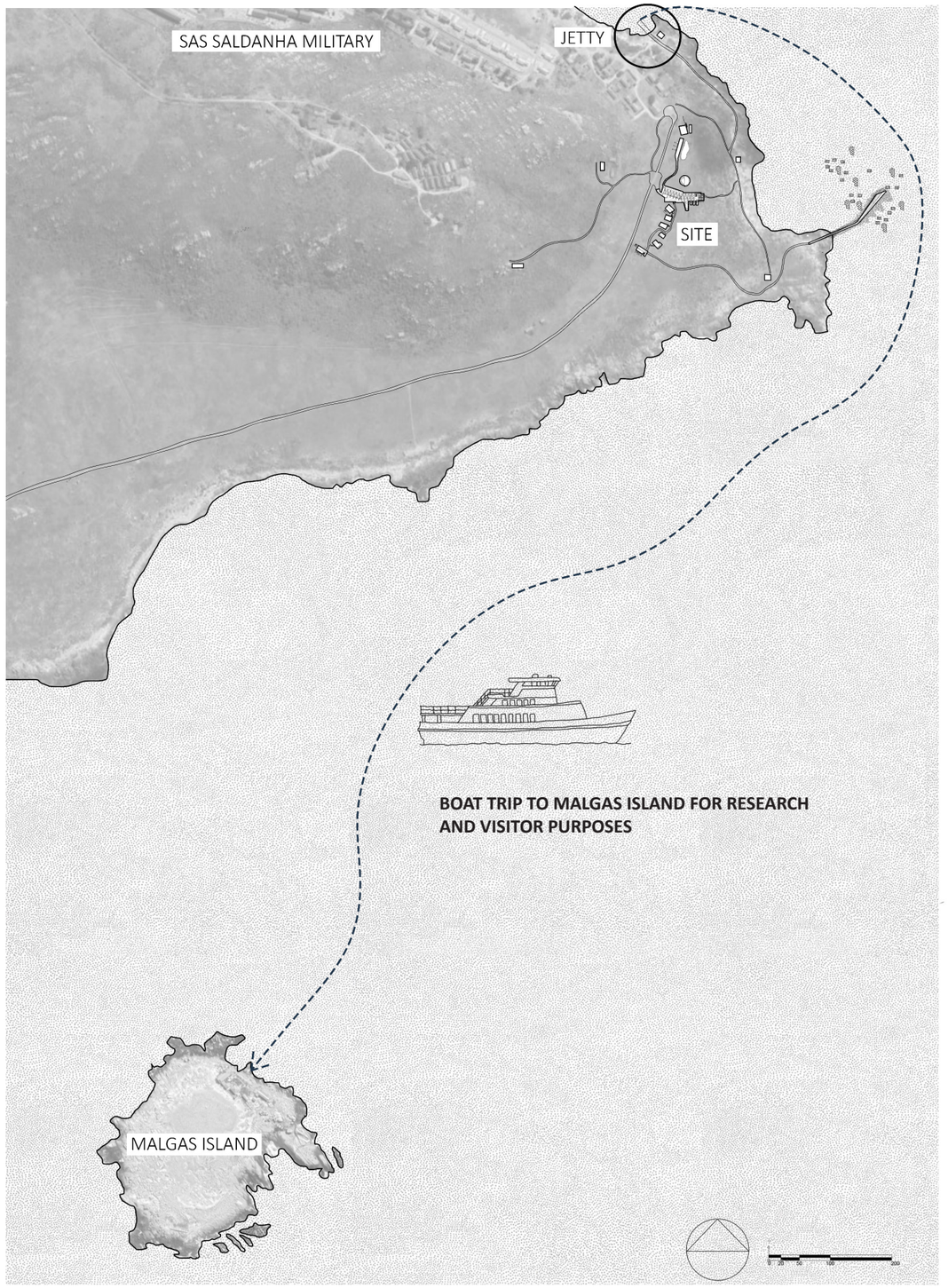


FIGURE 111 *Journey to Malgas Island (Author, 2022)*

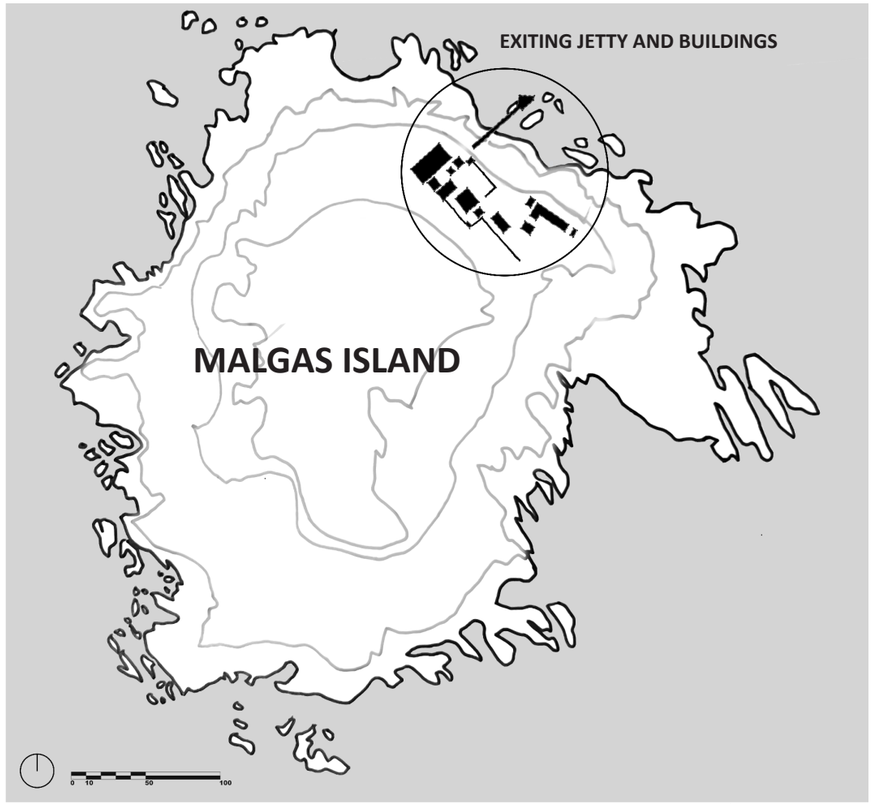


FIGURE 112 *Malgas island (Author, 2022)*

1. HOME OF CAPE GANNET COLONY
2. 1 0F 6 ISLANDS WHERE COLONIES ARE FOUND
3. MOST BUILDINGS INHABITED BY MARINE BIRDS
4. 1 BUILDING IS NOT IN A GOOD STATE WHERE VISITORS 5. STAY AND CONDUCT RESEARCH
6. EXISTING JETTY
7. ONLY ACCESSIBLE WHEN THE WEATHER IS CLEAR

The visitor will proceed with a guide to the concrete boat launching site, where they will be provided with life jackets. They will then proceed with their journey on the open water to Malgas island which is located 1.6km from the launching site. On Malgas island, they will follow a safe distance to observe the Cape Gannet colony and other marine species before being taken back to the mainland. Malgas island is seen as the secondary site and only one building will be adapted for better accommodation and research facilities as well as adding a viewing space for visitors to not interfere with any species on the island.

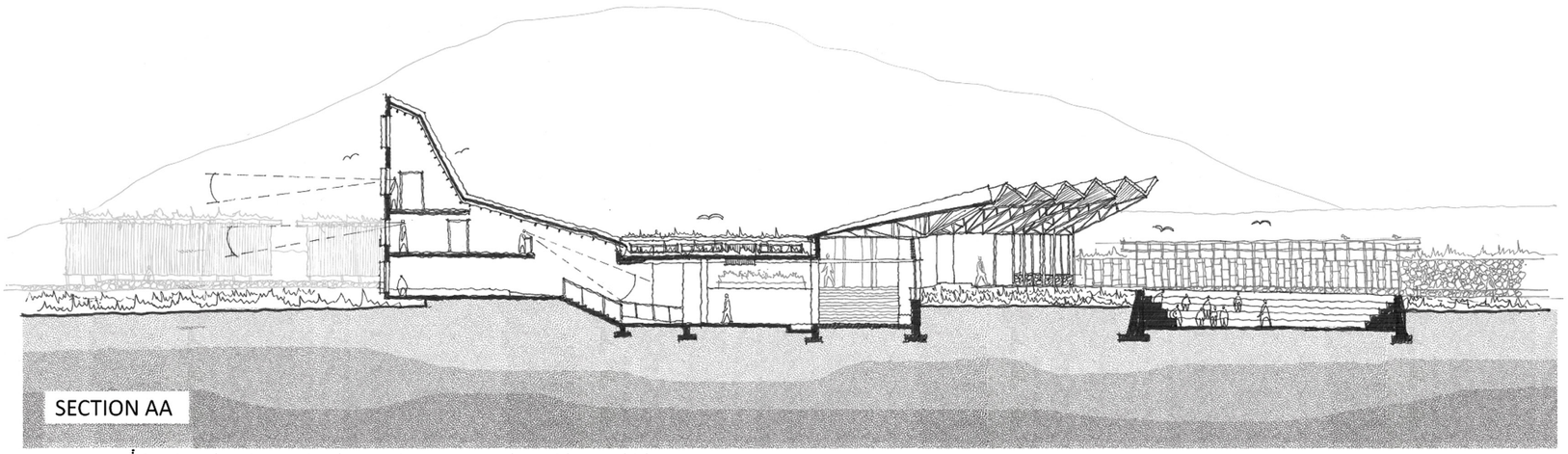


FIGURE 113 *Section showing main observation tower and outside amphitheatre (Author, 2022)*

Section AA represents a section through the main observation tower towards Malgas island where visitors can see the island and the landscape from a different perspective. The core consists of a cafe where humans and animals start to co-exist. The exterior amphitheater forms an integral part of the educational spaces and is embedded into the landscape, being protected from harsh weather conditions. The organic vegetated roof can also be seen in the background as well as a habitat wall behind the amphitheater.



The concept of hiding and reveal are seen in the sections where some elements of the design are embedded in the ground(cafeteria), some are located above the ground (viewing tower), and some are underground (exhibition, classroom, interpretation).

Section BB shows the visitor's journey from the entrance, down, towards the cafeteria, being lowered into the ground. The visitor's curiosity is sparked once they enter and they are drawn into a foyer space where views start to become alive through the design. There are also habitat and resting spaces for multiple species which can be observed from the inside.

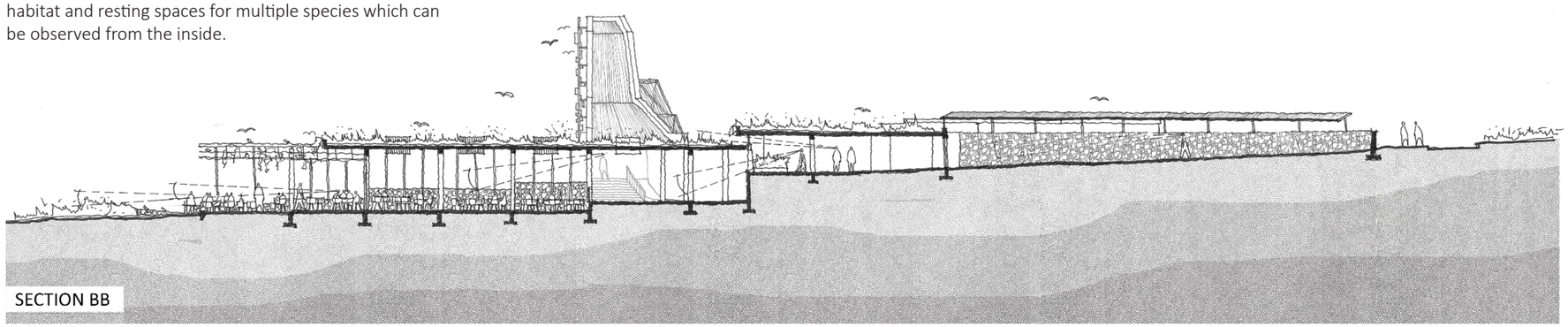
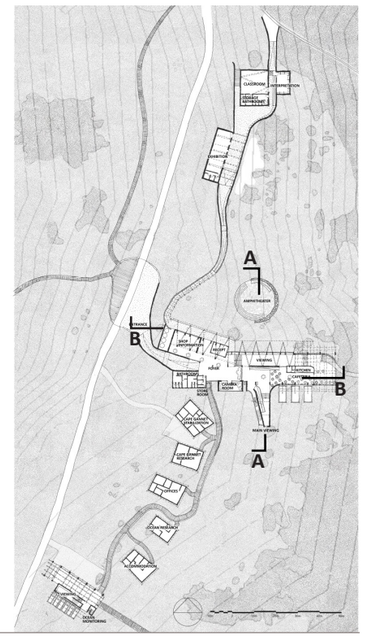
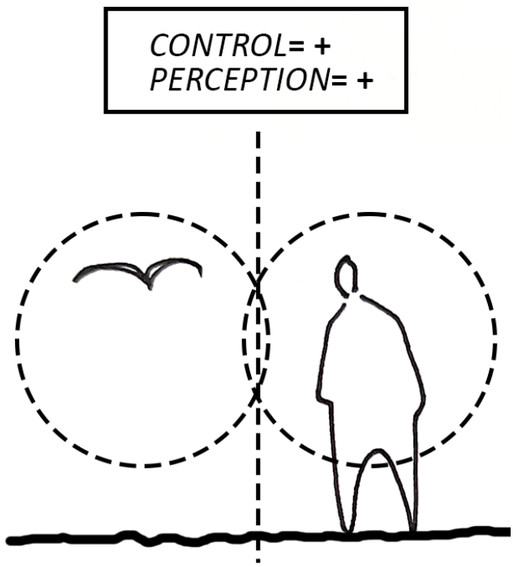
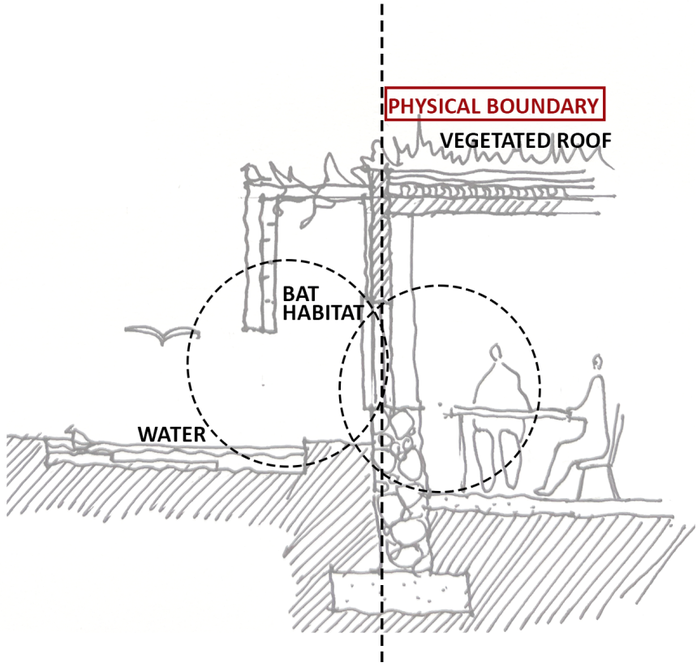
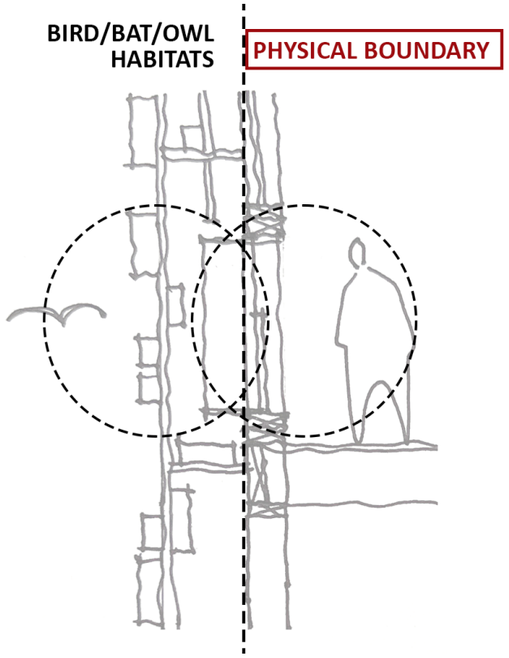


FIGURE 114 *Section showing route through the building (Author, 2022)*









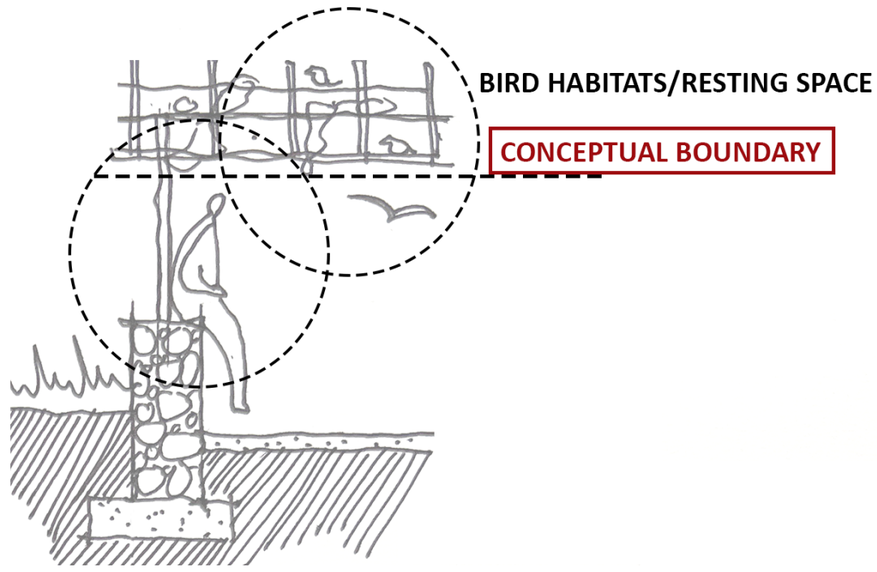


FIGURE 115 *Control vs perception (Author, 2022)*

5.16
CONTROL AND PERCEPTION

Cohabitation spaces are created when the line of separation and division is blurred and the exterior and interior co-benefits from each other at the line of the boundary. The boundary is no longer seen as a line of separation but gains the identity of coexistence. (Cheryl, 2020:45)

Conceptual and physical boundaries are established to make sure both humans and animals are positively impacted by the design. Humans and animals can start to co-exist in a safe space and in a sensitive way. The visitors perceive the animals as friendly and the architecture controls the relationship between these two via conceptual and physical boundaries.

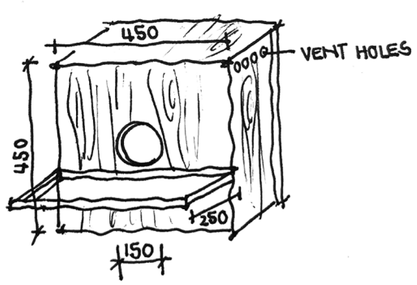
Four elements are implemented in the design to speak to the needs of the animals on the site
1. Habitat walls
2. Green roofs
3. Habitat roofs
4. Water holes

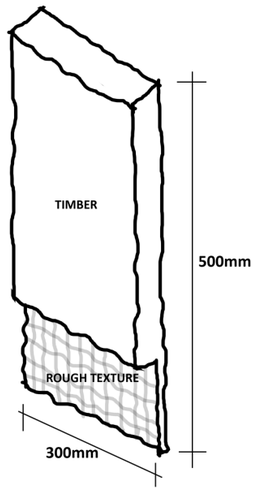
5.17
MULTI-SPECIES COHABITATION APPROACH

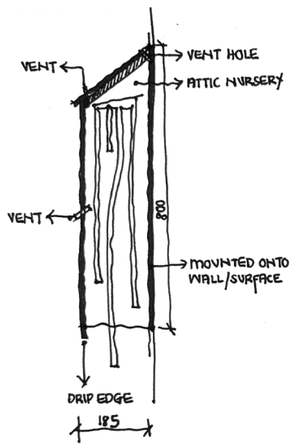
A multi-species cohabitation approach, which derived from the theoretical background, was implemented by looking at how humans and animals can co-exist.

The primary animal clients fall under the group of synanthropic species. These species live close to humans and benefit from us. They include birds, bats, owls, insects, and certain mammals. Creating habitat spaces for them is easy as they don't require much space, but it was necessary to take into consideration the relationship between them and humans once they are incorporated into the design. The secondary animal clients are those species which does not benefit from humans. The design speaks to the needs of both types of species by providing them with food, water, and shelter.

The construction of the pergolas and resting spaces for birds would need to have steel plates below the timber elements to catch any bird dropping as well as for easy maintenance. Where there are no steel plates, the bird droppings will act as fertilizer for planters which benefits bees, butterflies, and insects.







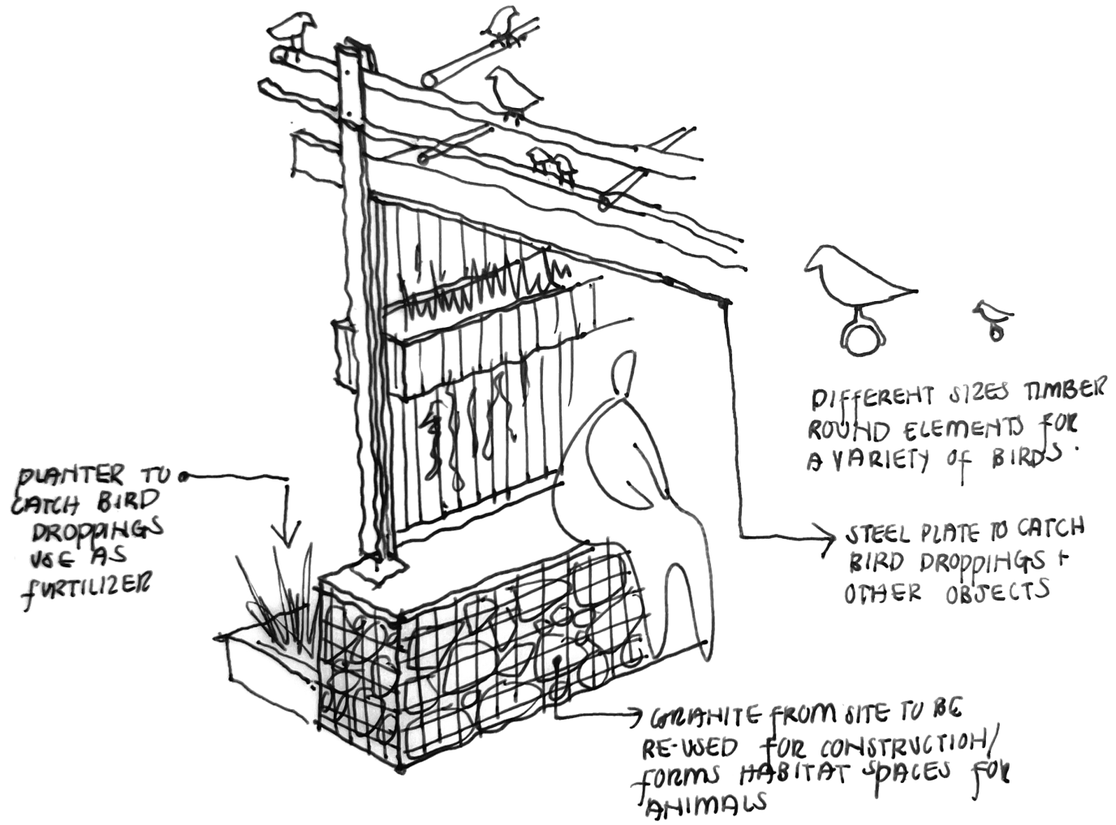


FIGURE 116 *Animal habitat specs (Author, 2022)*



FIGURE 117 *Exterior timber walkway to allow for animal movement (Author, 2022)*

5.18

MELLOR PRIMARY SCHOOL- ENGLAND

Mellor Primary School consists of locally sourced, natural, and reclaimed materials and uses modern methods of construction. A habitat gable wall (Fig. 119) provides habitats for small animals, plants, insects, and birds. The wall also performs as a rain screen. The compartments are filled with recycled and ecologically sound materials such as half logs and reclaimed timber offcuts. Terracotta and plastic pipes, plastic bottles, and bamboo tubes are used for an 'insect hotel' and bird/bat boxes are fixed onto the wall. Each compartment provides a home for a different kind of species. Pot plants are also attached to the wall to attract wildlife. (EXOVA, 2017)

Both humans and animals benefit from the habitat wall (rain screen, education, habitats) and it is also visually appealing. The wall gained an extra function without altering any aspect of the building's exterior or interior. The habitat wall is highly interactive and engaging, thus its educational value should not be overlooked (Brough, 2017). It creates a knowledge base tool for environmental education, stimulating the environment, and is also functional in its context.

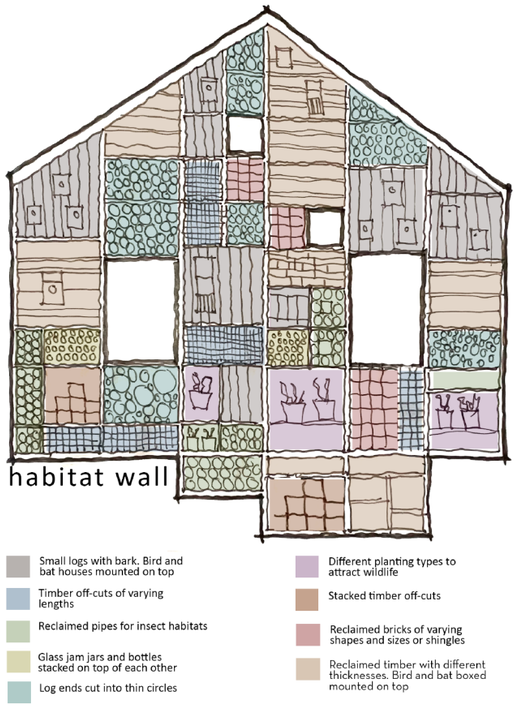


FIGURE 118 *Mellor Primary school habitat wall consists of a variety of habitat spaces with different materials (Author, 2022, based on Brough, 2017)*



FIGURE 119 *The 'Habitat Wall' provides different habitats for insects and small animals (Lane, 2017)*

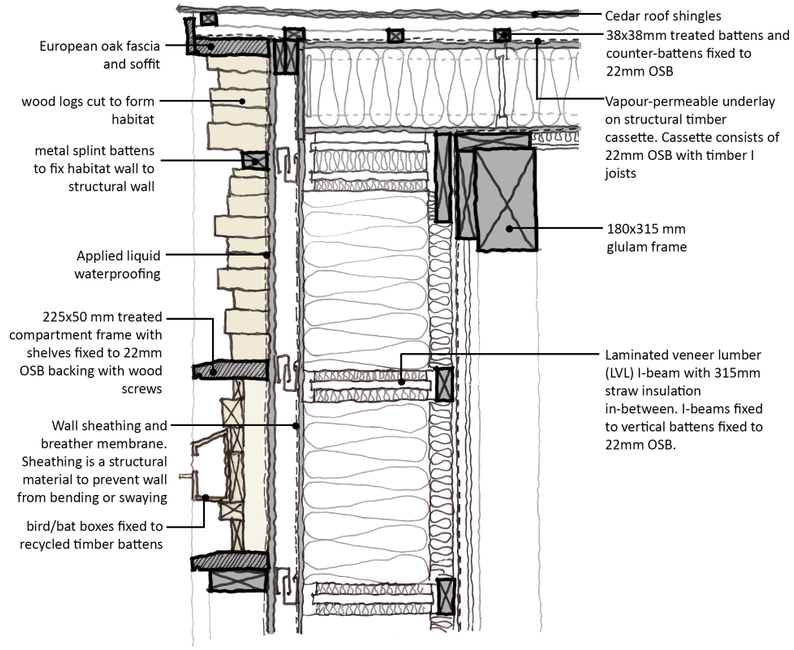


FIGURE 120 *Habitat wall section of roof and wall junction (Author, 2022, based on Wigglesworth Architects, 2017)*

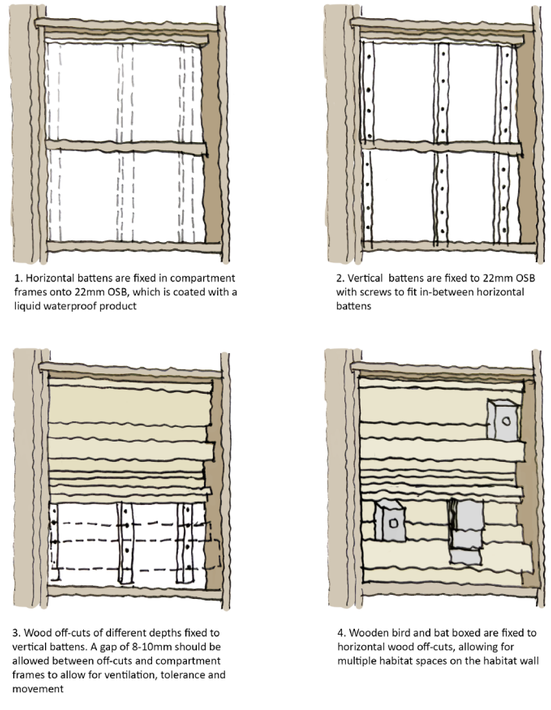


FIGURE 121 *The construction process of wood compartments of habitat wall (Author, 2022, based on Brough, 2017)*

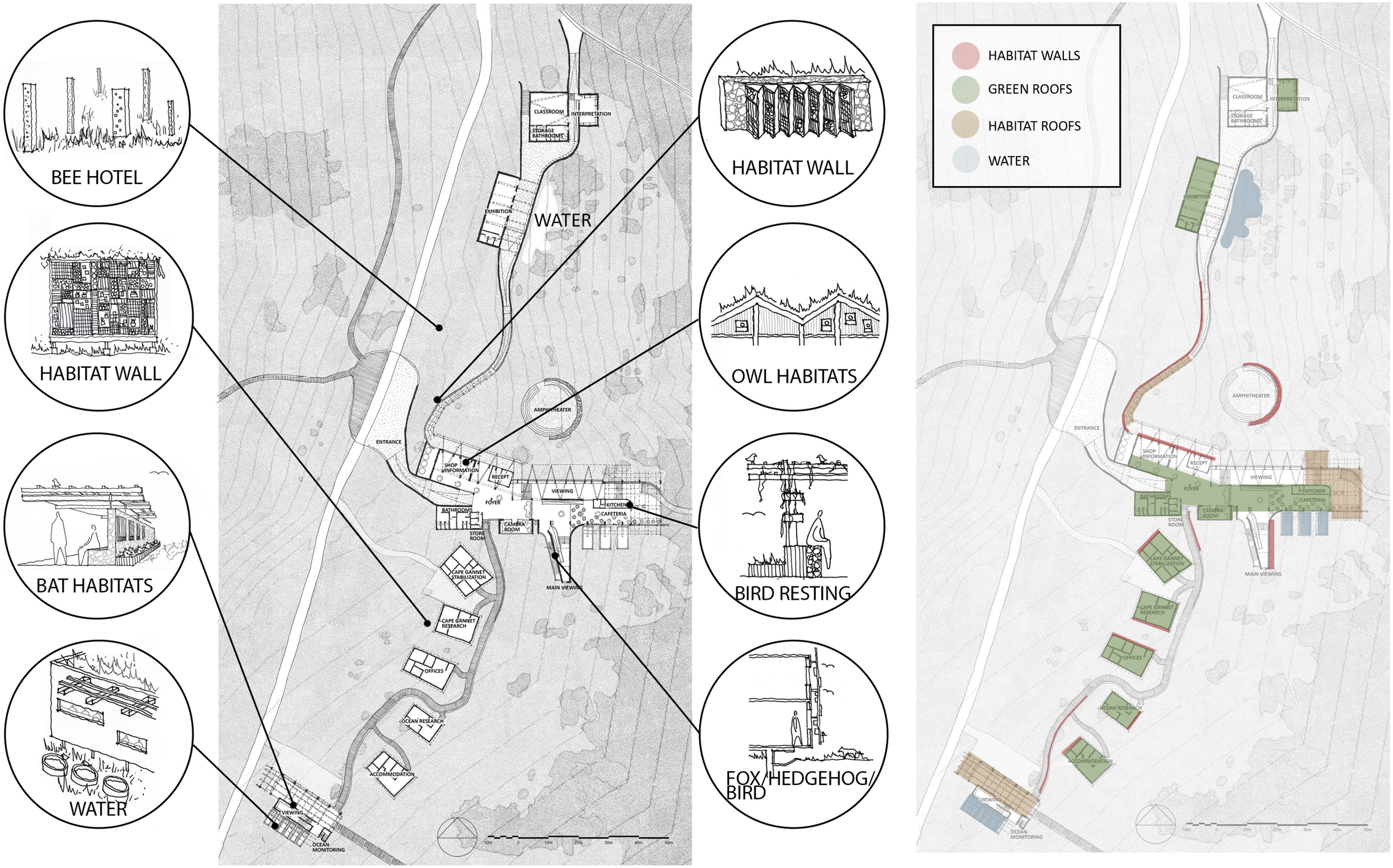


FIGURE 122 *Animal habitats incorporated in the design (Author, 2022)*



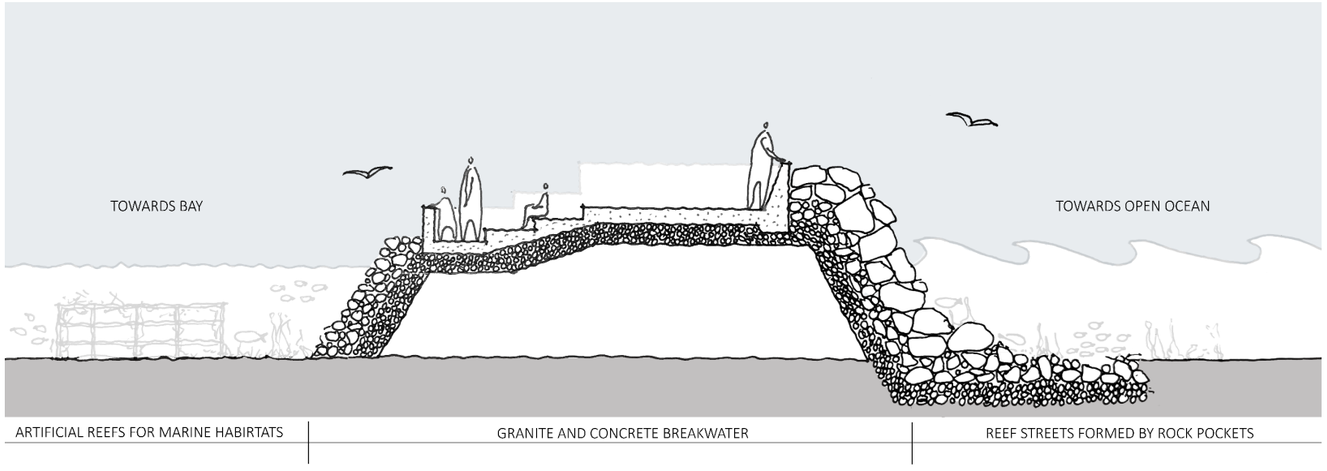
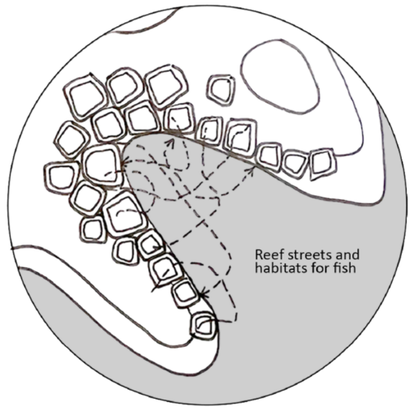


FIGURE 123 *Breakwayter plan and section (Author, 2022)*



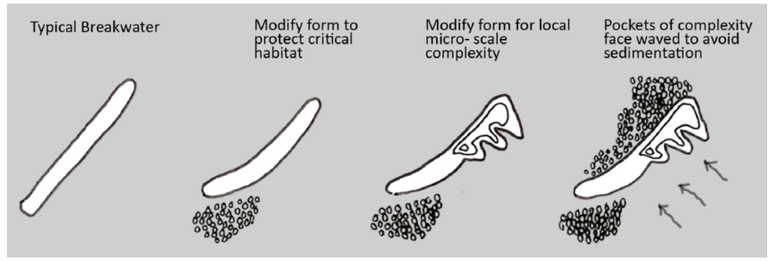


FIGURE 124 *Plan view of stone breakwaters providing habitats for marine species (Author, 2022, based on SCENARIO JOURNAL, n.d.)*

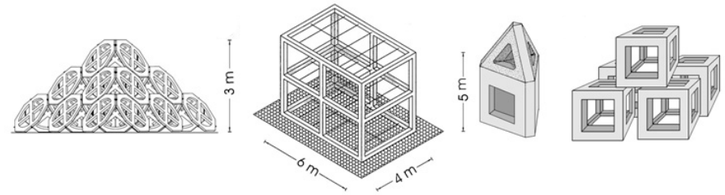


FIGURE 125 *Examples of production of artificial reef modules (Spagnolo, 2015)*

5.19
BREAKWATER AND ARTIFICIAL REEFS

The breakwater and artificial reefs enhance the marine biota and form reefs and streets for fish habitats. The multi-species cohabitation approach is used not only to enhance marine ecology but for the co-existence of humans and marine species. In a study by Wu, Tweedley, Loneragen, & Zhang (2019), it was proven that artificial reefs constructed from stone and concrete had a similar effect on ecosystems as natural rocky reefs within 3 years. Thus, the use of rocks should be encouraged instead of concrete where possible as they have the same effect and is a more sustainable solution.

5.20
MATERIALITY

The materiality of the building was specifically chosen:

1. For materials to have the least impact on the existing ecosystems
2. For an Ecocentric way of construction: a construction and manufacturing process to least interfere with the environment
3. As a result of the location: wind, saline water, moisture, sand
4. For the building to be in harmony with the landscape
5. For the materials that were removed during excavation to be reused as much as possible
6. For sufficient and successful animal habitats to mimic their natural habitats

Durability is important as the building would be exposed to coastal elements such as saline water, wind, sand, and moisture having an impact on the materials. Allowing the materials to weather during a period creates not only a specific aesthetic of beauty but it allows the building to be an ever-changing entity in the landscape. The only protection the building has is the mountain on the West and the fact that it is set into the ground. It was important for me, that the materials that are excavated should not go to waste. Thus, these materials (granite, sand, and vegetation) should be utilized in the construction, granite breakwaters in the ocean, and backfill.

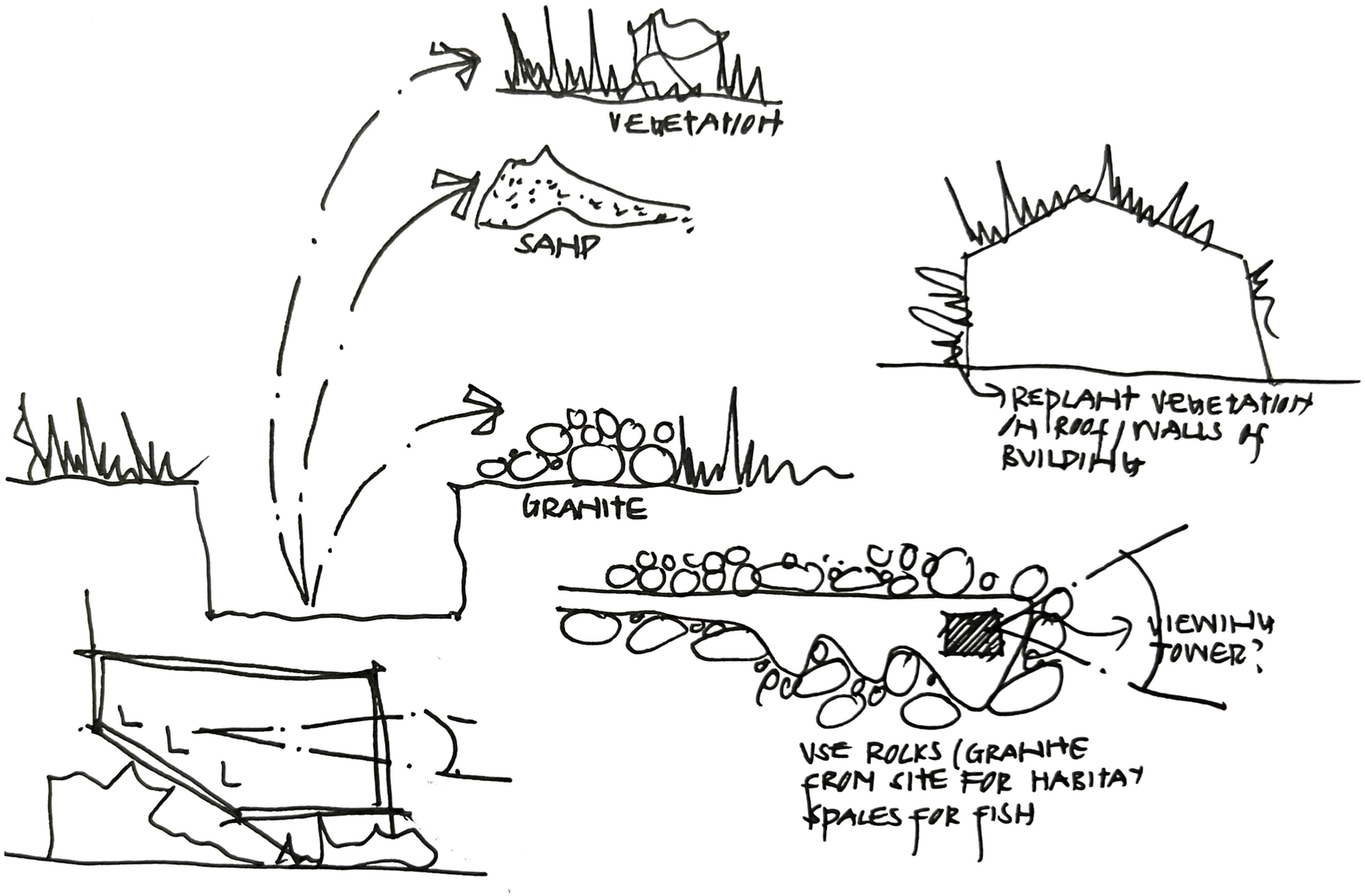


FIGURE 126 *Replacing materials removed during construction (Author, 2022)*

CROSS LAMINATED TIMBER

For the design to fully speak to the language of an Ecocentric world model, the construction process and materiality had to relate to this as well. Constructing a building in such a landscape is more than just the final product, it is taking a sensitive approach to how materials are sourced, how they arrive on the site, the effects of the construction process on the environment, and the impact of the final design when it is occupied. Not only does an Ecocentric architecture means thinking of the present way of making but it also entails what happens to the building in the future. It was important to think of the effect of the construction of the building on the animals on site to least interfere with their home.

Cross-laminated timber is one of the main construction materials of the design due to it being more sustainable than most conventional construction materials. Cross-laminated timber (CLT) is made of SA Pine timber members glued and laminated at right angles to one another to form structural panels (XLAM South Africa, n.d.). CLT is currently not a mainstream construction method in South Africa, but I believe it will become a breakthrough material in South Africa the more it is incorporated into architectural designs.

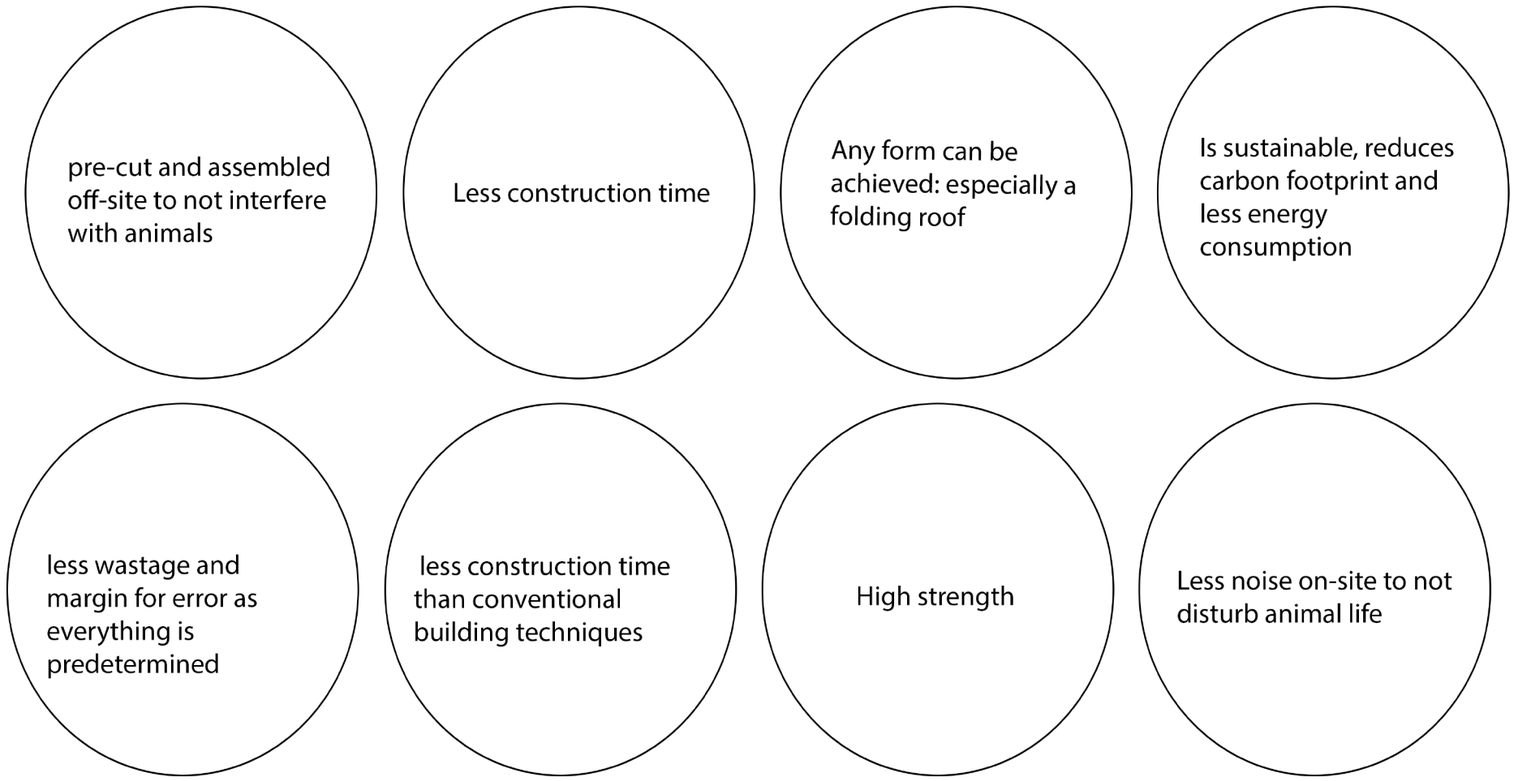


FIGURE 127 *Benefits of Cross Laminated Timber (Author, 2022, based on XLAM South Africa, n.d.)*

THE MAKING: CLT

A visit to the XLAM factory in 2021 made me realize how easy and efficient the process of making CLT walls are. The CLT panels come in standard sizes and are laser cut to cut the timber into various forms generated by CAD software. Thus, any shape could be precisely cut and there is less margin for errors when working with complex structures such as the folding roof of the design.

The CLT walls will be pre-cut before arriving on site and will be assembled on-site. It takes 30% less time to construct a CLT building than using conventional construction methods (XLAM South Africa, n.d.).





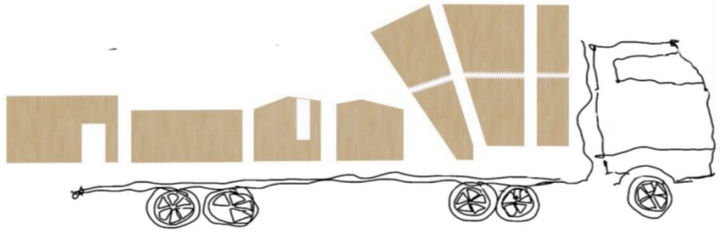


FIGURE 129 *Pre-cut CLT pieces transported to the site (Author, 2022)*

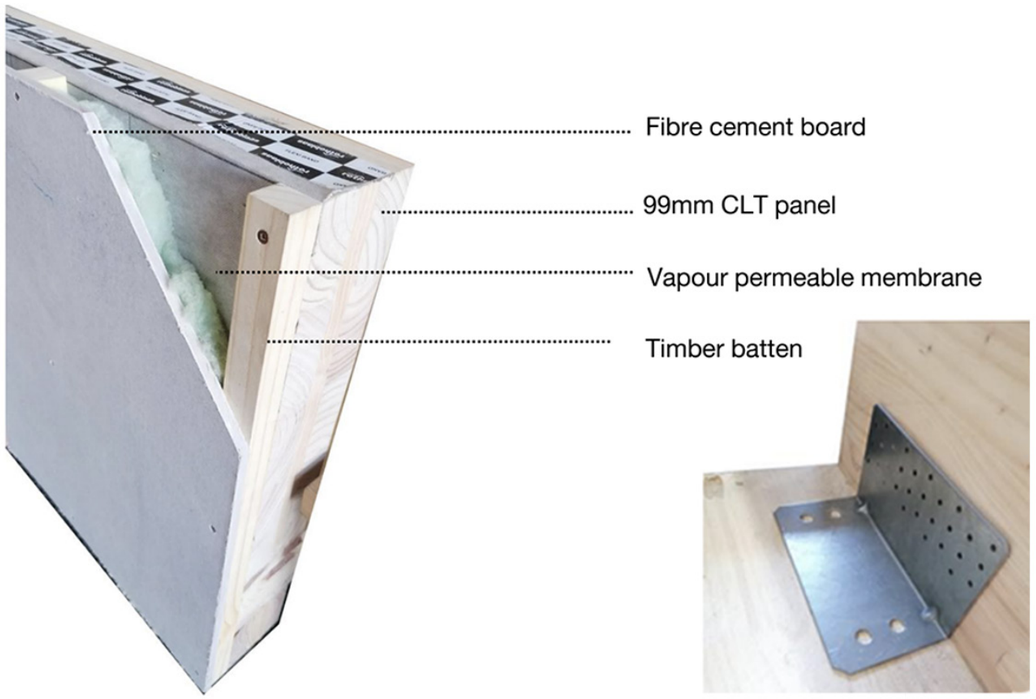
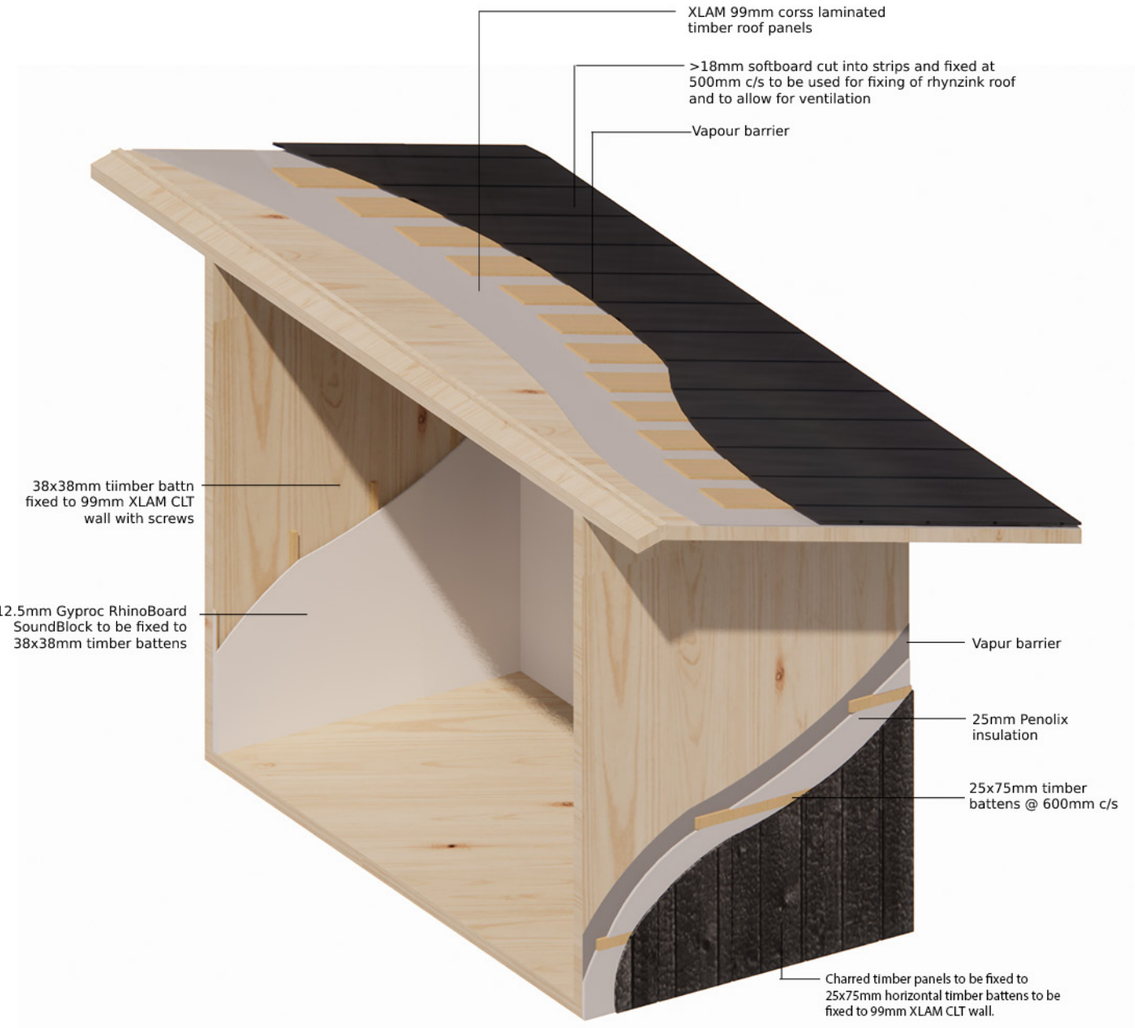


FIGURE 128 *Example of a CLT wall construction (Snyman, 2021)*



FIGURE 128 *CLT panels pre-cut (XLAM, n.d.)*



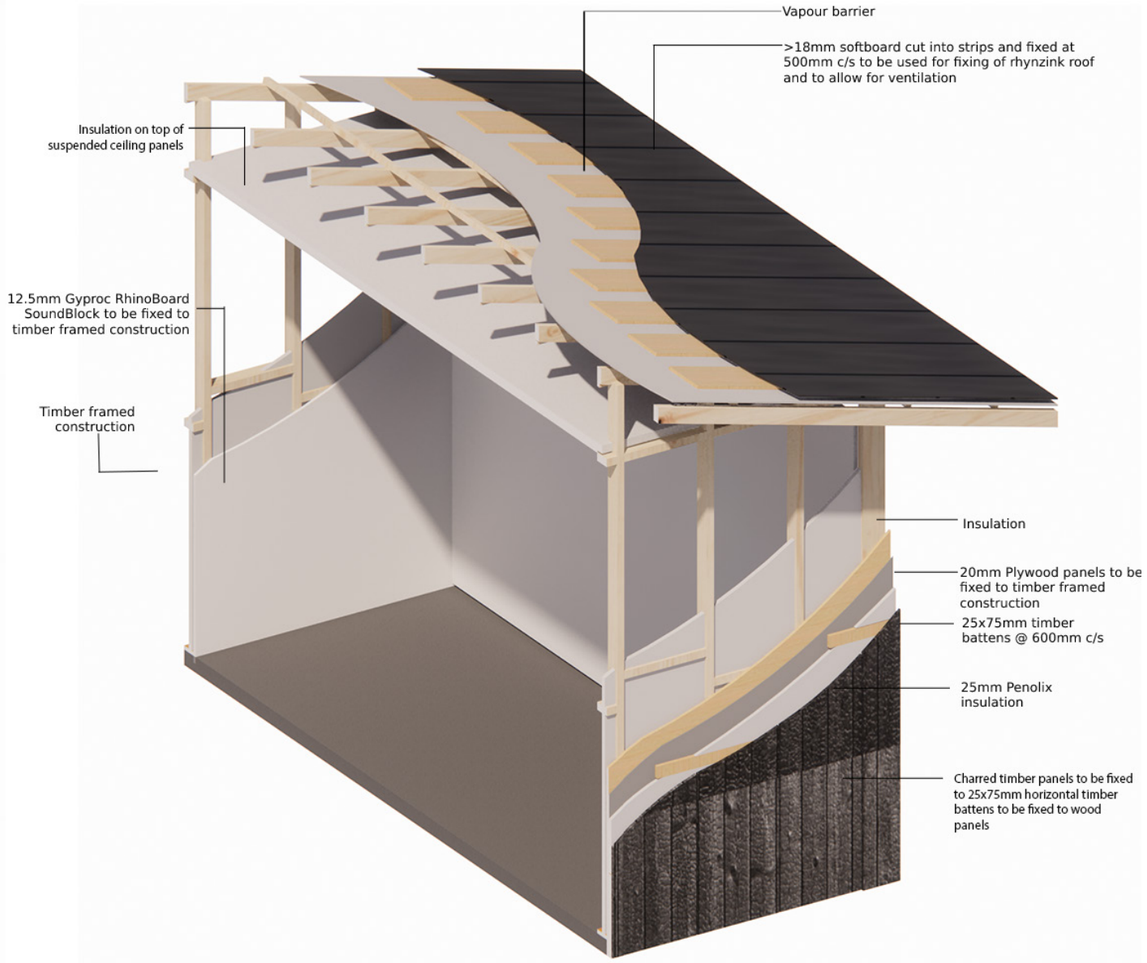


FIGURE 131 *Normal timber vs CLT construction comparison (Author, 2021)*

The following 3D renders of timber construction were done to explore the difference. It was discovered that CLT is much more sufficient and easier to construct once the pieces are laser cut in a warehouse. Although the images are not an accurate representation of the design, they gave me a clear answer that CLT would be beneficial for the design and the natural environment.

The use of seaweed as insulation allowed me to explore new and sustainable ways of 'making'. Seaweed is abundant close to the site and thus it is a better choice for insulation.

TOUCHING THE EARTH

The parts of the design which are constructed underground are located close to where there is already human settlement, due to the noise and access of heavy vehicles. The parts of the building that consist of CLT pre-cut panels are lifted above the landscape and are situated further into the nature reserve. The construction time is less and the impact on the natural surroundings and noise pollution are less.

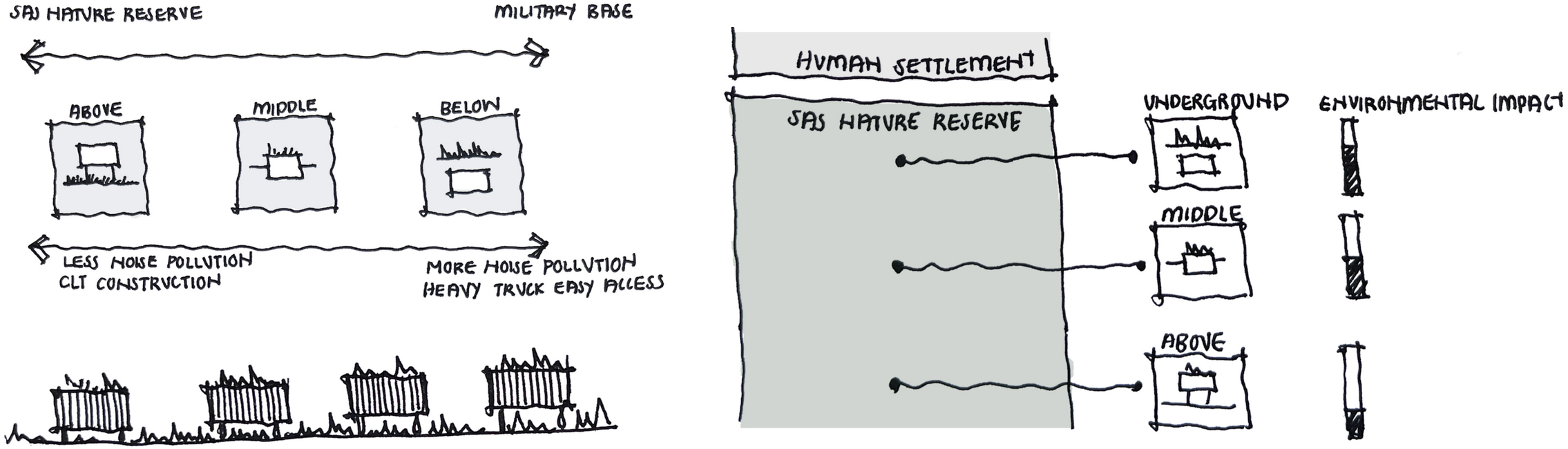


FIGURE 132 *Different construction techniques to respect environment (Author, 2022)*

What will happen after??

Due to CLT being easy to construct, it is also easy to disassemble. In case there is a need for the building to close at any point in time, the building could be easily 'taken apart' and the timber could be reused. As some parts of the building is underground, this could also be refilled and repaired close to its initial state. As a result of the small footprint of the design, which also has many benefits, the building does not have a very big impact on the natural environment and these decisions were carefully thought of in the design process.

PART 0**6**

CONCLUSION

The main research question “What is the role of Architecture to shift to an Ecocentric world model to better the relationship between humans, Cape Gannets, and the natural environment in Saldanha Bay? was answered throughout the dissertation and the Saldanha Wildlife Preservation and Research Centre responded successfully to this question.

The design provides many opportunities to better the relationship between humans and the natural surroundings including various species and the Cape Gannet. With the use of a multi-species cohabitation approach, the architecture becomes the mediator between the two, and they start to co-exist. Through this approach, the architecture provides shelter, food, and water to various species, thus positively impacting their lives.

The design successfully makes people aware of Cape Gannet, and the threats they are facing by providing environmental education and allowing the visitors to experience Malgas island and the Cape Gannet colony in real life. Environmental education plays an important role in environmental literacy and progressing toward an Ecocentric world model.

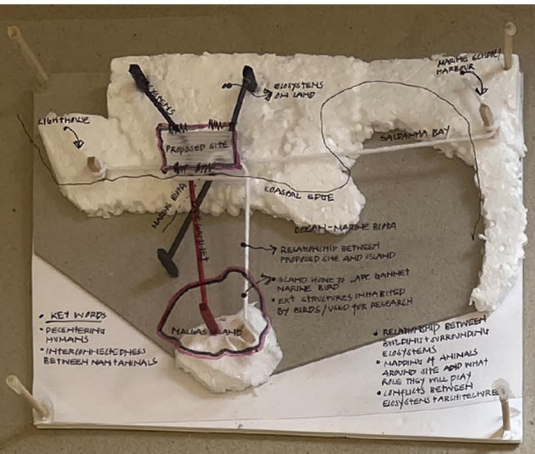
Stabilization and research facilities are provided for the Cape Gannets and marine birds from Malgas island which assist in the preservation of these species under threat. Monitoring and research facilities are also provided for the ocean to tackle the primary concern of pollution which have a major effect on the Cape Gannets, marine ecology, and the natural environment.

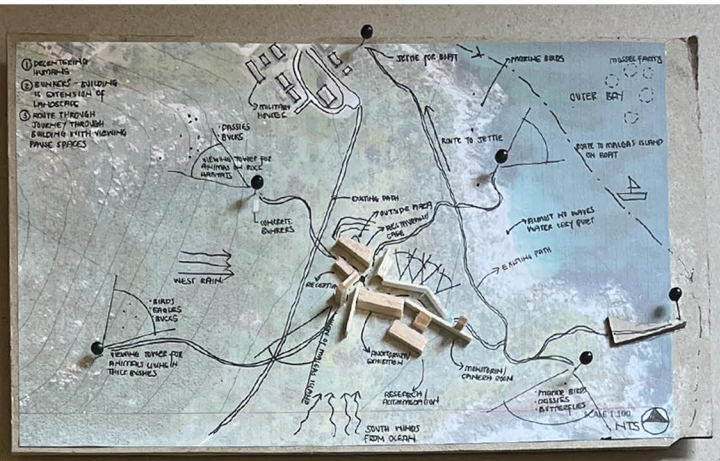
A sensitive approach to materiality and construction techniques was chosen to have the least impact on the environment in the construction phase, when the building is occupied, and when the building needs to be deconstructed due to certain reasons.

The answer to a contemplative question I asked myself throughout the design “Will the wildlife be better off with the design?” was “yes”, I do believe that a sensitive approach was taken to least interfere with the wildlife. The design aims to benefit existing ecosystems, assisting the Cape Gannet, and allowing the visitors to experience this magnificent place and the power of nature in ways they haven’t experienced it before. Hopefully, this could be the answer to how the Saldanha Wildlife Preservation and Research Centre can help assist in progressing toward an Ecocentric world model where humans and animals are not only seen as equal but where both benefit one another in a symbiotic way.

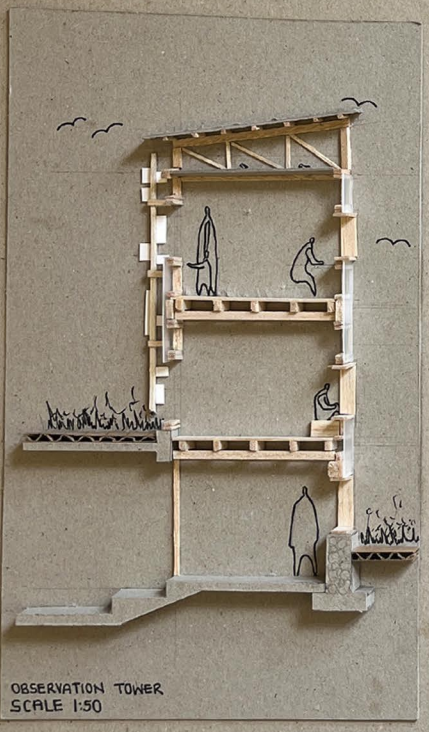


FIGURE **133** *Dry sea bamboo (Author, 2022)*

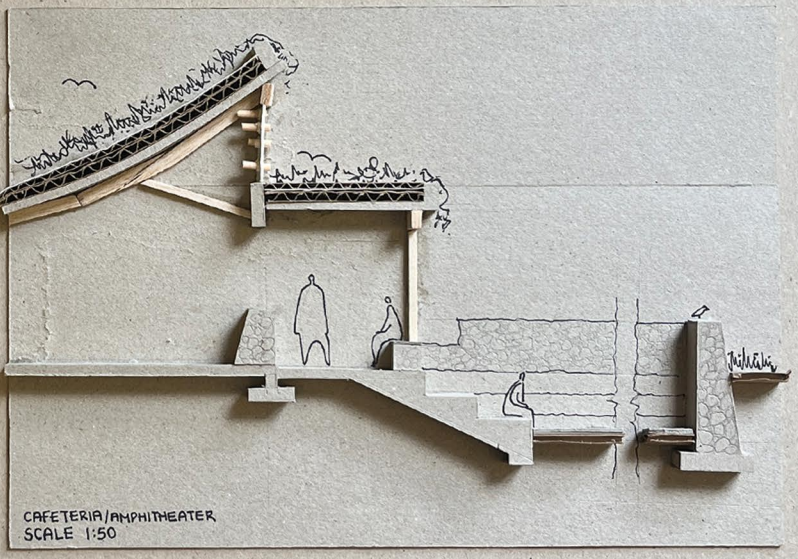








OBSERVATION TOWER
SCALE 1:50

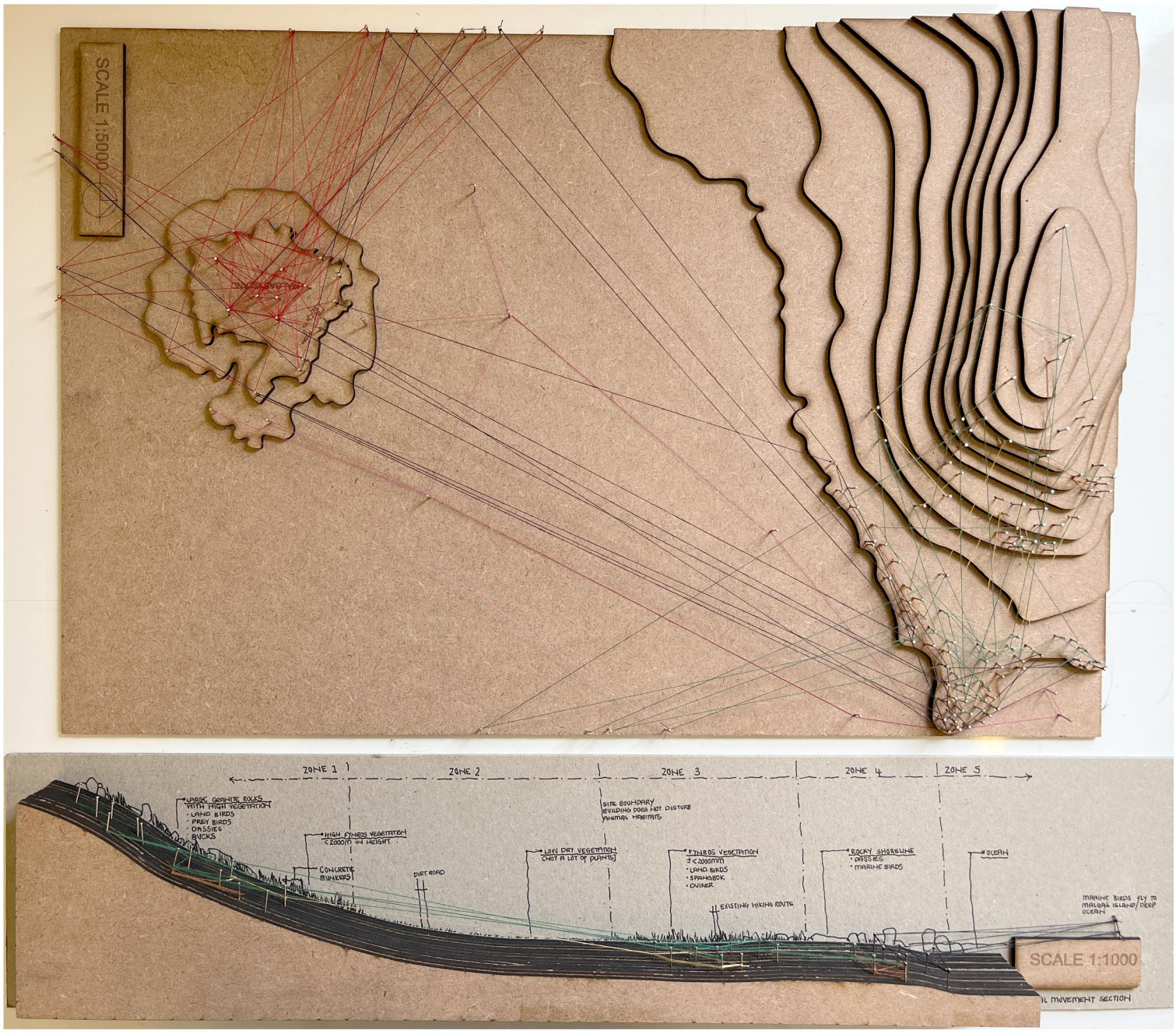


CAFETERIA/AMPHITHEATER
SCALE 1:50

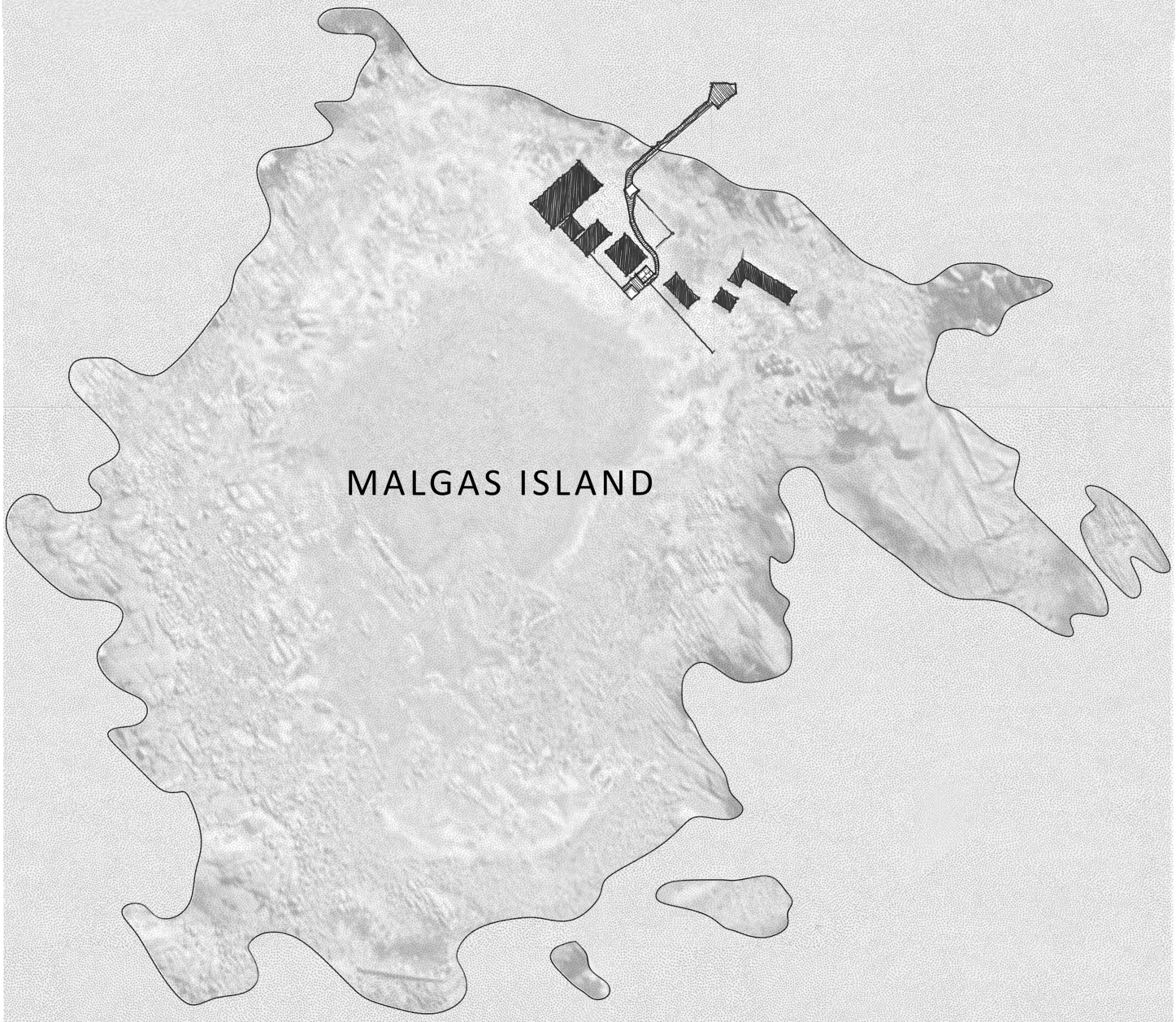


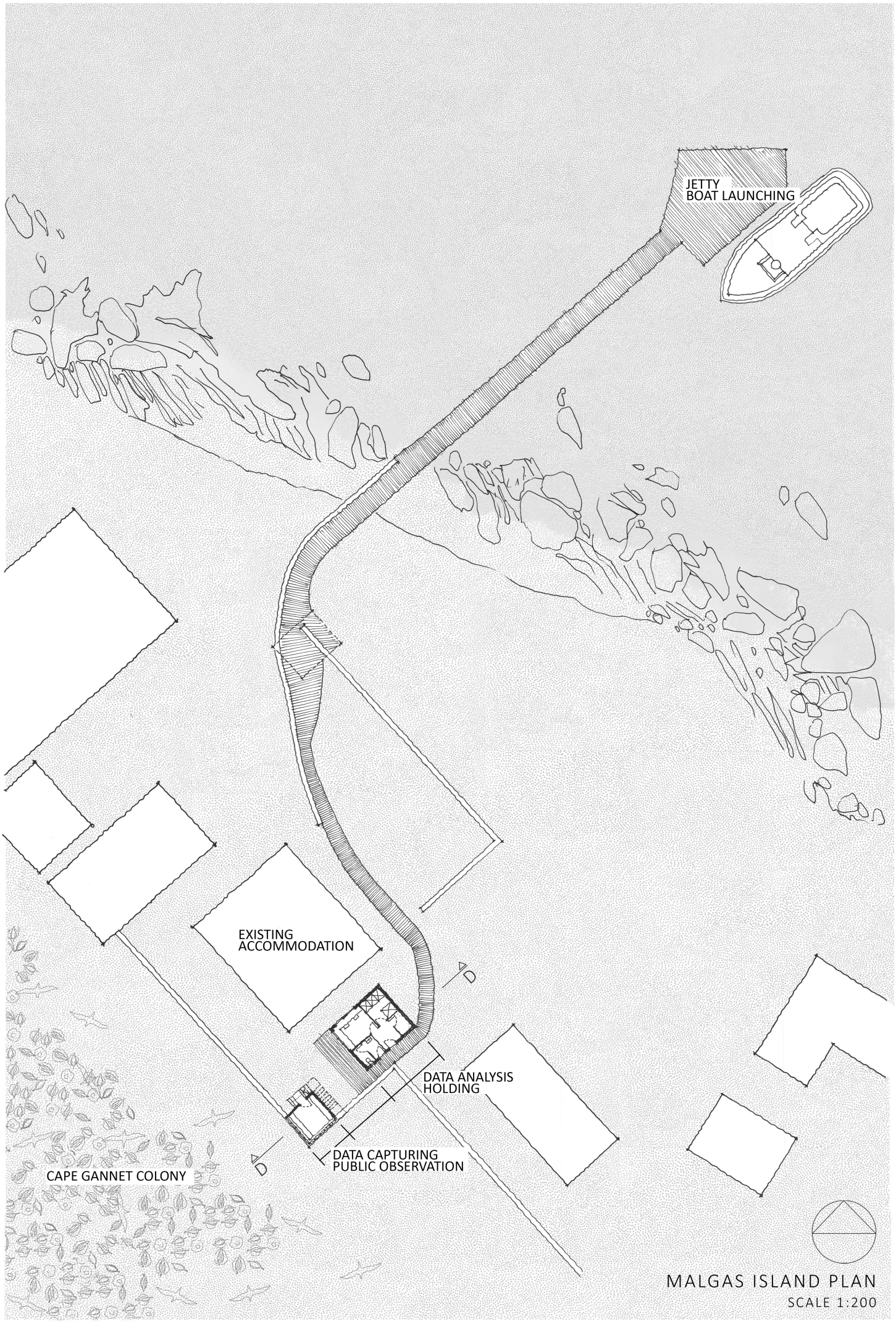



Scale 1:1000


SCALE 1:5000
ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
LARGE GRANITE ROCKS WITH HIGH VEGETATION
· LAND BIRDS
· PREY BIRDS
· DASSIES
· BUCKS
HIGH FYNBOS VEGETATION <2000MM IN HEIGHT
CONCRETE BUNKERS
DIRT ROAD
SITE BOUNDARY BUILDING DOES NOT DISTURB ANIMAL HABITATS
LOW DRY VEGETATION (NOT A LOT OF PLANTS)
FYNBOS VEGETATION ± <2000MM
· LAND BIRDS
· SPRINGBOK
· QUINEA
EXISTING HIKING ROUTE
ROCKY SHORELINE
· DASSIES
· MARINE BIRDS
OCEAN
MARINE BIRDS FLY TO MALGAS ISLAND/DEEP OCEAN
SCALE 1:1000
IL MOVEMENT SECTION

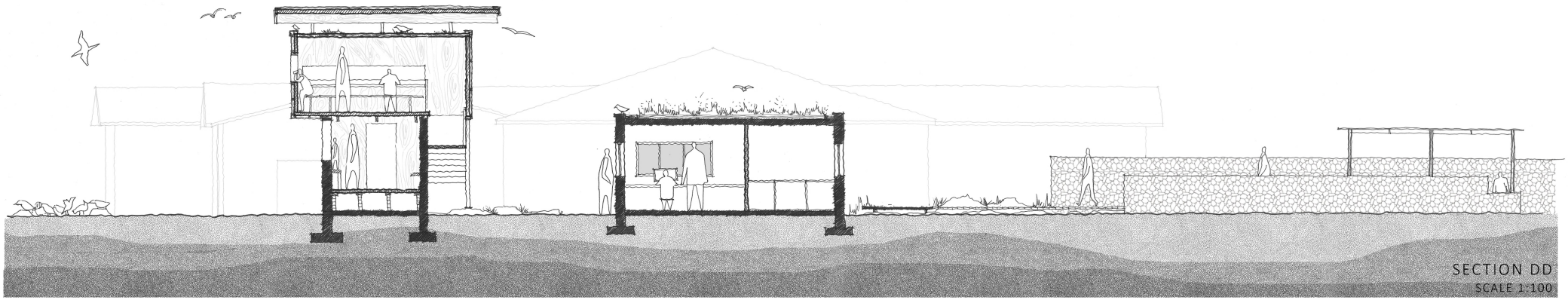

SAS SALDANHA MILITARY
SITE
MALGAS ISLAND
SITE PLAN
0 20 50 100 200


MALGAS ISLAND



MALGAS ISLAND PLAN

SCALE 1:200

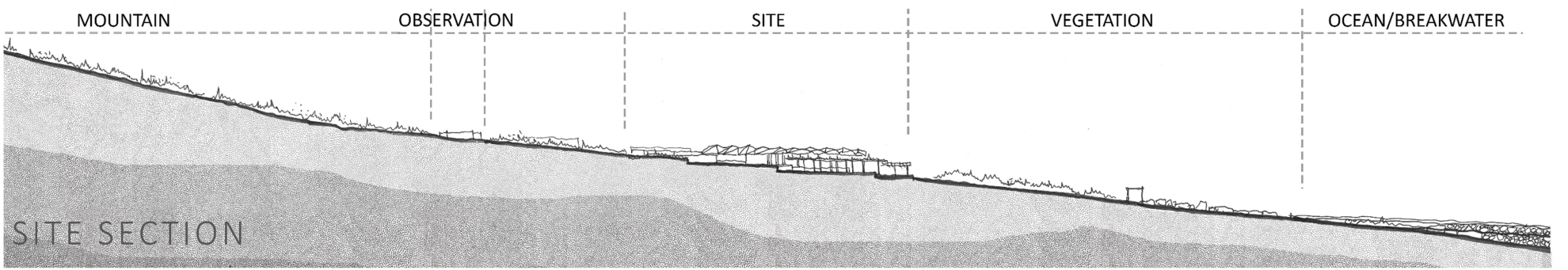


SECTION DD
SCALE 1:100

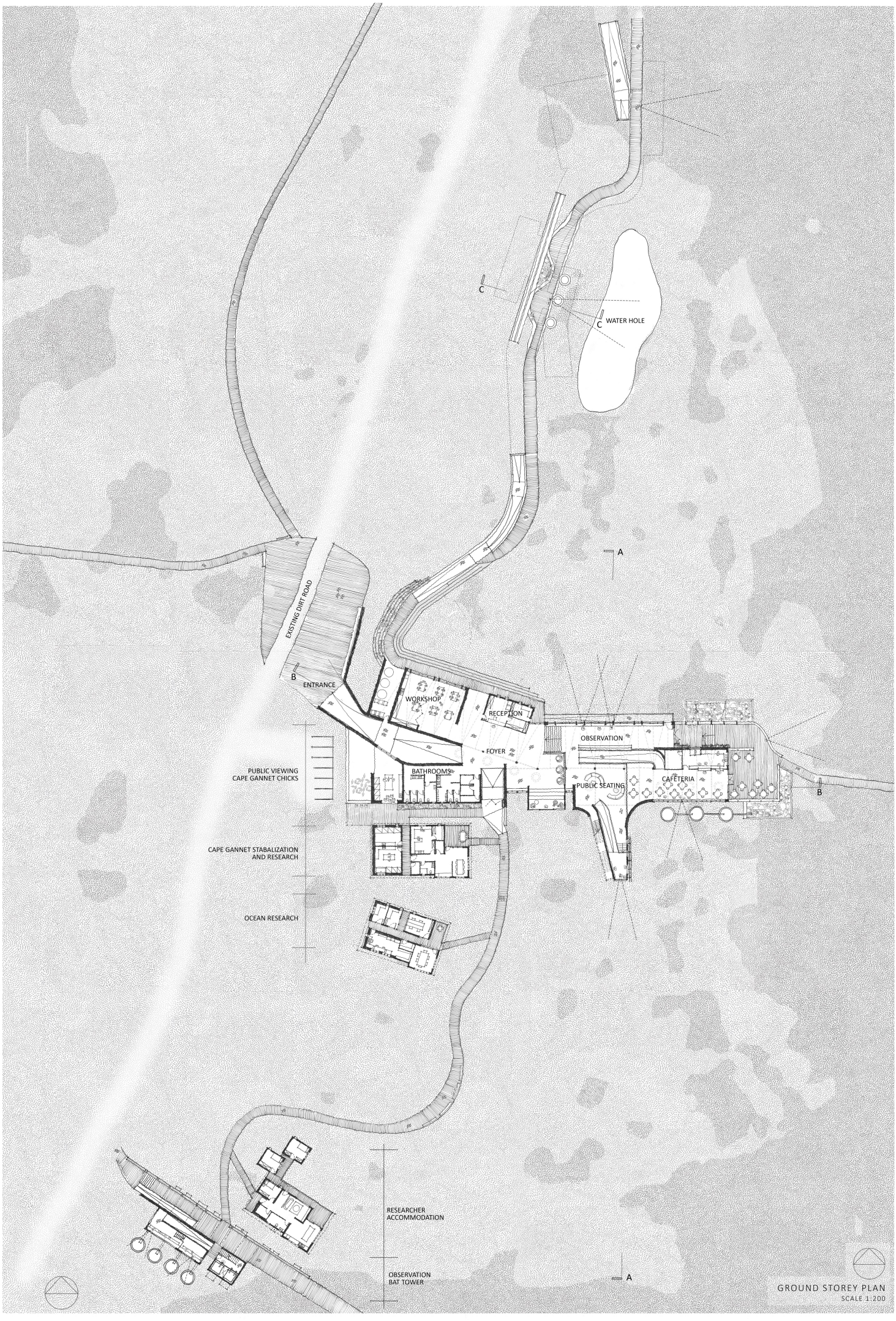
CAPE GANNET COLONY	DATA COLLECTION/ PUBLIC OBSERVATION	DATA CAPTURE/ RESEARCH	WALKWAY TO JETTY



SITE PLAN

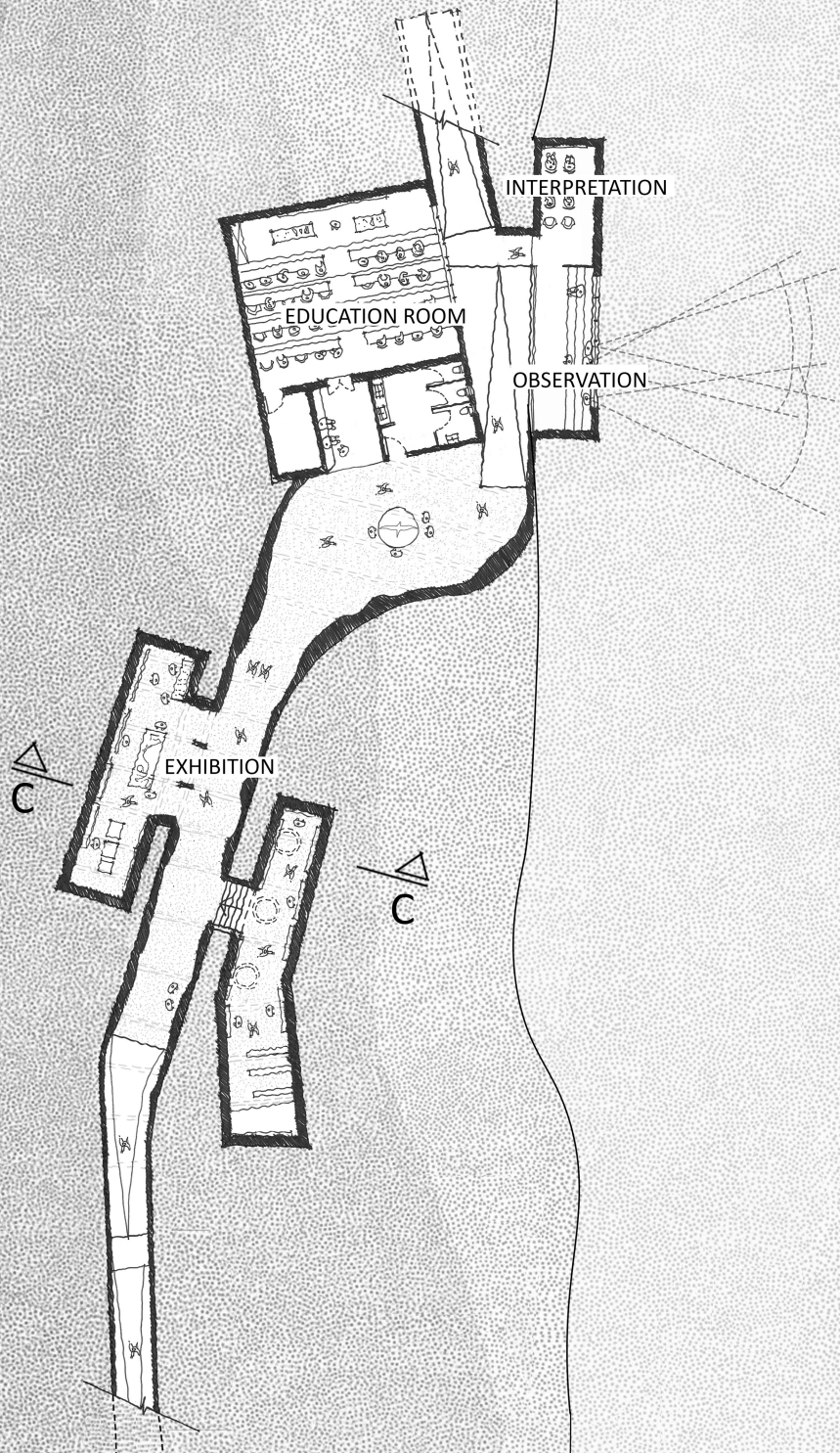


SITE SECTION



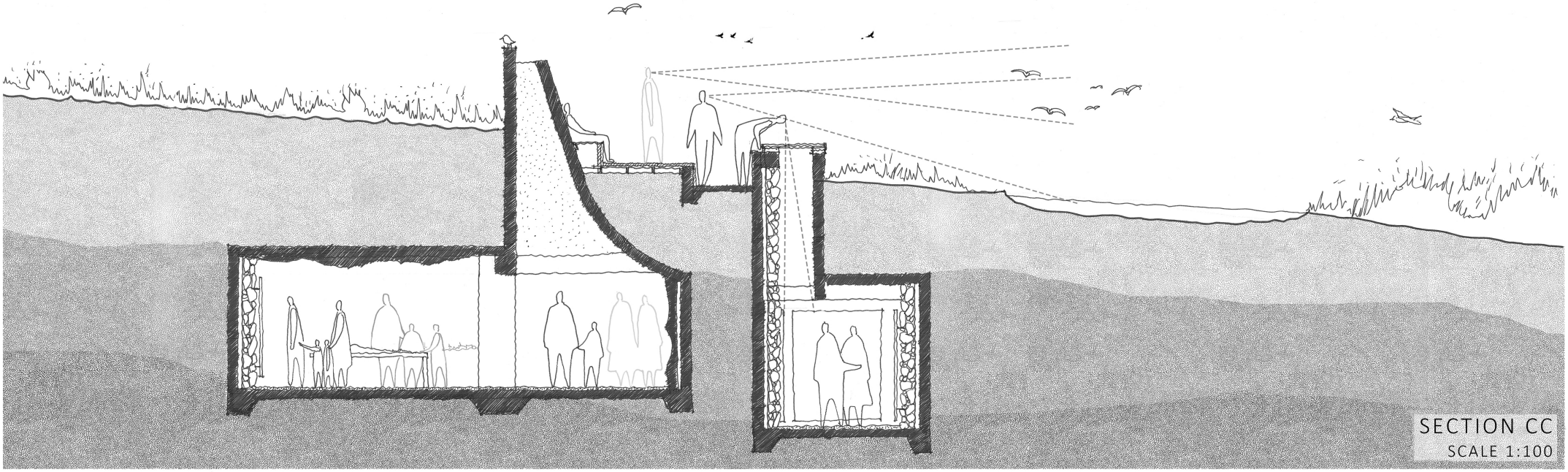
GROUND STOREY PLAN

SCALE 1:200



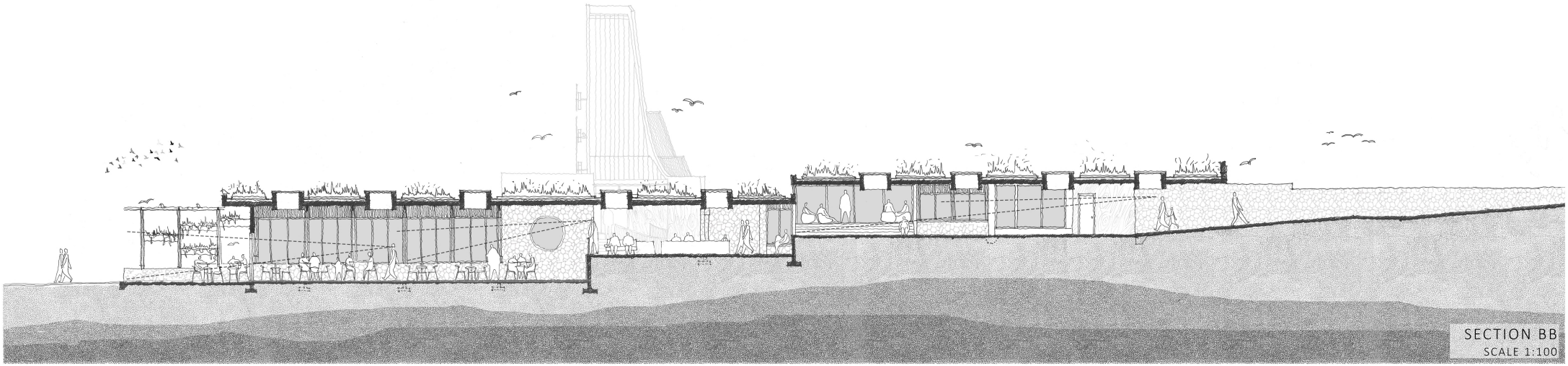
LOWER STOREY PLAN

SCALE 1:200



SECTION CC
SCALE 1:100

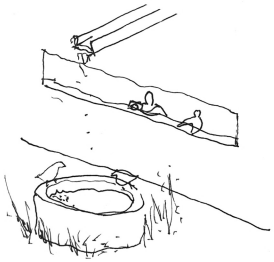
VEGETATION | EXHIBITION | WALKWAY | WALKWAY | VISUALS | ANIMAL WATER HOLE



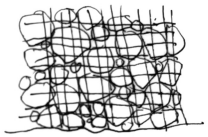
SECTION BB
SCALE 1:100

WALKWAY	EXTERIOR SEATING	CAFETERIA	PUBLIC SEATING	RECEPTION/WAITING	ENTRANCE WALKWAY

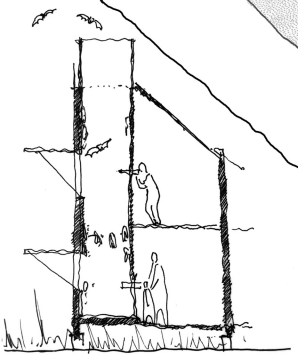
ANIMAL HABITATS



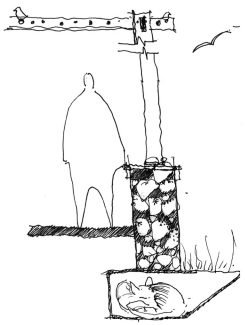
WATER



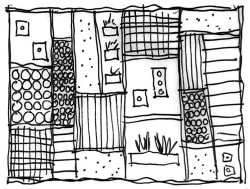
INSECT HABITATS



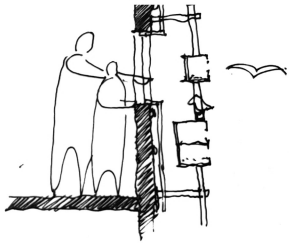
BAT TOWER



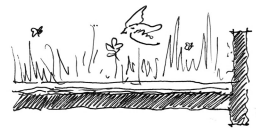
FOX/HEDGEHOG HABITATS
RESTING PERGOLAS



HABITAT WALLS



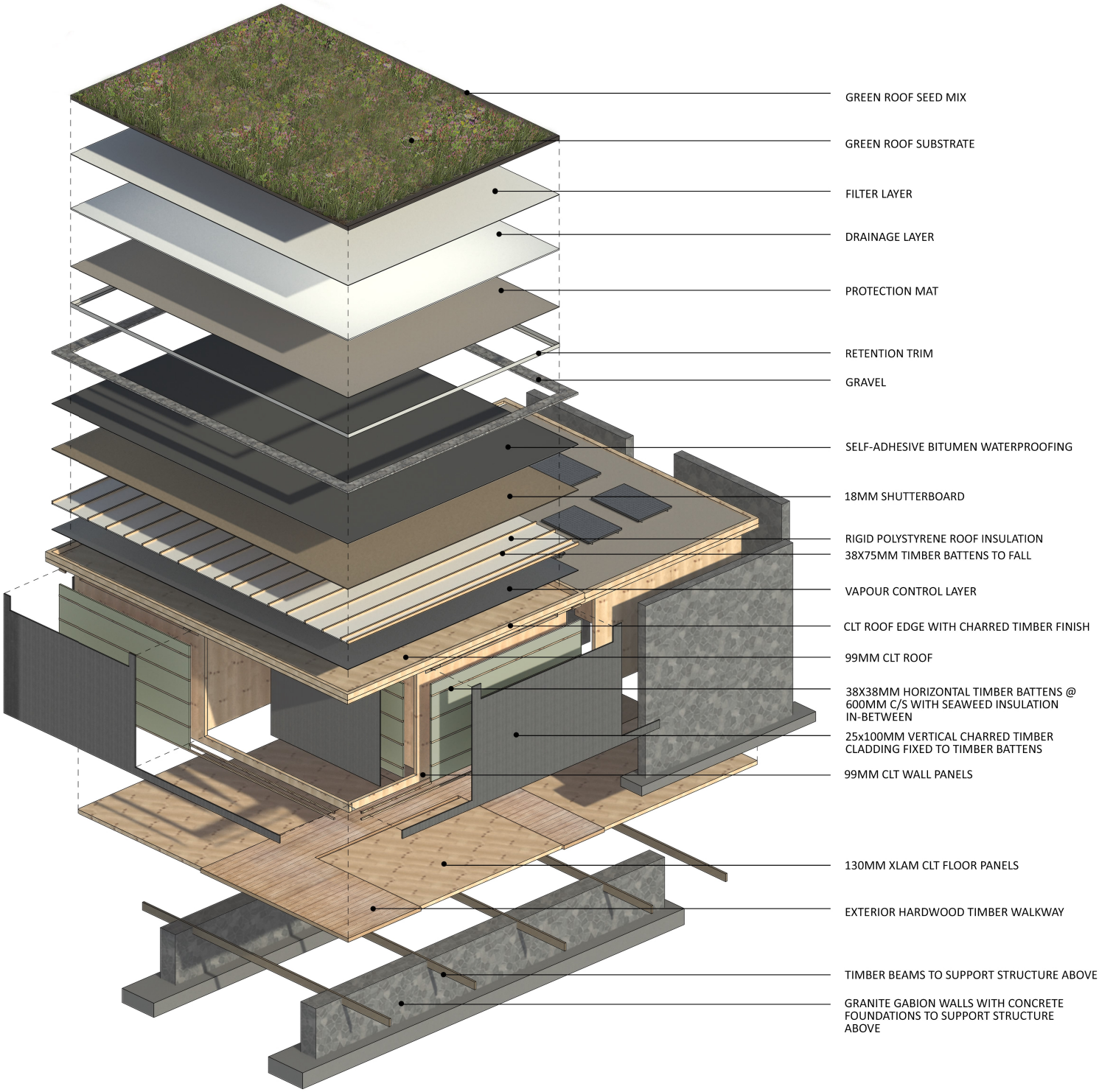
BIRD/OWL HABITATS

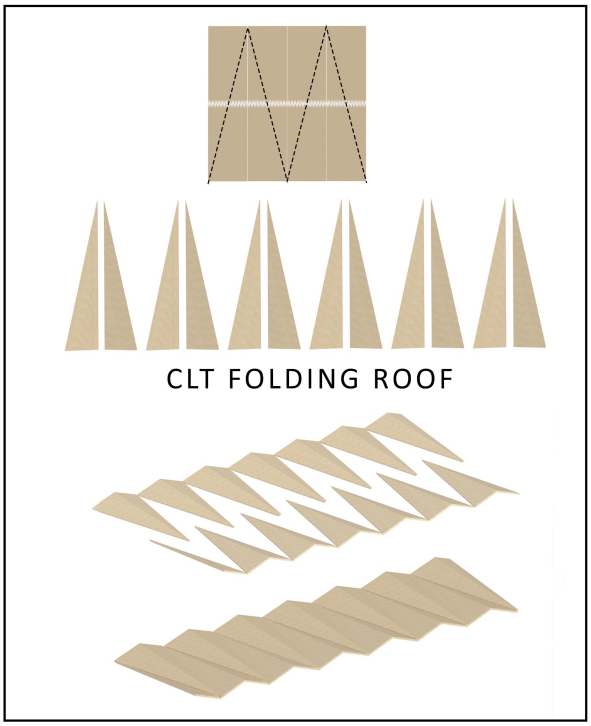


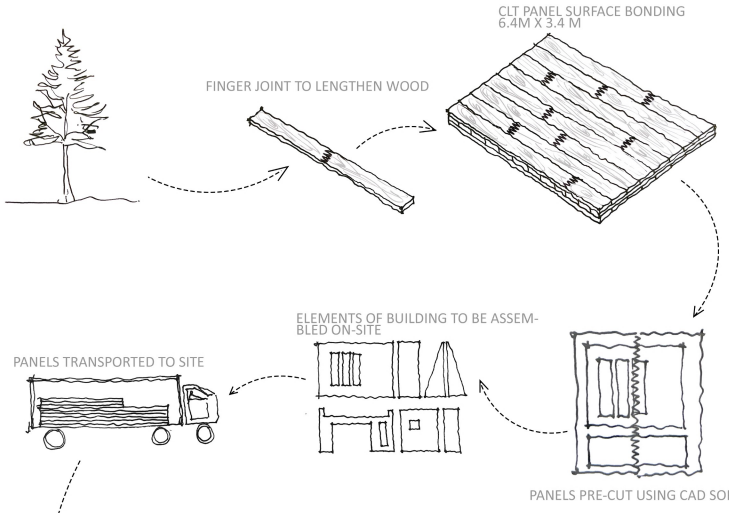
VEGETATED ROOF

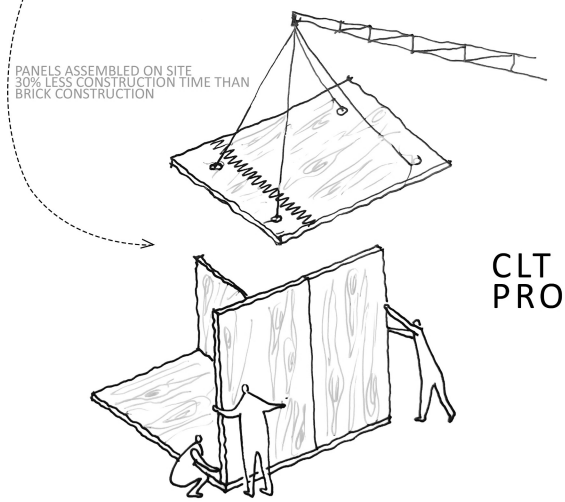
RAISED WALKWAYS

MARINE`BIRD HABITATS


GREEN ROOF SEED MIX
GREEN ROOF SUBSTRATE
FILTER LAYER
DRAINAGE LAYER
PROTECTION MAT
RETENTION TRIM
GRAVEL
SELF-ADHESIVE BITUMEN WATERPROOFING
18MM SHUTTERBOARD
RIGID POLYSTYRENE ROOF INSULATION
38X75MM TIMBER BATTENS TO FALL
VAPOUR CONTROL LAYER
CLT ROOF EDGE WITH CHARRED TIMBER FINISH
99MM CLT ROOF
38X38MM HORIZONTAL TIMBER BATTENS @ 600MM C/S WITH SEAWEED INSULATION IN-BETWEEN
25x100MM VERTICAL CHARRED TIMBER CLADDING FIXED TO TIMBER BATTENS
99MM CLT WALL PANELS
130MM XLAM CLT FLOOR PANELS
EXTERIOR HARDWOOD TIMBER WALKWAY
TIMBER BEAMS TO SUPPORT STRUCTURE ABOVE
GRANITE GABION WALLS WITH CONCRETE FOUNDATIONS TO SUPPORT STRUCTURE ABOVE







CLT PROCESS

pre-cut and assembled off-site to not interfere with animals

Less construction time

Any form can be achieved: especially a folding roof

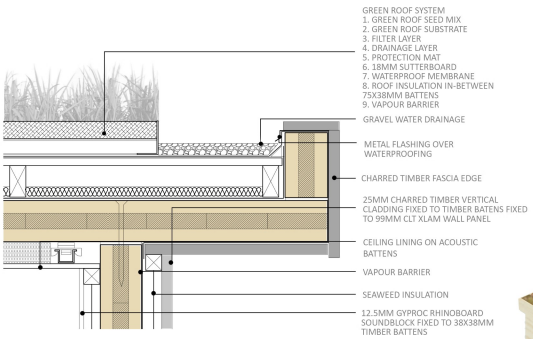
Is sustainable, reduces carbon footprint and less energy consumption

less wastage and margin for error as everything is predetermined

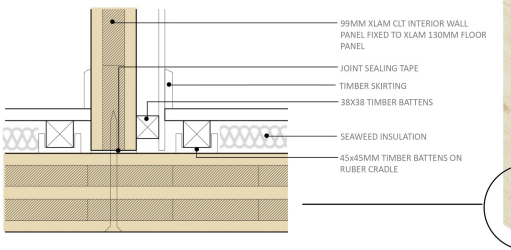
less construction time than conventional building techniques

High strength

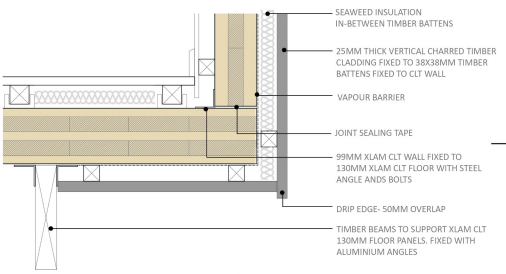
Less noise on-site to not disturb animal life



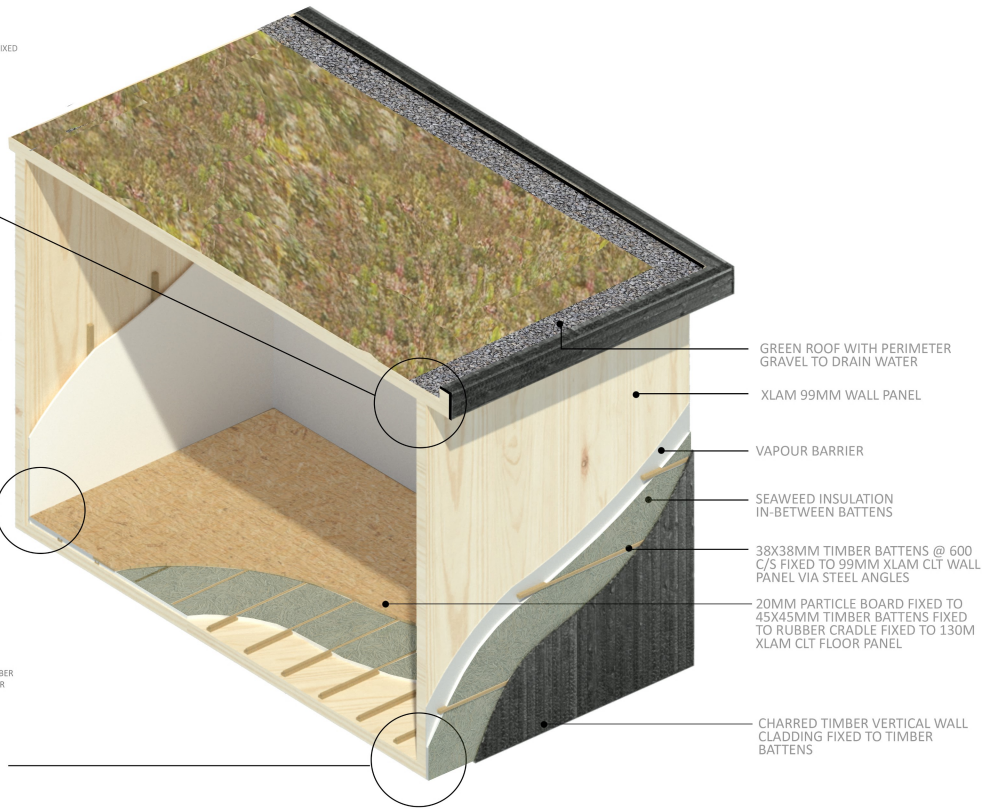
WALL TO ROOF CONNECTION [NTS]

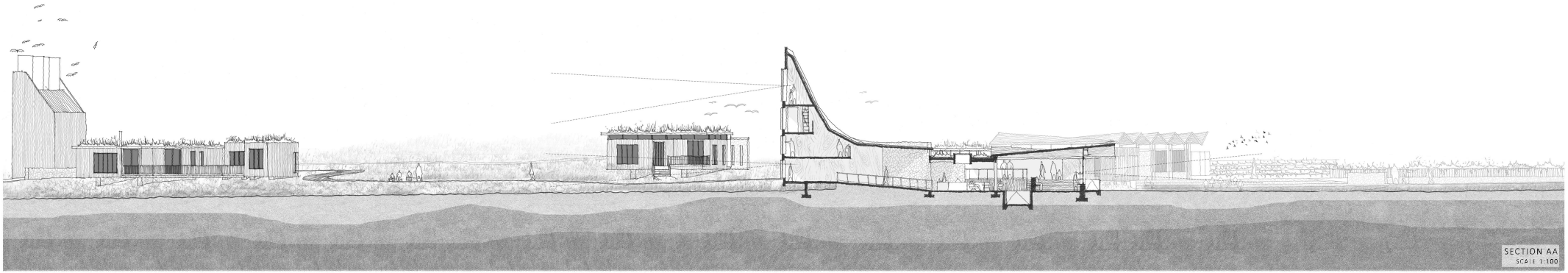


INTERIOR WALL TO FLOOR CONNECTION [NTS]

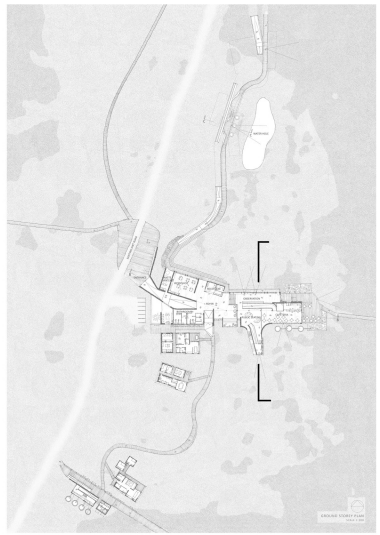


EXTERIOR WALL TO FLOOR CONNECTION [NTS]



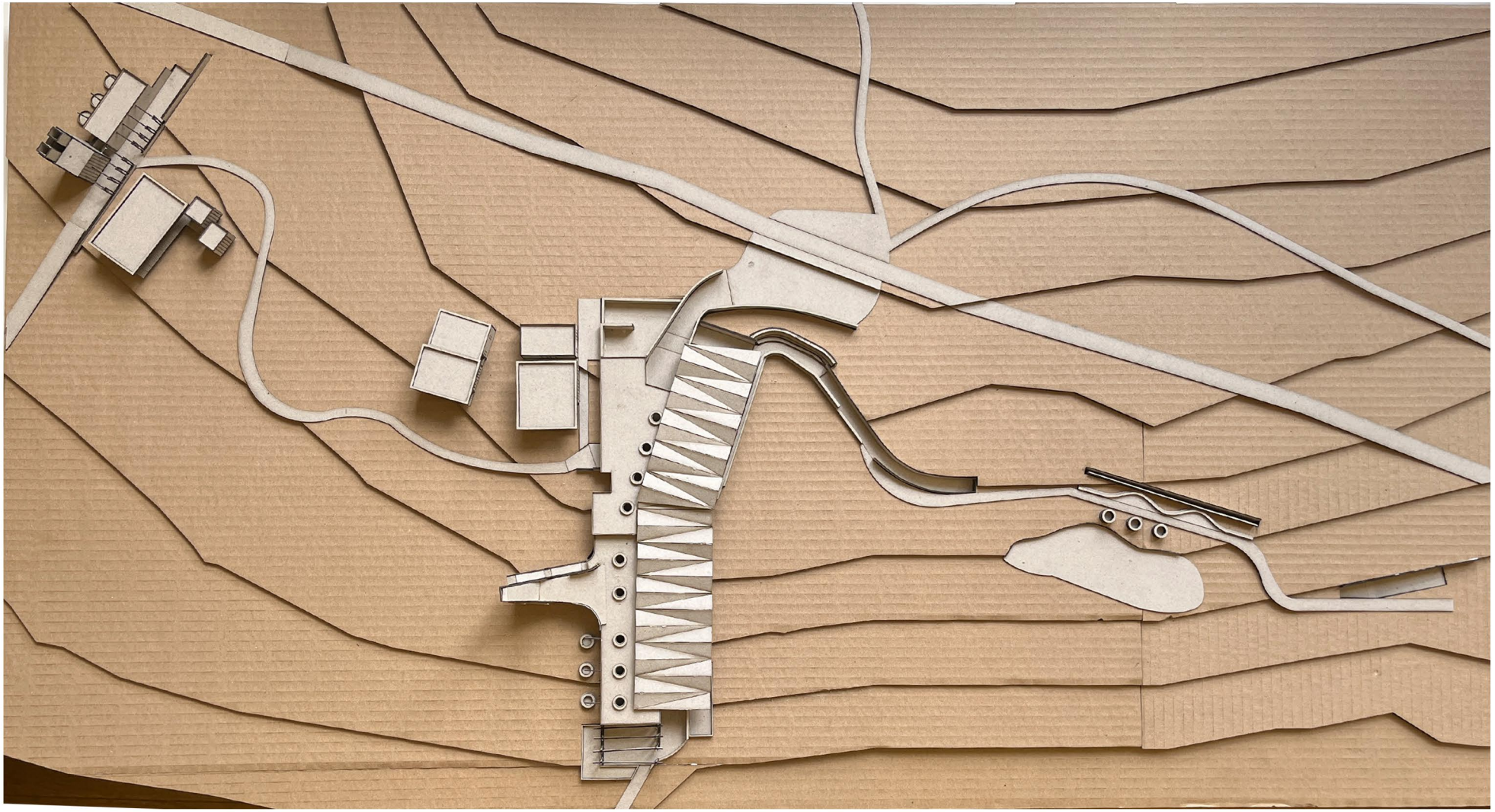


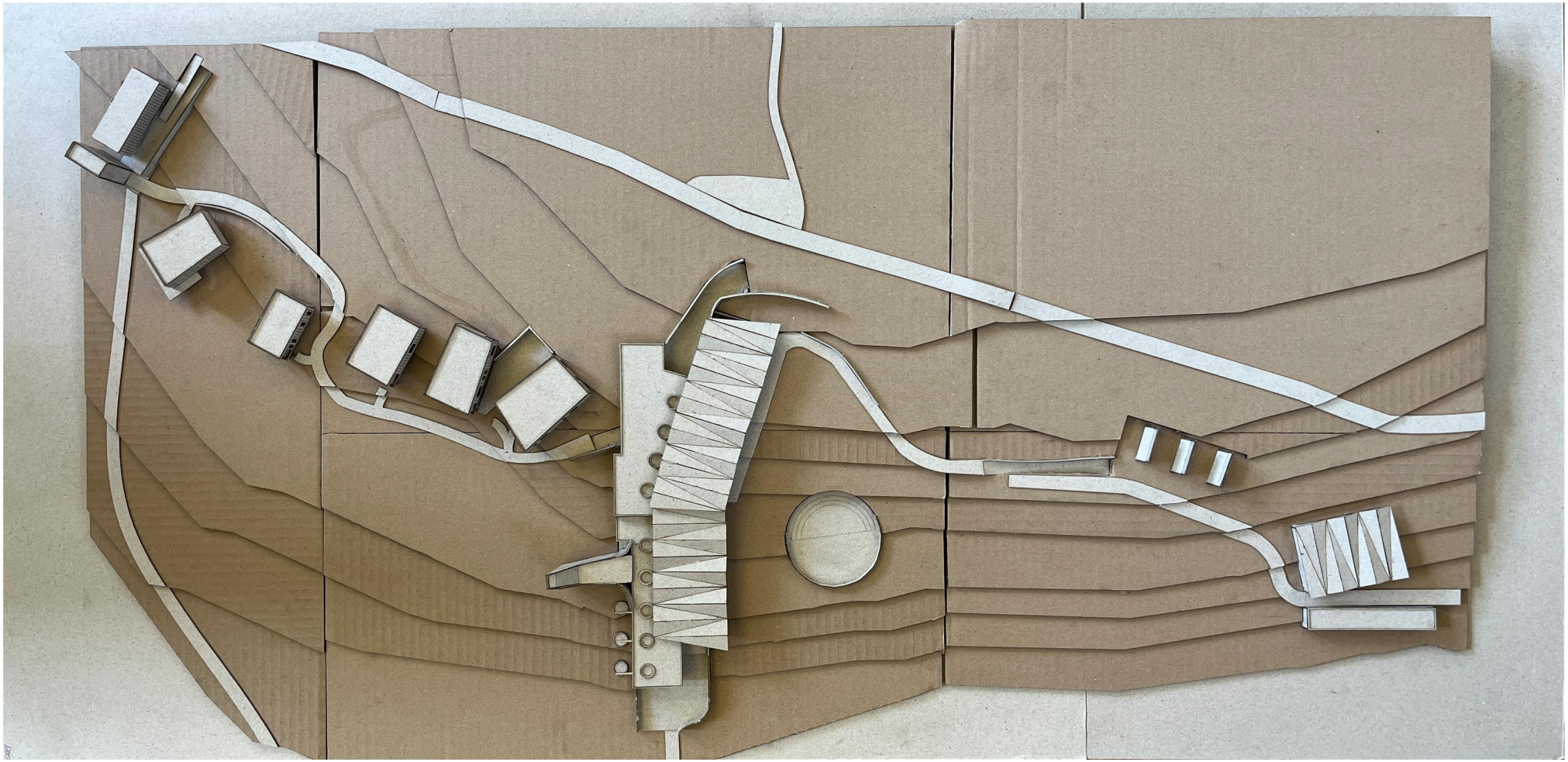
BAT TOWER | RESEARCHER ACCOMMODATION | LIFTED TIMBER WALKWAY | OCEAN RESEARCH | MAIN OBSERVATION TOWER | PUBLIC SEATING/OBSERVATION | OUTSIDE AMPHITHEATRE | WALWKAY



SALDANHA PRESERVATION AND RESEARCH CENTRE

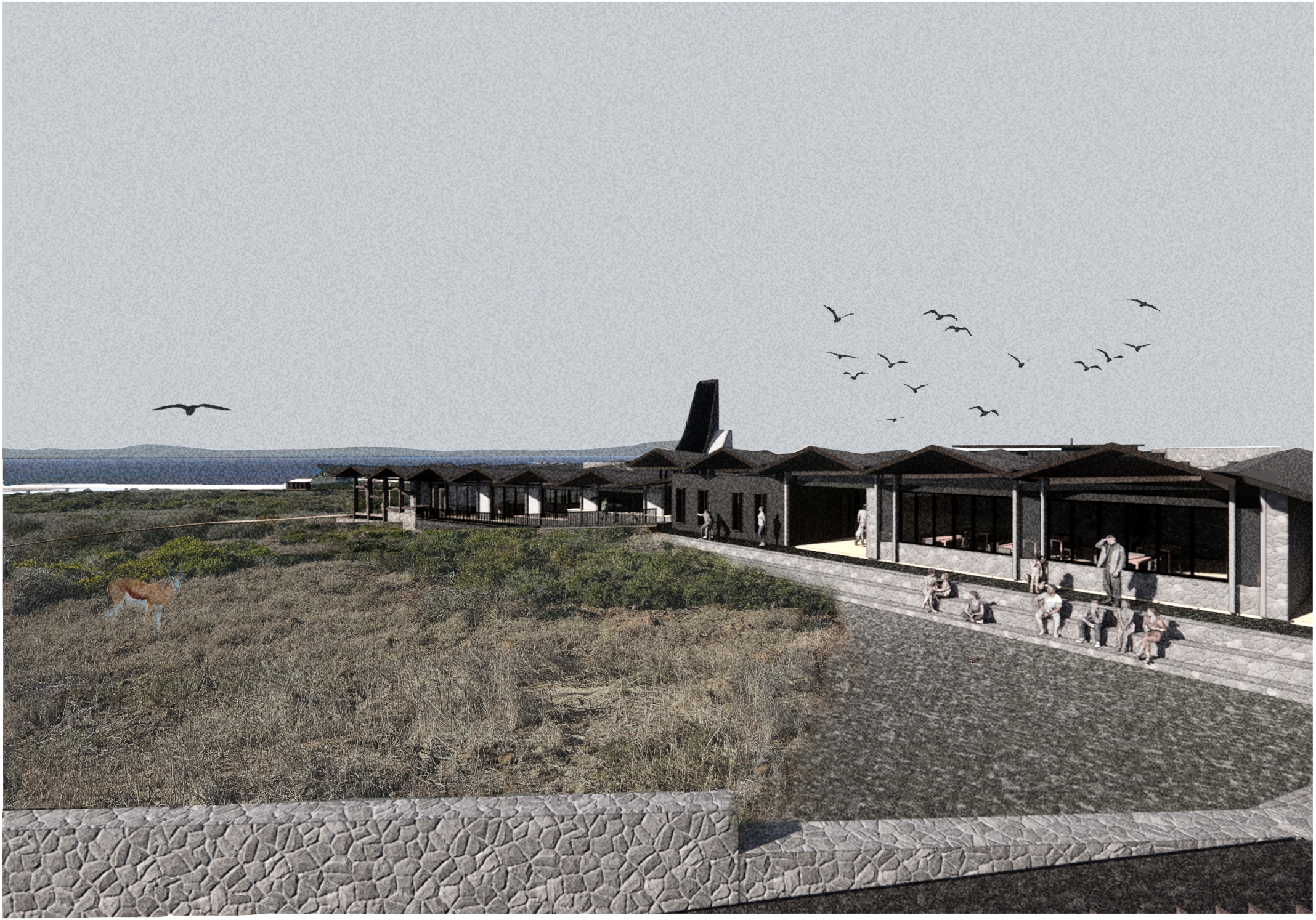
SECTION 1:20













REFERENCES

ArchDaily. (2011). *Gutman Visitor Center at the Jerusalem Bird Observatory / Weinstein Vaadia Architects*. [online] Available: https://www.archdaily.com/181290/gutman-visitor-center-at-the-jerusalem-bird-observatory-weinstein-vaadia-architects. [2022, June]

Boehnert, J. (2015). *Ecological Literacy in Design Education*. Art. 3, 8(1): 1-11. DOI: 10.7577

Boenhert. (2018). *Design, Ecology, Politics: Towards the Ecocene*. Loughnorough University. DOI:10.5040/9781474293860

Brough, E. (2017, July 19). *Enabling Community Build at Mellor Primary School*. Available: https://www.swarch.co.uk/journal/enabling-community-build-mellor-primary-school/ [2022, 2 April]

Capra, F. (2007). *Sustainable Living, Ecological Literacy, and the Breath of Life*. Canadian Journal of Environmental Education(12), 1-10.

Cheryl, L. W. (2020). *OF BRIDS AND BOUNDARIES*. National University of Singapore, Masters of Architecture, Singapore. Available: https://issuu.com/cherylwj/docs/lee_wei_jia_cheryl_a0157718u_report_compressed [2022, 1 April]

Clark BM, Massie V, Hutchings K, Laird M, Biccard A, Brown E, Duna O.O. & Turpie J (2016). *The State of Saldanha Bay and Langebaan Lagoon 2016, Technical Report*. Report No. AEC 1691/1 prepared by Anchor Environmental Consultants (Pty) Ltd for the Saldanha Bay Water Quality Forum Trust

Delancey, G. (2004). *Architecture can save the world: Building and environmental ethics*. The Philosophical Forum, 35(2), 147-159. DOI:10.1111/j.0031-806X.2004.00167.x

Demacon (2009). *Saldanha Development Zone Saldanha Development Zone Pre-Feasibility Analysis*. Cape Town: DEMACON Market Studies

Dodington, N. (2014, July 31). *Cross-Specie Design Imperative. The Expanded Environment*. Available: www.expandedenvironment.org/cross-species-imperative/ [2022, 12 March]

EXOVA. (2017). *Mellor Primary School, Mellor, Stockport*. Buckinghamshire: TRADA.

Ferreira, J. C., Vasconcelos, L., Monteiro, R., Silva, F. Z., Duarte, C. M., & Ferreira, F. (2021). *Ocean Literacy to Promote Sustainable Development Goals and Agenda 2030 in Coastal Communities*. (J. Albright, Ed.) Educ. Sci., 6211. Available: https://www.mdpi.com/2227-7102/11/2/62 [2022, 15 March]

Fothergill, A., Hughes, J., & Scholey, K. (Directors). (2020). *David Attenborough: A Life on Our Planet* [Motion Picture]. United Kingdom. [2022, 7 April]

Gunawan, S. (2015). *Synathropic Suburbia*. Thesis, University of Waterloo, Masters of Architecture, Waterloo. Available: https://issuu.com/sarahgunawan/docs/synanthropicsuburbia_sarahgunawan [2022, 18 March]

Herrington, S. (2010). *The Nature of Ian McHarg's Science*. Landscape Journal, 29(1), 1-20. DOI:10.3368/lj.29.1.1

King, R. J. (2000). E*nvironmental Ethics and the Built Environment*. Environmenta Ethics, 22, pp. 115-131. Available: https://my.vanderbilt.edu/greencities/files/2014/08/King-built-environment.pdf [2022, March 14]

Knight, T. and Tobias, N. (2019). *SPECIAL FEATURE: Local fishers and activists want Langebaan fish farms stopped —but government mussels in*. [online] Daily Maverick. Available at: https://www.dailymaverick.co.za/article/2019-10-13-local-fishers-and-activists-want-langebaan-fish-farms-stopped-but-government-mussels-in/. [2022, April]

Kopnina, H., & Shoreman-Ouimet, E. (2015). *Sustainability*. New York: Routledge. doi:10.4324/9780203109496

Leopold, A. (1949). *A Sand County Almanac and sketches here and there*. United States: Oxford University Press. doi: 0-19-500777-8

McBride, B. B., Brewer, C. A., Berkowitz, R. A., & Borrie, W. T. (2013). *Environmental literacy, ecological literacy, ecoliteracy: What do we mean and how did we get here?* Ecosphere, 4(5), 1-20. Available: http://dx.doi.org/10.1890/ES13-00075.1. [2022, 16 March]

Minteer, B. A. (2014). Environmental Ethics. (Nature Education). *Knowledge Project*. Available: https://www.nature.com/scitable/knowledge/environmental-ethics-96467512/#:~:text=Environmental%20ethics%20is%20a%20branch,sustain%20biodiversity%20and%20ecological%20systems. [2022, 14 March]

Mitchell, D. B. (2009). *A philosophical analysis of David Orr's theory of ecological literacy: Biophilia, Ecojustice and moral education in middle school learning communities.* University of Georgia, Masters of Arts, Athens.

Orr, D. (1991). *What is Education For? Six myths about the foundations of modern education, and six new principles to replace them*. The Learning Revolution(IC#27), 52-59. Available: https://www.context.org/iclib/ic27/orr/ [2022, 16 March]

Orr, D. (1992). *Place and Pedagogy*. The NAMTA Journal, 38(1):262-269. DOI:10.5822/978-1-61091-017-0_27

Orr, D. W. (1990). *Environmental Education and Ecological Literacy.* Education Digest, 55(9): 21-29. https://doi.org/10.1890/ES13-00075.1

Pintos, P. (2019). *Gallery of The Weston Visitor Centre and Gallery / Feilden Fowles - 4*. ArchDaily. Available: https://www.archdaily.com/914491/the-weston-visitor-centre-and-gallery-feilden-fowles/5ca75d27284dd1533000018a-the-weston-visitor-centre-and-gallery-feilden-fowles-photo?next_project=no. [2022, June]

Roudavski, S. (2020. *Multispecies Cohabitation and Future Design*, in Boess, S., Cheung, M. and Cain, R. (eds.), Synergy- DRS International Conference 2020, 11-14 August, Held online. https://doi.org/10.21606/drs.2020.402

Saldanha Nature & History. (2015). *WORLD WAR II HISTORY.* Available: http://saldanhanature.co.za/world_war_ii_history/. [2022, April]

Sarah Wigglesworth Architects. (2015). *Mellor Primary School.* Sarah Wigglesworth Architects. Available: https://www.swarch.co.uk/work/mellor-primary-school/ [2022, 4 April]

Serenari, C. (2021). *Reconsidering the role of the built environment in human.* Poeple and Nature, 3(1): 104-114. DOI: 10.1002/pan3.10163

Schmidt, J., Brown, P. G., & Orr, C. J. (2016). *Ethics in the Anthropocene: A research agenda*. The Anthropocene Review, 3(3): 188-200. https://doi.org/10.1177/2053019616662052

Smith, N., Bardzell, S., & Bardzell, J. (2017). *Designing for Cohabitation: Naturecultures, Hybrids, and decentering humans in design*. Supporting Local Space, 6(11): 1714-1726. DOI:10.1145/3025453.3025948

STEPHEN, V. (2018). L*ost in a sea of birds on Malgas Island*. TimesLIVE. Available: https://www.timeslive.co.za/sunday-times/lifestyle/travel/2018-10-06-lost-in-a-sea-of-birds-on-malgas-island/. [2022, April]

Taneja, N., & Gupta, K. (2015, April). *Environmental Ethics and Education- A Necessity to Include Environmental Orientated Cognizance*. International Advanced Research Journal in Science, Engineering and Technology (IARJSET), 2(1): 398-400. DOI:10.17148

United Nations World Commission on Environment and Development. (1987). *Our common future*. New York: Oxford University Press.

van der Waag, I. van der W. (n.d.). *A brief military history of the Saldanha Bay area*. capeinfo. Available: https://capeinfo.com/more/history/military-history-of-the-saldanha-bay-area. [2022, May]

Washington H, Taylor B, Kopnina H, Cryer P and Piccolo JJ (2017) *Why ecocentrism is the key pathway to sustainability*. The Ecological Citizen, 1: 35–41.

Wu, Z., Tweedley, J. R., Loneragen, N. R., & Zhang, X. (2019). *Artificial reefs can mimic natural habitats for fish and macroinvertebrates in temperate coastal waters of the Yellow Sea*. Ecological Engineering 139: 1-13. DOI:10.1016/j.ecoleng.2019.08.009 [2022, 19 March]

XLAM South Africa. (n.d.). Home. Available: https://xlam.co.za/ [2022, July]

LIST OF FIGURES

Figure 1. Author (2022). *Two sea birds* [photo]. Cape Town [2022, March]

Figure 2. Author (2022). *Cape Gannet marine bird classified as vulnerable* [collage]. Cape Town [2022, March]

Figure 3. africadotfilm. (2018). *SHORELINE: A Homebrew film nature series* [Online image]. Available : https://africa.film/shoreline-a-homebrew-films-nature-series/ [2022, 20 July].

Figure 4. Author (2022). *North Lighthouse in SAS nature reserve* [photo]. Cape Town [2022, March]

Figure 5. Author (2022). *Project Aims* [diagram]. Cape Town [created 2022, June]

Figure 6. Author (2022). *Project Challenges* [diagram]. Cape Town [created 2022, June]

Figure 7. Author (2022). *Anthropocentric vs Ecocentric world model* [diagram]. Cape Town[cretaed 2022, March]

Figure 8. Lane, B (2017). *Mellor Primary School, Mellor, Stockport*. Buckinghamshire: TRADA [2022,5 April]

Figure 9. Author (2022), adapted from Gunawan, S. 2015. *Synathropic Suburbia*. Thesis, University of Waterloo, Master of Architecture, Waterloo. Available: https://issuu.com/sarahgunawan/docs/synanthropicsuburbia_sarahgunawan [2022, 20 March]

Figure 10. Oettle. J (2022). *Educating kindergarten children about green peas* [photo]. Langebaan [2022, January]

Figure 11. Oettle. J (2022). *Kindergarten children sorting out beetroots* [photo]. Langebaan [2022, January]

Figure12. Author (2022). *The connection between humans and the landscape* [collage]. Cape Town [created 2022, June]

Figure 13. Author (2022), adapted from Serenari, C.n. 2021. *Reconsidering the role of the built environment in humans*. People and Nature (3), 104-114 [2022, March 20]

Figure 14. Author (2022). *Interrelationships between nature and knowledge* [collage]. Cape Town [2022, March]

Figure 15. Author (2022). *Relationship between the site and marine rehabilitation centres in Cape Town* [map]. Cape Town [2022, June]

Figure 16. Clark et al (2016). *The State of Saldanha Bay and Langebaan Lagoon (2016), Technical Report*. [graph]. Prepared by: Anchor Environmental Consultants (Pty) Ltd for the Saldanha Bay Water Quality Forum Trust [2016, September]

Figure 17. Clark et al (2016). *The State of Saldanha Bay and Langebaan Lagoon (2016), Technical Report* [graph]. Prepared by: Anchor Environmental Consultants (Pty) Ltd for the Saldanha Bay Water Quality Forum Trust [2016, September]

Figure 18. Author (2022). *Saldanha historical timeline* [diagram]. Cape Town [created 2022, June]

Figure 19. Hilton, T. (1949.). *The whaling Yards at Dongergat* [online image]. Flickr. Available at: https://www.flickr.com/photos/hilton-t/ [2022, May].

Figure 20. Hilton, T. (1949.). L*and Locked Harbour and Whaling Station, 63 miles from Cape Town* [online image]. Flickr. Available at: https://www.flickr.com/photos/hilton-t/ [2022, May].

Figure 21. Welman, L., Lacea, S. and Ferreira, A. eds., (2016). *Co-evolution of Saldana Bay town and its port* [image]. Stellenbosch University, South Africa. [2022, May]

Figure 22. Author (2022). *Site in relation to Cape Town*[map]. Cape Town [2022, May]

Figure 23. Author (2022). *Site Location* [map]. Cape Town [2022, May]

Figure 24. Author (2022), based on Chapman et al. 2019. *Risk and Resilience Assessment of Natural Capital in the Greater Saldanha Bay Municipality: A Navigational Tool for Strategic-Level Decision-Making*[map]. Western Cape Department of Environmental Affairs and Development Planning. DEA&DP. Cape Town [2022, May]

Figure 25. Author (2022). *Site relation to Saldanha Bay* [map]. Cape Town [2022, March]

Figure 26. Saldanha Bay Munipipality (2019). *St Helena Bay* [online image] Available: https://sbm.gov.za/category/towns-of-sbm/ [Accessed May 2022].

Figure 27. OCEANS (n.d.). *Struisbaai Oceans traditional Fishermen* [online image] . Available at: https://struisbaaioceans.co.za/gallery/ [2022, June].

Figure 28. HOME FRONT (2019). *The Saldanha Bay Industrial Development Zone* [online image]. BusinessDay. Available at: https://www.businesslive.co.za/bd/national/2019-02-19-saldanha-bays-idz--has-attracted-more-than-r3bn-in-investments/ [2022, June].

Figure 29. Author (2022). *Focus area of the site and Malgas Island* [map]. Cape Town [2022, May]

Figure 30. Author (2022), based on Google Earth, n.d. [online image]. *Ecological threats in Saldanha Bay*. Available at: https://earth.google.com/web/@0,0,0a,22251752.77375655d,35y,0h,0t,0r. Cape Town [2022, May]

Figure 31. Chapman et al. 2019. *Peacock diagram for the degradation and loss of marine aquatic biodiversity and ecosystems* [diagram]. Risk and Resilience Assessment of Natural Capital in the Greater Saldanha Bay Municipality: A Navigational Tool for Strategic-Level Decision-Making. Western Cape Department of Environmental Affairs and Development Planning. DEA&DP. Cape Town

Figure 32. Author (2022). *Ecological threats in Saldanha Bay collage* [collage]. Cape Town [created 2022, March]

Figure 33. Froneman, A. (2021). C*ape Gannet announced Bird of the Year for 2022* [online image]. Getaway. Available at: https://www.getaway.co.za/travel-news/cape-gannet-announced-bird-of-the-year-for-2022/ [2022, June].

Figure 34. Kotze, J. (2014). *Pollution of Saldanha Bay by particulate iron carried by stormwater runoff* [image].

Figure 35. Barry, C. (n.d.). *Investigation of a green substance which was noticeable in the entire bay – Saldanha side* [online image]. Available at: https://sbwqft.org.za/investigation-of-a-green-substance-which-was-noticeable-in-the-entire-bay-saldanha-side/ [2022, May]

Figure 36. Peter & Beverly Pickford Wildlife Photography (2020). *The environmentally compromised site of the now mothballed Saldanha Steel plant, 14.5km from the Boulders wind farm* [online image]. Daily Maverick. Available at: https://www.dailymaverick.co.za/article/2020-06-09-breezy-proposal-for-mothballed-saldanha-steel/ [2022, May]

Figure 37. Author (2022). *Drawing of the site* [drawing]. Cape Town [2022, March]

Figure 38. Author (2022). *Site Investigation* [drawing]. Cape Town [2022, May]

Figure 39. Author (2022). *Site weather conditions* [drawing]. Cape Town [2022, May]

Figure 40. Author (2022). *Site viewing opportunities* [drawing]. Cape Town [2022, May]

Figure 41. Author (2022). *Site access routes* [drawing]. Cape Town [2022, May]

Figure 42. Author (2022). *View from the jetty location of the bay* [photo]. Cape Town [2022, May]

Figure 43. Author (2022). *Malgas Island in the distance* [photo]. Cape Town [2022, May]

Figure 44. Author (2022). *Existing concrete jetty close to the site* [photo]. Cape Town [2022, May]

Figure 45. Author (2022). *View of Marcus Island extension* [photo]. Cape Town [2022, May]

Figure 46. Author (2022). *Inside a concrete bunker* [photo]. Cape Town [2022, May]

Figure 47. Author (2022). *View from hiking route* [photo]. Cape Town [2022, May]

Figure 48. Author (2022). *Exiting concrete bunker* [photo]. Cape Town [2022, May]

Figure 49. Author (2022). *Two concrete bunkers close to the site* [photo]. Cape Town [2022, May]

Figure 50. Author (2022). *Existing elements around the site* [map]. Cape Town [2022, May]

Figure 51. Author (2022). *Vegetation* [photo]. Cape Town [2022, May]

Figure 52. Author (2022). *Image of flower in are*a [photo]. Cape Town [2022, May]

Figure 53. Author (2022). *Dry vs green vegetation* [photo]. Cape Town [2022, May]

Figure 54. Author (2022). *Animal movement mapping* [model]. Cape Town [2022, June]

Figure 55. Author (2022). *Types of wildlife in area* [drawing]. Cape Town [2022, May]

Figure 56. Author (2022). *Mapping of viewing towers* [model]. Cape Town [2022, June]

Figure 57. Author (2022). *Animal movement vs vegetation* [diagram]. Cape Town [2022, June]

Figure 58. Author (2022). *Location of Malgas Island* [map]. Cape Town [2022, June]

Figure 59. Author (2022). *Malgas Island* [map]. Cape Town [2022, June]

Figure 60. Author 2022, based on Okes et al (2019). *Distribution of demersal hake trawlers off the west coast of South Africa in relation to the foraging range of the Cape Gannets from Malgas Island (yellow dot)* [map]

Figure 61. Author (2022). *Marine birds found on Malgas Island* [drawing]. Cape Town [2022, June]

Figure 62. SA-V (n.d.). *CAPE GANNET* [online image].SA-V. Available at: https://www.sa-venues.com/wildlife/birds_cape_gannets.php [2022, June].

Figure 63. Chadwick, P. (n.d.). *Safety Nets for South African Seabirds Hot* [online image]. AFRICAN CONSERVATION. Available at: http://www.photodestination.co.za/safety-nets-for-south-african-seabirds.html [2022, September]

Figure 64. Author (2022). *Towards a design* [diagram]. Cape Town [2022, June]

Figure 65. Author (2022). *Design principles* [drawing]. Cape Town [2022, July]

Figure 66. Author (2022). *Design brief diagram* [diagram]. Cape Town [2022, July]

Figure 67. Cook, P. (2019). *The Weston Visitor Centre and Gallery / Feilden Fowles* [online image] Archdaily. Available at: https://www.archdaily.com/914491/the-weston-visitor-centre-and-gallery-feilden-fowles/5ca75d27284dd1533000018a-the-weston-visitor-centre-and-gallery-feilden-fowles-photo?next_project=no [2022, June].

Figure 68. Author (2022), based on FEILDEN FOWLES (n.d.). *Drawings* [online image]. FEILDEN FOWLES. Available at: https://www.feildenfowles.co.uk/the-weston/ [2022, June].

Figure 69. Author (2022), based on FEILDEN FOWLES (n.d.). *Drawings* [online image]. FEILDEN FOWLES. Available at: https://www.feildenfowles.co.uk/the-weston/ [2022, June].

Figure 70. Author (2022), based on FEILDEN FOWLES (n.d.). *Drawings* [online image]. FEILDEN FOWLES. Available at: https://www.feildenfowles.co.uk/the-weston/ [2022, June].

Figure 71. Balaban, A. (2011). G*utman Visitor Center at the Jerusalem Bird Observatory / Weinstein Vaadia Architects*[online image]. Archdaily. Available at: https://www.archdaily.com/181290/gutman-visitor-center-at-the-jerusalem-bird-observatory-weinstein-vaadia-architects [2022, June].

Figure 72. Author (2022). Based on Weinstein Vaadia Architects (2011). *Gutman Visitor Center at the Jerusalem Bird Observatory / Weinstein Vaadia Architects*. Archdaily. Available at: https://www.archdaily.com/181290/gutman-visitor-center-at-the-jerusalem-bird-observatory-weinstein-vaadia-architects [Accessed Jun. 2022]

Figure 73. Author (2022). Based on Weinstein Vaadia Architects (2011). *Gutman Visitor Center at the Jerusalem Bird Observatory / Weinstein Vaadia Architects*. Archdaily. Available at: https://www.archdaily.com/181290/gutman-visitor-center-at-the-jerusalem-bird-observatory-weinstein-vaadia-architects [Accessed Jun. 2022]

Figure 74. Author (2022). Based on Weinstein Vaadia Architects (2011). *Gutman Visitor Center at the Jerusalem Bird Observatory / Weinstein Vaadia Architects*. Archdaily. Available at: https://www.archdaily.com/181290/gutman-visitor-center-at-the-jerusalem-bird-observatory-weinstein-vaadia-architects [Accessed Jun. 2022]

Figure 75. Pons, E. (2014). *Bell-Lloc Winery / RCR Arquitectes* [online image]. Archdaily. Available at: https://www.archdaily.com/536508/bell-lloc-winery-rcr-arquitectes [2022, May]

Figure 76.Bell-lloc Winery / RCR Arquitectes (13 Aug 2014). ArchDaily. Available at: <https://www.archdaily.com/536508/bell-lloc-winery-rcr-arquitectes> ISSN 0719-8884 [2022, May]

Figure 77. Bell-lloc Winery / RCR Arquitectes (13 Aug 2014). ArchDaily. Available at: <https://www.archdaily.com/536508/bell-lloc-winery-rcr-arquitectes> ISSN 0719-8884 [2022, May]

Figure 78. Author (2022). Based on Strydom, Z. (2022). Cape Gannet [interview]. 23 Jul.

Figure 79. Author (2022). *Concrete bunker* [photo]. Cape Town [2022, May]

Figure 80. Author (2022). *Hidden concrete bunker* [photo]. Cape Town [2022, May]

Figure 81. Author (2022). *Birds making nests in holes of concrete bunker* [photo]. Cape Town [2022, May]

Figure 82. Author (2022).*Bird nests in the interior of the bunker* [photo]. Cape Town [2022, May]

Figure 83. Author (2022). *Concrete bunker framing ocean views* [photo]. Cape Town [2022, May]

Figure 84. Author (2022). *View of the ocean through bunker window* [photo]. Cape Town [2022, May]

Figure 85. Author (2022). *Bunker observation* [drawing]. Cape Town [2022, May]

Figure 86. Author (2022), adapted from Gunawan, S. 2015. *Synanthropic Suburbia*. Thesis, University of Waterloo, Masters of Architecture, Waterloo. Retrieved March 18, 2022, Available: https://issuu.com/sarahgunawan/docs/synanthropicsuburbia_sarahgunawan [2022, 20 March]

Figure 87. Author (2022). *Concepts* [diagram]. Cape Town [2022, July]

Figure 88. Author (2022). *Concept model* [model]. Cape Town [2022, July]

Figure 89. Author (2022). *Route through* [model]. Cape Town [2022, July]

Figure 90. Author (2022). *Hide and reveal* [model]. Cape Town [2022, July]

Figure 91. Author (2022). *The idea of hide and reveal* [diagram]. Cape Town [2022, July]

Figure 92. Author (2022). *Preliminary drawings* [drawing]. Cape Town [2022, July]

Figure 93. Author (2022). *Archi Maki concept model* [model]. Cape Town [2022, July]

Figure 94. Author (2022). *Placement of functions on-site* [diagram]. Cape Town [2022, July]

Figure 95. Author (2022). *Preliminary floorplans* [drawing]. Cape Town [2022, July]

Figure 96. Author (2022). *Technical concept sectional models* [model]. Cape Town [2022, July]

Figure 97. Author (2022). *Preliminary section drawings* [drawing]. Cape Town [2022, July]

Figure 98. Author (2022). *Site model* [model]. Cape Town [2022, July]

Figure 99. Author (2022). *Form development* [drawing]. Cape Town [2022, July]

Figure 100. Author (2022). *Response to weather* [drawing]. Cape Town [2022, July]

Figure 101. Author (2022). *Response to topography* [drawing]. Cape Town [2022, July]

Figure 102. Author (2022). *Response to views [*drawing]. Cape Town [2022, July]

Figure 103. Author (2022). *Response to vegetation and animal movement* [drawing]. Cape Town [2022, July]

Figure 104. Author (2022). *Animal movement vs building form* [diagram]. Cape Town [2022, July]

Figure 105. Author (2022). *Perspective of the main observation tower* [drawing]. Cape Town [2022, July]

Figure 106. Author (2022). *Perspective of outside amphitheatre* [drawing]. Cape Town [2022, July]

Figure 107. Author (2022). *Site in relation to Malgas Island* [drawing]. Cape Town [2022, July]

Figure 108. Author (2022). *Site plan and site section* [drawing]. Cape Town [2022, July]

Figure 109. Author (2022). *Floorplan* [drawing]. Cape Town [2022, July]

Figure 110. Author (2022). *Public vs private* [diagram]. Cape Town [2022, July]

Figure 111. Author (2022). *Journey to Malgas Island* [map]. Cape Town [2022, July]

Figure 112. Author (2022). *Malgas Island* [map]. Cape Town [2022, July]

Figure 113. Author (2022). *Section showing main observation tower and outside amphitheatre* [drawing]. Cape Town [2022, July]

Figure 114. Author (2022). *Section showing the route through the building* [drawing]. Cape Town [2022, July]

Figure 115. Author (2022). *Control vs perception* [diagram]. Cape Town [2022, July]

Figure 116. Author (2022). *Animal habitat specs* [drawing]. Cape Town [2022, July]

Figure 117. Author (2022). *Exterior timber walkway to allow for animal movement* [drawing]. Cape Town [2022, July]

Figure 118. Author (2022), adapted from Brough, E. 2017. *Enabling Community Build at Mellor Primary School*. Available: https://www.swarch.co.uk/journal/enabling-community-build-mellor-primary-school/ [2022, 2 April]

Figure 119. Lane, B (2017). *Mellor Primary School, Mellor, Stockport.* Buckinghamshire: TRADA [2022,5 April]

Figure 120. Author (2022), adapted from Wigglesworth Architects. 2017. *Mellor Primary School, Mellor, Stockport*. Buckinghamshire: TRADA [2022,5 April]

Figure 121. Author (2022), adapted from Brough, E. 2017. *Enabling Community Build at Mellor Primary School*. Available: https://www.swarch.co.uk/journal/enabling-community-build-mellor-primary-school/ [2022, 2 April]

Figure 122. Author (2022). *Animal habitats incorporated in the design* [drawing]. Cape Town [2022, July]

Figure 123. Author (2022). *Breakwater plan and section* [drawing]. Cape Town [2022, July]

Figure 124. Author (2022), adapted from SCENARIO JOURNAL n.d., *Living Breakwaters*. Available: https://scenariojournal.com/strategy/living-breakwaters/ [2022, 8 April]

Figure 125. Spagnolo, A. 2015. *FAO- GFCM, STUDIES AND REWIES: PRACTICAL GUIDELINES FOR THE USE OF ARTIFICIAL REEFS IN THE MEDITERRANEAN AND THE BLACK SEA, 96*. Available: https://www.researchgate.net/figure/Examples-of-production-artificial-reef-modules-A-France-B-Tunisia-C-Spain-D_fig3_292142332 [2022, 13 April]

Figure 126. Author (2022). *Replacing materials removed during construction* [drawing]. Cape Town [2022, July]

Figure 127. Auhtor (2022). Based on XLAM (n.d.). *What are the advantages?* XLAM. Available at: https://xlam.co.za/ [2022, August]

Figure 128. Snyman (2021). *Example of CLT wall construction* [photo]. Cape Town [2022, September]

Figure 129. Author (2022). *Pre-cut CLT pieces transported to the site* [diagram]. Cape Town [2021, July]

Figure 130. XLAM (n.d.). *What are the advantages?* XLAM. Available at: https://xlam.co.za/ [Accessed Aug. 2022]

Figure 131. Author (2022). *Normal timber vs CLT construction comparison* [diagram]. Cape Town [2021, July]

Figure 132. Author (2022). D*ifferent construction techniques to respect environment* [diagrams]. Cape Town [2022, July]

Figure 133. Author (2022). *Dry sea bamboo* [photo]. Cape Town [2022, May]

Application for Approval of Ethics in Research (EiR) Projects
Faculty of Engineering and the Built Environment, University of Cape Town

ETHICS APPLICATION FORM

Please Note:
Any person planning to undertake research in the Faculty of Engineering and the Built Environment (EBE) at the University of Cape Town is required to complete this form **before** collecting or analysing data. The objective of submitting this application *prior* to embarking on research is to ensure that the highest ethical standards in research, conducted under the auspices of the EBE Faculty, are met. Please ensure that you have read, and understood the **EBE Ethics in Research Handbook** (available from the UCT EBE, Research Ethics website) prior to completing this application form: http://www.ebe.uct.ac.za/ebe/research/ethics1

APPLICANT'S DETAILS		
Name of principal researcher, student or external applicant		TILANIE OETTLE
Department		ENGINEERING AND THE BUILT ENVIRONMENT
Preferred email address of applicant:		OTTTIL001@myuct.ac.za
If Student	Your Degree: e.g., MSc, PhD, etc.	MArch (Prof)
	Credit Value of Research: e.g., 60/120/180/360 etc.	120
	Name of Supervisor (if supervised):	MIKE LOUW
If this is a researchcontract, indicate the source of funding/sponsorship		N/A
Project Title		DECENTERING HUMANS: A multi-specie cohabitation approach

I hereby undertake to carry out my research in such a way that:

- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

APPLICATION BY	Full name	Signature	Date
Principal Researcher/ Student/External applicant	TILANIE OETTLE		10/05/2022
SUPPORTED BY	Full name	Signature	Date
Supervisor (where applicable)	MIKE LOUW		10/05/2022

APPROVED BY	Full name	Signature	Date
HOD (or delegated nominee) Final authority for all applicants who have answered NO to all questions in Section 1; and for all Undergraduate research (Including Honours).			
Chair: Faculty EIR Committee For applicants other than undergraduate students who have answered YES to any of the questions in Section 1.	Prof. H. von Blottnitz		4 July 2022